



36TH EUROPEAN
CONFERENCE CETACEAN
SOCIETY

NAVIGATING WATER OF CHANGE

BOOK OF ABSTRACTS

Azores 2025



ABSTRACT BOOK EDITION

Editors: Afonso Prestes, Catarina Gonçalves, Ayça Eleman, Marc Tolosa, Margarida Rolim, Laura González García.

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Graphic designers: Myriam El Assil, Marc Tolosa, Margarida Rolim

First logo designer: Beatriz Brilhante

Photographers credited in the abstract book and conference layouts: Anxo Cao, Marc Tolosa, Sanne Bakers, Francisco Garcia, Beatriz Silva, David Rodrigues, Laura González García, Pablo Varona, Alexandre Madruga, Rafael Martins, Seán O’Callaghan, Bert Soëhn.

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How to cite:

Prestes ACL, Gonçalves C, Eleman A, Tolosa M, Rolim M, González García L (2025). Navigating Waters of Change. Book of Abstracts. 36th Conference of European Cetacean Society. Ponta Delgada, Azores, Portugal. 586 p.



FOREWORD

Navigating Waters of Change

Azoreans, as oceanic islanders settled at this hotspot for cetaceans in the mid-Atlantic, are first-degree witnesses of the undeniable changes in our ocean and its inhabitants. Our motto, “Navigating Waters of Change”, is inspired by the Azores. The Azores as an essential piece of the distribution puzzle of Atlantic cetaceans, as a crossroad in oceanic migration corridors and as a link between Atlantic regions. The successful transition from whaling to whale-watching 30 years ago already evidenced the genuine nature of the Azorean society, historically and culturally connected with whales, that still maintains this intertwined coexistence nowadays.

However, worldwide, we are living in unprecedented times. Human pressures are crossing planetary boundaries, creating impacts that threaten long-term environmental stability. While the oceans have served as a critical buffer against many of these impacts, they do so at a considerable cost - one that is altering oceanographic processes and affecting marine biodiversity. Advances in technology, along with the growing involvement of stakeholders traditionally outside the research sphere, are enabling us to record more data than ever before. Citizen scientists, industry partners, and automated monitoring systems are expanding the scope and scale of data collection, offering new opportunities to enhance our understanding of marine ecosystems. Now more than ever, we must foster fresh and innovative ideas, strengthen collaboration, and maximise the potential of our scientific and human resources.

As we look to the future, we are committed to take action and ensure proper science to support appropriate decisions at the highest level. Let’s foster synergies to solve the most urgent needs with the best available tools. Let’s engage in meaningful discussions. Let’s work together. Let’s get inspired by all the presenters and participants at the 36th ECS.

Laura González García

Chair of the Local Organising Committee

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Volunteer Coordinator: Margarida Rolim

MON. 12

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9:00 - 13:00

VARIABLE COFFEE
BREAK SCHEDULE

LUNCH
13:00 - 14:00

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14:00 - 18:00

VARIABLE COFFEE
BREAK SCHEDULE

MOVIE SESSION
20:00 - 22:00

TUE. 13

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9:00 - 13:00

VARIABLE COFFEE
BREAK SCHEDULE

LUNCH
13:00 - 14:00

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14:00 - 18:00

VARIABLE COFFEE
BREAK SCHEDULE

ICE BREAKER
20:30 - 22:30

WED. 14

OPENING
9:00 - 9:20

KEYNOTE
LUKE RENDELL
9:30 - 10:15

SESSION 1:
ABUNDANCE, HABITAT
& DISTRIBUTION I
10:15 - 10:45

COFFEE BREAK
10:45 - 11:30

SESSION 2:
BEHAVIOUR & ECOLOGY I
11:30 - 13:00

LUNCH
13:00 - 14:30

SESSION 3:
HUMAN INTERACTIONS &
CLIMATE CHANGE I
14:30 - 15:45

COFFEE BREAK
15:45 - 16:30

SESSION 4:
CONSERVATION &
MANAGEMENT I
16:30 - 17:30

POSTER SESSION 1
ODD CODE NUMBERS
17:30 - 19:00

ART & SCIENCE
CETACEANS HARMONY
20:00

STUDENT PARTY
22:00

THU. 15

KEYNOTE
CRISTINA BRITO
9:00 - 9:45

SESSION 5:
BEHAVIOUR
9:45 - 10:45

COFFEE BREAK
10:45 - 11:30

SESSION 6:
PHYSIOLOGY, HEALTH &
WELFARE
11:30 - 13:00

LUNCH
13:00 - 14:30

SESSION 7:
ABUNDANCE, HABITAT
& DISTRIBUTION II
14:30 - 15:45

COFFEE BREAK
15:45 - 16:30

SESSION 8:
HUMAN INTERACTIONS &
CLIMATE CHANGE II
16:30 - 17:30

POSTER SESSION 2
EVEN CODE NUMBERS
17:30 - 19:00

STUDENT AGM
19:00 - 20:30

MOVIE NIGHT
20:30 - 22:30

FRI. 16

KEYNOTE
JOE ROMAN
9:00 - 9:45

SESSION 9:
CONSERVATION &
MANAGEMENT II
9:45 - 10:45

COFFEE BREAK
10:45 - 11:30

SESSION 10:
ABUNDANCE, HABITAT
& DISTRIBUTION III
11:30 - 12:40

LUNCH
12:45 - 14:15

SESSION 11:
GENETICS & EVOLUTION
14:15 - 14:55

SESSION 12:
EMERGING TOPICS
14:55 - 16:00

COFFEE BREAK
16:00 - 16:45

ANNUAL GENERAL
MEETING + CLOSING
CEREMONY
16:45 - 19:00

DOCUMENTARY
LATITUDES OF CHANGE
18:00

BANQUET
20:30

DANCING
23:00

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TEATRO MICAELENSE
CLUBE NAVAL PONTA D.
BPAR PONTA DELGADA
AZORIS ROYAL GARDEN

PORTAS DO MAR
RAIZ BAR
COLISEU MICAELENSE
IGREJA DO COLÉGIO



SCIENTIFIC PROGRAM

PLENARY SESSIONS

Teatro Micaelense (Rua de São João, 9500-106, Ponta Delgada)

DAY 1 – Wednesday, May 14th

8:00 9:00 Registration

Opening Ceremony

9:00 9:20

- **Laura González García**, Chair of the Local Organising Committee
- **Mónica Silva**, Chair of the Scientific Committee
- University of the Azores Representative
- Government Representative
- Municipality Representative
- **Tilen Genov**, Chair of the European Cetacean Society

9:30 10:15 Luke Rendell

Changing perspectives on human and cetacean cultures

10:15 10:40 **SESSION 1: Abundance, Habitat & Distribution I** (moderated by Tilen Genov)

10:15	10:27	Oral	Northern bottlenose whales (<i>Hyperoodon ampullatus</i>) make migration roundtrips between the Nordic Seas and the Azores	Paul J. Wensveen
10:27	10:40	Oral	Distributional changes of small cetaceans in European Atlantic waters and the North Sea from SCANS-IV in 2022	Anita Gilles



10:40	10:45	Short	Migration of male sperm whales from the Barents and the Norwegian Seas	Marie-Anne Blanchet
10:45	11:30	Coffee break		
11:30	13:00	SESSION 2: Behaviour & Ecology I (moderated by Joe Roman)		
11:30	11:42	Oral	Impact of baleen whales on ocean primary production	Carla Freitas
11:42	11:55	Oral	Tracing time's footprints: exploring feeding ecology and historical changes of Mediterranean common dolphin (<i>Delphinus delphis</i>) over two centuries	Martina Pasino
11:55	12:07	Oral	Cetacean-driven carbon dynamics in the Pelagos Sanctuary	Arianna Azzellino
12:07	12:20	Oral	3D acoustic tracking of marine mammals: exploring diving and foraging behaviour in tidal rapid environments	Katie Rapson
12:20	12:32	Oral	Ecology, energy and effort: Variations in facultative opportunistic feeding of the common dolphin in the Celtic Seas ecoregion	Sofia Albrecht
12:32	12:37	Short	A comparative review on harbour porpoise foraging behaviour and methods; A case study in the Belgian part of the North Sea	Sofya Aoufi
12:37	12:42	Short	Temperature-based habitat segregation between common and Atlantic spotted dolphins in Azorean waters	Maria Inês Pinheiro da Silva



12:42	12:47	Short	Movements, diving behavior and group fidelity of long-finned pilot whales (<i>Globicephala melas</i>) in northern Norway	Faith Cunningham
12:47	13:52	Short	Length matters: Morphology as indicator of foraging behavior in Galápagos sea lions	Svenja Stoehr

13:00 14:30 Lunch

14:30 15:45 SESSION 3: Human Interactions and Climate Change I (moderated by Mark Simmonds)

14:30	14:42	Oral	Adapting to the Anthropocene: Challenges of a small cetacean in a warming ocean	Nadya C. Ramírez-Martínez
14:42	14:55	Oral	Evaluating the impact of underwater noise on cetacean habitats in the Mazarrón Escarpment (Spain)	Amalia Jurado-Mc Allister
14:55	15:07	Oral	Poor body condition of bottlenose dolphins foraging with shrimp trawlers	Lorenzo Fiori
15:07	15:20	Oral	Systematic approach to evaluate pinger's effectiveness in the reduction of dolphin bycatch in the pair trawl fishery in the Bay of Biscay	Elsa Cuende de Francisco
15:20	15:25	Short	The loud side of Carbon Capture and Storage (CCS) - Effects of seismic surveys on harbour porpoises	Tim Taugnitz
15:25	15:30	Short	Assessing the vulnerability of common dolphin population to bycatch: bias in the sex and age of the individuals caught in the Bay of Biscay	Amaia Astarloa

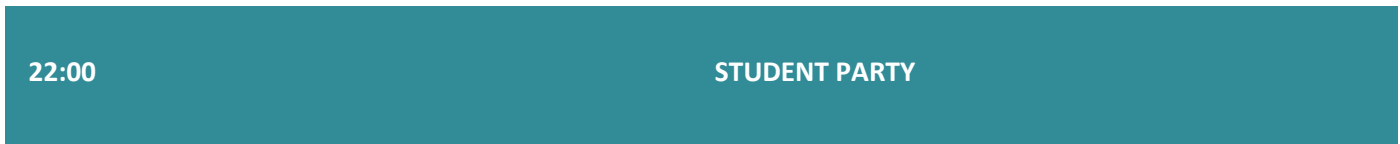
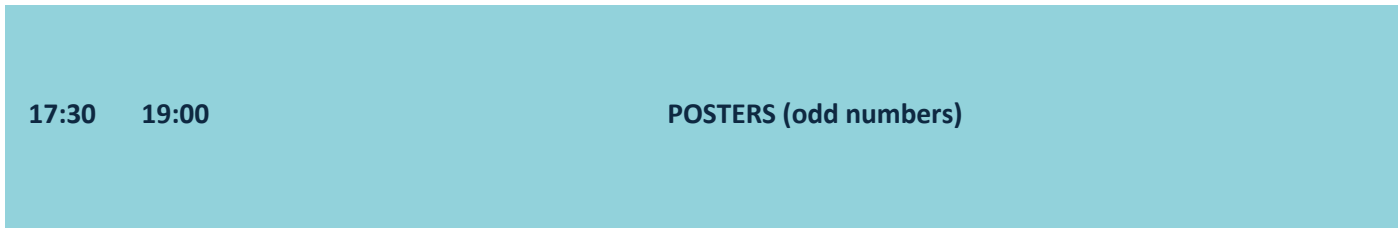


15:30	15:35	Short	Beluga and walrus vocal reactions to vessel traffic in a proposed marine protected area	Veronica L.M. Coppolaro
15:35	15:40	Short	Anthropic Pressure on Cetaceans Stranded Along the Ligurian Coast Within the Pelagos Sanctuary: A Case Series	Virginia Mattioda
15:40	15:45	Short	Assessing the behavioural response of humpback whales to variable vessel practices in Skjálfandi Bay, Iceland	Thomas Grove

15:45 16:30 Coffee break

16:30 17:30 SESSION 4: Conservation and Management I (moderated by Luís Freitas)

16:30	16:42	Oral	Whalers in “A Post-Whaling World”: Conservation Needs of Marine Mammals and Sustainable Development Needs of Whaling Communities in the Wider Atlantic	Russell Fielding
16:42	16:55	Oral	Less talk and more action: while science improves our understanding of threats to Hawaiian false killer whales, managers fail to act	Robin Baird
16:55	17:07	Oral	Shifts in habitat suitability for harbour porpoises leads to reduced importance of Marine Protected Areas	Floris van Beest
17:07	17:20	Oral	Operationalizing the Conservation of Cetacean Cultures – challenges and opportunities	Mark Peter Simmonds
17:20	17:25	Short	Shifting spatial patterns of Southern Right Whales in Brazilian calving grounds: implications for conservation and management	Marina Batochio



DAY 2 - Thursday, May 15th

9:00	9:45	Cristina Brito	<i>W is for World, Water and Whale:</i> <i>Blue Humanities and Marine Mammal Conservation</i>

9:45 10:45 SESSION 5: Behaviour (moderated by Mónica A. Silva)

9:45	9:57	Oral	Anonymous societies and cultures of open-ocean cetaceans, especially sperm whales	Hal Whitehead
9:57	10:10	Oral	From Quantity to Quality: How social selectivity increases with age in bottlenose dolphins	Bruno Díaz López
10:10	10:22	Oral	Behavioural responses of killer whales to long-finned pilot whales: insights into acoustic mediation	Anna Selbmann
10:22	10:35	Oral	Age-sex segregation in mediterranean goose-beaked whale (<i>Ziphius cavirostris</i> G. Cuvier, 1823)	Massimiliano Rosso





10:35	10:40	Short	Coda patterns of sperm whales (<i>Physeter macrocephalus</i>) in the Gulf of Catania, South-Western Ionian Sea, Italy	Davide Michel Lelong

10:40	10:45	Short	Non-coda vocalizations produced in social context by sperm whales in the Azores	Simone Guipini

10:45	11:30	Coffee break		

11:30	13:00	SESSION 6: Physiology, Health and Welfare (moderated by Manuel Arbelo)		

11:30	11:42	Oral	Declining reproductive health in fin whales (<i>Balaenoptera physalus</i>) in the Gulf of St Lawrence	Devonne Gardiner

11:42	11:55	Oral	Energy expenditure of humpback whale mother-calf pairs: insights from biologging tags and UAS-photogrammetry	Augusta Hollers

11:55	12:07	Oral	Investigating the blubber proteome of mass stranded pilot whales: towards novel health biomarkers	Alexandra Tranganida

12:07	12:20	Oral	Sharing is caring? – Pathogens and pathogen-specific antibodies in Arctic endemic seal species and the newly sympatric harbour seals in Kongsfjorden, Svalbard	Luca Schick

12:20	12:32	Oral	Challenges and Lessons Learned in Small Cetacean Disentanglement: The case of a short-finned whale calf in Tenerife, Spain	Nakita Câmara

12:32	12:45	Oral	Fungal colonization and drug resistance in bottlenose dolphins: A new frontier in marine mammal health with One Health implications	Victor Garcia-Bustos



12:45	12:50	Short	Sea temperature and pollution are associated with increased risk of infectious disease mortality in short-beaked common dolphins (<i>Delphinus delphis</i>)	Rosie Williams
12:50	12:55	Short	Experience in biomonitoring contaminants in cetacean from the western Mediterranean. Fifty years of study on Murcia coastline.	Emma Martínez-López
12:55	13:00	Short	Mercury influx to Greenland societies from the hunt of toothed whales over three decades (1993-2020)	Rune Dietz

13:00 14:30 Lunch

14:30 15:45 SESSION 7: Abundance, Habitat & Distribution II (moderated by Emer Rogan)

14:30	14:42	Oral	Spatially-Explicit Cetacean Abundance Estimates from Multiple Data Sources in the Mediterranean	Ana Cañadas
14:42	14:55	Oral	Redistribution of baleen whales after a regime shift in the Southeast Greenland marine ecosystem	Mads Peter Heide-Jørgensen
14:55	15:07	Oral	Passive acoustic monitoring - investigating the power to detect changes in relative density of small cetaceans between years	Signe Sveegaard
15:07	15:20	Oral	Trap and release - satellite tagging of minke whales to study seasonal migration in the North Atlantic	Jonas Teilmann
15:20	15:25	Short	Ocean gliders for passive acoustic monitoring of odontocetes in the Cabrera Archipelago National Park, Western Mediterranean	Greta Jankauskaite



15:25	15:30	Short	Mum Power: Insights into the role of female Antarctic fur seals in mitigating predation risk	Ane Liv Berthelsen
15:30	15:35	Short	Modelling the abundance of deep-diving cetaceans in the Azores	Catarina T. Fonseca
15:35	15:40	Short	Influence of the water depth on the detection probability of click loggers (C-PODs) in harbour porpoise monitoring in the German Baltic Sea	Léon Rostock
15:40	15:45	Short	Whale abundance in relation to capelin abundance in East Greenlandic waters in autumn	Gudjon Mar Sigurdsson

15:45 16:30 Coffee break

16:30 17:30 SESSION 8: Human Interactions and Climate Change II (moderated by Anita Gilles)

16:30	16:42	Oral	Marine Mammals in the Anthropocene: developing a systematic evidence base of threats to nineteen North Atlantic species	Emily Hague
16:42	16:55	Oral	From torpedoes to pingers: a two centuries-long perspective on the management of interactions between fisheries and small cetaceans in the French Bay of Biscay	Marie Petitguyot
16:55	17:07	Oral	Integrating neural networks to aid remote monitoring of Mediterranean monk seal-vessel interactions	Angela Amlin
17:07	17:20	Oral	Trade partnership analyses can recover illegal wildlife product commodity chain structures and estimate bycatch mortality rates for Caspian seals	Simon Goodman



17:20	17:25	Short	Shipping noise propagation modelling in deep ocean areas using open source data.	Fran Félix Z.
17:25	17:30	Short	Mapping areas of potential cetacean-fisheries conflict in the north coast of mainland Portugal	Beatriz Barbieri

17:30	19:00	POSTERS (even numbers)		

19:00	20:30	STUDENTS AGM		

20:30	MOVIE NIGH			

DAY 3 - Friday, May 16th

9:00	9:45	Joe Roman	<i>Lifting Baselines: Marine Mammal Recovery, Ecological Function, and the Consequences of Conservation Success</i>	

9:45	10:45	SESSION 9: Conservation and Management II (moderated by Laura González García)		

9:45	9:57	Oral	Multi-year acoustic monitoring reveals fine-scale habitat preferences of harbour porpoise (<i>Phocoena phocoena</i>) and species decline within a Special Area of Conservation.	Nicole Todd



9:57	10:10	Oral	A twenty yr photoidentification study reveals low survival and rapid demographic decline for bottlenose dolphins (<i>Tursiops truncatus</i>) living in the Aeolian archipelago (Italy)	Monica Francesca Blasi
10:10	10:22	Oral	Inter-annual, seasonal and diel changes in North Atlantic right whale diving behaviour present challenges for estimating entanglement and collision risks, and availability bias	Véronique Lesage
10:22	10:35	Oral	Plastic ingestion by marine mammals: The current state of knowledge, future research priorities and call to action	Sarah Nelms
10:35	10:40	Short	Exposure of short-finned pilot whales (<i>Globicephala macrorhynchus</i>) to high-amplitude vessel noise in the Teno-Rasca Special Area of Conservation (Canary Islands, Spain)	Carla Rubio
10:40	10:45	Short	Using photogrammetry to assess Mediterranean sperm whale body condition supports the presence of a breeding ground in the waters off Menorca, Balearic Islands	Daniel Norena Medina

10:45 11:30

Coffee break

11:30 12:45 Session 10: Abundance, Habitat & Distribution III (moderated by Cristina Brito)

11:30	11:42	Oral	Tracking Bryde's Whales: Movement and Behavior in the Central North Atlantic	Luís Freitas
11:42	11:55	Oral	Comparative analysis of harbour porpoise density from parallel observer-based and digital aerial surveys: challenges and opportunities	Dominik Nachtsheim
11:55	12:07	Oral	Non-local conditions drive baleen whale migration phenology at a key stopover site in the North Atlantic	Sergi Pérez-Jorge

12:07	12:12	Short	Characterizing Fraser's dolphin (<i>Lagenodelphis hosei</i>) in the Lesser Antilles: Distribution, movements and co-occurrence to inform conservation strategies in the Caribbean.	Lucas Bernier
12:12	12:17	Short	Systematic Efforts Reveal a New Cetacean Biodiversity Hotspot in Tanzania	Ekaterina Kalashnikova
12:17	12:22	Short	Humpback Whales (<i>Megaptera novaeangliae</i>) of the Cabo Verde Islands: Migratory Patterns, Distribution and Population Abundance	Frederick Wenzel
12:22	12:27	Short	Assessing the distribution and migration patterns of pygmy blue whales in the western Indian Ocean based on passive acoustic monitoring on multiple years and sites	Flore Samaran
12:27	12:32	Short	Sperm whale movements and habitat preferences in the Azores	Mareike Duffing Romero
12:32	12:37	Short	Residency patterns of common bottlenose dolphin (<i>Tursiops truncatus</i>) In Natura 2000 SCI in the Central Adriatic Sea	Maša Frleta-Valić

12:45 14:15 Lunch

14:15 15:07 SESSION 11: Genetics and Evolution (moderated by André Moura)

14:15	14:27	Oral	From fluke to food web: internationally optimized eDNA sampling protocol for whale watching platforms reveals marine ecological networks in the Azores	Lauren Rodriguez
14:27	14:40	Oral	The evolutionary ecology and demographic history of narwhals	Marie Louis

14:40	14:52	Oral	Monitoring the gut microbiota from birth until weaning in a declining Antarctic pinniped	Petroula Botsidou
14:52	14:57	Short	Spatiotemporal monitoring of Northeast Atlantic cetaceans and their predator-prey interactions through environmental genetics	Cristina Claver
14:57	15:02	Short	Genomic diversity associated with morbillivirus susceptibility in <i>Stenella coeruleoalba</i>	Cátia S. E. Silva
15:02	15:07	Short	From whales to medicine: exploring Cetacea evolution and physiology as models for human diseases	Nádia Artilheiro

15:07 16:00 **SESSION 12: Emerging Topics** (moderated by Rui Prieto)

15:07	15:19	Oral	Southern elephant seals give new insight in cetacean presence and feeding habitats in the Southern Ocean	Anatole Gros-Martial
15:19	15:31	Oral	Toward Real-Time Detection of Harbour Porpoises in Passive Acoustic Data: An adaptable framework for the detection and classification of marine mammals	Ellen White
15:31	15:36	Short	A new era in high seas conservation: the opportunities and risks of artificial intelligence for governance of high seas marine protected areas	Jennifer Daan Petronella de Leur
15:36	15:41	Short	Estimating lipid store mass of free-ranging whales in vivo using drone photogrammetry and biologging tags	Alec Burslem
15:41	15:46	Short	Advancing killer whale vocalization analysis: a neural network approach for categorizing single- and two-voiced calls	Tatiana Marie Joséphine Marchon

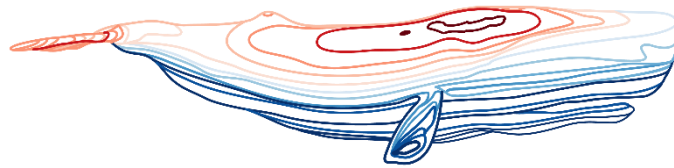


Investigating Alzheimer’s Disease-like neuropathology in
Bottlenose and Striped dolphins in Italy: the role of viral co-
morbidities in Amyloid- β Deposition.

15:46 15:51 Short

Camilla Testori

16:00	16:45	Coffee break
16:45	18:30	<i>European Cetacean Society Annual General Meeting</i>
18:30	19:00	Closing Ceremony
20:30		BANQUET & DANCING <i>(Coliseu Micaelense)</i>



36TH EUROPEAN
CONFERENCE CETACEAN
SOCIETY
NAVIGATING WATERS OF CHANGE
AZORES 2025

EVENTS OPEN TO THE COMMUNITY

MOVIE NIGHT

Teatro Micaelense

15th May 2025, 20h

- **Protecting the Azores Sea: the future is now**

This documentary marks a key moment for marine conservation in the Azores: the creation of RAMPA, the largest Marine Protected Area Network in the North Atlantic. It safeguards 30% of Azorean waters—half fully protected, half highly protected—meeting global conservation goals. RAMPA was developed through an extensive participatory process, involving over 40 meetings with representatives from fisheries, tourism, shipping, NGOs, and authorities. Based



on the best available science, this collaboration led to a network that balances ecological protection with the needs of local communities. [3 minutes, presented by Adriano Quintela, from Blue Azores]

- **The Pelagic Social Lives of the North Atlantic Humpbacks**

Pelagic social behaviors seen in Bermuda including fighting humpbacks, associations of male humpbacks, and young calves in December and January. [10 minutes, presented by Andrew Stevenson]

- **PROMED - PROtecting MEDiterranean Diversity**

PROMED is an animation video, produced by Ottopiuotto in collaboration with Fondazione Acquario di Genova, to disseminate the aims of the PROMED project (www.promedproject.org). PROMED (PROtecting MEDiterranean Diversity) is a project to study the effects of climate change on cetaceans in the Mediterranean Sea, by applying predictive mathematical models to the data shared on the Intercet platform (www.intercet.it) by a large international network. PROMED is funded by Aderholt/Goh Trust and coordinated by Fondazione Acquario di Genova. [2:07 minutes, presented by Guido Gnone]

- **Two Sides of the Same Sea**

Two Sides of the Same Sea captures dissimilar bottlenose dolphin behaviours in Türkiye's Marmara Sea, observed and recorded for the first time in the region: While August 2024 footage documents "infanticide", an adult interacting intensely with a dead male newborn near Kınalıada, March 2024 footage reveals "epimeletic behaviour", an adult caregiver guarding a dead male for six days. This rare dual observation offers cetologists important insights into dolphin behavioural and social complexity, as well as intraspecies dynamics in human-impacted ecosystems. [7:00 minutes, presented by Arda M. Tonay]

- **Latitude du Changement (trailer)**

A group of citizens embark on board the 'Atlas' for a 12,000 km sailing trip to Greenland. The crew is collecting scientific data, exploring new horizons and braving storms: a human adventure motivated by participatory science and the desire to surpass oneself. [2:36 minutes, presented by Virginie Wyss]

- **What is Ambergris?**

The video shows the international impact that the discovery of a nine kilo stone of ambergris found inside a sperm whale on the island of La Palma (Canary Islands) has had on the media and the spectacular images of the conditions in which it was made. the in situ necropsy on Nogales beach where the stranding occurred. [5:08 minutes, presented by Diego Llinás]

- **Rough-Toothed Dolphins of the East**

The video summarises the first encounter of rough-toothed dolphins within the Eastern Mediterranean Sea of Türkiye, with drone footages and acoustic recording of the species, with a little spice of the spirit of the crew during the dedicated research effort of DMAD from the uncharted waters. [9:15 minutes, presented by Aylin Akkaya]

- **Head Ramming in Sperm Whales Demystified**

We report on several sperm whale head ramming drone observations made independently in the Azores and Balearic islands, involving not only pairs of large individuals assumed to be males, but also pairs of smaller individuals, confirming head ramming in the species. The behaviour occurs partially or totally underwater and is only easily detected from an elevated position, and increasingly widespread use of drones can be instrumental in documenting and better understanding this behaviour in this and other species. [3:58 minutes, presented by Rui Prieto]



- **Presences - Art & Science intersections**

"Presences", a documentary by filmmaker Kenny MacBain, explores the collaboration between artist Barbara Petter Putnam and researcher Dr. Luigi Bundone. Their journey began with the 2019 Marine Mammal World Conference in Barcelona, during a workshop on communicating marine science to the general public. The film traces how their partnership evolved into the creation of the art quilt Presence, highlighting its significance and offering a glimpse into present and future collaborative works born from this unique fusion of science and art. [10 minutes, presented by Barbara Petter Putnam & Luigi Bundone]

- **Waves of Ink**

Since 2019, the Whale Wise research team has been studying cetaceans in Bakkaflói, Iceland with a particular focus on the small fjord of Finnafjörður. Their research has primarily involved long-term acoustic monitoring and land-based surveys. Data from a 2021–2022 hydrophone deployment revealed consistent humpback whale vocalizations and song throughout the winter. Building on these findings, Tom and Alyssa traveled to Finnafjörður in January 2025 to document cetacean sightings and complement ongoing hydrophone recordings. [10 minutes, presented by Alyssa Stoller]

- **Beyond the sea: Long Finned Pilot Whale**

This video showcases Lorbone's work in assembling the skeletons of stranded cetaceans along the Alboran Sea coast. Through innovation, education, and conservation, and with the key collaboration of multiple entities, the project transforms remains into knowledge, connecting science with the public to raise awareness of marine biodiversity. It was a project sponsored



by the Faculty of Science of Granada and promoted by the Observatorio del Mar. And this project wouldn't have been possible without the collaboration and help of the SeaShore Association and Science Park and the Aula del Mar of Granada. [4:27 minutes, presented by Anne Lizarralde Vallejo]

- **The Sperm Whales of the Azores**

The Sperm Whales of the Azores is a film about the behaviours displayed in the close surface waters by animals from female units observed in waters around São Miguel island. The intention is to share some of our findings and to also draw the attention to the implications of these. Ultimately, this film is a call for self-reflection on ethics and improvements regarding the methods we use and specially the vessel approach and interactions in the area. [9:27 minutes, presented by Jasmine Zereba]

- **Hydrotwin**

Hydrotwin is an AI-powered acoustic monitoring solution that uses passive hydrophones to analyze underwater soundscapes in real time. Acting as a “Google Maps” for ocean noise, it detects, tracks, and classifies marine mammals, vessels, and other sound sources. Deployed in the Azores, Hydrotwin supports cetacean conservation, impact assessments, and noise pollution research. Future developments include advanced noise mapping, drone and satellite integration, and broader deployment. By combining AI and acoustics, Hydrotwin is transforming ocean monitoring into a smarter, more sustainable tool for marine protection. [2 minutes, presented by Rita Carriço]



VIDEO SESSION

Biblioteca Pública e Arquivo Regional de Ponta Delgada

12th May 2025, 20h

- **Protecting the Azores Sea: the future is now**

This documentary marks a key moment for marine conservation in the Azores: the creation of RAMPA, the largest Marine Protected Area Network in the North Atlantic. It safeguards 30% of Azorean waters — half fully protected, half highly protected — meeting global conservation goals. RAMPA was developed through an extensive participatory process, involving over 40 meetings with representatives from fisheries, tourism, shipping, NGOs, and authorities. Based on the best available science, this collaboration led to a network that balances ecological protection with the needs of local communities. The film follows this process, showing how science, dialogue, and shared responsibility can support meaningful ocean protection. RAMPA offers an example of how regional leadership can contribute to global efforts for biodiversity, climate resilience, and sustainable livelihoods. More than a conservation policy, RAMPA represents a collective commitment to the future. The ocean is seen not as a cost, but as a vital resource —essential to life, identity, and well-being. [17 minutes, presented by Luísa Madruga, from Blue Azores]

- **The History of the Humpbacks in Bermuda**

This gives a brief history of whaling in Bermuda and the dangers humpbacks face since the whaling ban took effect. [10 minutes, presented by Andrew Stevenson (Whales Bermuda)]

- **Building the Big Picture**

- The LIFE20 NAT/IT/001371 CONCEPTU MARIS project focuses on conserving cetaceans and sea turtles in the Central and Western Mediterranean. After three years of ferry-based monitoring, the team built a standardized data archive to support species assessments. Over 6000 live observations reveal variation in the frequency and distribution of several species, including widespread ones like striped dolphin and loggerhead turtles, and identified critical areas for long-term conservation of species, including the rarer ones such as Cuvier's beaked whales, pilot whales, and Risso's dolphins. [4 minutes, presented by Antonella Servidio & Antonella Arcangeli (Ispra - Italian Institute for Environmental Protection and Research as coordinator, produced by Triton Research)]

- **A tale of moments in Blues - Whales and Dolphins in Azores**

For years, the Azores have been synonymous of cetacean diversity and abundance. Although previously an active sperm whaling centre, which was fundamental for the livelihood of locals and part of the cultural identity of these isolated islands until 1985, another cycle has started in the early 90's – Whale watching. This video shows a glimpse of what one can witness while sailing offshore in the Azores' islands. It takes you from the shoreline and the sound of crashing waves to a stunning ballet of surface and underwater motion. Multiple species are included, such as *Stenella frontalis*, *Tursiops truncatus*, *Pseudorca crassidens*, *Globicephala macrorhynchus*, *Mesoplodon bidens*, *Delphinus delphis*, *Orcinus orca*, *Balaenoptera borealis* and *Physeter macrocephalus*. [4:20 minutes, presented by João Bernardo Barreiros (Centre for Ecology, Evolution and Environmental Changes - Azorean Biodiversity Group – Island Biodiversity, Biogeography & Conservation – IBBC; Department of Earth and Environmental Sciences (DISAT), University of Milano-Bicocca, Milan, Italy)]

- **Desertores Islands Expedition**, by Alessandro Bocconcelli. Our short movie describes the 2024 expedition in northern Patagonia, Desertores Islands. We monitored existing industrial salmon farms, collected data on the noise produced by the farms, cleaned up beaches impacted by the plastic dumped in the water by the farms, and completed an outreach program with the local rural schools. [3:10 minutes, presented by Alessandro Bocconcelli (Woods Hole Oceanographic Institution, USA; Centinela Patagonia, Chile)]

- **Explore Pelagos: A Journey to Protect Our Giants of the Sea**

Explore Pelagos is a three-week scientific expedition with four stopovers within the Pelagos Sanctuary, in France, Monaco, and Italy. The scientific mission collected data on species and human activities while training and raising awareness among local stakeholders (institutions, managers, professionals, etc.). The stopovers provided opportunities to organize roundtable discussions with all stakeholders on key conservation challenges for the cetaceans in the Sanctuary, identifying needs, action perspectives, and collaboration opportunities, as well as raising awareness among the general public and younger audiences. This documentary, produced about the expedition, has been and will continue to be widely broadcast to highlight the conservation challenges of cetaceans in the Pelagos Sanctuary, as well as the actions carried out by the Sanctuary, its partners, and local stakeholders. [16:50 minutes, presented by Céline Tardy]

- **The "High Quality Whale-Watching®" certificate: 10 years of commitment to cetacean protection**

Since 2004, several studies have shown that commercial whale-watching activities are increasing in the Mediterranean, particularly in North-Western region. Aware of these



challenges, ACCOBAMS, the Pelagos Sanctuary, several NGOs and whale-watching operators collaborated for the creation of a consultative and voluntary management tool to ensure the sustainability of these activities: the “High Quality Whale-Watching®” Certificate, a label registered by ACCOBAMS and including a Code of Good Conduct developed in collaboration with the Pelagos Agreement. This 3-minute video captures the 10th anniversary event of "High Quality Whale Watching®" organized by MIRACETI association on November 15, 2024, in Saint-Maxime, France. The "High Quality Whale Watching®" certificate contributes to the sustainable development of cetacean watching activities while promoting the understanding and conservation of cetaceans on a broader scale through an integrated and coordinated approach. The video highlights this dedicated day bringing together all stakeholders invested in addressing conservation issues related to whale watching in the French Mediterranean. Throughout the day, participants from civil society, marine protected areas, institutions, businesses, and associations engaged in discussions during a retrospective conference, roundtables, and testimonials. The event offered a platform for HQWW® certified operators to celebrate their ongoing commitment. Since the creation of the "High Quality Whale Watching®" label in 2014 in France, significant progress has been made in promoting sustainable cetacean observation and conservation. Looking ahead, the next 10 years offer exciting opportunities for further development and broader impact in cetacean protection and sustainable tourism. [4:25 minutes, presented by Laurène Trudelle]



ART & SCIENCE

Igreja do Colégio

14th^h May 2025, 20h

‘Cetaceans Harmony’

A scientific musical conference

dedicated to the preservation of cetaceans

By Stéphanie Elbaz & Bastien Mérigot

A unique artistic-scientific event combining classical piano music and marine science to raise awareness about dolphin bycatch and cetacean conservation. Created by concert pianist Stéphanie Elbaz and marine biodiversity researcher Dr. Bastien Mérigot, the event features a live performance where each musical piece aligns with scientific themes such as acoustic bycatch mitigation. Her interpretations of classical compositions create an immersive listening experience that underscores the deep connection between marine life and human artistic expression.



VIDEO SESSION

Clube Naval de Ponta Delgada

16th May 2025, 20h

‘Latitude du changement’

A group of citizens boards the "Atlas" for a 12,000 km sailing journey from Terceira Island (Azores) to Greenland. The crew collects scientific data, explores new horizons, and braves storms — a human adventure driven by participatory science and pushing personal limits.

Realisation: Richard Mardens (Canada, 2023).

Presented by Virginie Wyss, Richard Mardens and Arnaud Conne.

Duration: 52 minutes.

KEYNOTE SPEAKERS

Luke Rendell



Luke Rendell is a renowned researcher on the evolution of learning, behaviour and communication, with a special focus on marine mammals. He is a reader in the School of Biology at the University of St. Andrews, and affiliated with the Scottish Ocean Institute, Sea Mammal Research Unit, the Centre for Social Learning and Cognitive Evolution, and the Institute of Behavioural and Neural Sciences. With over 100 research papers, Dr. Rendell also engages regularly in science dissemination with numerous interviews and appearances on television, newspapers and magazines, podcasts, and cultural events. His book *'The cultural lives of whales and dolphins'*, co-authored with Hal Whitehead, is a must-have item in any marine mammalogy library. In the beginning of his career, he spent time in the Azores aboard IFAW's R/V Song of the Whale, which, according to himself, kick-started his enduring relationship with sperm whales.

May 14th, 9:30h

Changing Perspectives on Human and Cetacean Cultures

"In this talk I will take a long-term perspective on the profound changes that the relationship between sperm whales and humans has navigated over the past two centuries, a history that is vividly illustrated by the changing economy of the conference location. Changes in human culture have in this period moved our relationship away from a culture of exploitation, with consequences for sperm whale culture, to one of understanding, appreciation, and conservation. Our science has played a large part in this transformation as it has led us to better understand the social structures and behavioural complexities that underly the extraordinary ecological success of sperm whales. I will trace the path of discovery from initial descriptions of vocal dialect variations through to our fast-evolving current understanding of the way cultural variation in sperm whale societies is more flexible than we have previously imagined."

Cristina Brito



In one word, Cristina Brito defines herself as an *islander*: a woman always moving among islands. She is an Associate Professor at the History Department of the NOVA University, researcher at CHAM - Center for the Humanities and a member of the UNESCO Chair on the ocean's cultural heritage. Her academic work focuses on early modern marine environmental history, perceptions and uses of the seas by human societies, oceanic histories, human and nonhuman entanglements, the Anthropocene, and the blue Humanities. As one of the Principal Investigators of the European Research Council (ERC) Sinergy Grant '*4-Oceans: Human History of Marine Life*', she and her co-workers are creating the '*World Atlas of Historical Marine Exploitation*' and, in the process, producing transformative research on the historical relation of humans with the oceans and marine life. She is also the author of several academic, scientific dissemination, fiction, and travel books, co-curates the '*Oceanities*' podcast, and collaborates with numerous science dissemination initiatives.

May 15th, 9:00h

W is for World, Water and Whale:

Blue Humanities and Marine Mammal Conservation

The blue planet we all live on is made up of networks of connections and of interactions between its elements. It is a multi-specific, multi-temporal and multi-cultural planet. Human societies share the aquatic part of the planet, among many organisms, with other mammals. Aquatic mammals correspond to important biomass in their ecosystems, but more importantly, they forge relevant ecological, cultural and historical interdependencies and entanglements. The so-called transgressive humanities, encompassing the conservation, environmental and digital humanities, are strong tools that scientists, scholars, artists and stakeholders have at their disposal to tackle pressing challenges of our days at local and global levels.

Joe Roman



Joe Roman once declared '*I'm obsessed with whale poop*'. Having coined the term '*whale pump*' and revolutionizing, with his co-author James McCarty, the way we think about the marine biological pump, that statement may not come as a surprise to many. Dr. Roman is a conservation biologist, author and fellow at the Gund Institute for Environment, and research affiliate at the Rubenstein School of Environment and Natural Resources, University of Vermont. His academic work spans a broad range of subjects, including endangered species policy, marine mammal ecology and conservation, invasive species, and biodiversity and human health. His scientific work is more than often featured in the news around the world, and he is an influential science communicator, having written several highly acclaimed and awarded books, and regularly contributing to numerous science dissemination outlets. If that was not enough, he fights invasive species one bite at a time as editor 'n' chef of eattheinvaders.org.

May 16th, 9:00h

Lifting Baselines: Marine Mammal Recovery, Ecological Function, and the Consequences of Conservation Success

For the first time in generations, biologists and policymakers are encountering rising populations of ocean predators, including cetaceans, pinnipeds, and sea otters. Although these successes reflect changes in policy since the 1970s, some people perceive these species as invaders, and conflicts are increasing. At the same time, the return of these marine mammals has been accompanied by research on the ecological function provided by whales and other marine mammals, including increasing nutrient subsidies, providing deep-sea habitats through whale falls, and enhancing our understanding of trophic cascades. It is time to celebrate these hard-earned successes and lift the baselines for recovering species.





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ORAL PRESENTATIONS



3D acoustic tracking of marine mammals: exploring diving and foraging behaviour in tidal rapid environments

Rapson, Katie ¹; Macaulay, Jamie ²; Gordon, Jonathan ²; Gillespie, Douglas ²; Montabaranom, Jessica ²; Longden, Emma ²; Northridge, Simon ³; Sparling, Carol ²

1. School of Biological and Marine Sciences, University of Plymouth
2. Sea Mammal Research Unit, University of St Andrews
3. School of Biology, University of St Andrews

Tidal stream energy projects are expanding in tidally energetic habitats, which are also known to be important regions for marine mammals. This necessitates a greater understanding of the fine-scale underwater movements and behaviour of marine mammals in high-flow regions, to determine both close-range and large-scale implications of offshore renewables, such as collision risk and habitat exclusion. Passive Acoustic Monitoring (PAM) is commonly used for detecting vocalising cetaceans such as Harbour porpoise (*Phocoena phocoena*), which produce narrow-band high-frequency echolocation clicks for navigation, foraging, and communication purposes. This project involved the deployment and further development of an existing PAM approach for acoustically tracking small vocalising cetaceans in tidal environments. Surveys were undertaken from December 2022 to July 2023 as part of baseline monitoring works at a shallow (40-70m depth) tidal turbine development site (Anglesey, UK). A large-aperture hydrophone array was used to detect echolocation clicks and determine their corresponding range, bearing and depth information. Orientation and GPS sensors were then used to geo-reference detections against tidal movement in the water column, and joining sequential localised click-trains allowed reconstruction of 3D tracks, providing information on the animal's underwater movements and behaviour. A total of 1999 porpoise track sections were detected across all field surveys. Porpoise spent a large proportion of time at <10m depth and also dived to the seabed in all tidal states, with a maximum recorded depth of 62m. Peaks in detections at 20-25m suggest porpoise may exhibit both demersal and pelagic foraging strategies. Additionally, the orientation of porpoise with respect to tidal phase was more variable during ebb than flood tides, indicating that tidal features may also be important for foraging. These results demonstrate the application of 3D acoustic tracking for marine mammals in tidal environments and highlight the importance of site-specific monitoring for offshore renewable developments.



A twenty yr photoidentification study reveals low survival and rapid demographic decline for bottlenose dolphins (*Tursiops truncatus*) living in the Aeolian archipelago (Italy)

Blasi, Monica Francesca ¹

1. Filicudi Wildlife Conservation

Despite the recent update of the Mediterranean bottlenose dolphin (*Tursiops truncatus*) subpopulation to the "Least Concern" status by the IUCN, several populations are suffering a decline in their area of occupancy, mainly due to acute fishery. From 2005-2024, a photo-identification study was conducted to assess the population status of bottlenose dolphins living in the Aeolian archipelago (Tyrrhenian Sea), the only archipelago in Italy where a marine protected area has not yet been established. Results show that the number of individuals dropped by 50% during the study period, precisely from 42 (2005-2017) to 20 (2018-2024). Within the first 13yr of study a few numbers of calves for reproductive females were reported (N=16; mean = 2.3 ± 1.1 ; range: 1-4). The interbirth period confirmed predicted values (3.5 ± 1.6 yr; range 2-7 yr), however, a high calves mortality within the first year of life (12.5%) and weaning age (<6 yr) (25%) was reported. The low reproductive rate might justify the rapid decline in the annual encounter rate (80%; $P < 0.01$) and group size (50%; $P < 0.01$). A low recapture rate (N=2; 0.6%) and different fin marks pattern between the Aeolian dolphins and those (370) photoidentified in other areas of Sicily have been found, suggesting geographical isolation and different ecological conditions, levels of social interactions and threats, although one individual travelled > 1251 km across the Mediterranean Sea. Distribution was associated exclusively to trammel nets, although seasonal variations were observed between feeding and nursery areas. Permanent lesions were frequently reported (53.8%) and most of them were traumata such as mutilations (69.2%). The results of this study suggest that fragmented bottlenose dolphin communities might face high risk for their survival due to low movements and local anthropogenic threats. Urgent conservation actions are needed to protect this dolphin population.

Adapting to the Anthropocene: Challenges of a small cetacean in a warming ocean

Ramírez-Martínez, Nadya C. ^{1,2}; Pigeault, Rémi ¹; Fiorentino, Dario ³; Groeger, Matthias ⁴; Meier, H.E. Markus ⁴; Becherer, Johannes ⁵; Mayer, Bernhard ⁶; Siebert, Ursula ¹; Gilles, Anita ¹

1. *Institute for Terrestrial and Aquatic Wildlife Research (ITAW), University of Veterinary Medicine Hannover, Foundation, Werftstraße 6, 25761 Büsum, Germany*
2. *Fundación Macuáticos Colombia, Calle 27 # 79-167, Medellín, Antioquia, Colombia*
3. *Thünen Institute of Sea Fisheries, Herwigstraße 31, 27572 Bremerhaven, Germany*
4. *Department of Physical Oceanography, Leibniz Institute for Baltic Sea Research Warnemünde, Seestrasse 15, D-18119 Rostock, Germany*
5. *Universität Hamburg, Theoretische Ozeanographie, Bundesstr. 53, 20146, Hamburg*
6. *Asian School of the Environment, Nanyang Technological University, 50 Nanyang Avenue, 639798, Singapore*

The North and Baltic Sea are among the most heavily used areas by humans. Over recent decades, changes in the abundance or distribution of harbour porpoises (*Phocoena phocoena*) have been observed. While in the North Sea, shifts in distribution occurred from the 1990s to the early 2000s, more recently in the Western Baltic Sea, a sharp decline in abundance has been reported. The influence of climate system changes on cetaceans, including warming temperatures and frequent extreme events, remains nevertheless largely unclear. In this study, we aim to evaluate the ecological factors driving harbour porpoise distribution and densities (ind/km²) in the context of human-induced climate change, using data collected during two decades of dedicated line-transect surveys (2002–2023) covering 369,239 km of effort. The present and future monthly mean environmental data was retrieved from downscaled hydrological models (AHOI, MOM and MPIOM) and bathymetry (retrieved from GEBCO). Generalized Additive Models were fitted to model porpoise sightings (28,165 sightings) as a function of relief and environmental variables. Predictions were run for the current data (nowcasting) and future projections, the latter based on the IPCC RCP 8.5 scenario for 2030, 2050 and 2100. Results from the models, considering the bathymetry and sea surface temperature show a decrease in the projected porpoise density given the increase of temperatures in the future. However, no substantial changes in distribution could be detected, probably due to the high deviance explained by bathymetry and the limited number of dynamic variables. The usage of climate scenarios improves our understanding of porpoise ecological responses to future climate conditions, and this study provides a valuable overview of the effects on distribution and density. Furthermore, it sheds light on potential overlaps in distribution with current and future human activities given the accelerated industrialisation of the ocean environment.



Age-sex segregation in mediterranean goose-beaked whale (*Ziphius cavirostris* G. Cuvier, 1823)

Rosso, Massimiliano ^{1,2}; Borroni, Anna ^{1,2}; Petry, Anna Sabrina ^{1,3}; Tepsich, Paola ¹; Grossi, Francesca ¹; Sechi, Alberto Demetrio ^{1,2}; Verga, Alessandro ⁴; Bocconcelli, Alessandro ⁵; Moulins, Aurelie ^{1,2}

1. CIMA Research Foundation, Savona, Italy
2. NBFC, National Biodiversity Future Center, Palermo, Italy.
3. University of Rostock, Universitätsplatz 1, 18055 Rostock, Germany.
4. Golfo Paradiso Whale Watching, Camogli (GE), Italy.
5. Woods Hole Oceanographic Institution, Woods Hole, MA 02543 USA.

The social ecology of beaked whales remains largely a mystery, with fundamental questions about their social structures and behavior unanswered. Photo-identification studies suggest that goose-beaked whales (*Ziphius cavirostris*) exhibit fission-fusion social structure, typically seen alone or in small, temporary groups of 2–3 individuals. However, social preferences have not yet been investigated. For the first time, this study examined associations between sex/age classes in goose-beaked whales using the largest photo-ID dataset in the Mediterranean Sea. Photos from 523 sightings in the NW basin were analyzed, involving a total of 1,114 photographed whales. For each sighting, the number of individuals in seven sex-age categories was recorded: adult male, adult female, calving female, subadult male, subadult female, subadult of unknown sex, and juvenile. To investigate grouping behavior, three class-based association indices were calculated: Class Association, General Gregariousness, and Pairwise Affinity. The age/sex organization was also analyzed using K-means cluster analysis. A group randomization method generated expected association values (10,000 randomizations), and two-tailed statistical tests were then applied to compare observed associations with the 2.5% tails of the randomized distribution, testing the null hypothesis that all classes exhibit the same association patterns. Results indicated that goose-beaked whales associate less frequently than expected, with clear age-sex class segregation. Calving females, juveniles, and subadult males showed a strong preference for associating with individuals of the same sex-age class, whereas adult males exhibited a significant affinity for adult females, with or without calves. Among the classes, subadult males and females with calves formed groups with significantly more and fewer associates than expected, respectively. Differences in the habitat of these clusters were tested using Kruskal-Wallis tests across various environmental variables. Clusters consisting of subadults and/or juveniles were sighted in waters with shallower seafloors compared to the adults' cluster. Habitat differences among subadult sex classes were also recorded.



Anonymous societies and cultures of open-ocean cetaceans, especially sperm whales

Whitehead, Hal ¹; Walmsley, Sam ¹

1. *Dalhousie University*

Cetaceans of the open ocean, including sperm whales, have an unusual feature in their social structures: anonymous societies. Moffett (Behavioural and Brain Sciences 2024) proposes that a “society” is a group of individuals who mutually recognize one another to be members, creating a perception of “we-ness”. This can be achieved through individual recognition. However, particularly important and rare are “anonymous societies” when individuals know who is (and who is not) a member of their society but do not recognize them individually. In vertebrates, this societal recognition is typically through culturally-transmitted symbols. Anonymous societies can be very large, and can structure populations in ways that are important for population dynamics, evolution, ecology and conservation. Open-ocean cetaceans live in a fluid environment largely free of territorial boundaries. Contest competition is rare, and they often depend on one another for raising offspring, surviving predators, foraging communally and sharing adaptive knowledge. Thus, open-ocean cetaceans are well adapted for the development of anonymous societies. The clans of female sperm whales are exemplars. Clans typically contain thousands of social family units, each with about 10 females and offspring, numbers that preclude individual recognition of all clan members. Clans are distinguished by culturally transmitted behaviour and vocal dialects, which seem to include learned symbols of clan membership. Units only form groups with other units from their own clan even though different clans may use the same waters. Thus, sperm whale clans are anonymous societies, whose numerical sizes and geographical spans—1000’s km—seem only to be rivalled by ethno-linguistic groups of humans. The drivers producing these very large-scale social structures are unclear but may include traits which humans and sperm whales share: mobility, large brains, cooperative care of offspring, and cultural capacity.



Behavioural responses of killer whales to long-finned pilot whales: insights into acoustic mediation

Selbmann, Anna ¹; Samarra, Filipa I. P. ¹; Barluet de Beauchesne, Lucie ²; Marchon, Tatiana M. J. ¹; Hayward, Ellen ³; Svavarsson, Jörundur ¹; Miller, Patrick J. O. ³; Wensveen, Paul J. ¹; Curé, Charlotte ⁴

1. *University of Iceland*
2. *Biodiv-Wind SAS, Cerema-Université Gustave Eiffel, UMRAE*
3. *University of St. Andrews*
4. *Cerema-Université Gustave Eiffel, UMRAE*

Interactions between killer whales and long-finned pilot whales have been observed throughout the North Atlantic, with killer whales showing avoidance or high-speed avoidance (porpoising) when approached by long-finned pilot whales. The mechanisms behind these interactions remain unclear but acoustic cues likely play an important role, as previous studies have shown that long-finned pilot whales are strongly attracted to killer whale sound playbacks. We hypothesised that acoustic mediation acts both ways in this interaction, and that killer whales would show an avoidance response to pilot whale sounds. To test this hypothesis, playback experiments with pilot whale and control sound stimuli were conducted to killer whales in Iceland in 2021-2023 (n=15 playbacks to eight groups). One whale per group was equipped with a multi-sensor tag. Surface observations of the behaviour of the tagged whale and its group were collected for each experiment. To assess the response to the playbacks, we used hidden Markov models from the tags' movement and acoustic timeseries data, as well as univariate regression models with variables such as a horizontal movement reaction score, group size and spacing, and calling rates. Results showed an avoidance response of the killer whales exposed to pilot whale sounds, marked by fast and directed movement away from the sound source, initial increases in calling rate followed by a strong decrease (and often cessation of calling), and increased cohesion and alignment of the group members. Our findings demonstrate new and key aspects of acoustic mediation: long-finned pilot whales approach killer whale sounds and killer whales avoid long-finned pilot whale sounds, both species exhibiting behavioural responses at the individual and group level. Therefore, this study provides important insights into the complexity of social behaviour within species and the mechanisms that structure the dynamics of multi-cetacean species communities.



Cetacean-driven carbon dynamics in the Pelagos Sanctuary

Azzellino, Arianna ¹; Barbaccia, Eleonora ¹; Frassà, Veronica ¹; Gabualdi, Mario ¹; Jahoda, Maddalena ²

1. *Politecnico di Milano, Civil and Environmental Engineering Department*
2. *Tethys Research Institute*

The quantification of carbon sequestration in marine ecosystems ('Blue carbon') has gained increasing attention over recent decades. While not directly involved in carbon sequestration, whales and dolphins are vital to ecosystem functioning and productivity. By feeding in the nutrient-rich mesopelagic zone at depth and releasing nutrient-dense fecal plumes at the surface, they facilitate nutrient cycling and enhance marine productivity. Despite their significance, studies on cetacean-driven carbon dynamics in the Mediterranean Sea remain sporadic, and no comprehensive assessment has been conducted so far for the Pelagos Sanctuary. The BLUESCAPE project aims to fill this gap by estimating Pelagos Sanctuary blue carbon stocks, and the phytoplankton carbon fixation driven by cetacean-mediated nutrient cycling. Cetacean ecosystem services were quantified using standard formulas from the Common International Classification of Ecosystem Services (CICES), tailored to reflect typical values specific to the Western Mediterranean Sea. Our findings indicate that cetacean populations in the Pelagos Sanctuary store approximately 1,800–2,800 tons of carbon (C), cycle about 4,300–5,000 tons of nitrogen (N) annually, and enhance the ecosystem carbon fluxes by up to 24,600–27,900 tons of carbon per year. Remarkably, the Pelagos Sanctuary cetacean carbon stock is 1.75 times greater than that of the combined North Sea, Skagerrak, and Celtic Sea, despite the Sanctuary covering only about 8% of their total area. Additionally, carbon fixation induced by cetacean nutrient cycling accounts for approximately 25% of the total carbon fixation across all coastal areas within the Sanctuary. These results highlight the critical role of cetaceans in sustaining marine ecosystem functioning and underscore the importance of quantifying ecosystem services as a basis for effective management and conservation strategies. By identifying key areas where cetacean-driven ecosystem impacts are most pronounced, this study provides actionable insights for protecting the ecological and carbon-related benefits of the Pelagos Sanctuary.

Challenges and lessons learned in small cetacean disentanglement: the case of a short-finned pilot whale calf in Tenerife, Spain

Câmara, Nakita ^{1,2}; Arbelo, Manuel ¹; Fernández, Antonio ¹; Caro, Belén ³; Piñero-Mesa, Mirna ^{4,5}; Iglesias, Ricardo ⁶; Neves, Silvana ²; Marrero-Pérez, Jacobo ^{2,7}

1. *Veterinary Histology and Pathology, Atlantic Center for Cetacean Research (CAIC). University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC). Trasmontaña s/n, 35413 Arucas. Canary Islands, Spain*
2. *The Oceanic Platform of the Canary Islands (PLOCAN). Carretera de Taliarte, s/n, 35214 Telde, Las Palmas of Gran Canaria, Spain.*
3. *Gestión y Planeamiento Territorial y Medioambiental (GESPLAN). Avenida Tres de Mayo, 71, 38005 Santa Cruz de Tenerife, Spain.*
4. *Atlantic Eco Experience Whale Watching Company. Puerto Colón, Pantalán 4, 38660 Adeje, Santa Cruz de Tenerife, Spain.*
5. *Bonadea II – Diomedea Whale Watching Company. Puerto Colón, Pantalán 4, 38660 Adeje, Santa Cruz de Tenerife, Spain.*
6. *Grupo Tragsa. Carretera General del Norte, 256 Esquina Camino La Colina, 38330 San Cristóbal de la Laguna, Santa Cruz de Tenerife, Spain.*
7. *Tonina Association. Research and Outreach of the Marine Natural Environment. Calle Doctor Antonio González, 5, 4th Floor, San Cristóbal de La Laguna, Santa Cruz de Tenerife, Spain.*

Over the years, protocols for disentangling large whales have been refined, relying on the expertise of specialized teams equipped with tools designed to minimize harm and stress. However, disentangling small, highly mobile cetaceans remains an underexplored and challenging task due to their size, agility, and complex social dynamics within pods. On August 29th, 2024, in the southwest of Tenerife (Spain), which is considered a special marine area for conservation (SAC), a short-finned pilot whale (*Globicephala macrorhynchus*) calf entangled in a plastic strap was reported, highlighting significant gaps in action protocols and guidelines, equipment, and expertise for addressing such cases. The objective of the plan of action was to document the challenges and outcomes of attempting to release the individual, which was observed within a resident pod. Direct interventions were carried out using a small vessel and specialized self-made tools designed to approach the animal and remove the entanglement while minimizing stress and injury. Despite multiple attempts, the disentanglement was unsuccessful due to the whale's rapid swimming, evasive behavior, protective actions by other pod members, and environmental factors such as bad weather and poor visibility. Nevertheless, subsequent observations confirmed the calf is now strap-free. Although the entanglement was not resolved through our procedures, this case provided critical insights into the operational, ethical and logistical challenges of disentangling small cetaceans. Most importantly, it highlights the numerous limitations of current reactive intervention techniques and the need to refine protocols



specifically focused on cetaceans, with high evasive capabilities, to enhance success rates while minimizing injuries. These findings contribute valuable knowledge to the field of marine mammal rescue and conservation, advancing efforts to mitigate anthropogenic threats (such as marine debris pollution), and improve proactive strategies and measures for protecting vulnerable marine ecosystems.



Comparative analysis of harbour porpoise density from parallel observer-based and digital aerial surveys: challenges and opportunities

Nachtsheim, Dominik ¹; Ramirez Martinez, Nadya ¹; Escobar Calderon, Felipe ¹; Siebert, Ursula ¹; Gilles, Anita ¹

1. *Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, Foundation, Büsum, Germany*

For an unbiased estimation of cetacean abundance, observer-based visual aerial surveys have been the goldstandard method for many decades. However, the rapid expansion of offshore wind farms in coastal waters has led to challenges for these surveys as they must operate at low altitudes (600 ft) to detect small cetaceans, such as the harbour porpoise (*Phocoena phocoena*). High-definition camera systems in digital aerial surveys perform in higher altitudes (1800 ft), and are hence increasingly used. However, the methodological transition provides challenges, including comparability between the two survey methods to ensure consistency for existing monitoring programmes. In this study, we conducted 32 parallel survey flights between 2017 and 2020 with two aircrafts (1 observer-based and 1 digital), surveying the same transects on the same day. Observer-based surveys followed line transect distance sampling, whereas digital surveys were regarded strip transect surveys assuming equal detection probability across the strip. With 8 cameras and a large strip width, digital surveys recorded a higher absolute number of harbour porpoise sightings (3,757 individuals) compared to observer-based surveys (1,629). Observer-based surveys allowed estimating absolute porpoise densities, while for digital surveys only relative densities could be calculated, not considering availability and perception bias. Comparisons were done on two levels: stratum and transect level. Stratum level comparisons (n=32) revealed a closer agreement in low density areas but higher variability with increasing densities. For this reason, densities were also compared between parallel-flown transects (n=251), which also revealed high heterogeneity precluding the development of any intercalibration factor. The high variability might be caused by inherent detection differences but also how environmental factors are considered in the detection and data processing workflow. Our study presents the multi-faceted challenge of calibrating the two survey methods. Importantly, there is no standard statistical procedure to account for visibility bias from digital surveys requiring further research.

Declining reproductive health in fin whales (*Balaenoptera physalus*) in the Gulf of St Lawrence

Gardiner, Devonne ¹; Ramp, Christian ²; Sears, Richard ³; Deros, Davina ¹; Bérubé, Martine ^{4,5}; Palsbøll, Per ^{4,5}; Delarue, Julien ⁶

1. School of Biological Sciences, University of Aberdeen, Aberdeen, AB24 2TZ, UK
2. Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, St Andrews, KY16 8LB, UK
3. Mingan Island Cetacean Study, Saint Lambert, Québec, J4P 1T3, Canada
4. Groningen Institute for Evolutionary Life Sciences, University of Groningen, Nijenborg 7, 9747 AG Groningen
5. The Netherlands Center for Coastal Studies, 5 Holway Avenue, Provincetown, Massachusetts 02657, USA
6. JASCO Applied Sciences (Canada) Ltd, 20 Mount Hope Avenue, Dartmouth, NS B2Y 4S3 Canada

Environmental changes are profoundly impacting marine ecosystems, and the Gulf of St Lawrence (GSL), Canada, has undergone major shifts in water temperature, salinity, and sea-ice extent. These environmental changes have disrupted ecosystem structure and productivity, reducing prey availability for several North Atlantic baleen whale species for which the GSL is a critical summer feeding ground. It is crucial we understand how environmental changes affect these top predators and impact their population health. Declines in abundance, survival, and altered migratory timing have been previously reported in GSL fin whales (*Balaenoptera physalus*). Here, to investigate whether the reproductive potential of fin whales in the GSL has also been impacted, we combined endocrine profiling, sightings data, and environmental datasets spanning 2005 to 2017. Reproductive hormone concentrations were measured in blubber biopsy samples collected from free-ranging females (n= 98) and males (n= 148) between May-September. Pregnancy rates declined sharply from 100% of biopsied animals in 2005-2007 (n= 26) to just 20% in 2017 (n= 5), closely linked to declines in euphausiids abundance over the same time period. In parallel, we found a significant decline in mean testosterone concentrations for males as they halved over the study period. While blubber testosterone concentrations increased over the feeding season, indicating physiological conditioning for reproductive behaviour prior to breeding, the rate of daily increase in testosterone concentrations declined by 3.1 ± 1.5 pg/g (wet weight) annually. End of season testosterone values in 2017 were 56.94% lower than in 2005, suggesting impaired reproductive conditioning in later years of the study. Together, these data reveal a marked decline in the reproductive health of fin whales in the GSL, possibly suggesting an inability to accumulate sufficient energy reserves required for reproduction, resulting from reduced prey availability. These findings underscore the urgent need to address environmental shifts and their cascading effects on marine life.

Distributional changes of small cetaceans in European Atlantic waters and the North Sea from SCANS-IV in 2022

Gilles, Anita ¹; Authier, Matthieu ²; Pigeault, Rémi ¹; Ramirez-Martinez, Nadya ¹; Benoit, Vincent ¹; Carlström, Julia ³; Eira, Catarina ⁴; Geelhoed, Steve C V ⁵; Laran, Sophie ²; Sequeira, Marina ⁶; Sveegaard, Signe ⁷; Taylor, Nikki L ⁸; Saavedra, Camilo ⁹; Vázquez-Bonales, José Antonio ⁹; Hammond, Philip S ¹⁰

1. *Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, Foundation, Buesum, Germany*
2. *Observatoire Pelagis, UAR 3462, CNRS-La Rochelle University, La Rochelle, France*
3. *Department of Environmental Research and Monitoring, Swedish Museum of Natural History, Stockholm, Sweden*
4. *Department of Biology & CESAM & ECOMARE, Aveiro University, Portugal*
5. *Wageningen Marine Research, Den Helder, The Netherlands*
6. *Instituto da Conservação da Natureza e Florestas (ICNF), Lisbon, Portugal*
7. *Department of Ecoscience, Aarhus University, Roskilde, Denmark*
8. *Joint Nature Conservation Committee, UK*
9. *Oceanographic Centre of Vigo, Spanish Institute of Oceanography, Spanish National Research Council (IEO-CSIC), Vigo, Spain*
10. *Sea Mammal Research Unit, University of St Andrews, UK*

Top predators are sentinels for modelling ecosystem change, including effects of ocean warming. In summer 2022, the 4th large-scale survey (SCANS) was completed in a 1.7 million km² study area stretching from the Strait of Gibraltar to southern Norway, providing robust abundance estimates and trends of regularly occurring cetacean species. These results are needed to support conservation assessments and to place estimates of bycatch and other anthropogenic mortality in a population context. SCANS-IV achieved the greatest coverage and effort to date. Data were collected by aerial and ship surveys (> 74,000 km covered), generating more than 5,000 sightings of 17 cetacean species. The SCANS-IV data were also modelled to infer species-habitat relationships and to predict distribution of harbour porpoise, common, striped, bottlenose and white-beaked dolphin, minke, fin, and beaked whales. Data were modelled as a function of static, physical and biological variables using Generalised Additive Models with a soap-film smoother to account for land barriers. Stacking identified models with highest predictive abilities, and selected models were checked for goodness-of-fit using standard and innovative (rootogram) diagnostics. Daily abundance estimates were averaged over the data collection period and corrected for transformation- and simulation-bias. Rigorous validation suggested robust results and model-based abundance predictions were in good agreement with conventional design-based estimates. Model results highlighted distribution shifts, range expansion and population decline for a few species. Harbour porpoise, for example, showed a range expansion southwards in the North Sea and Channel, and a decline in the Belt Sea, Celtic and Irish Seas. Common dolphin expanded its range northwards to the Hebrides. For the first time, SCANS-IV also covered offshore waters of Portugal, allowing a better distinction between common and striped dolphin habitats.



These new models will support risk-based assessments as well as multiple other evidence needs for cetacean conservation in European Atlantic waters.



Ecology, energy and effort: Variations in facultative opportunistic feeding of the common dolphin in the Celtic Seas ecoregion

Albrecht, Sofia ¹; Novak, Georgia ¹; Bentley, Karl ²; Minto, C  il  n ¹; Rogan, Emer ³; O'Donovan, Jim ⁴; Levesque, Stephanie ⁵; Daly, Mags ⁵; Berrow, Simon ⁵; Hernandez-Gonzalez, Alberto ⁶; Slattery, Orla ¹; Mirimin, Luca ¹; Murphy, Sin  ad ¹

1. *Marine and Freshwater Research Centre, Department of Natural Resources and the Environment, School of Science and Computing, Atlantic Technological University, H91 T8NW, Galway, Ireland*
2. *Marine Institute, H91R673, Co. Galway, Ireland*
3. *School of Biological, Earth and Environmental Science, University College Cork, T12 K8AF, Cork, Ireland*
4. *Department of Agriculture, Food and the Marine, Regional Veterinary Laboratory, T12 XD51, Cork, Ireland*
5. *Irish Whale and Dolphin Group, Kilrush, Ireland*
6. *Instituto de Investigaciones Marinas, 36208 Vigo, Spain*

Predators like the common dolphin forage by balancing the energy content of prey with the energy required to capture it, selecting prey based on their foraging strategy. Specialist or generalist foraging strategies in common dolphins, a species with high energetic demands, vary across regions. In the Celtic Seas ecoregion, no recent dietary data is available despite recent observations of declining body condition among stranded common dolphins and changes in prey communities over recent decades. Using conventional morphological stomach content analysis of a large stranding sample-set (n=138) collected over three decades, coupled with advanced modelling, we updated information on their foraging ecology in the region. Assessments of their dietary composition, trophic level, daily prey consumption (daily rations), and gross energy intake included explanatory variables time period, season, sex, maturity status, total body length, body condition, and cause of death. Advanced modelling approaches, including a bias-reduced multinomial model, novel to cetacean diet composition analysis, were applied to refine our understanding of these ecological patterns. In this study, common dolphins were identified as facultative generalists/opportunists, consuming prey of lower energy densities and at higher trophic levels compared to more southern European waters. The most important prey species were intermediate-energy *Trisopterus* spp., potentially representing a favouring trade-off for lower hunting effort. Variations in foraging ecology were observed across all variables, likely reflecting shifts in prey availability, reproductive needs, movement patterns, and physical capabilities. This study also highlighted the limitations of stomach content analysis, here representing only a small portion (18%) of daily required energy intake, underscoring the need for large sample sizes for robust dietary assessments. The findings provided vital insights into common dolphin ecology within the Celtic Seas ecoregion, delivering essential information to support future ecosystem-based management approaches.



Energy expenditure of humpback whale mother-calf pairs: insights from biologging tags and UAS-photogrammetry

Hollers, Augusta ¹; Gough, William ¹; van Aswegen, Martin ¹; Szabo, Andrew ²; Evans, Lewis ¹; Currie, Jens ³; Blawas, Ashley ⁴; Bejder, Lars ¹

1. Marine Mammal Research Program, University of Hawai'i at Mānoa
2. Alaska Whale Foundation
3. Pacific Whale Foundation, Marine Mammal Research Program, University of Hawai'i at Mānoa
4. Stanford University

Quantifying daily energy expenditure of cetaceans is important for modeling population-level responses to climate change and anthropogenic disturbance, especially for capital breeders where mothers simultaneously fast and lactate. Technological advances in biologging and unoccupied aerial system (UAS; drone) photogrammetry help overcome the limits of traditional captive respirometry methods, allowing for better energy usage estimates in large cetaceans. We quantified energy expenditure of humpback whale (*Megaptera novaeangliae*) mothers and calves on their winter breeding ground in Hawai'i using 42 biologging suction-cup tag deployments and UAS-photogrammetric measurements (n=12 mothers, n=30 calves) from 2020-2024. We divided each deployment into behavioral states, quantified the per-second energy expenditure of each state using two independent methods (Field Metabolic Rate [FMR] and Thrust Power [TP]), and modeled the average daily energy expenditure for mothers and calves. Energy expenditure estimates were similar across methods: calves expended 3,256 J/s (SD= 1045) (FMR) vs. 2,925 J/s (SD= 927) (TP). Mothers expended 11,280 J/s (SD= 7229) (FMR) vs. 9,379 J/s (SD= 2301) (TP). Both groups saved significant energy while resting (mothers: -50% J/s, calves: -107% J/s). Overall daily energy expenditure from movement and metabolism was 847 MJ (SD= 229) for mothers, and 240 MJ (SD= 84) for calves. Using previous UAS-derived estimates of total daily energy loss of lactating females in Hawai'i (2,641 MJ/day, SD=318; van Aswegen et al., 2024), we subtracted the average 847 MJ/day used in a mother's metabolism and movement, to estimate 1,794 MJ/day transferred through milk to the calf (68% of total daily energy loss). Our findings provide a best-estimate of humpback whale energy expenditure, crucial to future studies on the relationship between behavior and energy usage in large cetaceans, and population consequences of disturbance.



Evaluating the impact of underwater noise on cetacean habitats in the Mazarron Escarpment (Spain)

Jurado-Mc Allister, Amalia ¹; Frassà, Veronica ²; Martinez-Martinez, Pablo ¹; Sosa, Karen ¹; Méndez, Antonio ³; Azzellino, Arianna ²; Felis, Ivan ¹

1. CTN-Marine Technology Center
2. Politecnico di Milano
3. Centaceos y Navegación

Cetaceans play a vital role as top predators in marine ecosystems, regulating trophic chains and maintaining ecological balance. However, maritime traffic, has become a significant threat in the last century due to the continuous low-frequency noise pollution produces. This noise disrupts cetacean communication, causing stress, interference with predator-prey dynamics, and increased mortality risks. This study evaluates the impact of underwater noise from maritime traffic on cetaceans in a Mediterranean tourist area, comparing a high-traffic zone with a lower-traffic zone. Three species were analyzed: bottlenose dolphins (*Tursiops truncatus*), striped dolphins (*Stenella coeruleoalba*), and pilot whales (*Globicephala melas*). AIS maritime traffic was used to develop underwater noise models to predict noise levels. Whale-watching records were also gathered to develop habitat suitability model. Observations from 2017–2022 were used to develop species presence/absence probability matrices, which were validated with sightings from 2023–2024. The developed habitat models were employed to pinpoint the optimal habitats for the target species and to identify where the species was absent despite the presence of optimal habitat conditions. The deviations from expectations based on habitat suitability were analyzed in relation to noise levels. Habitat models successfully predicted 80% of cetacean presence. However, only 70% of the predicted presence cells matched actual sightings. False positives for optimal habitats (suitability values >0.8) were higher in high-traffic areas, reaching 55% for bottlenose dolphins and 80% for pilot whales and striped dolphins. These false positives were predominantly located in areas of intense maritime traffic and elevated noise levels, aligning with our hypothesis. The findings emphasize the need to reduce anthropogenic pressure on cetaceans caused by maritime traffic. Future steps involve implementing measures such as reducing vessel speeds and limiting recreational activities in high-traffic areas to test whether decreasing low-frequency continuous noise leads to an increase in cetacean observations in the high-traffic area.

From fluke to food web: internationally optimized eDNA sampling protocol for whale watching platforms reveals marine ecological networks in the Azores

Rodriguez, Lauren ¹; Barbaccia, Eleonora ²; García Ovide, Belén ³; Robertson, Jana ¹; Sobe, Lennie ⁴; Viscontini, Giada ⁴; Leitão, Rita ⁴; Smit Pellure, Taïme ⁵; Ceballos-Caro, Ángela ⁶; Lanfredi, Caterina ⁷; Jahoda, Maddalena ⁷; Villa, Enrico ⁴; Azzellino, Arianna ²; Rasmussen, Marianne Helene ³; Traugott, Michael ¹; Thalinger, Bettina ¹

1. *University of Innsbruck Department of Zoology*
2. *Politecnico di Milano DICA Civil and Environmental Engineering Department*
3. *University of Iceland's Húsavík Research Center*
4. *Cetacean Watching Lda*
5. *Ocean Missions*
6. *Instituto de Salud Carlos III Centro Nacional de Microbiología*
7. *Tethys Research Institute*

Marine biodiversity is critical to the health and resilience of ocean ecosystems, yet efficient monitoring, which is essential for conservation efforts and investigating ecosystem dynamics, remains challenging. Conventional approaches often rely on research cruises or specialized platforms that are constrained by limited time frames and narrow taxonomic focus. In contrast, whale watching platforms, frequently operating daily in regions characterized as biodiversity hotspots, provide a unique prospect for frequent monitoring initiatives. Environmental DNA (eDNA) analysis complements this opportunity by offering a simple, non-invasive sampling method for studying oceanic ecosystems and can be easily integrated into routine operations. This study presents insights into marine biodiversity around the Azores (Portugal) using eDNA metabarcoding and a sampling protocol that was optimized among three providers operating in the Atlantic and Mediterranean Sea. In summer 2023, 142 eDNA samples were collected from boats operating in the Azores and off the coasts of Italy and Iceland near various marine mammal species. Paired field-tested variables included water volume (2-10L), sampling timing (5-20 minutes after cetacean presence), and filter type (3 pore sizes). Cetacean eDNA was amplified via quantitative PCR (qPCR) to compare sampling efficiency. Based on Linear Mixed Models, larger water volumes (10 L), immediate sampling post-encounter, and filters with 1.2 µm pore size significantly increased eDNA detection probability ($p < 0.05$; AIC = 257.7) and signal strength ($p < 0.05$; AIC = 1208.35). In 2024, this optimized protocol was applied during whale watching tours in the Azores, where 150 eDNA samples were collected. eDNA metabarcoding of these samples revealed not only the presence of cetaceans and their prey—such as small pelagic fish and krill—but also co-occurring marine vertebrates as well as ecologically-important planktonic metazoans. These insights shed light on the transformative potential of leveraging eDNA-based methods together with whale watching operations for large-scale, cost-effective marine monitoring efforts that advance conservation strategies.



From Quantity to Quality: How social selectivity increases with age in bottlenose dolphins

Díaz López, Bruno ¹; Methion, Séverine ¹

1. Bottlenose Dolphin Research Institute BDRI, Galicia (Spain) - www.thebdri.com

Fission-fusion social systems, such as those of bottlenose dolphins, offer a unique opportunity to explore how social networks evolve with age. Accumulating evidence from humans and other mammals suggests that older individuals often maintain smaller, more selective social networks, potentially prioritizing quality over quantity in social interactions. To investigate this phenomenon in a cetacean species, we analyzed 1,901 sightings of bottlenose dolphins recorded over a 11-year period (2014–2024) in Galician waters, Spain. A total of 378 individuals were identified, focusing on 38 males already adults in 2014 and monitored throughout the study period across 1,324 sightings. Our results revealed that adult males actively reduced their network size as they aged while maintaining strong connections with specific partners linked to fitness benefits. Network strength, reach, clustering, and affinity all declined significantly with age, while centrality showed no significant changes, suggesting that individuals prioritized social selectivity over structural centrality within the network. These findings provide evidence for increasing social selectivity with age, consistent with the social selectivity hypothesis. Furthermore, the stability of core associations over time suggests that behavioral choices, rather than external factors like the loss of social partners, drive these changes. This study highlights the value of longitudinal data in understanding age-related social dynamics in animals and provides compelling evidence for selective social behavior in a nonprimate species with a complex social system. By demonstrating parallels between bottlenose dolphins and other long-lived mammals, including humans, our findings contribute to a broader understanding of the evolutionary pressures shaping social aging in highly social species.

From torpedoes to pingers: a two centuries-long perspective on the management of interactions between fisheries and small cetaceans in the French Bay of Biscay

Petitguyot, Marie ¹; Danto, Anatole ^{2,3}; Pierce, Graham J. ¹

1. *Instituto de Investigaciones Marinas, Consejo Superior de Investigaciones Científicas (IIM-CSIC), Vigo, Spain*
2. *Department of Anthropology, Tartu Ülikool, Tartu, Estonia*
3. *Centre de recherche Europes-Eurasie (CREE), Institut national des langues et civilisations orientales, Paris, France*

Interactions between fisheries and small cetaceans, such as dolphins and porpoises, have been documented in the French Bay of Biscay for centuries, raising both ecological and socio-economical concerns. Efforts to manage and mitigate these interactions have long been a priority. This study aims to analyze the socio-environmental factors that have shaped management strategies in France over the past two centuries, with the goal of identifying insights to inform future solutions. The analysis involved a comprehensive review of hundreds of archival records, government reports, fisheries literature, and scientific studies spanning from the 16th century to the present. This approach identified three distinct phases of management: ¹ widespread culling campaigns from the 19th century to the mid-20th century, organized by the government, the fishing and scientific community, and supported by the public, whereby destructive methods, including military vessels deploying torpedoes, were used to reduce competition with fisheries; ² the post-World War II era, characterized by institutional restructuring, the introduction of protective legislation for cetaceans, and growing scientific and public awareness of conservation needs; and ³ the late 20th century to the present, marked by a shift towards ecosystem-based approaches, including bycatch mitigation measures such as acoustic deterrent devices, gear modifications, and temporary fisheries closures. There has been a clear shift in management focus, from prioritizing fisheries' interests for over a century to a more integrated approach balancing conservation, sustainable exploitation and socioeconomic goals in recent decades. However, contemporary measures remain contentious, with ongoing debates about both their efficacy in achieving conservation objectives and their socio-economic impact on the fishing industry. By contextualizing historical management efforts, this study highlights the interplay of ecological, social, and economic drivers that have influenced how marine resources are managed and underscores the need to account for different stakeholder perspectives when seeking evidence-based solutions to ocean management problems.



Fungal colonization and drug resistance in bottlenose dolphins: A new frontier in marine mammal health with One Health implications

Garcia-Bustos, Victor ¹; Ruiz-Gaitán, Alba Cecilia ²; Acosta-Hernández, Begoña ¹; Álvaro, Teresa ³; Rojo-Solís, Carlos ³; Valls, Mónica ³; Pérez-Royo, José Manuel ²; Rosario Medina, Inmaculada ¹

4. University Institute of Animal Health and Food Safety (IUSA), University of Las Palmas de Gran Canaria
5. Health Research Institute La Fe
6. Oceanogràfic Valencia

Background: Pulmonary mycosis is a significant health issue in bottlenose dolphins (*Tursiops truncatus*), primarily caused by *Aspergillus* and *Candida* species. These infections pose a threat to both wild and captive dolphin populations and have broader implications within the One Health framework. However, fungal colonization in cetaceans, particularly in respiratory systems, remains underexplored. Methods: In August and September 2023, ten bottlenose dolphins from Oceanogràfic aquarium (Valencia, Spain) were sampled. Six exhaled breath samples per dolphin were cultured on Sabouraud-chloramphenicol and CHROMagar *Candida*, with additional CHROMagar supplemented with 32 mg/L fluconazole. Cultures were incubated at 24°C and 37°C for up to 21 days. Fungi were identified using chromogenic media, MALDI-TOF, and molecular techniques. Antifungal susceptibility was assessed using Sensititre YeastOne YO10 AST Plate and VIPCheck plates. Results: A total of 88 fungal isolates were identified: 21 yeasts (23.86%) and 67 filamentous fungi (76.14%), with an average of 8.8 isolates per dolphin. Predominant filamentous fungi included *Aspergillus niger* (21.59%), *A. fumigatus* (6.82%), and *A. terreus* (5.68%). Environmental fungi such as *Cladosporium* (9.09%) and *Penicillium* (3.41%) were also isolated. Yeasts were dominated by *Candida albicans* (15.91%) and *Candida glabrata* (6.82%). Resistance to itraconazole was detected in 50% of *C. albicans* isolates, while 16.7% of *C. glabrata* exhibited multidrug resistance. Additionally, one *A. terreus* isolate demonstrated resistance to posaconazole. Conclusion: The detection of azole-resistant *Aspergillus* and *Candida* species in dolphins highlights emerging antifungal resistance in marine mammals. These findings have significant implications for marine biodiversity, veterinary medicine, and public health. This study underscores the urgent need for integrated surveillance and control strategies within a One Health framework to mitigate the risks posed by resistant fungal pathogens in interconnected marine and human ecosystems.



Impact of baleen whales on ocean primary production

Freitas, Carla ¹; Skogen, Morten ²; Sigurðsson, Guðjón Már ³; Biuw, Martin ⁴; Haug, Tore ⁴; Lindblom, Lotta ⁴; Gundersen, Kjell ²

1. *Institute of Marine Research, Research Station Flødevigen, His, Norway*
2. *Institute of Marine Research, Bergen, Norway*
3. *Marine and Freshwater Research Institute, Hafnarfjörður, Iceland*
4. *Institute of Marine Research, Tromsø, Norway*

Primary production in the ocean is a fundamental process that supports marine food webs and global carbon sequestration. This process depends on nutrients that are often limited in surface waters. Whales are known to excrete essential elements such as nitrogen, phosphorus, and iron, yet the extent of their contribution to ocean primary production remains unclear. Here, we present regional estimates of nutrient excretion by baleen whales in high-latitude feeding grounds and use end-to-end ecosystem models to evaluate the impact of these nutrients on primary production. Our findings show that minke and fin whales are the main nutrient contributors among baleen whales in the Barents, Norwegian, Greenland and Iceland Seas. Overall, minke, fin, sei, humpback, blue and bowhead whales support annual and seasonal local net primary production, with the greatest effects observed during summer stratification and in offshore areas distant from other nutrient sources. Increase in primary production have cascading effects on the food web, creating elevated levels of mesozooplankton biomass. This study highlights the ecological significance of nutrient cycling by whales and underscores the value of integrating whale excretion data into ecosystem modelling to assess the broader impacts of whales on marine productivity.



Integrating neural networks to aid remote monitoring of Mediterranean monk seal-vessel interactions

Amlin, Angela ¹; Pfyffer, Julien ²; Guinand, Andy ²; Gonzalvo, Joan ³; Notarbartolo di Sciara, Giuseppe ³; Hastie, Gordon ¹; Rendell, Luke ⁴

1. University of St Andrews – Sea Mammal Research Unit
2. Octopus Foundation
3. Tethys Research Institute
4. 1University of St Andrews – Sea Mammal Research Unit

The Mediterranean monk seal (*Monachus monachus*) is one of the rarest marine mammal species in the world, relying on remote sea caves to haul-out for rest, pupping, and moulting. Due to the inaccessibility of many of these caves and difficulty of conducting in-cave observations without causing disturbance, remote cameras have been used since the late 1980s to monitor population trends and investigate monk seal behaviour. This ongoing study is using remotely captured images to analyse potential impacts of vessel activity on monk seal cave occupancy, and to validate the effectiveness of an integrated remote sensing approach to assessing and monitoring threats to seal populations. Between May 2019 and October 2023, autonomous camera monitoring units deployed at six sites in the Inner Ionian Sea Archipelago captured 879,000+ images. Each unit featured dual solar-powered cameras: an infrared camera inside the haul-out cave to record seal presence, and a visible light RGB camera outside the cave to track vessels in adjacent waters. Images were collected simultaneously every 15 minutes and transmitted using mobile data networks. Seal presence was manually determined in 427,000+ images collected inside the caves, while neural network image analysis processed over 451,000 external images for vessel presence. Seals were present in ~11% of cave images. Linear models fitted to seal occupancy as a function of vessel count at each site showed a significant negative relationship at four of six sites – the more boats outside a cave, the less likely that cave was to be occupied by one or more seals. While there is more to understand about how boat traffic affects cave use, it clearly often has a detrimental impact, and this research equips conservation managers with actionable knowledge to implement targeted interventions to mitigate disturbance and promote conservation of this rare species.



Inter-annual, seasonal and diel changes in North Atlantic right whale diving behaviour present challenges for estimating entanglement and collision risks, and availability bias

Lesage, Véronique ¹; Ramp, Christian ¹; Harvey, Valérie ¹; Johnson, Catherine ¹; Auger-Méthée, Marie ²; Sorochan, Kevin ¹; Gosselin, Jean-François ¹; Mosnier, Arnaud ¹; Plourde, Stéphane ¹; Andrews, Russel

1. Fisheries and Oceans Canada
2. University of British Columbia

Over a third of the critically endangered North Atlantic right whale (NARW) population summers in the Gulf of St. Lawrence, Canada, where they are aerially monitored for abundance and distribution to mitigate collision and entanglement risks. Adequately estimating heterogeneity in diving behaviour, both temporally and spatially, is required for reliable assessment of abundance and risks. Here, we examined this question using 27 satellite-linked time-depth/fastlocGPS Argos transmitters deployed on NARW in the Gulf of St. Lawrence in May-July (n=12, 2022), July (n=6, 2023), and August (n=9, 2019). A state-space model applied to location data (n=7,354) estimated move-persistency and distinguished between area-restricted search (ARS) and transit. Dive patterns varied in characteristics on a diel and yearly basis. In 2022, tagged whales displayed around-the-clock diving near the seabed, where in 2019 and 2023, tagged whales generally remained near the surface (< 12 m) at night and dove near the seabed during the day. Year 2022 contrasted with other years in that barely any surface active groups (SAGs) were documented through other sources during that year. The state space model results combined with dive data indicated that NARW tended to perform shallower dives while in transit across the Laurentian Channel and shipping lane, making them more prone to collision risk and potentially more available for detection by aerial survey platforms compared to when in ARS behaviour and potentially foraging. SAGs were systematically underestimated in our sample by the tendency of the tags to get knocked off by whales during this activity, leading to potential underestimation of collision risks and overestimation of entanglement risks. Overall, these results emphasize the challenges associated with capturing variability on multiple fronts from low sample sizes when attempting to estimate collision and entanglement risks, or the proportion of individuals unavailable to survey platforms (availability bias).



Investigating the blubber proteome of mass stranded pilot whales: towards novel health biomarkers

Tranganida, Alexandra ¹; Brownlow, Andrew ²; ten Doeschate, Mariel T.I. ²; Davison, Nicholas J. ²; Kershaw, Joanna ³; Derous, Davina ¹

1. University of Aberdeen
2. University of Glasgow
3. University of St Andrews

Biomarkers sensitive to different stressors are needed for the accurate monitoring of marine mammal health, and thus are vital for informed management of animal populations and their environments. Label-free proteomics is an approach that allows for the identification and relative quantification of thousands of proteins in the sample analysed, providing a powerful tool in biomarker discovery. However, for useful health biomarker identification, information on natural variability in proteins of interest across different life-history physiological challenges is needed. Here, we applied a label-free proteomic approach to analyse the proteome of the outer blubber layer of 49 long-finned pilot whales (*Globicephala melas*) that mass stranded and died in 2023 on the Isle of Lewis, Scotland. Blubber samples were collected by the Scottish Marine Animal Stranding Scheme within 24 hours of stranding, representing a range of sex, age and reproductive classes. A total of 3106 proteins were identified by Liquid Chromatography-Tandem Mass Spectrometry in these samples. Differential analysis was performed to compare the proteome between sexes and reproductive classes to investigate variability between individuals associated with different physiological states. Preliminary results show that extracellular matrix related proteins were differentially expressed in juveniles compared to adults. These differences could be attributed to blubber development in the young, growing individuals compared to sexually mature animals. In addition to providing insight into the blubber proteome over different physiological states, helpful in the prospective use of this tissue for future biomarker identification, we demonstrate here the application of an omics technique on blubber tissue from stranded animals, maximising the information that can be collected from these events.



Less talk and more action: while science improves our understanding of threats to Hawaiian false killer whales, managers fail to act

Baird, Robin ¹; Harnish, Annette ¹; Mahaffy, Sabre ¹; Kratofil, Michaela ¹

1. Cascadia Research Collective

Three partially overlapping populations of false killer whales have been identified in Hawaiian waters: the Northwestern Hawaiian Islands (NWHI) population, an open-ocean (“Hawai’i pelagic”) population, and the endangered main Hawaiian Islands (MHI) insular population. Considerable funding and effort have been invested into science to identify threats and assess abundance for these populations, including NOAA large-vessel line-transect surveys, photo-identification for mark-recapture abundance estimation and assessment of fisheries-related injuries, and satellite tagging to examine movements and behavior, among others. The NWHI population largely resides within the Papahānaumokuākea Marine National Monument, and has little overlap with human activities. By contrast, bycatch in the U.S. longline fishery of the Hawai’i pelagic population has exceeded sustainable levels since bycatch and abundance estimates have been available, and the potential for bycatch in non-longline fisheries that overlap with the population has been consistently ignored since first raised in 2010 by the False Killer Whale Take Reduction Team. Based on mark-recapture abundance estimation, the MHI population has been declining since it was listed as endangered in 2012. An examination of fisheries-related injuries for those who have survived hooking or entanglement indicates that fishery interactions are frequent and widespread throughout the MHI population. However, while there have been considerable scientific advances in our knowledge of the threats facing both the Hawai’i pelagic population and the MHI population, management efforts to address these threats have either been completely absent or woefully inadequate. Measures implemented as part of the 2012 Take Reduction Plan to reduce bycatch in the offshore longline fishery have been ineffective, and no management measures have been taken to address bycatch in nearshore fisheries for either the Hawai’i pelagic population or the MHI population. We suggest reasons why managers have failed to enact meaningful conservation measures, and why prospects for the endangered and declining MHI population are grim.



Monitoring the gut microbiota from birth until weaning in a declining Antarctic pinniped

Botsidou, Petroula ¹; Schloter, Michael ²; Nagel, Rebecca ³; Hoffman, Joseph ¹

1. Faculty of Biology, Department of Evolutionary Population Genetics, Bielefeld University, Germany
2. Research Unit for Comparative Microbiome Analysis, Helmholtz Munich, Germany
3. Centre for Biological Diversity, School of Biology, University of St Andrews, UK

All mammalian hosts carry unique gut microbial communities which are essential for critical functions such as food digestion, nutrients absorption, growth, and immune system regulation. This host-specific gut microbiota is affected by a plethora of intrinsic and extrinsic factors, which can in turn impact host fitness and health. Understanding these relationships can provide fundamental insights into host resilience and adaptation to environmental changes, particularly in populations living in remote environments where systematic knowledge is often limited. In our example, this is a wild population of Antarctic fur seals (*Arctocephalus gazella*) breeding at Bird Island, South Georgia, which has been declining over the past three decades in response to reductions in krill availability due to climate change. Our unique natural study system comprises two colonies of high and low density and two contrasting years of food availability. By performing 16S rRNA amplicon sequencing on rectal swabs collected during 2018-2019 from 100 mother-pup pairs from birth until weaning, we aim to elucidate which intrinsic and extrinsic factors shape the composition and structure of Antarctic fur seals gut microbiome. Our results reveal that developmental status, host stress—as indicated by saliva cortisol levels—and food availability are the most influential parameters shaping gut microbiota composition and diversity, while host sex and genetic quality play less significant roles. These findings provide the first insights into the ecological and physiological factors influencing the gut microbiota in Antarctic fur seals. By unraveling the interplay between environmental stressors, host-associated traits and gut microbiome structure and function, we aim to enhance our understanding of the effects of ecological change on a key indicator species for the health of the Southern Ocean.



Multi-year acoustic monitoring reveals fine-scale habitat preferences of harbour porpoise (*Phocoena phocoena*) and species decline within a Special Area of Conservation

Todd, Nicole ¹; Jessopp, Mark ²; Rogan, Emer ²; Kavanagh, Ailbhe ³

1. University College Cork
2. University College Cork, Ireland
3. Marine Institute, Galway, Ireland

Understanding spatio-temporal variation in habitat use is essential in underpinning our ecological understanding of species behaviour (for example foraging and predator/prey interactions) and supporting conservation and management decisions. Passive acoustic monitoring (PAM) data, collected from three monitoring locations within a Special Area of Conservation (SAC) for harbour porpoise in southwest Ireland, detected porpoises on average 77% of days throughout 2020 - 2023. General Additive Models (GAMs) were applied to examine the spatio-temporal trends in harbour porpoise occurrence and foraging behaviour, and to investigate intra-site differences in habitat use. Preferred habitat was identified at the most sheltered site, with twice the acoustic detections observed compared to the other sites. Harbour porpoise occurrence and foraging behaviour were found to be variable across relatively small spatial scales and across diel, tidal, and lunar cycles, suggesting sequential habitat use across the region. Notably, an anomalous increase in porpoise detections was observed during the duration of a COVID-19 lockdown, aligning with decreased anthropogenic disturbances, and decreased ambient noise levels in the region during this period. However, we observed an overall 67% decline in acoustic detections between 2020 and 2023, which is of concern given the status of the bay as a SAC for harbour porpoise and the declining abundance estimates reported in the region prior to the commencement of this study. This study provides insights into fine-scale spatial and temporal patterns in the distribution of harbour porpoise that can inform future monitoring. Long-term PAM, with appropriate spatial coverage, should be integrated into protected area management plans to detect potential decreases or shifts in species occurrence over time.



Non-local conditions drive baleen whale migration phenology at a key stopover site in the North Atlantic

Pérez-Jorge, Sergi ¹; Berkowitz-Sklar, Daviana ²; Prieto, Rui ¹; Lehodey, Patrick ³; Abrahms, Briana ⁴; Hazen, Elliott ⁵; A. Silva, Mónica ¹

1. *Institute of Marine Sciences – OKEANOS, University of the Azores & Institute of Marine Research – IMAR, Horta, Portugal*
2. *Hopkins Marine Station, Stanford University, California, USA.*
3. *Mercator Ocean International, 2 Av. de l'Aérodrome de Montaudran, 31400, Toulouse, France*
4. *Center for Ecosystem Sentinels, Department of Biology, University of Washington, Seattle, WA, USA*
5. *Ecosystem Science Division, NOAA Southwest Fisheries Science Center, Monterey, CA, USA*

For long-distance migrants that forage along their migration route, resource tracking is an important behavioural adaptation that enables animals to maximize resource acquisition through a shifting landscape. However, resource tracking requires reliable cues to allow animals to match their migration timing with the timing of peak resource availability. In environments with predictable latitudinal gradients in resource availability, this can be achieved either by contemporaneous gradient-tracking or by tracking climatological gradients based on memory. In environments that lack predictable resource gradients, it remains unclear if and how animals can match the spatiotemporal distribution of resources. We investigated the drivers of phenology of the baleen whale northward migration in the absence of consistent foraging cues. We used boosted regression trees to model land-based sightings of blue and sei whales (2006-2011) at a major foraging stopover site, the Azores, using prey resources (modelled zooplankton biomass) in various locations across each species' migratory range. Blue whales were consistently ahead of the contemporaneous and climatological prey peak, while sei whales were always behind. Blue whale encounter rates and timing in the Azores were predicted with remarkable accuracy by previous foraging conditions in Northwest Africa, at the southern end of their migratory range. In contrast, resource availability at the northern end of the migratory range was the most important predictor of sei whale encounter rates in the Azores. Hence, the timing and relative abundance of blue and sei whales at this key stopover site were driven by non-local conditions at both ends of migration. These findings underscore the different information sources used by baleen whales to navigate complex and variable landscapes in search for food, offering new insights into the ecological drivers of long-distance migration in unpredictable environments.



Northern bottlenose whales (*Hyperoodon ampullatus*) make migration roundtrips between the Nordic Seas and the Azores

Wensveen, Paul J. ¹; Miller, Patrick J.O. ²; Roland, Rune ³; Neubarth, Barbara K. ⁴; Svavarsson, Jörundur ⁵

1. *Westman Islands Research Centre, Institute of Research Centres, University of Iceland, Vestmannaeyjar, Iceland Faculty of Life and Environmental Sciences, School of Engineering and Natural Sciences, University of Iceland, Reykjavík, Iceland*
2. *Sea Mammal Research Unit, Scottish Oceans Institute, School of Biology, University of St Andrews, St Andrews, UK*
3. *University of Oslo, Marine Biological Station, Drøbak, Norway*
4. *Coastal and Marine Management, University Centre of the Westfjords, Ísafjörður, Iceland Westman Islands Research Centre, Institute of Research Centres, University of Iceland, Vestmannaeyjar, Iceland*
5. *Faculty of Life and Environmental Sciences, School of Engineering and Natural Sciences, University of Iceland, Reykjavík, Iceland*

The northern bottlenose whale is a deep-diving oceanic odontocete with a broad distribution, ranging from Svalbard to the Azores. Historically, whalers hypothesized a north-south migration in the Northeast Atlantic, with whales moving north in spring and south in summer or early autumn. However, robust evidence for this migratory pattern remains lacking. Here, we describe the long-distance movements of northern bottlenose whales using satellite tags deployed in Iceland and Jan Mayen (Norway) between 2014 and 2023. To explore potential drivers of migration, we fitted hidden Markov models to the movement tracks of 14 individuals and linked horizontal movements to dive summary data. Most individuals were present in the waters between Iceland and the Faroe Islands in July. One whale in 2023 completed a 48-day migration roundtrip from there to an area just north of the Azores, where it remained for only two weeks before returning. Four other individuals, tracked in 2015, 2016, and 2023 and around the same time of year, exhibited very similar trajectories, which we interpreted as partially documented roundtrips. The hidden Markov models characterised the whales' movements during the southbound and northbound phases of the roundtrips as fast and directional. State switches from southbound migration to area-restricted movement were predicted to occur when the whales encountered sea surface temperatures (SSTs) of 23°C or higher, with SST supported as a predictor over latitude. Limited dive data during southbound migration and near the Azores indicated that the two whales from 2015 and 2016 increased time near the surface compared to in the Nordic Seas. This study suggests that high-latitude northern bottlenose whales periodically visit the oceanic Azores archipelago for brief periods in summer, potentially during fast roundtrips for physiological maintenance. It adds to a growing body of work suggesting alternatives to feeding-breeding as a function for migration in odontocetes.



Passive acoustic monitoring – investigating the power to detect changes in relative density of small cetaceans between years

Sveegaard, Signe ¹; Owen, Kylie ²; Kyhn, Line Anker ³; Jørgensen, Poul Boel Jørgensen ¹; Mikkelsen, Lonnie ¹; Galatius, Anders ¹; van Beest, Floris M. ⁴

1. Marine Mammal Research, Department of Ecoscience, Aarhus University, Denmark
2. Applied Ocean Physics and Engineering Department, Woods Hole Oceanographic Institution, Woods Hole, MA, USA
3. NIRAS, Denmark
4. Arctic Ecosystem Ecology, Department of Ecoscience, Aarhus University, Denmark

Small cetaceans are often monitored in special areas of conservation (SACs) or in relation to anthropogenic disturbances using passive acoustic monitoring (PAM) to assess changes in relative density. However, factors influencing the reliability of PAM results and the power to detect changes over time are often unclear. The harbour porpoise (*Phocoena phocoena*) is strictly protected in the EU and monitoring programs for evaluation of trends in density or abundance are mandatory. In Denmark, six SACs designated for porpoises have been monitored using PAM since 2012. The aims of this study were 1) to present the results and effectiveness of the Danish national monitoring program, and 2) to assess how the power to detect changes in relative density is influenced by the length of the monitoring period, number of stations, data variance, time between monitoring periods, and size of the SACs. In each SAC, five C-PODs were deployed for 3-4 monitoring periods, each covering approximately a year. Generalized linear mixed-effects regression models were used to determine changes in the mean porpoise positive minutes (PPM) per day/month. We found that the relative density of harbour porpoises in each SAC was either stable or increasing across the 11 years. There was sufficient power (>80%) to detect the observed changes between years (-22% to 36%) in three of the six SACs ($\alpha = 0.05$). The power analysis revealed that 5 stations with 12 months data collection per area, was sufficient to detect an annual change of 30%. Increasing the number of stations to 20 would provide sufficient power to detect annual changes of 15%, while increasing the number of months in each monitoring period did not increase the power substantially. This study demonstrates the necessity of performing power analyses to design appropriate monitoring programs for national monitoring and assessments of anthropogenic impacts at sea.

Plastic ingestion by marine mammals: the current state of knowledge, future research priorities and call to action

Nelms, Sarah ¹; Barnett, James ²; Bosker, Thijs ³; Botterell, Zara ¹; Brownlow, Andrew ⁴; Carroll, Emma ⁵; Davison, Nick ⁴; Deaville, Rob ⁶; Galloway, Tamara ¹; Garrard, Sam ⁷; Godley, Brendan ¹; Hunter, Emma ¹; Jarvis, Dan ⁸; Lindeque, Penelope ⁷; Santillo, David ⁹; Senko, Jesse ¹⁰; Stockin, Karen ¹¹; Zantis, Laura ³

1. *University of Exeter*
2. *Cornwall Marine Pathology Team*
3. *Leiden University*
4. *Scottish Marine Animal Stranding Scheme, University of Glasgow*
5. *University of Auckland*
6. *Cetacean Strandings Investigation Programme*
7. *Plymouth Marine Laboratory*
8. *British Divers Marine Life Rescue*
9. *Greenpeace Research Laboratories, University of Exeter*
10. *Arizona State University*
11. *Massey University*

The rapidly increasing abundance of plastic waste is of growing global concern – it is now omnipresent, irreversible and a planetary boundary threat. Indeed, plastic pollution is so ubiquitous that at least 70% of marine mammal species are exposed to it, even those residing in remote habitats, such as the polar regions. Entanglement in large plastic debris is recognised as a major threat to many marine species and a significant welfare issue for marine mammals due to the variety of injuries it can inflict. The impacts of plastic ingestion may be less visible but are equally concerning. They include perforations, ulcerations and obstructions of the digestive tract, as well as dietary dilution and starvation. Microplastics (<5mm in size) have emerged as a particular topic of interest because they are pervasive in the marine environment and increasing rapidly due to the continued input and breakdown of legacy plastics. Their small size enhances their bioavailability to a diverse array of marine organisms and could allow them to function as a 'Trojan horse' for an assortment of chemicals and pathogens. They are increasingly being found within animal and human tissues, but their effects are poorly understood. In this talk, we summarise our work and that of others to outline what is currently known about the extent of exposure and impacts from plastic pollution on marine mammals, highlight knowledge gaps and make recommendations for future work. Given that global plastic production is projected to triple by 2060 if no action is taken, we must urgently understand the impacts of this persistent pollutant and prioritise the direction of our collective research efforts.



Poor body condition of bottlenose dolphins foraging with shrimp trawlers

Fiori, Lorenzo ¹; Würsig, Bernd ²; Orbach, Dara ¹

1. Texas A&M University - Corpus Christi
2. Texas A&M University - Galveston

Common bottlenose dolphins (*Tursiops truncatus*) actively follow shrimp trawlers in Corpus Christi Bay, Texas; dolphins inspect trawl nets for trapped fish and feed on discarded bycatch. While trawlers provide accessible prey to dolphins, it is unclear if the prey meet dolphins' physiological needs. This study assessed body condition of dolphins foraging in association with shrimp trawlers compared to dolphins foraging independently in an adjacent bay. Between July and December 2024, a total of 37 adult bottlenose dolphins (nforaging with trawlers = 22; nforaging independently = 15) were photo-identified by their dorsal fins while foraging. A small unoccupied aerial system (UAS) launched from a research vessel and flown at 30 m altitude video-recorded each foraging dolphin. The surface area and blowhole-dorsal fin distance were measured from suitable videoframes to calculate each dolphin's body area index (BAI), a proxy of body condition. BAI was calculated from three independent frames for each dolphin to account for measurement error. Lateral and aerial imagery were used to assign a body condition score ranging from 1="emaciated" to 3="ideal" following established protocols. Fifteen of the 22 dolphins (68%) foraging in association with shrimp trawlers showed signs of poor body condition (e.g., exposed ribs and scapula ridge, depressed nuchal crest) and were categorized below 3. One of the 15 dolphins (6%) foraging independently scored below "ideal". The mean BAI was significantly higher for dolphins foraging independently ($t = 3.81$, $df = 34$, $p = 0.0002$), indicating better body condition than dolphins foraging with shrimp trawlers. Bottlenose dolphins in Corpus Christi Bay may resort to forage with shrimp trawlers when already in poor body condition. However, it cannot be excluded that the feeding opportunity provided by trawlers does not support dolphins' energy requirements. Future research is needed to quantify the prey energy content associated with the two foraging contexts.



Redistribution of baleen whales after a regime shift in the Southeast Greenland marine ecosystem

Heide-Jørgensen, Mads Peter ¹

1. *Greenland Institute of Natural Resources*

Significant oceanographic changes have recently influenced multiple trophic levels in Southeast Greenland's (SEG) coastal areas. Over the past two decades, drift ice transported by the East Greenland Current has decreased substantially. Since 2003, summer sea ice—a critical tipping element—has virtually disappeared, triggering a regime shift in oceanographic and ecological conditions. This 20-year period of minimal or absent coastal sea ice is unprecedented in 200 years of regional observations. Simultaneously, sea temperatures south of 73.5°N have risen sharply (>2°C since 1980), while the warm Irminger Current has carried increasingly warm, saline Atlantic Water into the region since 1990. These changes, combined with the loss of summer pack ice, have had cascading effects on the ecosystem. Boreal fish species have migrated into southern areas, while subarctic capelin have extended their range further north. At higher trophic levels, boreal cetaceans, including humpback, fin, killer, and pilot whales, are now either more abundant or newly present in SEG. Aerial surveys in 2015 and 2024 recorded baleen whale densities in SEG four times higher than in West Greenland. In contrast, West Greenland has seen declines in baleen whale species, except for humpbacks, suggesting a redistribution of whales in response to SEG's altered ecological conditions. The new cetacean species in SEG are estimated to consume 700,000 tonnes of fish annually, with fin whales alone predating over 1,500,000 tonnes of krill. Concurrently, narwhals and walrus have declined in abundance and catches in SEG, likely impacted by these profound habitat changes.

Sharing is caring? – Pathogens and pathogen-specific antibodies in Arctic endemic seal species and the newly sympatric harbour seals in Kongsfjorden, Svalbard

Schick, Luca ¹; Kovacs, Kit ²; Lydersen, Christian ²; Rohner, Simon ^{1,3}; Prenger-Berninghoff, Ellen ⁴; Heydel, Carsten ⁴; Postel, Alexander ⁵; Gremmel, Nele ⁵; Becher, Paul ⁵; Strube, Christina ⁶; Siebert, Ursula ¹

1. Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany
2. Norwegian Polar Institute, Fram Centre, Tromsø, Norway
3. Frankfurt Zoo, Frankfurt am Main, Germany
4. Institute of Hygiene and Infectious Diseases of Animals, Justus-Liebig-Universität Giessen, Giessen, Germany
5. Institute for Virology, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany
6. Institute for Parasitology, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany

Climate change transformations of Arctic marine ecosystems are having detrimental impacts on endemic marine mammals. However, the warmer conditions are providing new habitats for temperate marine mammals, some of which are expanding into Arctic regions. The objective of this study was to examine pathogen overlaps between endemic Arctic seals and newly sympatric harbour seals (*Phoca vitulina*) in Kongsfjorden, on the west coast of Spitsbergen, Svalbard, to evaluate the threat posed by novel pathogen introductions and disease transmission. Between 2021 and 2023, 44 harbour seals, 12 ringed seals (*Pusa hispida*) and four bearded seals (*Erignathus barbatus*) were live-captured in the fjord. Swab samples were analysed for genomes of Influenza A virus (IAV), Phocine Distemper Virus (PDV), and herpesviruses and microbiological screenings were performed. Serological analyses were conducted for the viruses, *Brucella*, *Leptospira* serovars, *Erysipelothrix rhusiopathiae*, and *Toxoplasma gondii*. Twelve harbour seals and two ringed seals tested positive for herpesvirus genome, while neither IAV nor PDV genome were detected. Neutralizing antibodies against Phocine herpesvirus-1 (PhHV-1) were detected in 34 harbour seals, four ringed seals and two bearded seals. Three harbour seals had neutralizing antibodies against PDV and one ringed seal had antibodies against IAV. Serological signs of former infection with *Brucella* sp. were found in two harbour seals and one bearded seal, but brucellosis was not confirmed via culture. Low titres suggestive of leptospire infection were detected in two harbour seals and one bearded seal. Six seals (one bearded, two ringed, three harbour seals) had elevated antibody titres against *T. gondii*. This study suggests the potential risk of pathogen transmission between seal species in the Svalbard Archipelago. Increased host density in remaining key habitats could facilitate disease transmission and harbour seals may serve as a source for novel pathogens, which could lead to increased pathogen pressure on immunologically naive Arctic seal populations.



Shifts in habitat suitability for harbour porpoises leads to reduced importance of Marine Protected Areas

van Beest, Floris ¹; Carstensen, Jacob ¹; Dietz, Rune ¹; Nabe-Nielsen, Jacob ¹; Sveegaard, Signe ¹; Teilmann, Jonas ¹

1. Department of Ecoscience, Aarhus University, Frederiksborgvej 399, DK-4000 Roskilde, Denmark

Marine ecosystems across the globe are under pressure requiring evaluations of whether marine protected areas (MPAs) remain effective in safeguarding marine life and critical habitats. Our objectives were to 1) estimate shifts in seasonal habitat suitability over a 25-year period (1997–2022) for the harbour porpoise (*Phocoena phocoena*) across the North Sea–Baltic Sea transition zone, and 2) quantify any spatiotemporal changes in the overlap between suitable habitats and an existing network of 62 MPAs (an area covering 16 404 km²) dedicated to harbour porpoise protection. Habitat suitability was estimated using the maximum entropy (MaxEnt) algorithm, based on satellite tag data of 111 individuals and a range of dynamic and static environmental conditions as predictor variables. Model output revealed a northward shift of medium and high suitable habitats during winter (Nov–Apr) over the study period. Changes in habitat suitability during summer (May–Oct) were also evident though without clear directional shifts. A maximum of 14.5% of the MPAs (area of 1 096 km²) were found to overlap with highly suitable habitat during the summers of 2005–2012, with a minimum of 6.4% (area of 194 km²) during the winters of 2013–2022. These results clearly indicate a decline in the spatiotemporal overlap between habitat suitability during winter and the location of MPAs dedicated to harbour porpoise protection in the North Sea–Baltic Sea transition zone. The model output may inform effective design of forthcoming MPAs under the EU Biodiversity Strategy for 2030.



Southern elephant seals give new insight in cetacean presence and feeding habitats in the Southern Ocean

Gros-Martial, Anatole ^{1,2,3}; Cazau, Dorian ³; Bazin, Sara ¹; Guinet, Christophe ²

1. *Geo-Ocean, Univ Brest, CNRS, Ifremer, UMR6538, F-29280 Plouzané, France*
2. *Centre d'Études Biologiques de Chizé, UMR 7372, CNRS, La Rochelle University, France*
3. *ENSTA – Institut Polytechnique de Paris, Lab STICC UMR 6285, F-29200, Brest, France*

Free-roaming elephant seals from Kerguelen Island and Península Valdés visit multiple environments when foraging between October and December. Twelve different individuals were biologged with DTAGs between 2017 and 2021. In this study, we assess for the first time the potential of passive acoustic datasets from tagged elephant seals to detect cetacean presence. These detections can then be compared with: i) the individuals' prey catch attempts (PCAs) and ii) flashes from surrounding bioluminescent animals, linking cetacean presence to preferential foraging environments. Cetacean detections were obtained through the manual annotation of recordings from hydrophones sampling at 32 or 38.4 kHz. The elephant seals' PCAs were computed using the DTAGs' accelerometer data, and flashes were identified by filtering light sensor data. Each variable was then averaged over an elephant seal's dive, giving comparable time series. Results show the presence of multiple cetacean species, including sperm whales, humpback whales, sei whales, fin whales, and Antarctic blue whales. The detection of sperm whales and humpback whales provides new insight into their distribution in the Southern Indian Ocean and Southern Ocean, as most studies focus on low-frequency (<200 Hz) calls that can be detected from further away. Furthermore, these detections show a strong correlation with the elephant seals' PCAs, indicating that whales and elephant seals share similar foraging habitats. This highlights the existence of areas of rich primary production that benefit predators of krill and mesopelagic fish. Additional work will look at the elephant seal's behavior to assess whether they follow cetacean acoustic gradients to find better foraging grounds. More important, we will examine these environments using DTAGs' temperature and salinity data, offering crucial elements to explain the mechanisms leading to the formation of high prey concentration zones, particularly in the context of a changing climate.

Spatially-explicit cetacean abundance estimates from multiple data sources in the mediterranean

Cañadas, Ana ¹; Aissi, Mehdi ²; Airoidi, Sabina ³; Alemany, Xisco ⁴; Arcangeli, Antonella ⁵; Atzori, Fabrizio ⁶; Marta, Azzolin ⁷; Bellingeri, Michella ⁸; Benamer, Ibrahim ⁹; Benmessaoud, Rimel ¹⁰

1. *Marine Geospatial Ecology Lab, Nicholas School for the Environment, Duke University, Durham, North Carolina, USA.*
2. *ATUTAX (Association Tunisienne de Taxonomie). Faculté des Sciences de Tunis, Département de Biologie, Campus Universitaire Farhat Hached, 2092, Manar II, Tunisia.*
3. *Tethys Research Institute, Viale G.B. Gadio 2, 20121 Milano, Italy*
4. *The International Commission for the Conservation of Atlantic Tunas, ICCAT. Corazón de María, 8. 28002 Madrid, SPAIN*
5. *Italian Institute for Environmental Protection and Research, Rome, Italy*
6. *Capo Carbonara Marine Protected Area, Via Roma 60, Villasimius (SU), Italy*
7. *Gaia Research Institute Onlus - Corso Moncalieri 68B, 10133 Torino, Italy*
8. *Acquario di Genova, Area Porto Antico, Ponte Spinola, 1, 16128 Genova, Italy*
9. *University of Omar Al-Mukhtar. El-Bayda, Libya.*
10. *Institut National Agronomique de Tunisie. Département - Génie Halieutique et Environnement. 43 Avenue Charles Nicolles, Tunis, 1082 Tunisi*

Research on cetacean populations across the Mediterranean Basin has historically been uneven, with concentrated efforts in the western and northern regions, particularly during the summer months. The ACCOBAMS Survey Initiative (ASI) in July 2018 conducted a large-scale survey (aerial and naval). Given the highly mobile nature of cetacean species, cross-border collaboration between scientists across the Mediterranean is essential to provide basin-wide estimates of species abundance and distribution. In this study, we analyzed 1.643 million km of tracklines in adequate searching conditions from 1991 to 2022 (both aerial and ship-board) under the auspices of 42 surveyor organizations, totaling 38,371 observations of 14 species of cetaceans, plus 2,570 observations with ambiguous species identification. Given the large amount and heterogeneity of survey organizations, protocols and platforms, “platform groups” were created by pooling together survey platforms with similar characteristics. Detection functions were modeled for each species/platform group, and density surface modeling was undertaken for nine species for the entire Mediterranean basin. Correction factors for availability and perception biases were applied. The corrected estimated abundances for summer (May to October) and winter (November to April), respectively, were: bottlenose dolphin 85,674 (CV=0.065) and 94,748 (CV=0.093); common dolphin 81,506 (CV=0.084) and 83,400 (CV=0.335); Cuvier’s beaked whale 4,275 (CV=0.133) and 4,208 (CV=0.136); fin whale 1,968 (CV=0.159) and 2,318 (CV=0.160); Long-finned pilot whale 8,429 (CV=0.135) and 7,189 (CV=0.141); Risso’s dolphin 14,630 (CV=0.089) and 15,864 (0.095); sperm whale 4,392 (CV=0.098) and 3,104 (CV=0.289); and striped dolphin 484,615 (CV=0.087) and 496,266 (CV=0.114). For all nine species and both seasons, density



prediction maps and associated uncertainty were produced. This analysis represents the most comprehensive spatially-explicit cetacean abundance estimates for the region to date, integrating data not only from large-scale surveys (typically aerial), but also from smaller, localized surveys that often cover nearshore areas where aerial surveys may not be the best option.



Systematic approach to evaluate pinger's effectiveness in the reduction of dolphin bycatch in the pair trawl fishery in the Bay of Biscay

Cuende de Francisco, Elsa ¹; Citores, Leire ²; Basterretxea, Mikel ¹; Krug, Iñigo ¹; Puente, Esteban ¹

1. AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Txatxarramendi ugarteaz/g, 48395 Sukarrieta, Bizkaia, Spain
2. AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Herrera Kaia, Portualdea z/g, 20110 Pasaia, Spain

The use of pingers in trawl nets in the Bay of Biscay is mandatory. Several studies have investigated their effectiveness in reducing common dolphin (*Delphinus delphis*) bycatch, but low bycatch rates and lack of statistical significance make assessment challenging. In this study, we used two bottom trawlers operating as a single unit to systematically test the effectiveness of various types of pingers in reducing dolphin bycatch. One boat used pingers while the other served as a control; and remote electronic monitoring (REM) was employed to achieve a high number of experimental replicas. We tested three types of pingers: ¹ high-intensity, wide-range frequency with shorter battery life, ² low-intensity, narrow-range frequency with long battery life, and ³ interactive high-intensity, wide-range frequency with intermediate battery life due to intermittent emissions. Each pinger was tested and the bycatch of any cetacean registered, on average, during 405 fishing hauls in a high bycatch period of different years, respectively. Results showed that Pinger 1 and Pinger 3 reduced dolphin bycatch by over 90% and 85%, respectively, while Pinger 2 showed no significant difference. The experience with Pingers 1 and 3 highlighted the importance of proper use, particularly their placement in the net and maintaining a full battery charge. Despite its lower effectiveness, Pinger 2's lack of need for periodic recharges made it more convenient for fishermen. Finally, the REM system proved to be an effective and cost-efficient tool for studying cetacean bycatch in trawl gears, and the alternating hauls of the pair trawlers ensured a robust experimental design for evaluating pinger effectiveness. This work advances our understanding of pinger effectiveness and supports optimized strategies for marine conservation and sustainable fishing.

The evolutionary ecology and demographic history of narwhals

Louis, Marie ^{1,2}; Skovrind, Mikkel ^{2,3}; Rey de la Iglesia, Alba ²; Ribeiro Parreira, Bárbara ²; Vicari, Deborah ⁴; Costa, Ana ⁵; Alfredo Samaniego Castruita, Jose ²; Routledge, Jennifer ⁶; Garde, Eva ¹; Heide-Jørgensen, Mads Peter ¹; Postma, Lianne ⁷; Ferguson, Steve ⁷; Kovacs, Kit M. ⁸; Lydersen, Christian ⁸; Szpak, Paul ⁶; Gopalakrishnan, Shyam ²; Lorenzen, Eline D. ²

1. *Greenland Institute of Natural Resources, Kivioq 2, 3900 Nuuk, Greenland*
2. *Globe Institute, University of Copenhagen, Øster Voldgade 5-7, 1350 Copenhagen, Denmark*
3. *Lund University, Box 117, 221 00 Lund, Sweden*
4. *Research Centre in Evolutionary Anthropology and Palaeoecology, Liverpool John Moores University, Byrom Street, Liverpool, L3 3AF, UK*
5. *University of Miami, Coral Gables, FL 33124 United-States*
6. *Department of Anthropology, Trent University SRC, 2089 East Bank Drive, Peterborough, ON K9L 1Z8, Canada*
7. *Fisheries and Oceans Canada, 501 University Crescent, Winnipeg, MB, R3T 2N6, Canada*
8. *Norwegian Polar Institute, Fram Centre, N-9296 Tromsø, Norway*

Climate warming is currently taking place at an unprecedented pace and is most rapid in the Arctic. The Arctic endemic narwhal is threatened by climate change, and in some regions, it is additionally endangered by overhunting. We employ a multidisciplinary approach, combining whole genome resequencing, cranial geometric morphometrics and stable isotopes analysis ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) of bone samples, to elucidate the evolutionary ecology and demographic history of narwhals across their range. Using whole genomes of 117 individuals, we identify three genetically distinct populations of narwhals: in the Canadian Arctic Archipelago and West Greenland (CAA/WG); in Northeast Greenland and Svalbard (NEG/Sv); and in Southeast Greenland (SEG). Our demographic history analysis indicates that each population had a low, long-term effective population size, followed by an expansion at the start of the Last Glacial period (~100,000 years ago), which might also reflect changes in population structure. Our findings also indicate that the three populations diverged relatively recently, which could explain the lack of cranial shape variation observed between CAA/WG and SEG narwhals. Tagging studies indicate that the three populations show non-overlapping distributions. Our stable isotope results are consistent with a lack of movement of narwhals between east and west of Greenland. We hypothesise that site fidelity to migratory routes and seasonal ranges likely maintains population structure and possibly also promotes local adaptation. Preliminary results suggest that genes related to long-term memory are under selection in the CAA/WG population, which undertakes the longest migrations. All three populations exhibit remarkably low levels of genetic diversity, with the SEG narwhals having more of their genomes in long runs of homozygosity, consistent with their small population size. We find evidence of purging of highly deleterious mutations, and an accumulation of moderately deleterious mutations in all three populations, raising concerns for the small SEG population.



Toward real-time detection of harbour porpoises in passive acoustic data: an adaptable framework for the detection and classification of marine mammals

White, Ellen ¹; White, Paul ²; Tandon, Rahul ³; Bull, Jonathan ¹

1. School of Ocean and Earth Sciences, University of Southampton
2. Institute of Sound and Vibration, University of Southampton
3. R.S Aqua

Passive acoustic monitoring (PAM) of the marine environment can provide continuous data within regional soundscapes, offering insights into species abundance, distribution, habitat use, behaviour and potential stressors. However, due to the scale of PAM datasets efficient automated analysis techniques are essential for extracting high-quality information from acoustic recordings. Effective algorithms must isolate individual vocalizations with high fidelity to enable behavioural studies while maintaining a near-zero false-positive rate, with their outputs of value to marine management and stakeholders. Here we present a novel pipeline for detecting and classifying sound sources in the marine environment, applied to harbour porpoise conservation. Harbour porpoises (*Phocena phocena*) are elusive and highly vocal marine mammals, commonly studied through passive acoustic monitoring (PAM). Understanding their regional distributions is critical due to their global protection status under the IUCN and sensitivity to anthropogenic disturbances. Despite decades of research on automated detection of harbour porpoise signals, no detector has yet proven robust across the variable ambient noise conditions of unseen environments. This work introduces a novel machine learning-based pipeline for detecting harbour porpoise vocalisations with a false-positive rate below 1%. Acoustic recordings from the west coast of Scotland, collected using diverse recording platforms, were used to develop and evaluate the approach. A genetic programming framework was employed as a detector, identifying features for detecting narrow-band high-frequency (NBHF) clicks from raw PAM data collected around the UK, using a small subset of training data. These detections were subsequently classified using a Temporal Convolutional Network (TCN), which incorporates temporal and contextual patterns characteristic of harbour porpoise vocalisations to group detections into click trains. This adaptable platform has the potential to support the development of automated tools for other marine species, leveraging expert species-specific knowledge to enhance detection and classification capabilities.



Tracing time's footprints: exploring feeding ecology and historical changes of Mediterranean common dolphin (*Delphinus delphis*) over two centuries

Pasino, Martina ¹; Iacovelli, Maria Vittoria ¹; Giola, Matilde ¹; Iacumin, Paola ²; Podestà, Michela ³; Gnone, Guido ⁴; Giménez, Joan ⁵; Tinti, Fausto ¹

1. University of Bologna
2. University of Parma
3. Museum of Natural History of Milan
4. Genoa Aquarium
5. Centro Oceanográfico de Málaga

The Mediterranean population of common dolphin (*Delphinus delphis*) presents an enigmatic natural history in the last centuries. Once widely prevalent in the 19th and early 20th, it faced a significant decline across most of the basin by the late 1960s. The causes and mechanisms behind this decline remain largely unknown and poorly understood. The IUCN has designated the Inner Mediterranean population of common dolphins as Endangered. Here, we analyzed stable isotopes of nitrogen and carbon ($\delta^{15}\text{N}$ and $\delta^{13}\text{C}$) on skeletal remains collected in 22 Mediterranean natural history museums to investigate spatio-temporal trophic shifts and niche partitioning of the Mediterranean common dolphin over the past 200 years. We compared the isotope composition of historical common dolphins with those of the contemporary populations of *Stenella coeruleoalba* and *Tursiops truncatus* which co-occur in the Mediterranean occupying different habitats and trophic niches. We found that common dolphin individuals inhabiting the Mediterranean before 1970 occupied a significantly higher trophic level than the contemporary ones. The comparative analysis between dolphin species revealed that historically common dolphins occupied a well-defined isotopic niche separate from other species, while the contemporary populations shifted to overlap those of the striped dolphin. We cannot exclude that this significant ecological shift could be driven by habitat and trophic competition with human activities as prolonged and intense fishery stock exploitation has occurred in the basin. However, it appears that a key factor in the common dolphin's decline was competition with the striped dolphin, a widespread species in the region, that has effectively "squeezed" the common dolphin's habitat. This is the first long-term evidence of an ecological and/or trophic shift in the common dolphin Mediterranean population, which could be the starting point for understanding the causes and impacts of the species' near-collapse in the Mediterranean.



Tracking Bryde's whales: movement and behavior in the central north Atlantic

Freitas, Luís ¹; Michelot, Theo ²; Esteban, Ruth ¹; Verborgh, Philippe ¹; Gauffier, Pauline ¹; Gouveia, Dino ¹; Berimbau, Luís ^{1,3}; Webster, Daniel ⁴; Hammond, Philip ⁵

1. *Madeira Whale Museum, 9200-031 Caniçal, Madeira, Portugal*
2. *Department of Mathematics and Statistics, Dalhousie University, Halifax B3H4R2, Canada.*
3. *Faculty of Sciences and Technology, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal*
4. *Bridger Consulting Group, Bozeman, MT USA*
5. *Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, Fife KY16 8LB, Scotland, UK*

Knowledge of Bryde's whales' habitat preferences and movements in offshore European Atlantic waters is very limited. This study involved deploying six SPOT 240c LIMPET satellite tags on adult Bryde's whales around Madeira Island between 2018 and 2020. Three tags transmitted consistently for 21 to 55 days, and their data were regularized to an 8-hour time step using a continuous-time state space model for further analysis. Two-state and three-state Hidden Markov Models (HMM) were applied to infer animal behavior from movement patterns based on variables like step length and turning angles, which were mapped against bathymetric features in the area. The whales traveled a total of 5020 km at average swimming speeds between 1.75 and 3.16 km/h. The HMM identified three clearly distinct behavioral states: State 1 - area-restricted search (ARS); State 2 - transit; and State 3 - exploratory. State 1 had the lowest speeds (0.99–1.90 km/h), followed by State 2 (6.97–7.57 km/h) and State 3 (3.18–4.24 km/h), corresponding to what would be expected for prey searching/feeding, transiting, and exploring, respectively. Most animals were in State 1 (ARS) around islands and seamounts, in State 2 (transit) when moving between features, and in State 3 (exploratory) when approaching or traveling between nearby islands or seamounts. The whale tagged in mid-summer was tracked northward, while those tagged in autumn moved southward before losing signal. These results suggest Bryde's whales are highly mobile across Macaronesia archipelagos, following a South-North-South seasonal movement pattern and traveling through open waters while foraging around islands and seamounts. This study sheds light into the movements and habitat preferences of Bryde's whales in European offshore Atlantic waters, providing insights to understand their ecology and to inform conservation efforts, such as creating offshore MPAs or reducing shipstrike risks.



Trade partnership analyses can recover illegal wildlife product commodity chain structures and estimate bycatch mortality rates for Caspian seals

Goodman, Simon ¹; Svolkinas, Linas ²; Ermolin, Ilya ³; Survorkov, Pavel ⁴; Holmes, George ²

1. School of Biology, University of Leeds, UK
2. Sustainability Research Institute, School of Earth and Environment, University of Leeds, UK
3. National Research University Higher School of Economics, St. Petersburg, Russian Federation
4. Institute of Demography, National Research University Higher School of Economics, St. Petersburg Russian Federation

Globally, bycatch associated with Illegal, Unreported and Unregulated (IUU) fisheries present significant threats to marine mammal populations, but are challenging to study due to their clandestine nature. Effective approaches are needed to quantify IUU bycatch and associated commodity chains. Endangered Caspian seals (*Pusa ~~caspicaeapsica~~*) are exposed to IUU fisheries targeting Caspian sturgeon species, and there is also demand for products from Caspian seals. We estimated Caspian seal mortality in IUU fisheries in Dagestan, Russia, by quantifying bycatch rates reported by fishermen, and through studying trade networks that specialize in trading in seal pelts, seal fur hats and seal oil (which is used as medicinal tonic). Semi-structured interviews were conducted with fishers and trade network participants in Dagestan, Russia, across 15 months in 2018-19, involving 401 informants in 33 settlements, covering more than 75% of IUU fishing effort. Trade network structure, geographic distribution, and spatial reach were reconstructed from participant social connections and trade partnerships, and seal mortality was estimated from the reported seal catch. The results suggest a minimum take of 17000 seals during the 2018-2019 fishing season, and that the trade network for seal furs and seal oil extends across Russia, reaching into China and South Korea. The full scale of seal mortality throughout the whole Caspian will be higher. The network structure comprised seven actor classes spanning fishers, boat owners and middle men, fur and blubber processors, fur crafts people, and traders. Targeting seal-fishery interactions through enhanced law enforcement is important, but will not be sufficient to reduce the supply and market demand for seal products. Approaches for reducing Caspian seal product trade networks should include creating incentives for local communities to diversify their economic activity, and developing community led protected areas. Our approach to trade network reconstruction may be applicable to other illegal wildlife trade contexts.



Trap and release – satellite tagging of minke whales to study seasonal migration in the North Atlantic

Teilmann, Jonas ¹; Kleivane, Lars ²; Kvadsheim, Petter ³; Dietz, Rune ¹; Sveegaard, Signe ¹; Balle Dalgaard, Jeppe ¹; Kyhn, Line A. ¹; Pyne Vinje, Anna Victoria ⁴; Mulsow, Jason ⁵; Ølberg, Rolf Arne ⁶; Harms, Craig ⁷; Roland, Rune ⁸; Houser, Dorian ⁵

1. Marine Mammal Research, Department of Ecoscience, Aarhus University, Roskilde, Denmark
2. LKARTS-Norway, Skutvik, Norway
3. Norwegian Defence Research Establishment, Sensor and Surveillance Systems, Horten, Norway
4. The Arctic University of Norway, Institute of Arctic and Marine Biology, Tromsø and Cable Guard AS, Stavanger, Norway
5. National Marine Mammal Foundation, Department of Conservation Biology, San Diego, CA, USA
6. Kristiansand Dyrepark, Kardemomme By, Norway
7. North Carolina State University, Department of Clinical Sciences and Center for Marine Sciences and Technology, Morehead City, NC, USA
8. Department of Biosciences; University of Oslo, Marine Biological Station, Biologveien 2, NO-1440 Drøbak, Norway

The spatiotemporal movements and population structure of North Atlantic minke whales (*Balaenoptera acutorostrata*) remain poorly understood despite decades of research. This study utilized capture-and-release methods to tag six subadult minke whales in Norwegian and Danish waters. Individuals were either incidentally entrapped in stationary pound nets in Skagen, Denmark, (as part of commercial fisheries), or guided into a purpose-designed net enclosure in Lofoten, Norway, located along migration routes. The direct access to the whale facilitated comprehensive health assessments, auxiliary data collection, and the attachment of satellite-linked telemetry devices to the dorsal fin of each whale prior to release. After release, the whales resumed their migration and active dive behaviour, with regular dives below 200m and dives lasting >7min. The whales were tracked for up to 10 months and revealed complex migratory trajectories. Three individuals demonstrated resource overlap in the Barents Sea south of Svalbard during summer months, while one migrated as far east as Novaya Zemlya in Russian waters. Subsequent southward movements included destinations such as the Azores, Canary Islands, and the Mediterranean Sea. These findings underscore the vast geographic range and ecological plasticity of subadult minke whales, highlighting prolonged utilization of high-latitude feeding hotspots during summer. The operational longevity of some tags far exceeded previous tracking results on minke whales, likely because direct access and control of the whale permitted fine-tuning of the dorsal fin attachment. With such an approach, we believe it will be possible to obtain tracks covering the year-round movements of the minke whale. More details about this fieldwork including animal welfare aspects can be found in this open access method paper: https://www.aquaticmammalsjournal.org/wp-content/uploads/2024/04/50.4_K...



Whalers in “a post-whaling world”: conservation needs of marine mammals and sustainable development needs of whaling communities in the wider Atlantic

Fielding, Russell ¹

1. *HTC Honors College, Coastal Carolina University*

The sustainable conservation of marine mammals depends not only upon considerations made for the marine mammals themselves. In communities found in at least 86 countries around the world, human societies have developed a reliance upon marine mammals as a food source. The equitable, sustainable development of these communities should be considered alongside marine mammal conservation efforts. As an example of the complexity inherent to simultaneous efforts on both fronts, this study reviews and synthesizes two lines of research related to a small-scale whaling operation for odontocetes based in the Eastern Caribbean country of St. Vincent & the Grenadines. The first line of research considers the patterns of marine mammal consumption and demand by the local public. Based upon multiple years of ethnographic research (2008-present), along with focused periods of survey (2021-2022; n=434) and interview (2018; n=921) administration, demand for, and socioeconomic valuation of, odontocete-based food products has been quantified. The second line of research analyzes the presence of mercury and other environmental contaminants in the tissues of the odontocetes. Through the collection of tissue samples from both the edible parts of odontocetes (2015-2016; n=122) and human hair (2021-2022; n=410) from volunteer participants, the human health risk of consuming odontocete-based food products has also been quantified. In synthesizing these two lines of research, this study suggests that odontocete-based food products in St. Vincent & the Grenadines are both highly popular and heavily contaminated. This finding complicates an already-complex system of human-cetacean interactions in need of efforts toward both sustainability and sustainable development. The study suggests recommendations for both future research and future policy considerations and concludes with a consideration of additional sites within the wider Atlantic where similarly complex human-cetacean interactions occur.



SHORT TALKS

Humpback whales (*Megaptera novaeangliae*) of the Cabo Verde Islands: migratory patterns, distribution and population abundance

Wenzel, Frederick ¹; Alves, Raquel ^{2,3}; Badosa, Elisabet ⁴; J. Basran, Charla ⁵; Berrow, Simon ⁶; Blazquez Hervas, Miguel ⁶; Broms, Fredrik ⁷; Bouveret, Laurent ⁸; Chosson, Valerie ⁹; Chaiko, Anton ¹⁰; Hennicke, Frank ¹¹; Jann, Beatrice ¹²; Massett, Nick ¹³; Mcneill, Lyndsay ¹⁴; Ryan, Conor ¹⁵; Peres dos Santos, Rui ¹¹⁶; Steiner, Lisa ¹⁷; Lopez Suarez, Pedro ¹⁸; Simão Delgado Rodrigues, Manuel ¹⁹; Whooley, Padraig ¹³; Wyss, Virginie ²⁰; Lubansky, Tanya ¹; Jones, Lindsey ¹; Allen, Judith ¹; Rasmussen, Marianne ⁵

1. North Atlantic Humpback Whale Catalogue, College of the Atlantic, Bar Harbor, Maine USA
2. MARE - Marine and Environmental Sciences Centre, ARNET - Aquatic Research Network, Regional Agency for the Development of Research, Technology and Innovation (ARDITI), Funchal, Portugal
3. Faculty of Life Sciences, University of Madeira, Funchal, Madeira Island, Portugal
4. University of La Laguna, Tenerife, Canary Islands, Spain
5. Húsavík Research Centre, Háskóli Íslands / University of Iceland, Hafnarstétt 3, 640 Húsavík, Iceland
6. Marine and Freshwater Research Centre, Atlantic Technological University, Old Dublin Road, Galway, Ireland.
7. North Norwegian Humpback Whale Catalogue (NNHWC), Straumsvegen 238, N-9109 Kvaløya, Norway
8. OMMAG Observatoire des Mammifères Marins de l'Archipel Guadeloupéen, Route Hégésippe Legitimus, Beauport, 97117 Port-Louis, Guadeloupe, FWI
9. Marine and Freshwater Research Institute, Fornubúðir 5, 220 Hafnarfjörður, Iceland
10. <anchajko@yandex.ru>
11. Boa Vista Tours, Sal-Rei, Boa Vista, Republic of Cabo Verde
12. Swiss Whale Society, Via Inera, CH-6999 Astano, Switzerland
13. Irish Whale and Dolphin Group, Merchants Quay, Kilrush County Clare, Ireland
14. Scottish humpback whale catalogue
15. Scottish Association for Marine Science, Scottish Marine Institute, Oban PA37 1QA, Scotland
16. CCMAR-Centre of Marine Sciences, Marine Ecology Human Impacts Diversity (MARDIV), University of Algarve, Edif 7. 8005-139, Faro, Portugal
17. Whale Watch Azores, 2 Estrada da Caldeira, Horta, Faial, Azores,
18. Bios, CV, Sal-Rei, Boa Vista, Republic of Cabo Verde
19. Naturalia, Sal Rei, Boa Vista, Republic of Cabo Verde
20. Marine Observer.org

Effective conservation of the endangered North Atlantic humpback whale (*Megaptera novaeangliae*) which breeds in the eastern North Atlantic around the Cabo Verde Islands off West Africa requires information about their spatio-temporal distribution, population size, and migratory patterns. Understanding temporal distribution is particularly important as annually only a portion of this population migrates between high-



latitude summer feeding grounds and their breeding grounds. During the winter/spring months between 1990 and 2024, we conducted cetacean surveys targeting humpback whales. Survey periods varied from 30 to 100 days in duration. Collectively, we obtained fluke photographs from 470 individually recognizable humpback whales from this region. These fluke photographs have been compared and included in the North Atlantic Humpback Whale Catalogue, which has >12,000 individual flukes (from 1972-2024) photographed from throughout the North Atlantic. Photo-identified individuals from the Cabo Verde Islands population have been previously photographed/recaptured on the high-latitude feeding grounds in northern Norway (including the Barents Sea and Svalbard archipelago), Iceland, Azores, Ireland, Scotland, NW Russia, West Greenland, Canary Islands, Madeira, Algarve (Portugal) and Guadeloupe (southeast Caribbean). The largest number of recaptures from high latitude feeding grounds were humpbacks identified in both Cabo Verde and Norwegian waters, then Iceland, Azores and Ireland/Scotland. Based on photo-identification of humpbacks via fluke photographs we report a high inter annual resighting rate of whales observed in more than one winter (46% $n=214$); and 15% ($n=71$) of this population observed in 5 or more different years. This high resight rate is partly due to high probability of detection in a small population, these results also suggest strong site fidelity to this breeding ground. We have observed slow population growth via recruitment including returning/surviving calves, as well as some migration to this breeding/calving region of the eastern North Atlantic.



A comparative review on harbour porpoise foraging behaviour and methods; a case study in the Belgian part of the North Sea

Aoufi, Sofya ¹; Rumes, Bob ¹; Debusschere, Elisabeth ²; Degraer, Steven ¹

1. Marine Ecology and Management, Institute of Natural Sciences, Vautierstraat 29, 1000 Brussels, Belgium
2. Flanders Marine Institute (VLIZ), Jacobsenstraat 1, 8400 Oostende, Belgium

Harbour porpoise, *Phocoena phocoena*, is a small cetacean with a large distribution in and around the North Sea. They use narrow-band high-frequency (NBHF) clicks to communicate, navigate and forage. As harbour porpoises have a high metabolism due to their small size and high energy demand, understanding their foraging behaviour is vital to inform conservation strategies, mitigate human impacts, and understand marine ecosystem dynamics. The aim of this study is to evaluate and refine the methodologies used for identifying foraging behaviour in harbour porpoises by comparing the outputs (recording methods, location, time period, foraging metric) of different methodologies and studies. Specifically, this review focuses on methodologies employed over the past two decades, with an emphasis on automated acoustic data analysis using Chelonia instruments such as T-PODs, C-PODs, and F-PODs. Inter-click intervals of NBHF clicks were analysed, and a novel method of identifying a foraging buzz—a terminal phase indicative of prey capture—was applied through a combination of existing research methodologies which narrows down the overlap between foraging and social calls. A comparison of the results of the different methodologies in foraging behaviour was made using a dataset comprised of seven cetacean loggers (F-PODs) spread out over two locations in the Belgian part of the North Sea for the duration of 2023. Preliminary results show broad consistency across methods, but the stricter criteria of this novel approach provide greater specificity, aiding in identifying subtle foraging behaviours and fine-scale variations. Ultimately, this research provides insights on the current methodologies in use for identifying foraging behaviour and can enhance conservation efforts by providing more precise data on the foraging patterns of harbour porpoises. The dataset used in this research was sourced from the European Tracking Network data portal (<http://www.lifewatch.be/etn/>), developed by the Flanders Marine Institute as part of the Flemish contribution to LifeWatch.



A new era in high seas conservation: the opportunities and risks of artificial intelligence for governance of high seas marine protected areas

de Leur, Jennifer Daan Petronella ¹

1. *MSc student Governance of Sustainability Transformations at Wageningen University (The Netherlands)*
Intern Aquatic Species Team at the United Nations Convention for Migratory Species (CMS) (Germany)

The high seas, covering 61% of the global ocean, are vital habitats for cetaceans, yet only 1.5% are protected by marine protected areas (MPAs). These species face significant threats from overfishing, shipping, and climate change, compounded by weak governance in areas beyond national jurisdiction. Advances in artificial intelligence (AI) provide innovative tools to address these challenges, particularly for complex and urgent issues like biodiversity conservation. However, little research has examined the opportunities and risks of AI for marine mammal conservation in the high seas. This study investigated the potential of AI to address governance gaps in high seas MPAs and enhance cetacean conservation. A mixed-methods approach was adopted, including a scoping review of 46 academic articles, seven expert interviews, and legal analysis of 16 international frameworks, such as UNCLOS and the BBNJ Treaty. Thematic analysis was used to identify key themes in AI applications, risks, and governance challenges. The results across the literature review and thematic analysis showed that AI applications, including real-time species monitoring, habitat mapping, and illegal fishing detection, show great promise for cetacean conservation. However, risks such as overreliance on AI, unequal access, limited understanding, and environmental impacts remain significant. Multiple governance gaps were identified, most importantly that regulations lag behind technological advances. Legal analysis revealed that while existing laws can regulate AI, vague language, a lack of jurisprudence, and the absence of standardized AI terminology create substantial uncertainty about their application. This research contributes to the emerging field of AI applications in marine conservation, offering actionable insights for cetacean protection in the high seas. By identifying opportunities, risks, and regulatory needs, it underscores the transformative potential of AI and the necessity of equitable, science-based governance to protect cetaceans in one of the ocean's most vulnerable and underregulated regions.

Advancing killer whale vocalization analysis: a neural network approach for categorizing single- and two-voiced calls

Marchon, Tatiana Marie Joséphine ^{1,2,3}; von Benda-Beckmann, Alexander Michael ⁴; Pereira Samarra, Filipa Isabel ²; Rasmussen, Marianne Helene ³; Deecke, Volker Bernt ⁵

1. *Faculty of Life and Environmental Sciences, University of Iceland, Iceland*
2. *Westman Islands Research Centre, University of Iceland, Iceland*
3. *University of Iceland's Research Centre in Húsavík, Húsavík, Iceland*
4. *TNO, Acoustic Sensor and Sonar Systems, The Hague, The Netherlands*
5. *Institute of Science and Environment, University of Cumbria, Ambleside, UK*

Studying animal communication relies on accurate and replicable categorization of sounds into biologically meaningful categories. Sound patterns are usually manually categorized by human observers, a time-consuming and subjective task. An unsupervised neural network (NN) has previously been demonstrated to detect biologically meaningful sound categories, by combining adaptive resonance theory and dynamic time-warping to account for aspects of animal sound perception. However, it categorizes sounds using a single frequency contour, while several species, including killer whales, can produce two-voiced calls, composed of synchronous low- and high-frequency components. By categorizing killer whale calls based only on the low-frequency component, essential information on variability of the high-frequency component is lost. To address this, we developed an enhanced NN (NN2) that processes both single- and two-voiced calls. This new method was tested against a categorization of Norwegian killer whale calls conducted by citizen scientists using WhaleFM ($n = 50$), and the well-described acoustic repertoire of northern resident killer whales (NRKW) established by experienced researchers ($n = 1121$). The new version shows promising results of categorization. The relationship between NN2 and citizen scientist categorizations was significant, with a relative low correlation explained by different matrix types (binary vs values from 0 to 20). Compared to categorization of the same calls by experienced researchers, the NN2 performance was extremely high, largely corresponded to human categorization, and performed better than NN. Interestingly, with the NRKW dataset, NN2 separated calls into finer categories than researchers. Some of these categories were explained by pod membership, however it is possible that the NN2 categorization reflects hypervariability in the NRKW call repertoire. This methodology provides a systematic and unbiased way to classify acoustic signals into biologically meaningful categories. It will facilitate comparative studies of killer whale vocalizations across populations and can be relevant to broader studies of animal communication.

Anthropic pressure on cetaceans stranded along the ligurian coast within the pelagos sanctuary: a case series

Mattioda, Virginia ¹; Giorda, Federica ¹; Consales, Guia ²; Testori, Camilla ¹; Zoppi, Simona ¹; Gorla, Maria ¹; Crescio, Maria Ines ¹; Serracca, Laura ¹; Varello, Katia ¹; Carta, Valerio ¹; Marsili, Letizia ^{2,3}; Baini, Matteo ²; Galli, Matteo ²; Fossi, Cristina ²; Fontanesi, Elena ⁴; Garibaldi, Fulvio ⁵; Pietroluongo, Guido ⁶; Mazzariol, Sandro ⁶; Brunelli, Francesco ⁷; Casalone, Cristina ¹; Grattarola, Carla ¹

1. Istituto Zooprofilattico Sperimentale del Piemonte, Liguria e Valle d'Aosta, 10154 Torino, Italy
2. Department of Physical, Earth and Environmental Sciences, University of Siena, Via Mattioli, 4, 53100 Siena, Italy
3. Centro Interuniversitario di Ricerca Sui Cetacei (CIRCE), University of Siena, 53100 Siena, Italy
4. Delfini del Ponente APS, Via Regione Bussi 27, 18100 Imperia, Italy
5. DISTAV, University of Genoa, Corso Europa 26, 16132 Genova, Italy
6. Department of Comparative Biomedicine and Food Science, University of Padua, 35020 Legnaro, Italy
7. AST Ancona, 261100 Ancona, Italy

In recent decades, environmental changes consequent to human activities have become more important factors in the conservation of wild species. Despite the Ligurian sea being part of the Pelagos Sanctuary, which has been a Specially Protected Areas of Mediterranean Importance (SPAMI) and a Marine Protected Area (MPA) since 1999, several anthropogenic threats affecting the health of cetacean populations living in this area are known to be present. In this study, data collected by the Italian National Reference Center for Diagnosis of stranded Marine Mammals (C. Re. Di. Ma) over a 3-year period (2020–2022) were considered to assess anthropic pressure on cetaceans living in the Ligurian sea. Out of a total of 37 stranded cetaceans, a complete post-mortem examination was performed on 23 cases. Of these, 14 were further selected considering at least one of these conditions: (i) confirmed, probable, or suspected interaction with fishing activities through the application of a standardized diagnostic framework (7/14; 50%), (ii) toxicological stress through the evaluation of OCs hazardous levels (14/14; 100%), and (iii) terrestrial pathogen-associated disease (systemic infection and/or associated lesions) (7/14; 50%). For 9 animals out of a total of 14 selected, the cause of death was classified as natural (6/14; 42,8%), anthropic (3/14; 21,4%), or not determined (5/14; 35,7%) based on gross and histological pathology and ancillary testing. The causes of strandings are generally multifactorial and it is important to develop an overall view, since it is often the synergistic action of multiple factors that has a negative impact on cetacean health, up to the death of the animal itself. Considering the results of this study, we can confirm high levels of anthropic pressure on cetaceans living in the Ligurian area of the Pelagos Sanctuary, with relevant findings concerning fishery interaction, OCs pollution, and terrestrial pathogen-associated diseases.



Assessing the behavioural response of humpback whales to variable vessel practices in Skjálfandi Bay, Iceland

Grove, Thomas ^{1,2}; Stoller, Alyssa ²; Laute, Amelie ²; Rasmussen, Marianne ³; Henry, Lea-Anne ¹

1. *School of GeoSciences, University of Edinburgh, Edinburgh, United Kingdom*
2. *Whale Wise, Swansea, United Kingdom*
3. *The University of Iceland's Research Center in Húsavík, Húsavík, Iceland*

Repeated disturbance of animal behaviour can affect individual welfare, fitness and population dynamics. Whale-watching vessels are known to influence whale behaviour, but responses vary between species and areas. Furthermore, limited understanding of how vessel practices contribute to disturbance hampers our ability to inform responsible whale-watching guidelines. We assessed the effects of whale-watching vessel presence, positioning and movement on humpback whale behaviour in Skjálfandi Bay, Iceland. Using whale-watching vessels as an opportunistic research platform, surface behaviours and movement tracks were measured. Positional errors were propagated into subsequent modelling. Vessel presence and movement variables were constructed from a novel combination of coarse-scale AIS and fine-scale GPS data, and were related to seven whale behavioural variables through generalised additive mixed models (GAMMs). The influence of encounter duration and non-compliance with a voluntary code of conduct were also explored. Our results showed that the behavioural interactions between whale-watching vessels and humpback whales (GAMM relationships) were complex. Nevertheless, key predictors of changes in whale behaviour included vessel speed, the number of vessels and encounter duration. For example, faster vessel speeds correlated with elevated dive times; the presence of more vessels altered surfacing patterns; and prolonged encounters reduced surface movement sinuosity. Results suggest potential horizontal and vertical avoidance, and more cautious surface behaviours, in a more intense vessel environment and with prolonged exposure. Furthermore, surface feeding behaviour decreased significantly when vessels were non-compliant with the code of conduct's speed guideline. The observed responses suggest that decisions made by captains during whale-watching encounters could impact the energy budget and welfare of individual humpback whales. As the industry in Iceland expands geographically, we encourage a review of existing policies to minimise behavioural disturbance. Findings from this study can inform updates to the code of conduct and guide future research.



Assessing the distribution and migration patterns of pygmy blue whales in the western Indian Ocean based on passive acoustic monitoring on multiple years and sites

Samaran, Flore ¹; Bazin, Sara ²; Dréo, Richard ³; Michel, Mathilde ¹; Leroy, Emmanuelle ⁴; Royer, Jean-Yves ²; Torterotot, Maëlle ¹

1. Lab-STICC, CNRS, ENSTA, Institut Polytechnique de Paris, Brest, 29200, France
2. Geo-Ocean, CNRS, IUEM, Plouzane, 29280, France
3. Université de Paris, Institut de Physique du Globe de Paris, CNRS, Paris, 75005, France
4. Globice Réunion, Saint Leu, La Réunion

The pygmy blue whale (*Balaenoptera musculus brevicauda*) is a migratory species that inhabits the Indian Ocean (IO). Unlike the Antarctic blue whale (*B. m. intermedia*), this subspecies is not found in the Southern Ocean south of 54°S, indicating that its feeding and wintering grounds are located within the IO. In the past decades, passive acoustic studies have facilitated the assessment of population identity based on song types. Pygmy blue whales comprise at least four distinct acoustic populations with different distributions across the IO. Here, we used seismic and hydroacoustic data collected from various monitoring networks to enhance our understanding of the distribution, movement, and seasonal patterns of the population inhabiting the southwest IO, which produces the "Madagascar" song type (SWIO song). The networks included 10 years of acoustic data from hydrophones in the southwest IO (OHASISBIO), 1 year of data from an ocean bottom seismometer network in the Mascarenes (RHUM-RUM), and 6 years of data from seismological (MAYOBS) and hydroacoustic (MAHY) instruments in the northern Mozambique Channel, near Mayotte Island. Various automated detectors and manual annotations were used to assess the number of positive hours per day with SWIO song for each site and each year. SWIO pygmy blue whale songs were detected from the north of the Mozambique Channel to the Kerguelen Plateau, and from Madagascar to the southwest of Amsterdam Island. Acoustic presence of the SWIO pygmy blue whale is highly seasonal, with peaks in the southern locations occurring from the austral summer to the winter months, and in the northern locations from autumn to the winter months. This seasonal pattern suggests that the northwestern IO serves as a breeding ground, while the southwestern IO serves as a feeding ground. Acoustic detections also reveal a puzzling similar bimodal pattern in two distinct locations—around Madagascar and south of Kerguelen Island. This study provides a more complete understanding of the habitat and dynamics of SWIO pygmy blue whale. Assessing the conservation status of these whales remains challenging; however, this study aims to highlight the ecological importance of this region for blue whales and how their populations have recovered from whaling.

Assessing the vulnerability of common dolphin population to bycatch: bias in the sex and age of the individuals caught in the Bay of Biscay

Astarloa, Amaia ¹; Mugerza, Estanis ¹; Basterretxea, Mikel ¹; Mugerza, Arnaitz ¹; Horrach, Lluís ¹; Claver, Cristina ¹; Pedrajas, Arkaitz ¹; García-Barón, Isabel ¹; Louzao, Maite ¹

1. AZTI, Marine Research, Basque Research and Technology Alliance (BRTA)

Fisheries bycatch remains a significant global issue, requiring extensive knowledge of species-fishery interactions and comprehensive data collection for effective assessment. This study focused on analysing the biological data of bycaught individuals to better understand the demographic effects of bycatch in the population affected. By taking advantage of the regulation APA/1200/2020, which mandates that cetaceans dying during fishing operations must be stored on board and brought to port for scientific analysis, 15 individuals caught in the fleets monitored by AZTI in the Bay of Biscay were taken to port and then necropsied. When storage was not possible, bycaught individuals were sampled on board. During 2022-2024 period, the species most frequently caught was common dolphin (*Delphinus delphis*), with 55 records detailing sex, morphological measurements, spatial location, date and gear involved. Common dolphin bycatch primarily occurred during winter months in the French shelf of the Bay of Biscay, involving three gear types: bottom gillnet (GNS), pair trawl (PTB) and otter trawl (OTB). Biological data revealed significant ($p < 0.05$) differences in the sex ratio of bycaught dolphins, with an 80% of the individuals being males. On average, males measured 208 cm in length and females 203 cm, which would indicate, according to previous studies relating total length and age, that 55% of the males analysed here were immature compared to 38% of females. These findings align with other studies in the Northeast Atlantic, which also reported a higher proportion of males, and may suggest that vulnerability to capture varies with sex and age, either through behavioral differences or group segregation.



Beluga and walrus vocal reactions to vessel traffic in a proposed marine protected area

Coppolaro, Veronica L.M. ^{1,2}; Marcoux, Marianne³; Loseto, Lisa ³; Ausen, Emma L. ¹

1. *University of Manitoba - Centre for Earth Observation Science*
2. *National Research Council of Italy (CNR) - Institute for the Study of Anthropic Impact and Sustainability in the Marine Environment*
3. *Fisheries and Oceans Canada (DFO)*

Vessel traffic and underwater noise pollution are increasing in the Arctic. Marine mammals are sensitive to vessel underwater noise which can have negative impacts both at the individual and the population-level. The marine region of Southampton Island, Nunavut, was recognized as a key area for many marine mammal species and is under consideration to become a marine protected area. Since vessel traffic is increasing in the region, the objective of this work is to investigate its potential impact on belugas and walruses. This is the first acoustic study of beluga and walrus reactions to vessel traffic in the area and the first investigation of their vocal behavior during exposure to motorboats. Underwater acoustic data were collected South of Southampton Island, Nunavut, Canada, from June to November 2018. AIS data were analyzed and compared to acoustic recordings to extract information about ship and motorboat presence. Generalized linear mixed models were used to investigate changes in beluga and walrus vocalization rates before, during and after a vessel encounter and depending on vessel type. Beluga vocalizations were never recorded during motorboat transits, which might indicate predator avoidance behavior. Walrus vocalization rates were found to decrease during and after a vessel encounter and were significantly lower in the presence of ships than of motorboats. This study shows that vessel traffic influences walrus vocal behavior. This should be investigated in walrus key areas around the Arctic and considered in vessel traffic noise mitigation strategies.



Characterizing Fraser's dolphin (*Lagenodelphis hosei*) in the Lesser Antilles: Distribution, movements and co-occurrence to inform conservation strategies in the Caribbean

Bernier, Lucas ¹; Bernus, Jeffrey ¹

1. *Caribbean Cetacean Society*

Fraser's dolphin (*Lagenodelphis hosei*) is among the least studied dolphin species, largely due to its tropical offshore distribution and low density. However, it is frequently observed in the Lesser Antilles. This study aimed to characterize the species using four years of data collected from Grenada to Anguilla. We employed species distribution models, movement analyses, and co-occurrence analyses with other species. Fraser's dolphin emerged as the second most frequently encountered dolphin species, with confirmed sightings recorded during our sampling period (March to October) along the Lesser Antilles. Key environmental factors, including depth, slope, distance to canyons, and eastward current velocity, best explained its distribution, accounting for 22.0% of the variance. The Caribbean side of the Lesser Antilles arc predominantly represented a continuum of suitable habitat. Additionally, ten individual recaptures demonstrated inter-island connectivity, spanning from the Grenadines to Guadeloupe, along the predicted suitable habitat. In this area, Fraser's dolphins exhibited the highest rate of co-occurrence with other species (83%), with significantly greater frequency and strength of co-occurrences compared to other cetaceans. This behavior is likely motivated by foraging purposes, a strategy constitutive of the species' ecology. The near absence of Fraser's dolphin observations outside the Lesser Antilles, combined with our findings, suggests they likely constitute a single population confined to the arc with low likelihood of spatial fragmentation between islands. These results underscore the importance of regional connectivity and the necessity of coordinated regulations across the Lesser Antilles to ensure the effective conservation of the cetacean community in an area where unregulated small cetacean hunting is conducted.



Coda patterns of sperm whales (*Physeter macrocephalus*) in the Gulf of Catania, South-Western Ionian Sea, Italy

Lelong, Davide Michel ¹; Cosentino, Luigi ²; Fossati, Claudio ³; Riccobene, Giorgio ²; Speziale, Fabrizio ²; Pavan, Gianni ¹

1. CIBRA, Department of Earth and Environmental Sciences, University of Pavia, Oavia, Italy
2. National Institute for Nuclear Physics (INFN)-Laboratori Nazionali Del Sud, Catania, Italy

Sperm whales produce stereotyped series of clicks called codas, linked to social communication and have become an hallmark of their culture as their temporal characteristics (number of clicks and rhythm) are stable and shared among individuals of the same population, forming specific acoustic clans. In the Mediterranean Sea, only one acoustic clan of sperm whales has been recognized and the '3+1' pattern is the predominant coda represented, with few others documented. The current study analyzed acoustic data from the OvDE acoustic station, part of the NEMO-SN1 cabled infrastructure deployed between 2005 and 2006 at 2000 m depth off the coasts of Catania, Italy, in the Mediterranean Sea to monitor the local soundscape. Codas were classified using parsimonious mixtures of multivariate contaminated normal distributions based on their absolute inter-click interval and a model was fitted for codas with different number of clicks. The models found 3 clusters for three-click codas, 4 for four-click patterns, and 1 for the five-click pattern, with a total of 8 clusters. On a total of 1416 codas identified, more than 95% of the dataset was composed by the four- and three-click patterns, evenly represented between the two families. The temporal characteristics of these two families follow mostly the '3+1' and '2+1' pattern already reported in literature for Mediterranean population. While the models identified different clusters of codas, these difference were not heavily marked and were distributed over a continuum that align with some of the recent literature, where codas seems to be willingly modulated by individuals during communication. The results of the current study integrate well with the current literature of the Mediterranean population and show that the current coda repertoire might be more diversified in the proportion of the single coda types.



Estimating lipid store mass of free-ranging whales in vivo using drone photogrammetry and biologging tags

Burslem, Alec ¹; Isojunno, Saana ²; Prieto, Rui ³; Silva, Mónica A ³; Miller, Patrick J O ¹

1. *Sea mammal research unit, University of St Andrews*
2. *Centre for research into environmental and ecological modelling, University of St Andrews*
3. *Institute of Marine Sciences – OKEANOS, University of the Azores, & Institute of Marine Research – IMAR, Horta, Portugal*

Lipid reserve mass is a key indicator of health and fecundity in wild mammal populations but is difficult to measure in free-ranging whales for which capture is impractical. Morphometric indicators of condition derived from overhead photographs can quantify an animal's volume and length but not its body composition. Conversely, tag derived densitometry provides information on body composition, but not changes in size or shape. Here, we introduce a method for quantifying absolute lipid stores noninvasively in free-ranging whales. This method uses a combination of UAV (drone) photogrammetry-based estimates of whale volume, tag-based estimates of tissue density and measurements of total and lean body composition from historical whaling records to estimate absolute lipid store in free-ranging sperm whales. Statistical analysis of simultaneous volume and density-based condition indicators (n=17) confirmed that underlying lipid-store body condition linked volume and density in sperm whales. On average, for a whale 12 m in length, volume increment of 1 m³ was predicted to be accompanied by an 6.3% increase in total body lipid content, while a decrease of 1 kg m⁻³ in tissue density was predicted to be accompanied by a 5.1% increase in lipid content. The combined method was estimated to be successful at estimating total body lipid mass to within 18% on average. These results support the accuracy of both densitometric and morphometric methods for quantifying body condition in this species. Furthermore, the resulting models can be used to impute plausible values of lipid store where only volume (UAV) or density (tag) data are available. While further validation is necessary to tie the observed pattern to underlying biological processes in sperm whales, this method is transferable to many other cetacean taxa allowing, for example, transitions in life history state or exposure to stressors to be tied to absolute measures of lipid energy store.

Experience in biomonitoring contaminants in cetacean from the western Mediterranean. Fifty years of study on Murcia coastline

Martínez-López, Emma ^{1,2}; Peñalver, José ³; López-Berenguer, Gabriel ⁴; Salcedo, Sara ¹; Baños-Doménech, Laura ¹

1. Area of Toxicology, Oceanosphaera Research Group. Faculty of Veterinary Sciences. University of Murcia, Spain
2. Toxicology and Risk Assessment Group, Biomedical Research Institute of Murcia (IMIB-Arrixaca), Spain
3. Fishing and Aquaculture Service (CARM), Murcia, Spain
4. Marine Biodiversity Group of Tragsatec. Spain.

The Mediterranean Sea is an eminently oligotrophic region hosting around 7% of the planet's biodiversity, making it one of the most biodiverse hotspots on a global scale. However, this natural space is also one of the most globally impacted due to increasing threats to its biodiversity. In this sense, chemical pollution is recognised as directly responsible for the large-scale loss of biodiversity and animal species. Because of this, measures have been developed for decades to mitigate its effects and reduce its impact. From a ONE HEALTH perspective, cetaceans have special characteristics that make them the best indicators of change in the marine environment and sentinels for public health and the health of our oceans. Many of the diseases that cetacean have shown to have direct public health implications, while others may indicate an 'environmental stress' syndrome. From 2009, we have worked together with the stranding network of the Murcia Region in the collection and subsequent toxicological analysis tissues from cetaceans stranded on the coast. Thanks to this close collaboration we had an excellent bank of internal tissues from more than 100 individuals from *Stenella coeruleoalba*, *Tursiops truncatus*, *Delphinus delphis*, *Globicephala melas* and *Grampus griseus*. We have determined an important set of pollutants including toxic metals, organochloride pesticides, polychlorinated biphenyls, polybrominated diphenyl ethers, perfluoroalkyl compounds (PFASs) and polycyclic aromatic hydrocarbons (PHAs) and pharmaceutical products (non-steroidal anti-inflammatory drugs (NSAIDs) and antibiotics). Certain types of pollutants such as metals (particularly THg) or PFASs showed higher concentrations compared to other high pollution areas of the world. On the other hand, Ibuprofen and Diclofenac were detected above those detected in other marine species. These contaminants have a high toxic potential, being capable of causing reproductive, endocrine and immunological alterations and affecting the central nervous system. This is a concern for wildlife conservation as it may alter the behaviour, energetics and reproduction of animals, which in turn may affect their fitness, population dynamics and adaptations to a rapidly changing environment. For these reasons, we are working to provide valuable information on their possible effects using a wide range of oxidative stress biomarkers and neuroenzymes in cetacean.



Exposure of short-finned pilot whales (*Globicephala macrorhynchus*) to high-amplitude vessel noise in the Teno-Rasca Special Area of Conservation (Canary Islands, Spain)

Rubio, Carla ¹; Aguilar de Soto, Natacha ²; Nachtsheim, Dominik A. ³; Schnitzler, Joseph G. ³; Arranz, Patricia ¹; Johnson, Mark P. ⁴; Marín, Olivia ¹

1. University of La Laguna, Canary Islands, Tenerife Spain.
2. Spanish Institute of Oceanography (IEO-CSIC), Tenerife, Canary Islands, Spain.
3. Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, Büsum, Germany.
4. Aarhus University, Aarhus, Denmark.

Short-finned pilot whale (*Globicephala macrorhynchus*) is a deep-diving delphinid found year-round at the Teno-Rasca Special Area of Conservation (SAC) off Southwest Tenerife, where they undertake dives reaching depths of up to 1000 m. Although known for its natural values and rich biodiversity the Teno-Rasca SAC hosts a commercial harbour and three recreational harbours. These ports provide base for an intense marine activity including numerous whale-watching tours and inter-island ferries. This raises concerns about the potential impact of shipping noise on the local pilot whale population. In this study, we quantified vessel noise exposure by analyzing data collected during three field seasons between 2019 and 2022 with multisensor data loggers (DTAGs) deployed on pilot whales (n = 18) off the southwest of Tenerife. An automated tool was developed to detect intervals of elevated received sound levels in the sound recordings that could correspond to vessel passes, using a fixed threshold of 84 dB re. 1 μ Pa RMS in the 16 kHz decade band. Each of the 370 detected intervals was subsequently validated through a manual review process involving spectrogram analysis and auditory inspection. This approach enabled the classification of noise sources into vessel-related or non-vessel-related categories, detecting a total of 24 vessel passages on 11 pilot whales, including calves, juvenile and indeterminate individuals. No vessel events were recorded in adults, albeit this might be due to a lower sample size. Vessel passages were recorded both during shallow and deep diving and while whales were at the surface. Exposure rates affected whales up to 13.25% of the tag-on time. Our findings emphasize that pilot whales at the SAC Teno-Rasca are subject to acoustic pollution from ships and underline the urgent need for stricter marine traffic regulations to protect the species and ensure the effectiveness of conservation measures in the SAC.



From whales to medicine: exploring Cetacea evolution and physiology as models for human diseases

Artilheiro, Nádia ¹; Machado, André ^{1,2}; Valente, Raul ¹; Ruivo, Raquel ¹; Castro, Filipe ^{1,2}

1. CIMAR/CIIMAR - Interdisciplinary Centre of Marine and Environmental Research, University of Porto
2. FCUP – Faculty of Sciences of University of Porto, University of Porto

The ecological transition from land to water made cetaceans one of the most iconic and unique groups among mammals. Remarkably, the morphological, behavioral and physiological changes to accommodate such transition were enabled by several molecular adaptations, such as gene loss, that often coincide with human disease profiles (e.g. the loss of psoriasis-specific genes in Cetacea). Thus, in the scope of the One Health initiative, aiming to link human, animal, and environmental health, cetaceans may serve as crucial models for comparative molecular studies: providing insights and strategies into human health and disease while informing on the environmental resilience of Cetacea. Here, we investigate genes loss episodes in Cetacea and explore those associated with human diseases. Using a consolidated computer-assisted pipeline, we screened 4532 genes present in Cetacea and Artiodactyla and filtered those exclusively lost across cetaceans. We found that Cetacea lost at least 1065 genes, that were further categorized into genes lost exclusively in Mysticeti (baleen whales) and Odontoceti (toothed whales). The association between these genes, pathways and organs was performed using G:Profiler and the Human Protein Atlas; further association to human diseases was performed using the Open Targets Platform. Our findings revealed the loss of at least 259 genes in Mysticeti and 217 genes in Odontoceti. In both groups we identified genes specifically related to sensory perception, immunity, or other biological pathways, and spanning various organs such as spleen, liver, lungs, testis, brain and lymphoid tissues. Several of these genes, when inactivated in humans, can lead to severe diseases like infertility, cancer, immune and mental disorders. The present findings constitute an important step to understand cetacean's evolutionary trajectories while highlighting their potential as biological models for the prospection of novel therapeutic targets of human diseases.

Genomic diversity associated with morbillivirus susceptibility in *Stenella coeruleoalba*

Silva, Cátia S. E. ¹; Gkafas, Georgios A. ²; Gaspari, Stefania ³; Marsili, Letizia ⁴; Raga, Antonio ⁵; Moura, André E. ⁶; Hoelzel, A. Rus ¹

1. Department of Biosciences, Durham University, Stockton Road, Durham, DH1 3LE, United Kingdom.
2. Department of Ichthyology and Aquatic Environment, School of Agricultural Sciences, University of Thessaly, Fytokou Street 384 46, Volos, Hellas, Greece.
3. Consiglio Nazionale delle Ricerche-Istituto di Scienze Marine, Venice, Italy.
4. Department of Physical, Earth and Environmental Sciences, University of Siena, Via Mattioli, 4, 53100 Siena, Italy.
5. Unidad de Zoología Marina Instituto Cavanilles de Biodiversidad y Biología Evolutiva, Parc Científic, Universitat de València, Aptdo 22085, E-46071-Valencia. Spain.
6. Wydział Biologii, Uniwersytet Gdański, ul. Wita Stwosza, 80-308 Gdańsk, Poland.

Pathogens represent a significant mortality source in wild marine mammals, and pathogen resistance processes are thus crucial to their long-term survival. Over the past 3 decades, Mediterranean striped dolphin (*Stenella coeruleoalba*) experienced multiple periodic outbreaks of Morbillivirus – a highly contagious virus causing high mortality. However, the biological basis of striped dolphin vulnerability to morbillivirus infection remains poorly understood. The present study addressed this knowledge gap, by investigating the species genetic diversity in the Mediterranean Sea using high resolution genetic markers (ddRADseq). A total of 14240 SNPs were analysed for 121 specimens spanning an 18-year period. Associations between epizootic periods and genomic measures of inbreeding, heterozygosity-fitness correlations and potential selection were investigated. Patterns of genetic diversity and population structure were also evaluated within the study area (Western Mediterranean and Atlantic), because of their potential influence in disease spread and species fitness. The results suggest stronger structure between Atlantic and Mediterranean individuals than within the Mediterranean region, and low effective population size despite known high census numbers. Levels of inbreeding for the Mediterranean striped dolphin were overall low, and genome-wide heterozygosity-fitness analyses did not reveal significant correlations between diversity levels and fitness associated with epizootic/non-epizootic periods. However, possible mechanisms of morbillivirus susceptibility were found in the analyses of selection across epizootic periods. A total of 23 loci were identified as under selection, in close proximity to genes involved in neural activity and immune functions, consistent with known physiology of morbillivirus infection/disease. Analyses of diversity for 17 of those loci, showed higher homozygosity during peak epizootics, which could reflect higher susceptibility to the virus for its carriers. This time-series data therefore provides novel and significant contributions to the scientific knowledge of striped dolphin Morbillivirus susceptibility. This knowledge is invaluable for future studies, and in helping predict future disease dynamics and conservation measures.



Influence of the water depth on the detection probability of click loggers (C-PODs) in harbour porpoise monitoring in the German Baltic Sea

Rostock, Léon ¹; Taugnitz, Tim ¹; Gallus, Anja ¹

1. *Ocean Museum Germany*

In long-term monitoring projects of echolocating toothed whales (Odontoceti) click loggers are a widely used device to investigate cetacean behaviour and occurrence. The click loggers are deployed at sea to monitor echolocation activity over several weeks using various anchoring systems. Installation depth of the measuring devices varies between different research projects. Harbour porpoises are mostly active in the upper part of the water column. Therefore, this study aims to assess the influence of detectors installation's depth on the detection probability of harbour porpoises. For this reason, data from nine acoustic monitoring stations deployed in 2012 in the German Baltic Sea, ranging from 39 days up to 118, was compared. Each station was equipped with two C-PODs, one installed 2 metres above the seabed in water depths between 14 and 41 metres and the second one 5 metres below the surface. The detection rates of each click logger were quantified using positive 10-minute intervals (DP10M). Detection differences between the surface-near and the bottom-mounted C-PODs were analysed using linear regression models. The results show a high correlation of the detection rates between upper and lower click loggers (slope = 0.91) without a significant influence of the installation depth on the ratio of the detection rates ($p = 0.862$). These findings indicate that harbour porpoises can be detected at both detectors along the depth range of this study without showing any significant differences in the DP10M. Further investigations should be conducted to assess the results in greater water depths.



Investigating Alzheimer's disease-like neuropathology in bottlenose and striped dolphins in Italy: the role of viral co-morbidities in Amyloid- β Deposition

Testori, Camilla ¹

1. Istituto Zooprofilattico Sperimentale del Piemonte, Liguria e Valle d'Aosta

Marine mammals, particularly dolphins, are critical sentinels of marine ecosystem health. With their extended post-reproductive lifespans and complex brain structures, Bottlenose (*Tursiops truncatus*-Tt) and striped (*Stenella coeruleoalba*-Sc) dolphins stranded along Italian coasts provide unique opportunities to investigate Alzheimer's Disease (AD)-like neuropathology, focusing on amyloid-beta-42 (A β) and phosphorylated tau (pTau) proteins. This study investigates their accumulation examining the influence of several factors, including co-morbidities and, in particular, viral infections. Brain tissues from 43 dolphins, including 30 Tt and 13 Sc, which were either stranded (14 Tt and 13 Sc) or had died under human care (16 Tt), were analysed. The parietal cortex, our most consistently archived cerebral tissue, was examined, and A β immunoreactivity was measured with a semi-quantitative HistoScore. HistoScores were correlated with age, sex, species, and concomitant pathologies, including viral infections such as Cetacean morbillivirus (CeMV) and Herpesvirus. A β plaques were detected in five older animals, incidentally in individuals with viral infections. The most pronounced case was in a Tt of over 59 years old with widespread and dense plaques. Cytoplasmic A β -42 expression was observed in most dolphins, with younger Tt showing higher scores. Protozoan cysts also cross-reacted with A β -42 antibody. Conversely, pTau expression was rare, limited to isolated foci in neurons and neuropil of few Tt. There was no significant overlap between A β -42 and pTau expression, suggesting independent pathological processes in cetaceans. The present study represents a pioneering effort to map AD-like neuropathology in dolphins from the Mediterranean region. It underscores the role of age and viral co-morbidities, particularly CeMV and Herpesvirus, in exacerbating A β plaque development. The findings highlight the distinct neuropathological patterns in dolphins, diverging from human AD pathology. Viral-induced neuroinflammation likely contributes to A β aggregation, emphasizing the importance of further research to understand these processes in marine mammals.



Length matters: morphology as indicator of foraging behavior in Galápagos sea lions

Stoehr, Svenja ¹; Childs, Alexandra ¹; Schwarz, Jonas F. L. ²; Krüger, Oliver ¹

1. *Bielefeld University, Germany*

2. *University of California, Santa Cruz, United States*

Understanding foraging behaviour is fundamental to exploring the ecology of species, populations, and even individual animals. A range of diverse foraging strategies can develop across these levels, as is the case for the Galápagos sea lion (*Zalophus worrebaeki*). In the context of a long-term monitoring project, the foraging behaviour of adult female sea lions was studied using time-depth recorders (TDRs). The data from these biologging devices revealed distinct foraging strategies, which are differently adapted to varying environmental conditions. However, the use of such devices is often associated with high costs and invasive attachment methods. We therefore established a novel, non-invasive and cost-effective method using vibrissae length as morphological proxy to visually identify foraging strategies. Specialized foraging behaviours lead to distinct and temporally stable patterns of vibrissae abrasion, enabling the classification of those strategies without the need for biologging. Through this method, we not only significantly increased the number of individuals with known foraging strategy but were also able to demonstrate a previously unreported level of temporal stability in foraging behaviour. By utilizing vibrissae length as a proxy for foraging strategy, we provide a powerful example of how morphological traits can give critical insights into the behavior and ecology of a species. This approach offers new opportunities to advance ecological research while minimizing the costs and invasiveness often associated with behavioral studies.

Mapping areas of potential cetacean-fisheries conflict in the north coast of mainland Portugal

Barbieri, Beatriz ^{1,2}; Afonso, Luís ^{1,3}; Oliveria-Rodrigues, Cláudia ^{1,4}; Gil, Ágatha ^{1,5,6}; Marçalo, Ana ⁷; Sousa-Pinto, Isabel ^{1,4}; Correia, Ana Mafalda ¹; Valente, Raul ¹

1. CIIMAR/CIMAR LA – Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal
2. FCT-UAAlg - Faculty of Sciences and Technology, University of Algarve, 8005-139, Faro, Portugal
3. ICBAS - School of Medicine and Biomedical Sciences, University of Porto, 4050-313, Porto, Portugal
4. FCUP - Faculty of Sciences, University of Porto, 4169-007, Porto, Portugal
5. CITAB - Centre for the Research and Technology of Agro-Environmental and Biological Sciences, University of Trás-os-Montes and Alto Douro, Vila Real, 5001-801, Portugal
6. IIM-CSIC - Instituto de Investigacións Mariñas, 36208, Vigo, Pontevedra, Spain.
7. CCMAR - Centre of Marine Sciences, University of the Algarve, Faro, 8005 139, Portugal

Cetaceans are apex predators and play a crucial role in maintaining the balance of marine ecosystems. As keystone species and bioindicators, they are highly vulnerable to anthropogenic threats, with bycatch posing a significant conservation challenge, especially for legally protected species. Understanding the spatiotemporal dynamics of cetacean-fisheries interactions is therefore critical for effective mitigation strategies. The northern coast of Portugal serves as an optimal case study for investigating cetacean-fisheries interactions due to the presence of some oceanic dolphin species and its intensive fishing activity, with a focus on the common dolphin (*Delphinus delphis*), the most frequently recorded and stranded cetacean species in Portuguese waters. Preliminary data from the ATLANTIDA project (2021-2024) were analysed, using visual monitoring surveys, conducted along predefined and random transects alongside monthly fishing effort data obtained from Automatic Identification System (AIS) records for the same timeframe. The study area extended from Caminha to Espinho. From our results, encounter rates varied across years and peaked in different seasons, with a total of 2.44 sightings/km, and a range of 0.69 and 10.55 sightings/km. This variability may reflect heterogeneity in survey effort or cetacean distribution. Fishing efforts were comparable between locations with sightings (2.182 hours/km²) and without (2.180 hours/km²), suggesting that cetaceans are not actively avoiding fishing areas and may frequent areas with moderate fishing activity due to shared habitat preferences. The highest fishing effort was recorded in August 2021, but encounter rates were relatively low (2.46 sightings/km). While this could suggest a potential avoidance of areas with intense fishing activity, the limited dataset does not provide sufficient evidence to support this interpretation conclusively. These findings provide a baseline for understanding cetacean-fisheries interactions in the region. Long-term, high-resolution data are essential to refine methodologies, address biases, and develop targeted strategies to mitigate bycatch, supporting cetaceans conservation and sustainable marine resources.



Mercury influx to Greenland societies from the hunt of toothed whales over three decades (1993–2020)

Dietz, Rune ¹; Søndergaard, Jens ¹; Heide-Jørgensen, Mads Peter ²; Rosing-Asvid, Aqqalu ²; Gustavson, Kim ¹; Sonne, Christian ¹

1. Aarhus University, Department of Ecoscience
2. Greenland Institute of Natural Resources

Greenland experiences dramatic increases in temperatures and loss of sea-ice due to global warming. Among other, this is changing the spatial distribution of toothed whale species towards more northern latitudes and hence what species are available for the Inuit subsistence hunting in Greenland. In the present study, hunting data for the period 1993–2020 was used to estimate annual harvest trends combined with consumed meat and mercury (Hg) concentrations for estimation of Hg influx to six selected Greenlandic municipalities. The potential Hg load for the entire population in the selected settlements/cities over time was compared with the Provisional Tolerably Yearly Intake (PTYI) of Hg. The estimates show that Hg exposure is increasing in local hunting societies due to the appearance of new toothed whale species, while in some of the other northern areas, a reduction in the traditional beluga and narwhal hunt reduces the Hg net influx from new cetacean species. For the entire Greenland, the PTYI of Hg is only exceeded by a factor of 1.2 to 1.3 over the period from 1993 to 2019. However, in Northwest Greenland (Qaanaaq), the PTYI is exceeded from 10.9 to 10.5 folds while in East Greenland, significant increasing trends were found for Ittoqqortoormiit (from 0.9 to 5.8 folds) driven by the narwhal hunt and for Tasilaq (from 0.0 to 3.6 folds) mainly due to the recent hunt of white-beaked dolphin, white-sided dolphin, pilot whale and killer whale. This study shows that climate change is not just changing atmospheric transport and releases of Hg from historic ice and snow deposits, but also ecosystem dynamics through new invasive species, leading to increased hunt on these species as well as increased human Hg exposure. We therefore recommend that the observed increasing trends in hunt and human Hg exposures are monitored closely in order to establish future quotas to protect the wildlife and the Inuit population in Greenland.



Migration of male sperm whales from the Barents and the Norwegian Seas

Blanchet, Marie-Anne ¹; Christensen, Guttorm ²; Freitas, Carla ³; Kovacs, Kit ¹; Lydersen, Christian ¹; Morange, Zoé ⁴; Pedersen, Ove ⁵; Simila, Tiu ⁵; Vogel, Emma ⁴; Rikardsen, Audun ⁴

1. Norwegian Polar Institute
2. Akvaplan Niva
3. Institute of Marine Research
4. UiT The Arctic University of Norway
5. Whale2Sea

Sperm whales (*Physeter macrocephalus*) are found in all the world's oceans with a distribution characterized by a strong sexual geographic segregation. Males occupy high latitudes, while females and juveniles stay year-round at lower temperate latitudes. Males are known to travel to lower latitudes to breed but aside from photo-ID matching little is known regarding their migration patterns. In 2020 – 2023, we instrumented 26 male sperm whales with ARGOS satellite tags at the edges of the continental shelf between northern Norway and Spitsbergen. Track duration ranged from 8 to 277 days (mean = 119 +/- 80 days). During tracking periods, 12 of the 26 animals started a southward migration. Departures occurred asynchronously with individuals leaving between the 18th of January and the 6th of October. All migrating individuals passed through the area between Iceland and the Shetland Islands, on either side of the Faroe Islands, travelling rapidly in a directed manner. Among the 12 migrating individuals, six started a return, northward trip after journeys ranging from 57 to 105 d (mean 84 d +/- 18) covering maximum distances (from the starting point of the migration) ranging from 3,993 to 7,951 km (mean 6,369 +/- 1,212 km). The points furthest away from the start of the migration ("destination") were spread over a large area covering the lower latitudes of the North Atlantic covering over 10 million km². Two individuals completed their migrations, returning to their foraging area after a total migration period lasting 175 d and covering 16,332 km and 180 d covering 17,669 km cumulative distance, respectively. Our results suggest that sperm whales in the North Atlantic do not appear to have a defined breeding area or period, but rather use much of the North Atlantic basin on a year-around basis



Modeling the abundance of deep diving cetaceans in the Azores

T. Fonseca, Catarina ¹; Romagosa, Miriam ¹; Esteban, Ruth ²; Berimbau, Luís ²; Lagoa, João ³; Serra, Maria ; Simião, Susana ³; Carreira, Gilberto ³; A. Marques, Tiago ^{4,5}; Pérez-Jorge, Sergi ¹; A. Silva, Mónica ¹

1. *Institute of Marine Sciences – OKEANOS, University of the Azores, & Institute of Marine Research – IMAR, Horta, Portugal*
2. *Madeira Whale Museum, Caniçal, Portugal*
3. *Regional Directorate for Maritime Policies (DRPM) from Regional Secretariat for the Sea and Fisheries of the Government of the Azores, Horta, Azores, Portugal*
4. *Centre for Research into Ecological and Environmental Modelling, The Observatory, University of St Andrews, St Andrews, KY16 9LZ, Scotland, United Kingdom*
5. *CEAUL - Centro de Estatística e Aplicações da Universidade de Lisboa, Departamento de Biologia Animal, Universidade de Lisboa, Campo Grande, Lisboa, Portugal*

Estimates of abundance and distribution of deep diving cetaceans, such as sperm whales (*Physeter macrocephalus*) and beaked whales (Ziphiidae), are required to estimate population trends and assess anthropogenic impacts. Although previous studies have investigated their habitat suitability in the Azores, information on these fundamental parameters remains scarce, particularly on their abundance. Here, we analyzed data from a line transect survey carried out in 2023 using design and model-based distance sampling approaches to estimate abundance and density of deep diving cetaceans in Azorean waters. Detection functions were modeled separately for sperm whales and pooled beaked whale sightings using Multiple Covariates Distance Sampling. Design-based models were stratified by region to account for spatial variations, while Density Surface Models (DSM) included both static and dynamic environmental variables with values extracted at surface level and averaged across depth layers to account for deep ocean drivers. Sperm whale abundance derived from design-based methods was estimated at 201 (95%CI=72–561; CV=0.41) with DSMs presenting similar results (181; 98-351; CV=0.33). Beaked whale estimates showed moderate variation, with a design-based estimate of 446 whales (312–639; CV=0.16) while DSMs yielded an estimate of 599 (279–1357; CV=0.39). Sperm whale abundance was best predicted by bathymetry, sea surface height, current velocity, surface and sub-surface temperature and epipelagic micronekton biomass. For beaked whales, abundance was associated with surface salinity, seafloor temperature and biomass of micronekton in the mesopelagic layer. Predicted density maps showed the highest densities for both taxa in the north-west region of the Azores central group of islands. Overall, variables characterizing the water column improved model fit, with a more noticeable effect on beaked whale models primarily linked to the inclusion of micronekton biomass. These findings provide a baseline for monitoring deep diving cetacean populations in the Azores and guide future efforts assessing anthropogenic impacts.



Movements, diving behavior and group fidelity of long-finned pilot whales (*Globicephala melas*) in northern Norway

Cunningham, Faith ¹; Rikardsen, Audun ¹; Blanchet, Marie-Anne ^{1,2}; Kiszka, Jeremy ³; Vogel, Emma ¹; Freitas, Carla ^{4,5}

1. UiT-The Arctic University of Norway, Faculty of Biosciences, Fisheries and Economics, 9037 Tromsø, Norway
2. Norwegian Polar Institute, Framsenteret, Hjalmar Johansens gate 14, 9296
3. Florida International University, Department of Biological Sciences, Miami, Florida, USA
4. Institute for Marine Research, Nordnesgaten 50, 5005 Bergen, Norway
5. MARE - Marine and Environmental Sciences Center, Piso-2 Caminho de Penteada, Funchal, Madeira, Portugal 9020-105

Long-finned pilot whales (*Globicephala melas*) are widely distributed and abundant throughout the North Atlantic, but sightings have appeared to increase in coastal areas in northern Norway over the past decade. However, little is known about the dynamics and ecological drivers of their movements in this region. Therefore, during March-August from 2023 to 2024 we equipped 11 long-finned pilot whales with satellite-linked tags off Andenes, northern Norway. The tags provided location and some dive information and transmitted data for 8-114 days (mean = 44) with movement ranging between 63 and 71°N. We identified areas of restricted search using first passage time and explored seasonal and diel patterns. The whales utilized mostly the continental shelf and the corresponding shelf break and periodically specific large and deep fjord systems. Two-thirds of their time was used in the upper 10 m of the water column, while most of their dives were within the 200-350 m range and rarely passed 600 m. Most deep dives ranged between 5 - 10 minutes and rarely passed 12 minutes. Movement data suggest that individuals tagged within the same group systematically remained close together, providing insights into the social behavior and stability of individual associations. Furthermore, individuals tagged in “super groups” appeared to have an association as they were periodically traveling together. Although individuals in these supergroups were mostly separated, they sometimes displayed the same overall movement directions. This study provides novel, important information on the movements of long-finned pilot whales at the current northern limit of their range in the North Atlantic. This work is important for predicting how high trophic level marine predators such as small cetaceans are and will continue to be affected by climate change. Our work also highlights the need for more coordinated efforts to monitor the movements of long-finned pilot whales, particularly in the northeast Atlantic, where their population structure is poorly understood, but threats affecting this species are diverse and, in some cases, intensifying.



Mum Power: Insights into the role of female Antarctic fur seals in mitigating predation risk

Berthelsen, Ane Liv ¹; Bartl, Johannes ²; Winterl, Alexander ²; Fox-Clarke, Cameron ³; Forcada, Jaime ³; Nagel, Rebecca ⁴; Fabry, Ben ²; Hoffman, Joseph ¹

1. Department of Evolutionary Population Genetics, Faculty of Biology, Bielefeld University, Konsequenz 45, 33501 Bielefeld, Germany
2. Department of Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany
3. British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET, UK
4. School of Biology, University of St Andrews, St Andrews, KY16 9TH, UK

Understanding density effects on predator-prey interactions in colonial species require high-resolution data on spatial occupancy and predator presence. In this study, we employed fixed cameras to monitor the abundance of Antarctic fur seals (*Arctocephalus gazella*) and their avian predators, snowy sheathbill (*Chionis alba*), giant petrel (*Macronectes* spp.) and brown skua (*Stercorarius antarcticus*), over a single breeding season at Bird Island, South Georgia. This remote observation approach offered a non-invasive and labour effective alternative to traditional monitoring methods, while providing a high-quality, continuous dataset for quantifying the effects of fine scale heterogeneity of seal density on predation risk. Pup abundance positively correlated with snowy sheathbills and giant petrels but not with brown skuas. Crucially, we found that adult female fur seals presence mitigated predation risk for pups, whereas the presence of males or other pups did not have the same effect. These findings provide novel insights into the role of density-dependent dynamics in mitigating predation risk within a pinniped breeding colony. Our study further underlines the utility of remote observation as a tool for ecological research in isolated locations.

Non-coda vocalizations produced in social context by sperm whales in the Azores

Guipini, Simone ¹; Pace, Daniela Silvia ^{1,2}; Pedrazzi, Giulia ^{1,3}; Oliveira, Cláudia ⁴; Silva, Mónica Almeida ⁴

1. Department of Environmental Biology, Sapienza University of Rome, Italy
2. CNR-IAS, Capo Granitola Unit, Torretta Granitola, Trapani, Italy
3. Echoes, Capitoline Centre for Marine Research - ETS, Rome, Italy
4. Institute of Marine Sciences – OKEANOS, University of the Azores & Institute of Marine Research – IMAR, Horta, Portugal

Sperm whales (*Physeter macrocephalus*) primarily communicate using click sequences called codas. However, several non-coda acoustic signals (i.e., squeals, chirrups, coda-creaks, trumpets and slow-clicks) are recorded in social context, although their potential communicative role remains poorly understood. Here we examine these non-coda sound types in the Azores, investigating their emission patterns and acoustic characteristics using 292 hours of acoustic data collected through DTAGs between 2010 and 2022. Generalized Additive Mixed Models, non-parametric tests and Markov models were applied to estimate the effects of social variables (group size), environmental factors (phase of day), and behavioural contexts (foraging vs. non-foraging) on the production (emission rates, ERs), the acoustic parameters extracted for each signal type, and the transitions between sound types. The results revealed that the ERs and the acoustic structure of these non-coda sounds were strongly, but differently, influenced by all ecological and social factors. Peculiarities emerge for each sound type, including ¹ squeals: overlapping events with other sounds emitted by the tagged individual; ² chirrups/coda-creaks: variable ERs across different phases of the day and a possible well-structured nature of their transitions (relationship between duration of each chirrup/coda-creak and the onset of the subsequent sound); ³ trumpets: recordings in the presence of multiple male individuals; ⁴ slow-clicks: long click sequences emitted with a longer interval during shallow dives and a shorter one during foraging dives. Markov models highlighted specific transition patterns between different signal types, with a general tendency to transition towards codas, the most commonly produced vocalizations in social context by sperm whales. This work contributes to the understanding of the complexity of sperm whale acoustic repertoire, supporting the hypothesis that non-coda signals emitted in social context may have communicative functions, shaped by social and environmental factors.

Ocean gliders for passive acoustic monitoring of odontocetes in the Cabrera Archipelago National Park, Western Mediterranean

Jankauskaite, Greta ¹; Garcia, Marissa ^{2,3}; Miralles, Albert ⁴; Rivera, Patricia ⁴; Rubio, Manuel ⁴; Tintoré, Joaquín ⁴; Webber, Thomas ⁵; Zarokanellos, Nikolaos ⁴; Klinck, Holger ²; Raga, Juan Antonio ¹; March, David ^{1,6}

1. *Cavanilles Institute of Biodiversity and Evolutionary Biology, University of Valencia, Paterna, Valencia, Spain*
2. *K. Lisa Yang Center for Conservation Bioacoustics, Cornell Lab of Ornithology, Cornell University, Ithaca, NY, USA, 14850*
3. *Department of Natural Resources and the Environment, Cornell University, Ithaca, NY, USA, 14853*
4. *SOCIB, Balearic Islands Coastal Observing and Forecasting System, Palma, Spain.*
5. *Scottish Association for Marine Science, Oban, Argyll, PA37 1QA, United Kingdom.*
6. *Centre for Ecology and Conservation, College of Life and Environmental Science, University of Exeter, Cornwall, United Kingdom.*

Monitoring cetacean presence is essential for assessing habitat use, population status, and exposure to anthropogenic threats such as ship strikes and underwater noise pollution. Autonomous underwater vehicles, such as ocean gliders, can be equipped with acoustic sensors for Passive Acoustic Monitoring (PAM), making them suitable platforms for simultaneous oceanographic and acoustic data collection across vast areas, at night and in poor weather conditions. Here, we present the CESCAB campaign (Cetacean Soundscapes in the Cabrera Archipelago National Park), an ocean glider mission designed to simultaneously collect biophysical information while using PAM to detect the acoustic presence of cetaceans within a large marine protected area (MPA). During a 32-day mission in summer 2024, a digital acoustic monitoring (DMON2) instrument onboard a Slocum glider operated on a duty cycle (30 seconds every 7.5 minutes) and recorded at a 240 kHz sampling rate to capture the full range of cetacean vocalizations, including echolocation clicks and whistles. The glider mission resulted in 51 hours of acoustic data, recorded across a path of 600 km, with dive profiles reaching depths of up to 1,000 m. Acoustic data analysis was conducted through visual inspection of spectrograms by a trained analyst using Raven Pro software as well as semi-automated detection and classification approaches. Three odontocete species were successfully detected and identified at the species level: sperm whale (*Physeter macrocephalus*), Risso's dolphin (*Grampus griseus*), and long-finned pilot whale (*Globicephala melas*). Additionally, vocalizations from other individuals were classified as belonging to the Delphinidae family. This study highlights the potential of ocean gliders to serve as PAM platforms for multi-species monitoring in large MPAs, enhancing surveillance and enabling the collection of cetacean distribution and habitat use data to inform conservation efforts. Supported by Generalitat Valenciana through IOS4DOM (CIDEAGENT/2021/058) project.



Operationalizing the conservation of cetacean cultures – challenges and opportunities

Simmonds, Mark Peter ¹; Brakes, Philippa ²; Nunny, Laetitia ³; Frisch-Nwakanma, Heidrun ⁴

1. *Bristol Veterinary School, University of Bristol*
2. *Whale and Dolphin Conservation*
3. *OceanCare*
4. *Convention for the Conservation of Migratory Species*

Highly social species may face unique conservation challenges. In particular, evidence for social learning and cultural transmission of information within and between generations can generate resilience or vulnerability. Recognition of discrete cultural units has so far only been achieved in a few instances. Resource requirements can differ across cultures within the same species, for example between foraging strategies, and cultural units may be important for maintaining the long-term persistence of viable natural populations. The removal of informed, often older, individuals may also have consequences beyond simply a reduction in absolute numbers, with repercussions for the transmission of ecologically relevant behaviours critical for populations to survive (e.g., knowledge of migratory routes and prey behaviour). The acoustic cultural clans of sperm whales are well established, and orca have distinct cultural units which can be differentiated by foraging strategy or vocal dialect. Orcas in the North Pacific have protection under the relevant USA and Canadian legislation. Many other cetaceans, including humpback whales, southern right whales and Baird's beaked whales similarly show evidence for culturally transmitted behaviour, attributes that may be important for their conservation. Identifying cultural units of relevance to conservation remains challenging. The member nations of the Convention for the Conservation of Migratory Species (CMS) have recognised the importance of this topic and the convention uniquely at this time hosts a relevant programme of work, which includes a CMS Concerted Action for sperm whales to better elucidate how the cultural structuring of the population in the eastern tropical Pacific may influence their conservation. In this presentation we review the opportunities and challenges of this field and work conducted to date on this issue under CMS. We highlight the steps necessary to define and identify cultural units and consider when and how the conservation of cultural units of cetaceans can be beneficial.



Residency patterns of common bottlenose dolphin (*Tursiops truncatus*) In Natura 2000 SCI in the central Adriatic Sea

Frleta-Valić, Maša ¹; Hofs, Jeroen ¹; Miočić-Stošić, Jure ²; Pleslić, Grgur ²; Mackelworth, Peter ²; Holcer, Draško ³

1. Blue World Vis, Put Batude 2, HR-21485 Komiža, Croatia
2. Blue World Institute of Marine Research and Conservation, Kaštel 24, HR-51551 Veli Lošinj, Croatia
3. Croatian Natural History Museum, Department of Zoology, Demetrova 1, HR-10000 Zagreb, Croatia

Monitoring common bottlenose dolphins (*Tursiops truncatus*) in the Natura 2000 Site of Community Importance (SCI) (HR3000469 Viški akvatorij, Croatia), has been conducted since 2007. A total of 618 sightings have been made with 604 distinctive adult individuals being catalogued. Abundance estimates for the SCI vary from 192 individuals (95% CI = 121-265) in 2010 to 263 (95% CI = 202-325) in 2018. To investigate residency and site fidelity, we calculated three site fidelity indicators (permanence, periodicity and occurrence) for all fairly and highly marked adult individuals recaptured at least once (N = 245). On the community level, a standardized site fidelity index of 0.028 showed a very low level of site fidelity in the SCI area. This is common for open pelagic waters and areas with lower productivity. Site fidelity indicators identify three clusters of individuals based on their degree of residence in the study area, using agglomerative hierarchical cluster analysis. The accuracy of clustering solution was confirmed by a cophenetic correlation coefficient of 0.72 and supports valid representation of the dendrogram dissimilarities. Based on this analysis, 94 individuals are resident in the SCI. As such, the SCI hosts a relatively small number of residents and a significant portion of wide-ranging animals. The home-ranges of animals observed a minimum of 10 times (N = 100) in the broader study area were calculated, using the minimum convex polygon (MCP) and fixed kernel density estimator (KDE) methods. Individual home ranges varied between 111.2 km² and 1576.4 km² (mean = 437.8 km², SD = 258 km²) (95% MCP), and 232.9 km² and 7838.2 km² (mean = 1910.7 km², SD = 1253.8) (95% KDE). Widening research effort in the future might explain non-resident ranges and their contribution to dynamics of the community, possibly implying the need for the enlargement of the SCI area.



Sea temperature and pollution are associated with increased risk of infectious disease mortality in short-beaked common dolphins (*Delphinus delphis*)

Williams, Rosie ¹; Curnick, David J; Baillie, Andrew; Barber, Jon L.; Barnett, James; Brownlow, Andrew; Deaville, Rob ; Davison, Nicholas J.; ten Doeschate, Mariel ; Murphy, Sinéad; Penrose, Rod ; Perkins, Matthew; Spiro, Simon; Williams, Ruth; Williamson, Michael J.; Cunningham, Andrew; Johnson, Andrew C.

1. *Institute of Zoology, Zoological Society of London*

The concurrent pressures of climate change and chemical pollution, often studied in isolation, have been linked to increases in infectious disease that threaten biodiversity. Understanding their interconnected nature is vital, as the impacts of climate-mediated environmental changes can be exacerbated by chemical pollution and vice versa. Using data from 836 UK-stranded short-beaked common dolphins (*Delphinus delphis*) (n=153 [analysed for polychlorinated biphenyl (PCB) blubber concentrations) necropsied between 1990-2020, we show that PCB concentrations and sea surface temperatures (SSTs) are associated with an increased risk of infectious disease mortality. Specifically, a 1 mg/kg lw increase in PCB concentration correlates with a 1.6% increase in disease mortality risk, while a 1°C rise in SST corresponds to a 14% increase. Additionally, we derived a novel PCB threshold concentration (22 mg/kg lipid) defined as the level where PCB blubber concentrations are significantly associated with infectious disease mortality risk. International efforts to reduce carbon emissions have mostly failed and despite regulatory efforts, PCBs remain a significant threat. We demonstrate the urgent need for conservation strategies that address both risk factors simultaneously to protect marine biodiversity.



Shifting spatial patterns of Southern Right Whales in Brazilian calving grounds: implications for conservation and management

Batochio, Marina ¹; Renault-Braga, Eduardo ¹; Rejane Groch, Karina ¹; Simões-Lopes, Paulo César ²; Daura-Jorge, Fábio ²

1. *Australis Institute for Environmental Research and Monitoring, Itapirubá Norte, BR*

2. *Department of Ecology and Zoology, Federal University of Santa Catarina, Florianópolis, BR*

Understanding critical habitat characteristics is vital for the recovery of threatened marine species. The southern right whale (*Eubalaena australis*), a locally endangered species, has shown steady population growth and early signs of distribution shifts in other calving grounds. Using 21 years (2002–2023) of aerial survey data from the primary calving ground in southern Brazil, covering 716.897 km² between -27.907°S and -29.367°S, we investigated changes in distribution and habitat in the Brazilian calving ground use through Kernel Density Estimators. Results revealed a northward expansion for females with calves, reduced use of southern areas, and consistent concentration zones over time. While the Área de Proteção Ambiental da Baleia-Franca (APA-BF), a key Marine Protected Area, includes critical habitats, significant portions of the species' range remain unprotected. Spatial segregation was observed between solitary adults and females with calves, with overlap limited to the central APA-BF. Solitary adults have sharply declined over the past decade, with no individuals recorded in the last three years—a trend raising critical questions for future research. These findings indicate shifts in habitat use over two decades, possibly influenced by environmental and demographic factors. By identifying critical habitats and documenting spatial changes, this study underscores the need to reassess the boundaries of the APA-BF. The observed trends also provide valuable insights for understanding how recovering populations respond to environmental pressures and habitat changes, offering important considerations for management and conservation efforts across the species' range.



Shipping noise propagation modelling in deep ocean areas using open source data

Félix Z., Fran ¹; Jesús, Sergio M. ²; Wensveen, Paul J. ³; Romagosa, Miriam ¹; Silva, Mónica A. ¹

1. *Institute of Marine Sciences – OKEANOS, University of the Azores & Institute of Marine Research – IMAR, Horta, Portugal*
2. *LARSyS, University of Algarve 8005-139 Faro, Portugal*
3. *Westman Islands Research Centre, Institute of Research Centres, University of Iceland, Vestmannaeyjar, Iceland*

Anthropogenic ocean noise has been increasing over the last decades, affecting marine ecosystems across the world. Underwater radiated noise (URN) from ships is the primary contributor, and the most pervasive and ubiquitous source of ocean noise, potentially interfering with marine animals' communication, causing stress and disrupting vital behaviours. Here, we present a sound propagation model (SPM) developed to estimate URN applicable to large, deep ocean areas, which we combined with openly available shipping density data from the Global Maritime Traffic Density Service. The BELLHOP beam-tracing model was used with input data including environmental variables (bathymetry, bottom composition, salinity and temperature) and source locations at a resolution of 4x5 km². Monthly shipping densities (ships per hour per 1 km²) were combined with source levels from ships (cargo, tanker, fishing and passenger from JOMOPANS-ECHO model) at three central 1/3 octave frequencies recommended by the MSFD TG11 (64 Hz, 126 Hz and 15849 Hz) and BELLHOP output to predict the noise levels with a resolution of 2.5 km². SPM outputs were validated against noise measurements from acoustic recordings from a calibrated hydrophone deployed at 1385 m depth. The results showed slight differences in SPL (in dB re 1 µPa) with higher values of SPM compared to noise measurements in the 1/3 octave frequency bands, ranging from 16.18 dB (maximum) to 7.65 dB (minimum), and also showed better correspondence in the noisiest months for all frequencies (12.81 dB at 64 Hz in June; 13.23 dB at 126 Hz in January and 7.65 dB at 15849 Hz in August). Further validation is needed to assess the performance of the model across the water column; however, the novel approach presented here can contribute to the estimation of URN and to URN risk assessment in deep ocean areas using open source data that are easily accessible to everyone.



Spatiotemporal co-occurrence of whales and capelin on the East Greenland shelf during autumn

Sigurðsson, Guðjón Már ¹; Vikingsson, Gisli ¹; Singh, Warsha ¹; Jansen, Teunis ²

1. Marine and Freshwater Research Institute, Fornubudir 5, 220 Hafnarfjörður, Iceland

2. Greenland Institute of Natural Resources, Kivoq 2, 3900 Nuuk, Greenland

Whales were systematically counted during the capelin autumn surveys in 2017 and 2018. The objective was to investigate whether any relationship existed between abundance of identified functional groups of whales and capelin. A total of 205 whales of seven species were observed in 2017 while 1295 whales of eight species were observed in 2018. The most common species was humpback whale (*Megaptera novaeangliae*) in both years. The species were divided into two functional groups, baleen, and toothed whales. Whale and capelin abundance data were then compiled on a fine spatial grid (0.5° x 1° latitude and longitude) for statistical analysis. Whales of both functional groups were found at a higher frequency than expected where capelin was present, with the relationship being stronger for baleen whales. Further, a Generalized Additive Model (GAM) showed a weak (11% deviance explained) but significant relationship between capelin echo abundance and total whale abundance. When modelled separately for the two main species that overlapped with capelin i.e. minke and humpback whales, this positive relationship was stronger (49% deviance explained for minke and 27% for humpback).



Spatiotemporal monitoring of Northeast Atlantic cetaceans and their predator-prey interactions through environmental genetics

Claver, Cristina ¹; García de Amézaga, Leire ¹; Mendibil, Iñaki ¹; Canals, Oriol ¹; Prieto, Rui ²; Cascão, Irma ²; Oliveira, Cláudia ²; A. Silva, Mónica ²; Louzao, Maite ¹; Santos, María ¹; Boyra, Guillermo ¹; Rodríguez-Ezpeleta, Naiara ¹

1. AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Sukarrieta, Spain
2. Institute of Marine Sciences – OKEANOS & Institute of Marine Research - IMAR, University of the Azores

In the current context of changing oceans, cetacean conservation requires ecosystem-scale management approaches grounded on a better understanding of marine food webs. Here, we tested the hypothesis that information critical for efficient cetacean monitoring, such as abundance and distribution, prey availability and dietary preferences, can be derived from environmental genetic data, which, combined with sighting and acoustic information, might become key for effective conservation. Firstly, we advanced towards a more comprehensive monitoring of cetacean distribution and interactions with prey through the analysis of fish and cetacean eDNA from ~300 water samples collected in the Bay of Biscay during a 6-year period (2018-2023) and compared this information to visual sightings of cetaceans and acoustic estimates of fish. We described spatial and temporal patterns of different key species in the area (such as dolphins and small pelagic fish) and provided information about predator and prey overlaps in space and time. Secondly, we studied the dietary preferences of rorquals and sperm whales in the Azores through the genetic analysis of 35 faeces (2011-2021) and 67 vertical profile water samples (2021). We found that rorquals consumed mesopelagic fish that perform diel vertical migrations (DVMs) such as myctophids, whose eDNA was found in water depths that matched the deep foraging behaviours during daytime and shallow foraging behaviours during night, suggesting that rorquals may rely on the DVM of mesopelagic fish to feed at these latitudes. We also found that despite the high cephalopod diversity in the water column, the faecal content of sperm whales was mainly composed by *Histioteuthis bonellii*, which was abundant in the water samples collected at 600-1200 m depths, where sperm whales are known to forage in this area. The novel information generated in this work suggests that the use of environmental and faecal DNA can become key for cetacean monitoring and represents the first genetic analysis of the diets of rorquals and sperm whales. Our work will help advancing towards a better evaluation and management of marine resources under an ecosystemic approach.



Sperm whale movements and habitat preferences in the Azores

Duffing Romero, Mareike ¹; Pérez-Jorge, Sergi ¹; Prieto, Rui ¹; Hazen, Elliott ²; Juliano, Manuela ³; Almeida e Silva, Mónica ¹

1. *Institute of Marine Sciences - Okeanos at the University of the Azores*
2. *SWFSC, NOAA Fisheries*
3. *University of the Azores*

The waters of the Azores are known to be an important foraging, nursing, and breeding habitat for sperm whales (*Physeter macrocephalus*) in the North Atlantic, yet their movements and habitat preferences in the area are poorly understood. To investigate this, we deployed the first set of satellite transmitters (n=13) on sperm whales in the Azores. After correcting for location errors using Bayesian state-space models (SSMs), we applied generalized additive mixed models (GAMMs) to the original and simulated tracks to predict the species' habitat preference based on environmental variables. Twelve of the 13 sperm whales remained in the Azores for the duration of the transmission (6-161 days). The movements of these whales suggest that the majority of the tracking time was spent in foraging activity. Sperm whales preferred areas of high mesoscale activity characterized by higher sea surface height, surface temperature and salinity, intermediate values of eddy kinetic energy and bottom temperature, and surface currents of varying orientation and intensity. They also preferred areas relatively close to shore (6-55 km from the shorelines). The highest probability of sperm whale occurrence was predicted around the islands of the central group (Faial, Pico, S. Jorge, Graciosa), the eastern group (S. Miguel and Sta. Maria), and the lowest probability in the areas between the central and western islands and offshore. Sperm whale presence varied throughout the year, with a higher probability of occurrence and more extensive distribution in the summer, reflecting the seasonal dynamics in oceanographic conditions in the region. Overall, our results show that sperm whales can use habitats within the Azores for substantial periods of time, emphasizing the importance of the region as a foraging hotspot for the species in the North Atlantic and highlighting the need to protect meso- and bathypelagic ecosystems that support these whales.



Systematic efforts reveal a new cetacean biodiversity hotspot in Tanzania

Kalashnikova, Ekaterina ¹; Orio, Davis Godfrey ²; Lyne, Patrick ³; Awbrey, Tim ⁴; Ngowo, Redfred ²; Akkaya, Aylin ³

1. Bazaruto Center for Scientific Studies (BCSS), Benguerre, Mozambique; Tanzania Cetaceans Program (TCP), Zanzibar, Tanzania
2. Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP), MPRU, Mtwara, Tanzania
3. DMAD-Marine Mammals Research Association (DMAD), Istanbul, Türkiye
4. Scottish Association for Marine Science (SAMS), Scotland

Cetaceans play a crucial role in the integrity of ecosystems, regulating prey populations, supporting nutrient cycling and carbon sequestration, making their presence vital for seascapes' health and dependent coastal communities. Despite its unprecedented biodiversity, few studies have been conducted in Tanzania leaving many important areas understudied, including Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP), located in the south of the country, where this study focuses its ongoing systematic efforts, and where only four species of cetaceans had been previously recorded. The survey site comprised 529 km² - an area characterised by narrow continental shelf, steep slope and great depths. 55 boat surveys were conducted from 2021 to 2024, with a total effort of 199 hours resulting in 267 sightings, including interspecies interactions of up to 4 taxa. Both spinner dolphins (*Stenella longirostris*) and Risso's dolphins (*Grampus griseus*) were recorded in all seasons, with 31 and 24 encounters respectively. Common bottlenose dolphins (*Tursiops truncatus*), rarely seen melon-headed whales (*Peponocephala electra*) and short-finned pilot whales (*Globicephala macrorhynchus*) were observed on 6, 5 and 3 occasions respectively, and Fraser's dolphin (*Lagenodelphis hosei*), pantropical spotted dolphins (*Stenella attenuata*), killer whales (*Orcinus orca*) and false killer whales (*Pseudorca crassidens*) had single records. Humpback whales (*Megaptera novaeangliae*) were encountered on 190 occasions. Aiming to establish long-term baseline knowledge on cetaceans' ecology across multiple years, we focus on cetaceans' inventory, occurrence, distribution and habitat use. The biodiversity and novel behaviour recorded are likely stemming from area's unique bathymetric and oceanographic features, including three major ocean currents: the South Equatorial Current, East Africa Coastal Current, and Equatorial Counter Current, which are, amongst other factors, shaping the MBREMP ecosystem warranting its high productivity. The data from this study identify this previously unrecognised area of cetacean biodiversity as one of the most significant for whales and dolphins at a national level, highlighting the need for continued monitoring and essential protection efforts.



Temperature-based habitat segregation between common and Atlantic spotted dolphins in Azorean waters

Pinheiro da Silva, Maria Inês ¹; Tobeña, Marta ¹; Machete, Miguel ¹; Silva, Mónica A. ¹; Pérez-Jorge, Sergi ¹

1. Institute of Marine Sciences – Okeanos & Institute of Marine Research – IMAR, University of the Azores, Horta, Portugal

The coexistence of sympatric species, which share similar ecological requirements and compete for resources in the same area, implies some degree of segregation. In the Azores, common dolphins (*Delphinus delphis*) and Atlantic spotted dolphins (*Stenella frontalis*) are the most frequently sighted species, but while the first is present year-round the second is a seasonal visitor in the area. Given the similarity of their ecological niches, the two species are expected to have some segregation mechanism to reduce interspecific competition. This study used a long-term sightings dataset (2001-2015) provided by the Azores Fisheries Observer Program (POPA) and relevant environmental variables, combined through species distribution models to investigate the distribution and the habitat overlap of the common and Atlantic spotted dolphins. A clear seasonal pattern was found with the decrease in the presence of common dolphins from May to September, accompanied by an increase in the presence of Atlantic spotted dolphins throughout these months. Sea surface temperature (SST) was the most important driver of the distribution of both dolphin species and their habitat overlap, with a marked threshold found around 21°C. Below this temperature, common dolphins were the dominant species having a widespread distribution, while Atlantic spotted dolphins were nearly absent. Above this threshold, the presence of common dolphins decreased sharply, and Atlantic spotted dolphins dominated. The spatial overlap between the two species was strongly influenced by monthly SST anomalies. These findings suggest a temperature-based habitat segregation between common and Atlantic spotted dolphins. Investigating their ecological segregation provides valuable insights into how sympatric species coexist in shared habitats. Moreover, understanding this process is crucial for predicting how climate change will affect the ecological niche of these species and influence their potential geographical distributions in the future.



The loud side of Carbon Capture and Storage (CCS) – effects of seismic surveys on harbour porpoises

Taugnitz, Tim ¹; Meyer, Jannes ¹; Bär, Tom ¹; Bellmann, Michael ²; Denkinger, Judith ¹; Dähne, Michael ³

1. *Deutsches Meeresmuseum*
2. *itap GmbH*
3. *Bundesamt für Naturschutz*

CCS is a suggested technology to fight climate change. The German government is currently planning to use CCS under the sea floor of the North Sea requiring the conduction of seismic surveys with airguns to derive 3D structures of the reservoirs. To examine the effect of airgun noise on porpoise acoustic behaviour and distribution, a field study was conducted, next to a research survey close to the Doggerbank Natura 200 site. To assess porpoise activity and distribution through passive acoustic monitoring (PAM), 11 CPODs were placed in different distances to the survey track. Four soundtraps recorded raw data of the sound impulse of the airgun. Porpoise activity and soundscape were recorded in and around the survey area before, during and after the survey, in up to 20km distances. The activity of porpoises was modelled in relation to the ship tracks as a proxy to sound source and the effect of different variables using GAM models. A two-dimensional kriging of the SEL recorded of the airgun was performed to get a better understanding of the potentially affected area according to German standards for causing a potential injury (< 160dB SEL in 750m distance). During CCS surveys the porpoise activity significantly decreased in relation to the distance of the airgun within a range of up to 10km. Furthermore, porpoise activity increased after the survey, indicating a return of animals to the exposed area. Our results indicate a significant habitat loss during the survey, while we are not able to quantify the number of affected animals due to the moving vessel and movements of animals. This study provides the first evidence that seismic surveys for CCS need to be considered as stressors in porpoise habitats and that an increase of the frequency of seismic surveys due to CCS must be considered in marine spatial planning.



Using photogrammetry to assess Mediterranean sperm whale body condition supports the presence of a breeding ground in the waters off Menorca, Balearic Islands

Norena Medina, Daniel ¹; Cerdá, Margalida ¹; Pelletingeas, Guillaume ¹; Vitoria, Yaiza ¹; Pirodda, Enrico ²; Brotons, J M ¹

1. *Asociación Tursiops, Marratxí, Balearic Islands, Spain*
2. *Centre for Research into Ecological and Environmental Modelling, University of St Andrews, St Andrews, UK*

Body condition is a key indicator of an animal's health, reflecting physiological status and resilience to stressors at both individual and population levels. The Mediterranean sperm whale (*Physeter macrocephalus*) population, classified as endangered in the past decade, requires innovative and non-invasive methodologies for monitoring. Unmanned Aerial Systems (UAS)-based photogrammetry has emerged as a valuable tool for assessing body condition in cetaceans due to its cost-effective and minimally invasive nature. Additionally, it has been demonstrated that this technique can be used to accurately determine pregnancy status in smaller odontocetes. This study aimed to 1) implement UAS-based methods to evaluate the body condition of Western Mediterranean sperm whales, and 2) investigate spatial variations in body condition around the Balearic Islands. Between 2020 and 2024, vertical images of 81 sperm whales were collected across the Balearic Archipelago, Spain. Three metrics were calculated to assess body condition: Body Condition Index (BCI), Body Area Index (BAI), and Width-Length ratio (WLR). BAI was calculated using the ventral region of the whale's body, specifically the portion spanning 20% to 60% of its total body length along the longitudinal axis. Our findings reveal that individuals observed in the north of Menorca had significantly higher BAI compared to those from other regions of the Balearic Islands. Furthermore, these individuals also exhibited larger BCI and WLR on average, suggesting that these waters are used by animals in different reproductive states. These results align with recent work proposing the northeastern waters off Menorca as a breeding area for Western Mediterranean sperm whales, thus serving as a critical habitat for the conservation of this endangered population.



POSTER PRESENTATIONS



Abundance and Distribution

AD-01. Applying random forest machine learning to model humpback whale seasonal distributions in north iceland: an insight into Skjálfandi Bay

Poggio, Matteo ¹; Vassallo, Paolo ¹; Basran, Charla J. ²; Rasmussen, Marianne H. ²

1. *Università degli Studi di Genova, Via Balbi, 5, 16126 Genova GE*

2. *University of Iceland's Húsavík Research Centre, Hafnarstétt 3, 640 Húsavík, Iceland*

Skjálfandi Bay in Northeast Iceland has recently been recognized as a Mission Blue Hope Spot, largely due to its biodiversity and contribution as a carbon sink. While this area is exempt from whaling, it is not immune to industrial fishing practices, cruise line passage, and industries such as a recently constructed silicon factory. Humpback whales visit the bay annually and have been increasing in numbers over the past few years, bringing an overwhelming amount of tourism for whale-watching companies. Given the ecological and economic importance of Skjálfandi Bay, and underlying threats, information that can help establish MPA level protection and regulation is needed. While research at the University of Iceland's Húsavík Research Center has mainly focused on behavioral, genetic, and photo-ID analysis, distributional and ecological niche studies are lacking. Considering this, the current study applied the Random Forest species distribution model to establish an overview of humpback whale monthly distribution within Skjálfandi Bay (March to September). Ten years of occurrence and vessel trackline data (2014-2023) was used to train the monthly models, using MatLab (R2023b) and R (4.42). Environmental variables included: Chlorophyll-a, Sea Surface Temperature (SST), Depth, Slope, and Distance from Coast. Low resolution variables: Chlorophyll-a and SST, were resampled and interpolated, allowing for high resolution distribution mapping. To select best performing models, confusion matrices were used, subsequently calculating specificity, sensitivity, and true skill statistic. Initial results showed a change in distribution across months with a progressive shift to deeper waters as the season progressed towards autumn. The variables of most importance for model performance varied monthly; however, depth seemed to hold recurring importance, as well as SST and Chlorophyll-a, while slope contributed little-to-no performance increase. Future research will incorporate fishing effort as an explanatory variable, compare other models, and create models under future climate scenarios.



AD-02. First stranding record of a rare and undescribed African form of *Stenella longirostris* on the continental coast of Europe: a case report

Román López, Marta ¹; Martín, Vidal ²; Cerezo Caro, Alejandra ¹; Arbelo, Manuel ³; Sierra, Eva ³; Vivas, María Soledad ⁴; Márquez, Teresa ¹; Grondona, Manuel ⁵; Iglesia, Claudia ³; Fernández, Antonio ³; Fernández-Maldonado, Carolina ¹

1. Seashore Environment and Fauna. Calle Sevilla, nº4. 11380. Tarifa, Cádiz. Spain. e-mail: seashore.ef@gmail.com
2. Society for Study of Cetaceans in the Canary Archipelago (SECAC)
3. Veterinary Histology and Pathology, Institute of Animal Health and Food Safety (IUSA), Atlantic Center for Cetacean Research, Marine Mammal Health WOAHCOL Centre, University of Las Palmas de Gran Canaria, Veterinary School, Las Palmas, Spain.
4. Environmental and Water Agency. Junta de Andalucía.
5. Territorial Delegation of Sustainability and Environment in Málaga. Junta de Andalucía.

On 11 November 2023, two male dolphins stranded alive in Cádiz, Spain. The event was attended by the Andalusian Stranding Network for Marine Mammals and Turtles, but both animals died before veterinary assistance could be provided. The individuals measured 187cm (a subadult) and 203cm (an adult) in total length, both displayed a triangular to strongly canted dorsal fin and an enlarged post-anal hump. The subadult exhibited a tripartite coloration pattern, although a darkened mid-lateral field gave the appearance of a two-part pattern, with a white ventral region showing intense mottling. A complete standardized necropsy was performed, revealing preliminary macroscopic findings consistent with cardiorespiratory shock and perimortem distress in both specimens. The subadult presented lesions suggestive of natural disease, including splenitis and pancreatitis, while the adult displayed moderate digestive and pulmonary parasitosis. Both individuals showed severe emphysema, alveolar edema, and intravascular gas bubbles in the brain and mesenteric vessels, along with congestion and peripheral hemorrhages. The diagnosis of cause of death is pending the results of the histopathological examination and additional ancillary tests. The spinner dolphin, *Stenella longirostris* (Gray, 1828), is widely distributed in tropical and subtropical oceanic waters, exhibiting several geographic forms, with four subspecies currently recognized. The external features of these specimens were consistent with those of an *S. longirostris* stranded in the Canary Islands in 2004 and the few reports of spinner dolphins from the northeastern African coast. The information thus far suggests that the individuals may belong to a poorly known geographic form of *S. longirostris* from West Africa, further supported by the presence of old scars from cookiecutter sharks, *Isistius brasiliensis*. Genetic and osteological studies will help to clarify this. This event represents the first documented stranding of *S. longirostris* on the European mainland, underscoring the importance of stranding networks in monitoring and documenting such occurrences.



AD-03. A decade of cetacean monitoring in eastern Sicilian waters: distribution patterns and conservation challenges (2015–2024)

Raffa, Alessandra ¹; Tumino, Carla ²; Garofalo, Dario ¹; Monaco, Clara ¹

1. Marecamp Association, Lungomare Scardamiano 1, 95021 Aci Castello, CT, Italy
2. Marecamp Association, Lungomare Scardamiano 1, 95021 Aci Castello, CT, Italy Department of Biological, Geological and Environmental Sciences, University of Catania, Italy

Between 2015 and 2024, the association Marecamp conducted comprehensive cetacean monitoring across three Sicilian areas: the Strait of Messina, the Gulf of Catania, and the waters off Augusta. A total effort of 7484.5 nautical miles resulted in 539 sightings, confirming the presence of seven of the eight cetacean species commonly found in the Mediterranean Sea. These include the sperm whale (*Physeter macrocephalus*), common bottlenose dolphin (*Tursiops truncatus*), striped dolphin (*Stenella coeruleoalba*), short-beaked common dolphin (*Delphinus delphis*), Risso's dolphin (*Grampus griseus*), fin whale (*Balaenoptera physalus*), and Cuvier's beaked whale (*Ziphius cavirostris*). In addition, four accidental species were recorded through citizen science contributions, with observations scattered across different areas: killer whale (*Orcinus orca*), false killer whale (*Pseudorca crassidens*), rough-toothed dolphin (*Steno bredanensis*), and humpback whale (*Megaptera novaeangliae*). Encounter rates (ER), analyzed for each species and area, offered key insights. Striped dolphins confirmed their dominance in offshore environments across all areas, particularly in Catania, where their ER (0.0576) was significantly higher than other species (MW test, $p < 0.001$). Bottlenose dolphins, with the second-highest ER (0.0539), significantly higher than other species in Augusta (MW test, $p < 0.01$), were more common in nearshore areas. Sperm whales, while less frequent, demonstrated a strong affinity for deeper waters near Messina. Fin whales and Risso's dolphins were rarely observed, resulting in the lowest ER (respectively 0.003 and 0.0004), emphasizing their vulnerability and sporadic presence in those areas, contrasting with consistent records from previous decades. This detailed ER analysis highlights ecological differences across the three study areas and reinforces the importance of targeted monitoring in managing cetacean populations. Marecamp's work demonstrates that habitat preference and encounter frequency vary between species, seasons, and area pressures. These findings contribute to a deeper understanding of Mediterranean cetaceans and support initiatives aimed at their long-term protection.



AD-04. Spatial distribution and social structure of the Iberian killer whale (*Orcinus orca*): insights from satellite telemetry and predictive modeling

Silgado Calderón, David ¹; Salazar Sierra, Juan Manuel ^{1,2}; Pelayo Ríos, Jesús ¹; Neva, Juan Carlos ¹; Baringo, Francisco ¹; González Tapia, Ángela M. ¹; Rivas García, Inmaculada ¹; Crespo, Tomás ¹; Castrillo Pérez, José Manuel ¹; García Bailón, Sara ¹; Endo, Yumi ¹; Alves, Rui ³; de Stephanis, Renaud ¹

1. CIRCE (Conservation, Information and Research on Cetaceans), Cabeza de Manzaneda 3, Pelayo, 11390 Algeciras, Cádiz, Spain
2. EIBE (Equipo de Investigación de Biología Evolutiva), Universidad de Granada, Granada, Spain
3. Orcas.pt, Portugal

This study investigates the spatial distribution and social structure of the Iberian killer whale (*Orcinus orca*) by combining satellite telemetry data from seven individuals tagged between 2013 and 2023 with predictive spatial modeling. Tags remained active for an average of 1 month and 23 days, with a maximum duration of 93 days. During spring, individuals predominantly occupied shallow waters of the Alboran Sea, with some groups migrating to French waters by late spring, while others remained in the Strait of Gibraltar. By late summer, all tagged individuals had moved to Portuguese waters. Predictive spatial models simulated potential distribution patterns based on behavioral traits and social structures, revealing a core aggregation of individuals in the Strait of Gibraltar from April to late June. The dispersion phase aligned with three distinct social groups: one migrating towards French waters, another towards Portuguese waters, and a third possibly shifting towards Moroccan waters. Additionally, winter tracking of two individuals indicated that resident groups remained in deeper waters within or near the Strait of Gibraltar. These findings underscore the critical role of social structure in shaping seasonal movements and highlight the value of spatial modeling as a tool for understanding and conserving this endangered population.

AD-05. Critical habitat delineation for the of bottlenose dolphins (*Tursiops truncatus*) in Montenegro

Garez, Ema ¹; Akkaya, Aylin ²; Özdemir, Ceyda ²

1. University Claude Bernard, Lyon 1, France

2. DMAD, Marine Mammals Research Association, İstanbul, Türkiye

The Mediterranean subpopulation of bottlenose dolphins was recently upgraded as “Least Concerned” by the IUCN Red List but showed a decline in Montenegrin waters. Indeed, they are exposed to many threats such as marine traffic, fisheries, tourism, pollution or climate change. Visual data on bottlenose dolphins were collected at sunrise and sunset through both land and boat surveys between September 2016 to March 2024 along the coast of Montenegro and in the semi enclosed bay of Kotor. Overall, 959 land surveys were conducted within Montenegro, of which bottlenose dolphins were sighted in 267 surveys. 156 of them were analyzed after cleaning the data. The collected data was mapped in QGIS 3.28.10. A Pearson’s Chi-squared test was conducted using R-Studio 4.2.2 and reveals a higher proportion of diving behavior in the middle of the country and a higher proportion of resting and surface-feeding behaviors in the south of Montenegro. Spatial mapping on bottlenose dolphin densities revealed a high encounter rate ($> 3,33$ per km^2) for travelling, diving and socializing in Herceg Novi, for travelling, diving and surface-feeding in Utheja, and for travelling, resting and surface-feeding in Ulcinj. That is in contrast to other stations that have medium ($> 2,22$ per km^2) or low ($> 1,11$ per km^2) encounter rate for the majority of the behavior. The aim of this study is to define critical habitat of this species linked to their behavior in a perspective of conservation. Thus, these results should be taken into consideration to recognise critical habitat for bottlenose dolphins in Herceg Novi, Utheja and Ulcinj. Indeed, in these places, there is a higher encounter rate for the majority of the behavior. Regulating anthropogenic activities in these areas could be important to mitigate anthropogenic impact.



AD-06. The use of drones as a new complementary tool for Sei whale identification. A preliminary study in Azorean waters

Zereba, Jasmine ¹; Tort, Beatriu ¹

1. Sea Colors Expeditions, Marina Ponta Delgada, Avenida Infante Dom Henrique Armazém nº 5, 9500-770 Ponta Delgada, Portugal

The use of Unmanned Aerial Vehicles (UAVs) in cetacean research has increased in recent years. UAVs have been used as a tool in several research fields, including the individual photo-identification in different cetacean species. It is particularly useful for identifying mysticetes, which often have very similar dorsal fins and behavioral patterns that make it difficult to obtain good identification images from the research vessel. The study presented was carried out around the island of Sao Miguel, in the Azores archipelago, from July to September 2023 and 2024. One of the objectives of the study was to determine the possibility of identifying Sei whales (*Balaenoptera borealis*) using zenithal images of their chevrons, as has been done for other Balaenopteridae species such as fin whales. Drone flights were conducted when conditions allowed; Beaufort < 4 and no whale watching vessels in the area. Surveys were conducted under lookout guidance, with a total of 28 Sei whale sightings in 2023 and 5 in 2024. Seven of these sightings involved drone flights, 6 in 2023 and 1 in 2024. A total of 14 Sei whales were identified by the drone using zenithal images of the chevrons. The identification rate was 93.75%, compared to 70% using conventional photo-identification methods. The UAV was also able to help guide the boat while flying. This increased the chances of a successful photo-identification from the boat. Although it is a preliminary study, the results obtained so far show the potential of this new photo-identification technique for Sei whale identification. However, the study will continue this 2025 with the goal of increasing the number of flights over Sei whales and Bryde's whales, which may also be identified through this technic. We hope to increase the number of animals identified and confirm the feasibility of this new technique on these species.



AD-07. Distribution, abundance, diet, length and condition of bottlenose dolphins in Galicia: patterns, trends and relationships with environmental variation

Roldán, Irene ¹; Hernández, Alberto ²; Gutiérrez, Paula ³; Saavedra, Camilo ³; López, Alfredo ⁴; Covelo, Pablo ⁵; Pin, Xabier ⁵; Fariñas, Andrea ²; Fernández, Diego ⁶; Pierce, Graham Jhon ²

1. University of Vigo IIM CSIC
2. IIM CSIC
3. COV IEO CSIC
4. University of Aveiro/CESAM CEMMA
5. CEMMA
6. COV IEO CSIC University of Valencia

In Galicia, NW Spain, strandings monitoring and sighting surveys have provided a variety of information about bottlenose dolphins (*Tursiops truncatus*) over the last 35 years, where there is a coastal population (resident in the Rías) and also individuals from an oceanic population. The relationships between aspects of bottlenose dolphin population status and ecology (spatial, seasonal, and year-to-year variation in occurrence and local abundance of live and dead individuals) and environmental variables (chlorophyll-a concentration and sea surface temperature) were analysed. We also examined the relationships between bottlenose dolphin size (body length), body condition (blubber thickness) and diet (numbers of European hake and blue whiting eaten). Statistical analysis was based on generalised additive models (GAMs). Only stranding-based data on bottlenose dolphins occurrence, size, body condition and diet spanned the entire study period, but no clear long-term trends were identified. Results from stranding data showed that the average body length of bottlenose dolphins varied seasonally, with smaller individuals appearing between June and August (presumably reflecting the calving season), and geographically, with larger individuals being found in southern latitudes. A higher amount of blue whiting and European hake was found in the diet of larger bottlenose dolphin individuals. Local abundance of bottlenose dolphins was higher in winter, but also in the warmest areas. This study illustrates the value of long-term monitoring to provide insights into population status and ecology which can inform conservation management.



AD-08. Evaluating and analysing citizen science data for harbour porpoise monitoring in the German Baltic Sea

Bär, Tom ¹; Taugnitz, Tim ¹; Steinbach, Emma ²; Dähne, Michael ³; Gallus, Anja ¹; Denkinger, Judith ¹

1. *Ocean Museum Germany*
2. *University Dresden*
3. *German Federal Agency for Nature Conservation*

One of the first large scale efforts to collect citizen science data of cetaceans was established in 2002 when activists in Germany contacted sailors to collect porpoise sightings. The data format and collection method has changed over time until in 2011 the Ocean Museum Germany took over the sightings database and established new web forms (2012) and a sightings app (2014). The museum has also established a stranding network in 1960 for collection purposes resulting in nearly 1300 harbour porpoises recorded until today. In this study we evaluate sightings data from 2015-2020, after the implementation of the smartphone app “Ostseetiere”, to compare them with the long-term stranding efforts and test a new method to analyse the data in an unbiased fashion. Filtering all strandings and sightings over this time period resulted in >8000 sightings and >400 strandings for further analysis and therefore presents one of the largest datasets for one species worldwide. To avoid known biases of citizen science efforts (e.g. double submissions, false positives, no effort correction) an approach was designed to quality check the data and develop occupancy maps. Data was therefore analysed in a grid with a cell of 5x5 km with a temporal resolution of one month. Each raster cell represents the binary information about whether there was a sighting in the grid cell ¹ or not (0). The grids produced for the years 2015 to 2020 were aggregated monthly to result in 12 maps representing seasonal and cross-year changes in porpoise occurrence. This approach proved to be very robust and gave valid information about the presence or absence of harbour porpoises in the German Baltic Sea. Like effort based approaches (acoustic monitoring, aerial surveys) the maps show higher occupancy in westerly regions and increasing occupancy in the summer months.

AD-09. Passive acoustic monitoring on Faroese survey vessel during North Atlantic Sightings Surveys (NASS)

Keith, Simon; Mikkelsen, Bjarn¹

1. Department of Marine Mammals, Faroe Marine Research Institute, Tórshavn, Faroe Islands

The North Atlantic Sightings Surveys (NASS) were conducted in July 2024 with the primary objective of obtaining quantitative data on the distribution and abundance of cetacean species across the north Atlantic. The dedicated survey portion by Faroe Islands was conducted on 19 days aboard the vessel *Ran* in two survey strata which extend 1200 km south of Iceland. Sightings and acoustic data were collected simultaneously during independent observer line transects, in passing mode. A 3 element hydrophone array (2kHz to 200kHz) was towed 165m behind the vessel at a depth of 7.3 m. A limited amount of real-time monitoring was conducted to ensure system function and sound recordings were made at 500kHz 16 bit and 192kHz 24 bit. A total of 414.5 hours of recordings (5,676 km) included 193.6 hours (3,714 km) simultaneous with on effort line transect visual survey at 8-12 knots, 88.3 hours (1,485 km) in transit at >5 knots, and 132.3 hours (477 km) on standby at night or in bad weather at speeds <5 knots (mean 1.96 knots). Background noise and hydrophone depth varied considerably depending on sea conditions and vessel speed. Acoustic click train and whistle events, and distances to these detections were determined using the PAMGuard click detector time-bearing-ICI display, whistle and moan detector and target motion analysis modules. Events were annotated manually and further analysed by species classifiers. The sperm whale (*Physeter macrocephalus*) was the most frequently detected species, heard along with Delphinids including long-finned pilot whale (*Globicephala melas*), and beaked whales including Sowerby's beaked whale (*Mesoplodon bidens*). The passive acoustic monitoring component of the NASS 2024 survey provided valuable additional information for a summer density estimate for sperm whales in this part of the northeast Atlantic; and it complements previous data on the distribution of other deep diving species in the region.



AD-10. Killer whale distribution in Iceland in relation to environmental variables and prey availability

Eleman, Ayça ¹; Samarra, Filipa ²; Óskarsson, Guðmundur J. ³; Pálsson, Snæbjörn ¹; Ólafsdóttir, Anna Heiða ³; Sigurðsson, Guðjón Már ³; Bertulli, Chiara Giulia ⁴; Martínez Catalan, Rodrigo A. ⁵; Rasmussen, Marianne H. ⁶; Hyman, Rob ⁷; Burgos, Julian M. ³

1. *Faculty of Life and Environmental Sciences, University of Iceland, Reykjavík, Iceland*
2. *Westman Islands Research Centre, University of Iceland, Vestmannaeyjar, Iceland*
3. *Marine and Freshwater Research Institute, Hafnarfjörður, Iceland*
4. *HX Hurtigruten Expeditions, London, United Kingdom*
5. *Bioconsult SH, Husum, Germany*
6. *The University of Iceland's Research Centre in Húsavík, Húsavík, Iceland*
7. *Elding Whale Watching, Egisgarður 5C, 101, Reykjavík, Iceland*

Understanding the habitat preferences of apex predators is essential for effective conservation management. Killer whales (*Orcinus orca*), although often considered dietary generalists, exhibit considerable variation in prey specialization among populations, resulting in differing prey dependencies. In Icelandic waters, killer whales predominantly prey on herring (*Clupea harengus*), with some individuals also targeting seals. However, their reliance on herring and their dietary flexibility in response to environmental changes remain poorly understood. This study investigates the distribution and habitat use of killer whales in Icelandic waters to predict areas of high suitability based on environmental variables and prey availability. Habitat suitability models, including Random Forest (RF), Generalised Additive Modelling (GAM), and MaxEnt, were developed using 317 systematically and opportunistically recorded sightings between 1993 and 2024. Seven environmental variables were analyzed: depth, distance to shore, chlorophyll-a concentration, sea surface temperature (SST), standard deviation of SST, salinity and mixed layer depth. Preliminary RF results indicate strong model performance, with an error rate of 11.36%. Depth, distance to shore, and mixed layer depth were identified as the most influential predictors of habitat suitability. Predicted suitable habitats align closely with the seasonal migrations of key prey species, including herring and mackerel (*Scomber scombrus*). Ongoing work focuses on building GAM and MaxEnt models while integrating prey abundance and distribution data to enhance predictions. These findings provide critical insights into the environmental and prey-related factors influencing killer whale distribution and feeding ecology in Icelandic waters. By improving our understanding of their habitat preferences, this research contributes to the development of targeted conservation strategies to protect this apex predator in the face of environmental changes.



AD-11. Photo-identification of bottlenose dolphin in Asinara National Park (Italy)

Sanna, Valeria ¹; Gazale, Vittorio ²; Pireddu, Laura ¹; Zanello, Aldo ²; Zappata, Michela ¹

1. *Associazione CRAMA*
2. *Parco Nazionale "Isola dell'Asinara"*

Photo-identification is one of the techniques employed by CRAMA Association to study the bottlenose dolphin population in Asinara National Park, conducted on behalf of the Institution. This non-invasive method, based on the analysis of individual characteristics, specifically dorsal fin markers and shapes, has allowed a significant amount of data to be collected over the years. The present study provides an overview of the results obtained through the photo-identification technique, focusing on site fidelity and habitat use by individuals. The study area is the Marine Protected Area “Asinara Island” (northwest Sardinia, Italy) and its surrounding waters. The MPA features a diverse marine environment, with significant differences between its western and eastern sides. The western side is characterized by steep rocky shores, significant bathymetric variation, and key biocenoses such as coralligenous assemblages, while the eastern side is defined by low shorelines and extensive *Posidonia oceanica* meadows. Data collection period spanned from 2010 to 2024, resulting in the identification of 64 individuals through photo-identification. These results were compared also with data collected during a study conducted in 2002 in the National Park, the comparison resulted in the identification of 2 recaptured individuals of the total 16 identified through photo-identification. Field photographic data were then analysed with the support of “DARWIN” software and subsequently uploaded into a dedicated database. Additionally, the sighting points were georeferenced on Google Earth. The results show that approximately 50% of the photo-identified individuals were not recaptured, while the remaining individuals were observed varying numbers of times. Additionally, the data suggest possible differences in habitat use patterns among individuals within the study area. This work has allowed the monitoring of site fidelity over the years and documented an increase in newly photo-identified individuals, contributing to the assessment of the population status in Asinara National Park.

AD-12. Unveiling marine mammal diversity in Anjouan's coastal waters: insights from an acoustic recorder in the Comoros Archipelago

Ferri, Sara ^{1,2}; Olivieri, Guido ³; Evrard, Anaëlle ²; Ali Ahmed, Rihana ¹; Zanolli, Anna ¹; Capasso, Giulian ^{2,4}; Abdou Rabi, Fouad ⁵; Ali Abdallah, Youssouf Ben ⁶; Giacomina, Cristina ¹; Favaro, Livio ¹; Caruso, Francesco ²

1. *University of Turin, Turin, Italy*
2. *Stazione Zoologica Anton Dohrn, Naples, Italy*
3. *University of Naples Federico II, Naples, Italy*
4. *University of Pisa, Pisa, Italy*
5. *Agence des Aires Protégées des Comores, Moroni, Union of the Comoros*
6. *Centre National de Contrôle et de Surveillance des Pêches, Inros Lackner SE, Parc National Shisiwani, USTHB*

The Comoros Archipelago, located in the northern Mozambique Channel, is characterised by volcanic islands and deep coastal waters, offering an ideal habitat for a wide range of marine mammals. However, despite being a known hotspot for cetacean biodiversity, their distribution and vocal behaviour remain largely unknown. Here, we present the results of the first passive acoustic monitoring exploring cetaceans' diversity in Shisiwani National Park (Anjouan, Comoros). An autonomous recorder was deployed in coastal waters (approximately 20m depth) and acquired data from April to September 2024. 7,532 recordings (~ 540 GB) were acquired at a 128 kHz sampling rate and with 16% of duty cycle (5 min every 30 min). Spectrogram visualisation and audio listening were carried out on a subsample of the dataset (5 min every hour, 3,766 files) to detect and classify marine mammal sounds. Our results reveal the presence of different cetaceans, including coastal and oceanic delphinids, and large mysticetes such as humpback whales (*Megaptera novaeangliae*). The deployed sensor also recorded evidence of human activity, suggesting the presence of anthropogenic pressures, even in this remote area. Our study represents a preliminary description of the soundscape of the area and an important step towards a better understanding of marine mammals' distribution in a potential hotspot and key region within the Indian Ocean Sanctuary. Overall, we also provided further evidence that passive acoustics is a powerful tool to investigate species diversity in a remote and unexplored area, paving the way for research and conservation actions.



AD-13. The value of perseverance: 45-year stranding network data indicates potential effects of dolphin morbillivirus outbreaks on striped dolphin population dynamics

Gozalbes, Patricia ¹; Aznar Avendaño, Francisco Javier ¹; Sofía, Ten ¹; Alonso Peralo, Isabel ¹; Alicia, García Gallego ¹; Fernandez, Chloé ¹; Fraija-Fernández, Natalia ¹; Izquierdo Serrano, Mar ¹; Jankauskaite, Greta ¹; Montero, Francisco ¹; Miguez, Raúl ¹; Pérez del Olmo, Ana ¹; Pool, Rachel ¹; Pons Bordas, Claudia ¹; Repullés Albelda, Aigües ¹; Ruiz García, David ¹; Tomás, Jesús ¹; Valmaseda Angulo, Marta ¹; Villar Torres, Mar ¹; Villora Montero, María ¹; Raga, Juan Antonio ¹

1. *Universitat de València*

Stranding networks represent an invaluable tool to obtain biological data on cetaceans. However, their long-term maintenance requires an arduous effort to achieve political agreement, funding, and temporal stability of workforce teams. Here, we show how basic data on stranded cetaceans can shed light on poorly known aspects of population dynamics. In the western Mediterranean, the striped dolphin population suffered two epidemics caused by the dolphin morbillivirus (DMV) in 1990 and 2007. The death toll could not be ascertained in any of these events but in 1990, the number of stranded animals almost doubled that in 2007, and their mean body length was also significantly higher. We used Generalized Additive Models (GAMs) to investigate temporal trends in striped dolphin body length in the period 1977-2024 (N= 434 individuals). On the one hand, the number of stranded dolphins detected was small after the 1990 epidemic (6-13 individuals/year) and rose weakly until 2000, when the increase was more marked. In 2015, numbers stabilized at ca. 25 ind./yr on average. On the other hand, both sexes showed a significant drop in body length of ca. 20-30 cm in the mid-1990's, with a steady increase from 2005 to early 2020's, when pre-1990 values were reached. In fact, strandings in 1996-2015 were enriched with calves and juvenile individuals. No clear impact of the 2007 mortality was detected. The effect of many other contributing factors notwithstanding (e.g., an increased efficiency of the stranding network to detect stranded animals over the years), these trends are compatible with a significant impact of the 1990 mortality on the striped dolphin population, reflecting shifts in abundance and age structure.

Acknowledgments: We are thankful to the project VARACOMVAL of the Biodiversity Foundation of the Spanish Ministry for the Ecological Transition and the Demographic Challenge (MITECO) under the NextGeneration EU Recovery, Transformation, and Resilience Plan (PRTR) for financial support to the Valencian Stranding Network. We also thank the Wildlife Service and the Conselleria de Medi Ambient, Aigua, Infraestructures i Territori of the Generalitat Valenciana for the logistic support. Lastly, immense gratitude goes to all participants of the Valencian Stranding Network.



AD-14. Stabilisation of reproductive timing in harbour seals (*Phoca vitulina*) population in the Dutch Wadden Sea: insights from long-term monitoring

Schop, Jessica ¹; Aarts, Geert ¹; Brasseur, Sophie ¹

1. Wageningen Marine Research

Synchronised life events are common in wildlife populations and offer evolutionary and ecological benefits. These synchronised behaviours often occur within a narrow timeframe, providing predictable opportunities for monitoring wildlife populations. Accurately forecasting these events is crucial for the effective planning and design of surveys. Previous research identified a forward shift in timing of harbour seal births in the Dutch Wadden Sea, with the peak in pup numbers advancing by an average of 0.71 days per year between 1974 and 2010 (Reijnders et al., 2010). The current study aims to investigate if the timing of peak in pup numbers in this area has continued or changed since 2010. A Generalised Additive Model (GAM) was used to analyse how timing of pupping changed in recent years. Preliminary results reveal that the forward shift in peak pup numbers has stabilised over recent years. This stagnation aligns with changes in population trends: the population trend has changed from exponential growth, until 2012, to a recent downward trend. Further analysis is required to confirm this pattern and explore their underlying causes, including the link with changes in population size, and demographic structure. These findings underscore the complexity of harbour seal population dynamics. Understanding how environmental factors, such as climate change and habitat quality, interact with population stability is critical to assessing shifts in reproductive timing. Such shifts may act as indicators of broader ecological changes. Such insight will aid in the development of effective conservation and management strategies for harbour seals in the Dutch Wadden Sea and beyond.



AD-15. Assessing potential climate-driven fluctuations in fin whale (*Balaenoptera physalus*) occurrence off São Miguel Island (Azores)

Tolosa, Marc ¹; Ruiz-Sagalés, Marc ²

1. Picos de Aventura - Animação e Lazer, Marina Pêro De Teive Avenida João Bosco Mota Amaral, 9500-771 Ponta Delgada, Açores
2. Department of Evolutionary Biology, Ecology and Environmental Sciences, and IRBio, Faculty of Biology, University of Barcelona, 08028 Barcelona, Spain

In some areas of the North Atlantic, fin whale (*Balaenoptera physalus*) distribution is more unpredictable than that of other Balaenopterids, as the species can flexibly adjust its range in response to climate fluctuations. In the Azores, despite traditionally being a regular visitor around the annual Spring Bloom, the occurrence of fin whales has notably declined in recent years. In this context, we assess temporal fluctuations in fin whale presence and explore temperature-related drivers by analysing 16 years (2009-2024) of whale-watching data collected off São Miguel Island. We fitted Generalized Linear Mixed Models and Generalized Additive Models to daily presence ratios (DPRs) of fin whales by month. Results showed higher fin whale presence between 2015 and 2018, followed by a marked decline after 2019, reaching the lowest annual DPRs during the last four years. Analyses of seasonality revealed no advancing trends but indicated less compact seasonal occurrence over the years. To investigate potential temperature drivers in these fluctuations, we modeled monthly DPRs in relation to sea surface temperature anomalies (SSTA) at local and large-scale levels and the differential SSTA (SSTA-diff, local minus large-scale anomalies). The accumulated SSTA-diff over the previous 18 months emerged as the strongest predictor, with higher fin whale presence linked to lower SSTA-diff. Annual models also confirmed that periods with lower SSTA-diff correlated with increased DPR, while indicating more compact seasonal patterns under higher SSTAs. Our results indicate significant interannual variability in fin whale presence, suggesting higher occurrence following locally cooler periods relative to large-scale anomalies, potentially due to prey availability. While temperature anomalies seem to influence fin whale distribution, further research on productivity-related variables and interspecific competition is needed to better understand these trends and anticipate future distribution shifts in the context of global ocean warming.



AD-16. Navigating the Tyrrhenian Sea: preliminary analysis of cetacean distribution within the LIFE Conceptu Maris Project

Farina, Marianna ¹; Maffucci, Fulvio ¹; Hochscheid, Sandra ¹; Teti, Roberta ¹; Moura, Érica ¹; Santini, Elena ²; Pasanisi, Eugenia ²; Arcangeli, Antonella ²

1. Stazione Zoologica Anton Dohrn - Italian National Institute for Marine Biology, Ecology and Biotechnology, Naples, Italy
2. ISPRA, Italian National Institute for Environmental Protection and Research, Rome, Italy

The Mediterranean Sea faces increasing anthropogenic pressures. Understanding cetacean distribution is crucial for effective conservation strategies. This study presents a preliminary analysis of cetacean presence in the offshore areas of the Tyrrhenian Sea, based on visual monitoring within the LIFE Conceptu Maris project. Between 2022 and 2024, 71 surveys were conducted along four ferry routes (Napoli-Palermo, Salerno-Palermo, Salerno-Tunis and Tunis-Civitavecchia), covering 14,167 km and documenting 168 sightings of nine species. *Stenella coeruleoalba* was the most frequently observed (N=102), followed by *Tursiops truncatus* (N=14) and *Delphinus delphis* (N=7). Occasional species included *Grampus griseus*, *Physeter macrocephalus* and *Ziphius cavirostris* (N=3 each), *Balaenoptera physalus* (N=2), and single sightings of *Balaenoptera acutorostrata* and *Globicephala melas*. 32 sightings remained unidentified. The cetaceans Sightings Per Unit Effort (SPUE) index showed seasonal and spatial variability, recording the highest value in winter (0.014), the lowest in autumn (0.009). Among the routes, Tunis-Salerno exhibited the highest SPUE value, while the Tunis-Civitavecchia, spanning the Tyrrhenian Sea from north to south, displayed the greatest species variability, particularly for occasional species and highlighting its potential as an indicator of the Tyrrhenian cetacean diversity. Bathymetric data from EMODnet database were analyzed at sighting locations and revealed significant differences in depth preferences (Kruskal-Wallis test, $p < 0.001$). Dunn's test revealed no significant variation in depth use for *S.coeruleoalba*, while *T.truncatus* favored bathymetries of 200-250 metres. This study contributes to filling a knowledge gap in the less-studied offshore areas of the Tyrrhenian Sea by exploring species occurrence and niche partitioning across seasons. Through its long-term program, it provides a crucial baseline for effective conservation strategies in this ecologically significant and underexplored region. Continued monitoring in these regions is essential to track changes in cetacean distribution, habitat use and anthropogenic impacts over time.



AD-17. First sightings of pygmy killer whale (*Feresa attenuata*) in the Azores Islands

Pérez-Neira, Fatima ^{1,2}; Tolosa, Marc ¹; Perez-Peña, Natalia ¹; Kulike, Lynn ³; Medeiros, César ³; González-García, Laura ^{3,4}

1. Picos de Aventura, Marina Pêro de Teive, Avenida João Bosco Mota Amaral 9500-771, São Miguel, Azores, Portugal
2. Atlantic Technological University, Galway, Ireland
3. Futurismo Azores Adventures, Ponta Delgada, São Miguel, Azores, Portugal
4. Institute of Marine Sciences - Okeanos, University of the Azores, Horta, Azores, Portugal

The pygmy killer whale (*Feresa attenuata* Gray, 1874) is a poorly known delphinid species typically found in offshore tropical and subtropical waters worldwide, with inshore sightings reported primarily near oceanic islands. Its distribution in the North Atlantic remains largely unknown, based on limited information from isolated sightings and stranding events. In 2023, the species' conservation status in Europe was classified as "Not Applicable" by Gauffier et al. under the regional assessments for the IUCN Red List of Endangered Species. In Macaronesia, the pygmy killer whale has been sporadically sighted over recent decades in Madeira and the Canary Islands. Here, we report the first three records of the species in the Azores, all occurring in early summer 2024 during whale-watching trips across different areas of the archipelago. The first sighting took place on June 20th off the northern coast of São Miguel island, and consisted of a pod of approximately 30 individuals, including juveniles and calves. Five days later, a pod of similar group size was sighted south of Pico island, and on July 2nd, a smaller pod was encountered off the southern coast of São Miguel. During all three sightings, individuals exhibited a characteristically erratic and boat-elusive behavior, limiting group structure assessments and photo identification efforts. These new reports provide novel insights into the distribution patterns of the species in the North Atlantic. Notably, the sightings coincided with record-high temperature anomalies in the region, suggesting a possible temperature-driven northward range expansion of the species during this period. These findings highlight the value of whale-watching data in detecting rare events and monitoring large-scale cetacean distribution shifts.



AD-18. Baseline abundance of bottlenose dolphins on the northeast coast of England in an area of population range expansion

Ellis, Grant ¹; Arso Civil, Mònica ²; Cheney, Barbara ³; Tapp, Sally ¹; Fernandez-Betelu, Oihane ⁴; Sinclair, Rona ⁵; Sparling, Carol ¹

1. Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, East Sands, St Andrews, KY16 8LB, UK
2. Marine Directorate, Scottish Government, 375 Victoria Road, Aberdeen, AB11 9DB, UK
3. University of Aberdeen, Institute of Biological and Environmental Science, Lighthouse Field Station, Cromarty, IV11 8YL, UK
4. Natural England, Lancaster House - Hampshire Court, Newcastle Upon Tyne, NE4 7HY, UK
5. NatureScot, Great Glen House, Leachkin Road, Inverness, IV3 8NW, UK

Increased reports of bottlenose dolphin (*Tursiops truncatus*) sightings south of the Scottish border over the last decade indicate a further southern range expansion of the protected East Coast of Scotland population. However, limited information from across the northeast coast of England makes assessing population trends or informing Environmental Impact Assessments and Habitats Regulations Appraisals challenging. Here we present findings from dedicated boat-based photo-ID surveys (n=15) conducted in the coastal waters of northeast England, between Tynemouth and Bridlington Bay, from July to September 2024. Dorsal fin images (~13,000) from 22 encounters were graded for quality and matched to the East Coast of Scotland ID Catalogue of known individuals. Closed mark-recapture models were fitted, using MARK and CAPTURE, to sighting histories of well-marked (nicked) animals. Corrected by a provisional mark rate, total abundance was estimated at 106 (95% CI 94-120) and 115 (95% CI 98-133) individuals, respectively. Of 50 well-marked animals identified, 80% (n = 40) were matched to the East Coast of Scotland population including two reproductive females associated with new calves. Confirmed sightings of known individuals as far south as Flamborough Head indicate that the distributional range of the East Coast of Scotland population now extends from the Moray Firth to East Yorkshire. The estimated abundance of animals in northeast England in summer 2024 represents ~ 47% of the most recent estimate for the East Coast of Scotland population (based on data from Scotland only). Together, these results provide further evidence that continued research in northeast England is important for ensuring future conservation and management of the entire East Coast population, and for appraising the effectiveness of conservation measures currently afforded by the Moray Firth Special Area of Conservation, which was designated for this population's protection.



AD-19. Assessing a bottlenose dolphin population using photo-ID around Mallorca, Balearic Islands, Spain

Vitoria, Yaiza ¹; Pelletingeas, Guillaume ¹; Noreña, Daniel ¹; Cerdà, Margalida ¹; Brotons, J M ¹

1. *Asociación Tursiops, Marratxí, Balearic Islands, Spain*

The bottlenose dolphin Mediterranean subpopulation (*Tursiops truncatus*) is classified as "vulnerable" in the IUCN Red List of Threatened Species. In Spain, the population inhabiting the waters around the Balearic Islands has been designated as a Management Unit under Descriptor 1 (Marine Biodiversity) of the European Marine Strategy Framework Directive (MSFD). Within the MSFD, a long-term monitoring programme has been established to assess Good Environmental Status (GES). Here, we present the results of the first two years of fieldwork carried out as part of this initiative. Between November 2022 and December 2024, surveys were conducted around Mallorca using photo-identification methods. During this period, over 6500 nautical miles were covered on 124 sampling days, resulting in 157 sightings and the identification of 426 individuals. Of these, 52.11% were recaptured between 1 and 14 times. Using a robust design approach, population estimates were calculated at 498 individuals (95% CI = 428 - 596) for 2023 and 506 individuals (95% CI = 428 - 631) for 2024. These values are significantly higher than previous estimates for the area, probably due to increased sampling effort. The results reveal that individuals exhibit seasonal distribution patterns, with greater distances from the coast recorded during periods of high shipping activity and anthropogenic pressure. Site fidelity was also observed, with 20% of the identified individuals classified as residents and 30% as regular visitors. Furthermore, 89% of recaptured individuals were recorded within 50 km between the most distant sightings, and 60% within 30 km, suggesting limited movement ranges. This study highlights the importance of long-term monitoring programmes to accurately assess demographic parameters and inform evidence-based conservation strategies for the effective management and preservation of the bottlenose dolphin population in the Balearic Islands.



AD-20. Comparing survey methodologies for long-term monitoring of bottlenose dolphin abundance in the Shannon Estuary, Ireland

Berrow, Simon ¹; Daly, Mags ¹; Dudley, Rebecca ¹; Levesque, Stephanie ¹; Regan, Sibeál ¹; Blázquez, Miguel ¹

1. Irish Whale and Dolphin Group

Long-term monitoring of a small population of bottlenose dolphins requires data on their distribution and abundance as well as important life-history parameters, which may explain any recorded changes. The current NPWS monitoring protocol designed to meet reporting obligations under the EU Habitats Directive involves 12 transects carried out between June and September in the outer Shannon Estuary, on a roughly 3-year interval. We compared this protocol collected in summer 2022 with a broader scale survey which involved one transect per month in both the inner and outer estuary over a 12-month period from January to December 2022 funded by the ESB, to explore any differences in abundance estimates. Mark-Recapture modelling of capture histories was used to estimate the abundance of marked individuals. During the NPWS survey a best estimate of 99-113 dolphins with a 95% CI of between 93 to 144 was recorded depending on the dataset used. Between January and December 2022 an abundance of 90 ± 5 (95% CI: 81 to 99) in the outer estuary and 58 ± 8 (95% CI: 45 to 76) in the inner estuary was estimated. For both surveys combined (24 surveys during a 12-month period) the abundance estimate was 149 ± 8 (95% CI: 134-166). The distribution of dolphins was similar from both monitoring protocols as dolphins occur consistently in known hotspots, but no dolphins were recorded in the upper inner estuary despite high survey effort. Abundance estimates were very similar in the outer estuary between the two survey types, but only half if only the inner estuary was surveyed. When both inner and outer estuary surveys were combined abundance was 28% higher during the extended survey. With increasing pressure on the Shannon Estuary, including offshore renewable hubs and a proposed LNG terminal it is important that long-term monitoring provides tight abundance estimates to inform environmental assessment.

AD-21. Estimating cetacean density and abundance in the Marmara Sea using passive acoustic monitoring

Özsandıkçı, Uğur ¹; Dede, Ayhan ²; Tonay, Arda Mehmet ³; Öztürk, Ayaka Amaha ³; Öztürk, Bayram ³; Akamatsu, Tomonari ⁴

1. Sinop University, Faculty of Fisheries/Turkish Marine Research Foundation (TUDAV)
2. Istanbul University, Faculty of Aquatic Sciences Turkish Marine Research Foundation (TUDAV)
3. Istanbul University, Faculty of Aquatic Sciences/Turkish Marine Research Foundation (TUDAV)
4. Waseda University, Research Organization for Nano & Life Innovation

Passive acoustic monitoring (PAM) is an effective technique for estimating the density and abundance of cetaceans. It enables researchers to observe these animals non-invasively, even in challenging conditions. In this study, we used PAM to estimate the population size of harbour porpoises (*Phocoena phocoena*) and delphinid species (including bottlenose and common dolphins) in the Marmara Sea. Two towed A-Tag (MLS200-AS2, Marine Micro Technology, Inc., Saitama, Japan) devices were used to detect the echolocation clicks of the cetaceans. Delphinids and porpoises were discriminated by comparison of the two band intensity ratios (70-130 kHz). A ship-based line transect survey was conducted from 9 to 12 September 2021, covering nine track lines (388.3 km in on-effort), with a total effort of 609.3 km. For harbour porpoises, 37 detections were recorded (30 on-effort, 7 off-effort), and the half-normal key function was selected as the best model (AIC = 464.407, Cramer-von Mises $p = 0.235$). The estimated harbour porpoise density was 0.07 individuals per square kilometre (SE = 0.022, CV = 0.299), corresponding to an abundance of 752 individuals (SE = 225, 95% CI = 409–1,385). For delphinids, 69 detections were recorded (44 on-effort, 25 off-effort). Due to the inability to differentiate between bottlenose and common dolphins acoustically, they were assessed collectively as delphinid species. The hazard-rate key function provided the best fit (AIC = 871.653, Cramer-von Mises $p = 0.104$), with an estimated delphinid density of 0.1104 individuals per square kilometre (SE = 0.0290, CV = 0.263) and an abundance of 1,150 individuals (SE = 302, 95% CI = 637–2,074). These results provide the first acoustic-based density and abundance estimates for cetaceans in the Marmara Sea, highlighting the effectiveness of PAM in regions with high anthropogenic activity and its potential for broader applications in cetacean conservation.

AD-22. Scanning ferry routes: preliminary results on eDNA traces of marine mammals and their preys in the Tyrrhenian Sea

Rota, Alessia ^{1,2,3}; Arcangeli, Antonella ⁴; Maffucci, Fulvio ⁵; Valsecchi, Elena ^{1,2}

1. *Department of Earth and Environmental Sciences, University of Milano-Bicocca, Milan, Italy*
2. *MaRHE Center, Magoodhoo Island, Faafu Atoll, Republic of Maldives*
3. *National Biodiversity Future Center, Piazza Marina, Palermo, Italy*
4. *ISPRA National Institution for environmental research and monitoring, Roma, Italy*
5. *Marine Turtle research group, Marine Animal Conservation and Public Engagement Department, Stazione Zoologica Anton Dohrn, Naples, Italy*

The conservation of cetaceans and their habitats in the Mediterranean Sea is inextricably linked to several threats, potentially generating ecological changes in biological communities. The study of cetacean abundance and distribution suffers constraints imposed by the inaccessibility of the habitat in which they live. This is true also for pelagic areas not particularly remote, such as the Tyrrhenian Sea which is surrounded by the Italian peninsula and its major islands. Presumably cetaceans' distribution is driven by their prey, whose composition and availability are often overlooked and underexplored. This is especially valid for offshore areas, where most marine mammals live, but data collection may be constrained. To address this challenge, we analysed environmental DNA (eDNA) to characterize the ecological community structure. As part of CONCEPTU-MARIS, a LIFE project (LIFE20 NAT/IT/001371) aiming at developing the first multidisciplinary protocol for long-term biomonitoring in open seas, we collected 63 eDNA samples in the Tyrrhenian Sea, using ferries as platform of opportunity. Seawater samples were collected during day and night-time along one route periodically for 2 years, covering all seasons. We used a metabarcoding approach, employing one broad-spectrum and two vertebrate-specific marker sets to explore the cetacean, fish and plankton communities of the region. We detected over 45 fish Families, over 100 invertebrates and several cetacean species. Occurrence, abundance and species richness data are compared among seasons and across space to identify relevant areas and temporal patterns for the cetacean abundance. The co-occurrence between cetaceans and their potential prey is used to reconstruct the local vertebrate community and infer possible interactions. Moreover, the analysis of samples collected at night-time allows to unveil the high species richness of the nocturnal communities. The information obtained will be pivotal in enhancing our understanding of the marine ecosystem dynamics, potentially supporting future conservation action planning for cetacean species.



AD-23. Risso's dolphin occurrence in the Northern area of the Pelagos Sanctuary

Pignata, Eleonora ¹; Calogero, Giulia ^{1,2}; Guidi, Carlo ¹; Biasissi, Elia ¹; Verga, Alessandro ³; Motta, Gabriella ⁴; Somà, Alessandra ⁴; Violi, Biagio ^{1,5}

1. *Menkab: il respiro del mare APS*
2. *Area Marina Protetta "Isola di Bergeggi"*
3. *Golfo Paradiso Whale Watching*
4. *Consorzio Liguria Via Mare Whale Watching*
5. *INFN, Istituto Nazionale di Fisica Nucleare, Sezione di Genova*

The International Union for Conservation of Nature has recently updated the Risso's dolphin Mediterranean population status from Data Deficient to Endangered. Within the Pelagos Sanctuary, over last few years, the sighting rate of this species has revealed an irregular trend compared with 2000-2010 interval. In this context it is crucial to develop an effective conservation plan and to increase knowledge on habitat use and seasonal migratory routes both on the Mediterranean and on local scale. Since 2018 to date, a photo-identification study on this species was carried out in the North of the Pelagos Sanctuary, between Genoa and Savona submarine canyons, a key marine mammals hotspot. Menkab association catalogue was compared with the data collected by two commercial whale watching companies: Golfo Paradiso and Consorzio Liguria Via Mare Whale Watching. Results revealed 96 different individuals with 4 of them yearly recaptured and with multiple recaptures in the last research season. Considering age classes, 46,9% of dolphins have been classified as adult, 29,2% as subadult and 23,9% as juvenile-calf. Newborns have been observed in 2020 and 2024. In the same years, unexpected multi species associations, such as Risso's with Striped dolphins and Common dolphins, have occurred. Results confirm continental slope and submarine canyon habitats preference. Furthermore it emerged that sightings have increased through the years, significantly during last one, leading to the assumption that the trend may continue. Some of these sightings have occurred nearby the Marine Protected Area of Bergeggi Island, underlining its precious role for cetacean species. To date it is necessary to implement the photo-ID catalogue and look for a better understanding of the presence and movements of Risso's dolphin within this study area, which is strongly characterized by human activities, in order to make conservation actions as effective as possible and to mitigate impacts.

AD-24. Fin whale song variability in the Northwestern Mediterranean waters

Feliu-Tena, Blanca ¹; Bou-Cabo, Manuel ²; Lara, Guillermo ²; Espinosa, Víctor ³; Pérez-Arjona, Isabel ³; Miralles, Ramón ⁴; Rodilla, Miguel ³; Degollada, Eduard ⁵; Tort, Beatriu ⁵; Belda, Eduardo J. ³

1. Instituto Español de Oceanografía (IEO-CSIC), C.O. Murcia, C/el Varadero 1, Lo Pagan, 30740 Murcia, Spain; Instituto de Inv. Para la Gestión Integrada de Zonas Costeras (IGIC), Universitat Politècnica de València (UPV), C/Paranimf 1, Grau de Gandía, 46730 Valencia, Spain; Unidad Mixta de Investigación IEO-UPV, Tinglados Muelle Frutero, Grau de Gandia, 46370 Valencia, Spain
2. Instituto Español de Oceanografía (IEO-CSIC), C.O. Murcia, C/el Varadero 1, Lo Pagan, 30740 Murcia, Spain; Unidad Mixta de Investigación IEO-UPV, Tinglados Muelle Frutero, Grau de Gandia, 46370 Valencia, Spain
3. Instituto de Inv. Para la Gestión Integrada de Zonas Costeras (IGIC), Universitat Politècnica de València (UPV), C/Paranimf 1, Grau de Gandía, 46730 Valencia, Spain; Unidad Mixta de Investigación IEO-UPV, Tinglados Muelle Frutero, Grau de Gandia, 46370 Valencia, Spain
4. Institute of Telecommunications and Multimedia Applications (iTEAM), Universitat Politècnica de València (UPV), Camino de Vera S/N, 46022 Valencia, Spain; Unidad Mixta de Investigación IEO-UPV, Tinglados Muelle Frutero, Grau de Gandia, 46370 Valencia, Spain
5. EDMAKTUB Association, Barcelona, Spain

The fin whale (*Balaenoptera physalus* (Linnaeus, 1758)) is the only baleen whale regularly present in the Mediterranean Sea annually. Passive acoustic monitoring (PAM) is a non-invasive technique and allows the assessment of the area's soundscape, identifying not only the vocalizations of these animals but also other natural and anthropogenic sources within the acoustic communication channel of this species. The recordings of two PAM stations have been analysed in the present work. An annual PAM station has been established over the last four years (2021–2024) in the western coast of the Ibiza Channel (Cape of San Antonio, Spain). The other one is located on the El Garraf coast (Barcelona, Spain), which is known as an important feeding ground for fin whales, during two spring periods in 2022 and 2023. The acoustic behaviour of the Mediterranean fin whales has been studied over the last two decades. Male fin whales perform patterned songs with regular Inter-Note-Intervals (INIs) between “20 Hz notes”, sometimes accompanied by “130 Hz notes”. The “20 Hz notes” can be of two types: Type A notes, “classic” 20 Hz pulses, and Type B notes, called “Backbeats.” According to the literature, these songs are related to breeding behaviour in foraging areas, and some authors have used INIs to differentiate between separated fin whale subpopulations. The present work shows the characteristics of the differentiated songs composed with 1818 “20 Hz notes” and 270 “130 Hz notes” detected in both locations over time. We measured INIs around 12–13 seconds and 15–16 seconds in both locations and at different times throughout the year, observing patterns between the different note types (A-B). These results shed light on the acoustic behaviour of fin whales in the western Mediterranean, providing valuable information to better understand behavioural and population aspects and to implement management strategies.



AD-25. Encounter rates, residency patterns and site fidelity of common bottlenose dolphin (*Tursiops truncatus*) and common dolphin (*Delphinus delphis*) in Thermaikos Gulf, Greece

Tomé Pérez, Andrea ¹; Giovos, Ioannis ¹; Gonzalvo, Joan ²

1. iSea, Environmental Organisation for the Preservation of the Aquatic Ecosystems, Thessaloniki, Greece
2. Tethys Research Institute, Milan, Italy

The Thermaikos Gulf is located in the North Aegean Sea. Thessaloniki, situated in its inner part, is Greece's second-largest city and has a port with heavy marine traffic. Previous literature on cetaceans in these waters is scarce. Between 2021 and 2024, we conducted the first systematic surveys dedicated to monitor local dolphin populations, covering a total of 2214 km in 47 daily surveys with survey effort. The two species studied were common bottlenose (*Tursiops truncatus*) and common dolphins (*Delphinus delphis*). Photo-identification effort, conducted whenever possible during 27 sightings of bottlenose and 8 of common dolphins, allowed us to create a catalogue totalling 84 bottlenose and 44 common dolphins. The encounter rate for bottlenose dolphins resulted in 0.003 ± 0.009 groups/km, with no significant differences between seasons (Kruskal-Wallis test, $P = 0.6543$). The monthly residency rates showed that, on average, each bottlenose dolphin was sighted in 0.13 ± 0.077 of surveyed months (19 months with survey effort). Common dolphins had a lower encounter rate, 0.002 ± 0.001 groups/km, with no winter encounters, and with a monthly residency rate of 0.066 ± 0.03 . Monthly and seasonal residency rates, and site fidelity rate were assessed in an agglomerative hierarchical cluster analysis. Our analysis resulted in three degrees of residency for bottlenose dolphins, namely transient, semi-resident and resident, with transient being the largest group, while only 5 individuals showed a strong residency. Common dolphins yielded only two groups (semi-resident and transient), showing low residency since the majority of individuals were transient ($n=36$). This work provides novel information on coastal dolphins inhabiting an area heavily influenced by anthropogenic activities. By continuing with monitoring efforts, we aim at identifying threats faced by cetaceans in the Thermaikos Gulf and contribute to the design of effective conservation measures.



AD-26. Passive acoustic monitoring of odontocetes on the South-West coast of mainland Portugal: one and a half years of data

Reis, Beatriz ¹; Neves, Francisco ¹; Silva, Teresa ¹; Cruz, Teresa ^{1,2}; Castro, João José ^{1,2}; Jacinto, David¹

1. MARE – Marine and Environmental Sciences Centre / ARNET – Aquatic Research Network, Laboratório de Ciências do Mar, Universidade de Évora, Sines, Portugal
2. Departamento de Biologia, Escola de Ciências e Tecnologia, Universidade de Évora, Portugal

Recent technological advancements have enabled the development of stand-alone devices for long-term monitoring of cetaceans providing high resolution data. Full waveform capture PODs (F-PODs) are passive acoustic sensors designed to detect echolocation clicks within a frequency range of 20 kHz to 160 kHz, at a range of approximately 1 km. These F-PODs have the capability to distinguish between narrow band high frequency echolocation clicks (which correspond to harbour porpoises in the study area) and other odontocetes echolocation clicks. In this work, four F-PODs were deployed between 18 and 25 metres of depth by scuba divers at four different locations along the south-west coast of mainland Portugal (Alentejo). One was deployed near an industrial and recreational port (Port of Sines) and the others were deployed in a marine park (Natural Park of “Sudoeste Alentejano” and “Costa Vicentina”). Between June 2023 and December 2024, the four sensors collected information on the frequency of odontocete presence. One site, located in the marine park, detected odontocetes on over 85% of the sampling period. The results suggest that, despite spatial and temporal variation, this region is important for the occurrence and conservation of these protected species. We will present and discuss our key findings from approximately one and a half years of implementing a passive acoustic monitoring network in the south-west coast of mainland Portugal, marking a pioneering effort in this ecologically and socially significant coastal area.

AD-27. Evaluating false negatives detection in dorsal fin catalogues using Happywhale's photo-identification algorithm

Alves, Raquel ¹; Alessandrini, Anita ¹; Weyn, Mieke ^{1,2}; Ferreira, Rita ^{1,3}; Fernandez, Marc ¹; Alves, Filipe ¹; Olio, Marilia ⁴; Cheeseman, Ted ⁵

1. MARE – Marine and Environmental Sciences Centre/ARNET – Aquatic Research Network, ARDITI, Madeira, Portugal; Faculty of Life Sciences, University of Madeira, Funchal, Madeira;
2. Department of Biology, University of Évora, Évora, Portugal;
3. Observatório Oceânico da Madeira, ARDITI, Madeira, Portugal;
4. Happywhale, Santa Cruz, CA, USA
5. Happywhale, Santa Cruz, CA, USA; Marine Ecology Research Centre, Southern Cross University, Lismore, NSW, 2480, Australia;

Photo-identification is a non-invasive and standard method in cetacean research, allowing individuals to be identified and tracked over time and across regions. Using natural markings of the animals, such as those on dorsal fins and/or tail flukes, this technique allows the development of long-term databases and provides valuable insights into population dynamics, movement patterns, or social structures. Happywhale is a digital platform for citizen science and research collaboration that combines an open-access image database with advanced machine learning capabilities. An automated image recognition algorithm enables the platform to rapidly compare new submissions against the database, which automates individual identification and provides a standardised and efficient method for managing and analysing photo-identification data. This study evaluates the ability of the algorithm to detect false negatives (when photographs of the same individual are misclassified as different individuals) in dorsal fin photo-identification catalogues. For this purpose, a catalogue of short-finned pilot whales (*Globicephala macrorhynchus*) from Madeira Island, comprising 1276 individuals and 1664 photos collected between 2004-2021 was uploaded to the Happywhale platform. Subsequently, the Happywhale identified a matrix of 741 potential false negatives with a similarity score ≥ 0.5 , of which 21 (1.6% of the catalogue) were confirmed by three researchers experienced in photo-identification. These results highlight the algorithm's ability to identify errors in large-scale photo-identification datasets, demonstrating the value of integrating machine-learning tools into catalogue management. Open-access platforms like Happywhale facilitate error detection and reduce workload, encourage collaboration, promote data sharing, and support future monitoring and conservation efforts.



AD-28. Modelling the habitat preferences of striped dolphins off São Miguel Island (Azores) using 12 years of whale watching data

Ramon-Martorell, Magí ¹; Miquel-Bosch, Judit ²; Tolosa, Marc ¹

1. Picos de Aventura, Marina Pêro de Teive, Avenida João Bosco Mota Amaral 9500-771, São Miguel, Azores, Portugal
2. Department of Animal Biology, Edaphology and Geology, University of La Laguna, Tenerife, Spain

The distribution and ecology of the striped dolphin (*Stenella coeruleoalba*) in the Mid-Atlantic waters of the Azores remain largely unknown, partly due to the overshadowing presence of more locally familiar species, such as the common dolphin (*Delphinus delphis*) and Atlantic spotted dolphin (*Stenella frontalis*). In this study, we investigate the habitat preferences and temporal distribution of striped dolphins by fitting Generalized Additive Models (GAMs) to 14 years (2009–2022) of whale-watching data collected under the MONICET platform. For this, we analyzed 8,498 sightings of small delphinid species (379 of which were striped dolphins) collected off São Miguel Island in relation to temporal and environmental parameters, including static and satellite-derived dynamic variables. The best-fitted habitat model, obtained by backward selection, identified depth and sea surface temperature (SST) as significant predictors of striped dolphin occurrence, revealing a strong preference for deep waters and SSTs between 19°C and 22°C. Modeling also indicated a clear preference of the species for offshore waters; however, due to high autocorrelation between distance to shore and depth (the stronger predictor), the former was excluded from the final model. Temporal models highlighted significant interannual fluctuations in occurrence as well as a mild preference for the central months of the year (May to August). Compared to previous studies on common and spotted dolphins in the region, our results suggest that the thermal suitability range of striped dolphins overlaps with those of the two species, while showing more pronounced offshore habits. These differences may reflect interspecific competition, but further research on their foraging habits is needed to better understand the factors shaping the habitat selection of striped dolphins in the dynamic Azorean marine environment.



AD-29. Spatio-temporal distribution and habitat use of harbour porpoise (*Phocoena phocoena*) in the Inner Danish Waters

Schubert, Alexander ¹; Ham, Gin Swen ¹; Diederichs, Ansgar ¹

1. BioConsult SH GmbH & Co. KG, Schobueller Str. 36, D-25813 Husum, Germany

As part of an environmental baseline surveys for offshore wind, we conducted passive acoustic monitoring (PAM) of harbour porpoises (*Phocoena phocoena*) in the Kattegat and Kriegers Flak areas (Baltic Sea). Data from 30 CPOD stations deployed in 2023 and 12 digital aerial surveys across approximately 7,900 km² confirm that harbour porpoises occur regularly in moderate to high numbers in this area. While harbour porpoise abundance is lower in the Kriegers Flak area, a pronounced phenology was observed, with peaks in spring/early summer and autumn. In contrast, the Kattegat area exhibits a higher abundance in summer and shows a more consistent phenology throughout the year with a high variability between monitoring stations, with spring and autumn peaks observed partly in some sub-areas only. Additionally, harbour porpoise activity is higher at night in Kriegers Flak, while daytime activity predominates in the Kattegat area. These differences in phenology and diel activity suggest that the two areas are utilised differently by harbour porpoises. Given their continuous feeding requirements, it can be inferred that the Kattegat area offers a more consistent food supply, whereas the availability of prey in Kriegers Flak appears more seasonal, potentially influencing porpoise distribution. The observed distribution, phenology, and activity patterns are of particular interest in the light of recent reports from SCANS and miniSCANS, which indicated a decline in harbour porpoise sightings in the Western Baltic Sea (including Kattegat and Kriegers Flak). Our results may help to identify reasons for the negative trend and to understand the response to specific environmental conditions.

AD-30. Brown fur seal under pressure: a historical perspective on extractions in Southern Africa

Carvalho, André ¹; Roque, Ana Cristina ²; Falcato, Diogo ¹

1. CHAM - Centre for the Humanities, NOVA FCSH

2. Centre for History of the University of Lisbon

This presentation explores the methodological challenges of reconstructing the history of Brown Fur Seal exploitation in southern Africa, seeking to identify distribution areas and main colonies, estimate the number of animals affected and assess the impact of human pressure in recent centuries. It employs a two-pronged approach to understand their historical dynamics in the region: an exhaustive literature review and targeted analyses of historical records and material evidence. It emphasizes interdisciplinary collaboration between natural and human sciences, calling for a unified methodological framework to address discipline-specific questions while accommodating the complexities of a holistic analysis. Historical documentation provides a reliable basis for mapping the distribution areas and colonies of these marine mammals, ranging from southern Namibia to Mossel Bay. This includes identifying potential breeding and winter gathering colonies. A comparison with current data shows that, despite some changes, the species continues to inhabit the same regions, including the main breeding colonies. However, historical hunting had a strong impact on Brown Fur Seal populations. The focus on the devastating effect of colonial extractions, since the time of the first colonial Dutch administrator in the 17th century to the contemporary British occupation of the Cape, allow us to assess population numbers and changing patterns according to economic interests. Our findings on the impact of human pressure on these animals over the past centuries challenge the notion of long-term extinction and interspecies relationships. On the one hand, the population is currently increasing in the region; on the other hand, recent reports from Namibia highlight the current government's decision to cull 30,000 seals in response to the severe drought and famine affecting the country. This study suggests the resilience of the brown seal population despite centuries of exploitation, while also revealing the complexities of reconciling conservation efforts with modern socioeconomic and environmental pressures.



AD-31. Fin whale *Balaenoptera physalus* occurrence revealed by photo-identification in the southwest iberian peninsula with insights into their long distance movements

Ferreira, Inês ¹; Millecamps, Luana ¹; Marrero-Pérez, Jacobo ²; Whooley, Pádraig ³; Magalhães, Sara ¹

3. *Mar Ilimitado, Science & Tourism, Porto da Baleeira, 8650-368 Sagres, Portugal*
4. *Tonina Association. Research and Outreach of the Marine Natural Environment. Calle Doctor Antonio González, 5, 4th Floor, San Cristóbal de La Laguna, Santa Cruz de Tenerife, Spain*
5. *Irish Whale and Dolphin Group (IWDG), Merchants Quay, Kilrush, Co. Clare, Ireland, V15 E762*

The southwest coast of the Iberian Peninsula stands out as a geographically important area due to its strategic location in the northeast Atlantic Ocean and is habitat for several cetacean species, including the fin whale, where it is currently considered a visitor. Understanding the occurrence and movements of species is fundamental to implementing effective conservation measures, and this is particularly important for highly mobile species such as the fin whale, which faces significant anthropogenic pressures. Here we use photo-identification techniques to understand the occurrence of fin whales in the southwest Iberian Peninsula and compare our catalogue against other regions' catalogues to contribute to the existing knowledge of their long-distance movements. Data regarding 97 fin whale sightings was recorded off Sagres, southwestern Portugal, between 2012 and 2024 during non-systematic boat-based surveys onboard whale-watching tours. A catalogue comprising 485 images led to 116 identifications of at least 81 individually recognizable whales (left side). Seven whales were later re-sighted in the area. Our records showed year-round presence of the species, with a higher incidence in summer, coinciding with increased tourism demand. The comparison with other region's catalogues resulted in one match with the Irish fin whale catalogue, curated by the IWDG, but none with the Canary Islands (Asociación Tonina). Our study revealed a dynamic non-resident population of fin whales, with individuals using these waters throughout the year and at least some returning later to the area, indicating cyclical movements. This, together with the novel long-distance movements detected, supports the idea that the inshore waters off Sagres form part of a larger population, likely involving different northeastern Atlantic stocks serving as part of their migration route. This offers fresh insights into our limited understanding of the movements of this species in the North Atlantic and highlights the importance of long-term and cooperative studies.

AD-32. There's no place like home: estimating home range of common bottlenose dolphins (*Tursiops truncatus*) to inform spatial conservation planning in the Central Tyrrhenian Sea

Mataj, Marianna ^{1,2}; Turchi, Alice ^{1,2,3}; Labriola, Maria Silvia ^{2,4,5}; Pedrazzi, Giulia ^{1,2}; Mattiussi, Alex ^{1,2}; Rinalduzzi, Sofia ^{2,4}; Giacomini, Giancarlo ¹; Pace, Daniela Silvia ^{1,6}

1. Department of Environmental Biology, Sapienza University of Rome, Italy
2. Echoes - Capitoline Centre for Marine Research - ETS, Rome, Italy
3. PhD Program in Environmental and Evolutionary Biology, Sapienza University of Rome, Italy
4. Department of Biology, University of Rome Tor Vergata, Rome, Italy
5. PhD Program in Evolutionary Biology and Ecology, University of Rome Tor Vergata, Italy
6. CNR – Institute for the Study of Anthropogenic Impacts and Sustainability in the Marine Environment – Capo Granitola Unit, Torretta Granitola, Trapani, Italy

Knowledge on distribution, habitat use, and home-range of cetacean species would allow to minimize potential harmful interactions with humans and implement both efficient spatial planning of anthropogenic activities and spatially explicit conservation measures in a certain region. Here, we investigated for the first time the spatial patterns of bottlenose dolphins in the central Mediterranean using 95 sightings (observation period 153h), and relative behavioural data, collected between 2017-2023 in the Tiber River estuary area. Key behavioural states [“natural” feeding (FEE), foraging on fishing gears (FFG) and socializing (SOC)] were measured and used to estimate ¹ the time invested by dolphins in each behavior, and ² the home-ranges (HR; 95% probability) and core-areas (CA; 50% probability) under different conditions. The presence of calves in each behavioral state was considered a proxy of concomitant rearing activities (REA). “adehabitat” R package was used to derive HRs/CAs as Minimum Convex Polygons. FFG was recorded 53% of the observation time in more offshore areas, followed by FEE (18%) and SOC (3.5%) occurring more coastally. Calves were mostly spotted during FEE and SOC. The largest estimated HR (734 km²) and CA (163 km²) were associated with FEE, the smallest with SOC (194 km² and 49 km², respectively). REA clearly overlapped with FEE and SOC (HR=750 km²; CA=165 km²), with a limited overlay with FFG (HR=502 km²; CA=106 km²). Our results definitely identified the ranges of key dolphin activities, highlighting priority coastal areas where dolphins regularly feed without interaction with fisheries and raise their young, to be considered for future spatial conservation decisions. Further, this information on the population residing at the Tiber River estuary can be used to support the establishment of a Central Tyrrhenian IMMA (Important Marine Mammal Area), a powerful tool for drawing attention to areas in need of management and developing area-based conservation measures.



AD-33. Temporal dynamics of the most sighted sperm whale social units off São Miguel Island, Azores

Agnelli, Emma ¹; Valor, Laia ¹; Silva, Mariana ¹; Idárraga Garcés, Valeria ¹; López, Laia ¹; González García, Laura ²

1. *Futurismo Azores Adventures, Portas do Mar, Ponta Delgada, Azores, Portugal*
2. *Institute of Marine Sciences – OKEANOS, University of the Azores, Horta, Azores, Portugal.*

Sperm whales (*Physeter macrocephalus*) have long captured interest, both historically as targets of whaling and more recently through the focus of researchers and a growing whale watching industry. In the Azores, sperm whales of both sexes can be observed year-round, though sightings are predominantly composed of groups of females and juveniles. Despite their year-round presence, information on social units remains limited, resulting in an incomplete understanding of their seasonal patterns or long-term residency. This study analyzed opportunistic sperm whale occurrence data collected from whale-watching vessels around São Miguel Island from 2021 to 2024, comprising 889 sightings, of which 542 counted with photos valid for identification. Notably, 34% of the total sightings included at least one previously known individual. From 56% of the sightings with photos, 65 known individuals were matched and re-sighted between 1 and 52 times, while the remainder sightings were of previously undocumented individuals. Based on previously identified social units, results of temporal distribution revealed a higher identification rate for two of these units, as they were sighted regularly throughout the study period (n=222 and n=69) suggesting potential year-long residency. Both groups often overlapped in time and space, indicating that they may be part of a larger social group. Conversely, another social unit, previously identified in Pico Island and in the Canaries, displayed a seasonal presence off São Miguel, observed consistently in May and June across the four consecutive years (n=73 sightings). These findings underscore the importance of São Miguel Island as a critical habitat for both resident and migratory sperm whale social units contributing to our understanding of their social organization and movement patterns. Furthermore, it underscores the importance of opportunistic data from whale-watching vessels in filling knowledge gaps about sperm whale populations.

AD-34. A long-term cetacean monitoring checkpoint along the Livorno-Bastia fixed transect in the eastern Pelagos Sanctuary (North Tyrrhenian Sea)

Caneve, Gaia ¹; Pignata, Eleonora ²; Gregoriotti, Martina ³; Carosso, Lara ⁴; Campana, Ilaria ⁵; Castelli, Alberto ¹; Arcangeli, Antonella ⁶

1. University of Pisa, Department of Biology
2. CONISMA
3. ISPRA, Biodiversity Department Accademia del Leviatano APS
4. Accademia del Leviatano APS Capo Carbonara Marine Protected Area
5. CONISMA Accademia del Leviatano APS
6. ISPRA, Biodiversity Department

The Pelagos Sanctuary is one of the key areas for the preservation of Mediterranean cetaceans. A high variability is recognised, however, across seasons and years. Understanding species movement patterns and trends among years is thus critical to identify effective conservation measures. Since 2008, a transect crossing the southeastern area of the Pelagos Sanctuary has been monitored within the Fixed Line Transect Mediterranean Monitoring Network and the Life CONCEPTU MARIS project. Monitoring was performed throughout the year from 2008 to 2024 along the Livorno-Bastia transect, between Italy and Corse. In total, over 63,000 km were performed on effort, totalizing 436 cetacean sightings. The most encountered species were *Stenella coeruleoalba* (Sightings per Unit of Effort (Km), SPUE=0.0034±0.0003 SE) and *Tursiops truncatus* (SPUE=0.0024±0.00028 SE), with a rather stable trend over time. *Balenoptera physalus* was the only species showing a significant difference in SPUE among years (test KW; H=10.87; p<0.05) and seasons (test KW; H= 2.642; p<0.001), with a significant decrease during the latter years. The species is mostly present during spring and autumn, likely linked to a migratory passage towards and from the summer feeding ground in the Pelagos Sanctuary. *Delphinus delphis* ~~e~~and *Physeter macrocephalus* were only recorded during the first years of monitoring. *Grampus griseus* and *Ziphius cavirostris* were recorded only occasionally. The considerable disappearance of *D. delphis* and *P. macrocephalus*, along with the significant decline of *B. physalus* during the last years, highlights the need for further investigation to better understand the drivers of these changes and identify the most appropriate mitigation measures to support the conservation of the species.



AD-35. Cetacean diversity in South-east Portugal: A review of 5 years of data collection in Faro (Algarve)

Gil, Susana ¹; Rodrigues, Afredo ¹; Peres dos Santos, Rui ²

1. *Ocean Vibes Algarve - Tourism & Research, Faro - Portugal*
2. *Marine Ecology Human Impacts and Diversity (MARDIV), Centre of Marine Sciences (CCMAR), Campus de Gambelas, University of Algarve, Faro, Portugal*

The Algarve region is a major dolphin-watching destination in Europe, with 52 licensed companies operating and four resident odontocete species present year-round. While whale-watching tourism has been long established in the Western Algarve, the Eastern Algarve only recently saw the emergence of both tourism and year-round research surveys. Despite the number of boats in the area, data on cetacean diversity remains scarce, as most operators are seasonal and do not collect information for research purposes. This study aimed to assess live cetacean diversity and seasonality in the Eastern Algarve using boat-based surveys conducted in Faro. Over the study period, 15 species were recorded, including resident odontocetes such as common dolphins (*Delphinus delphis*) and bottlenose dolphins (*Tursiops truncatus*), as well as migratory visitors like fin whales (*Balaenoptera physalus*) and humpback whales (*Megaptera novaeangliae*). Detailed species occurrence, sighting rates, and seasonality patterns were analysed. To quantify cetacean diversity in the area, the Simpson Diversity Index was calculated. Our findings highlight the Eastern Algarve as a hotspot of cetacean diversity, emphasising its importance as a habitat for resident and migratory species. This study represents the first dedicated effort to document cetacean diversity in the region based solely on live sightings. These results provide a foundation for future conservation strategies and underscore the need for long-term monitoring to better understand population dynamics and habitat use.

AD-36. Fin whales in south portugal: a case study in Faro

Rodrigues, Alfredo ¹; Gil, Susana ¹; Santos, Rui ²

1. *Ocean Vibes Algarve - Tourism & Research, Faro - Portugal*
2. *Marine Ecology Human Impacts and Diversity (MARDIV), Centre of Marine Sciences (CCMAR), Campus de Gambelas, University of Algarve, Faro, Portugal*

Fin whales (*Balaenoptera physalus*) are widely distributed baleen whales found in all major oceans, yet the migration routes of many populations remains poorly understood. This study aimed to investigate the occurrence, behaviour, and distribution of fin whales in Faro region, the southernmost point of mainland Portugal, and a known cetacean hotspot. Data was collected using whale-watching vessels between 2019 and 2024, resulting in 193 sightings and over 50 photo-identified individuals. Identification relied primarily on chevron and dorsal fin patterns, complemented by aerial images when conditions allowed. Most sightings occurred during spring, with a peak in April and May with Fin whales often seen foraging in the area in pods up to 14 individuals. Associations with other Mysticeti and Odontoceti species were also recorded. These findings suggest that Faro serves as a significant feeding area for fin whales, in contrast to nearby regions where sightings are rare. This study contributes to understanding the connectivity of North Atlantic and Mediterranean populations. Recent studies using satellite tracking show that some whales moved from Norway to the Algarve. Additionally, researchers have hypothesised potential links between Mediterranean fin whales and Faro region. This research represents the first dedicated study of fin whale occurrence, behaviour, and distribution in mainland Portugal, highlighting the importance of the Faro region as a key habitat for this species and providing valuable insights for conservation and population management efforts.

AD-37. Decadal monitoring of bottlenose dolphins in the French Mediterranean: insights into population stability and conservation indicators

Tardy, Céline ¹; Antich Gabriel, Andrea ¹; Brofiga, Claire ¹; Labach, Hélène ¹

1. Association MIRACETI, Place des traceurs de pierres, La Couronne, 13500 Martigues, France

Since 2013, a long-term integrated monitoring program has been implemented to support cetacean management in the French Mediterranean, led by MIRACETI in partnership with the French Office of Biodiversity (OFB). The program aims to evaluate the distribution and abundance of bottlenose dolphins (*Tursiops truncatus*) and track changes in these demographic parameters over time. This information contributes to estimate and compare indicators for the MSFD monitoring program (European Directive 2008/56/EC) across the French Mediterranean. Two three-year monitoring periods, spaced eight years apart, were conducted using standardized protocols for effort, sightings, and photo-identification. The first series (2013–2015) covered 16,000 km, recording nearly 150 bottlenose dolphin sightings and photo-identifying nearly 1,000 individuals. The second series (2021–2023) covered 9,000 km, with almost 100 sightings and nearly 400 different individuals photo-identified. While encounter rates remained stable along the Riviera coast, they increased in the Gulf of Lion and Corsica, resulting in an overall increase from 0.0068 to 0.0086 between the two series. Abundance estimates using Capture-Mark-Recapture methods were 557 individuals (95% CI: 216–872) during the first series and 500 individuals (95% CI: 245–1,198) during the second for the French continental waters (Riviera coast and Gulf of Lion). Additionally, the second series provided the first abundance estimate for Corsica: 289 individuals (95% CI: 219–385). These findings reveal no significant changes in bottlenose dolphin abundance over nearly a decade, suggesting a stable population along the French Mediterranean coast. The results highlight the importance of long-term monitoring programs in regularly informing MSFD indicators, assessing conservation efforts, and guiding future management strategies.

AD-38. A new Mediterranean photo-ID catalogue for the bottlenose dolphin

Nanni, Melissa ¹; Velestrini, Elisa ²; De Bonis, Lorenzo ³; Aveta, Silvia ⁴; Brogi, Mirko ⁵; Cervelli, Ilaria ⁶; Chinelli, Dario ⁷; Chirico, Donatello ⁷; Clemente, Nicola ⁷; Congiu, Sabrina ⁷; Costa, Erica ⁷; Del Pizzo, Flavia ¹; El Haddad, Nicole ⁸; Gazzola, Federica ⁹; Iemma, Aaron ¹⁰; Inglis, Federico ⁷; Mancini, Gianluca ¹¹; Masulli, Andrea ¹; Montesano, Joelle ¹²; Pratesi, Isabella ¹³; Prato, Giulia ¹⁴; Scagliola, Alice ⁷; Sebastiani, Ludovico ¹⁵; Sellini, Alessandra ⁷; Terranova, Francesca ¹⁶; Pintore, Laura ¹⁷

1. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; Department of Earth Sciences, University of Rome Sapienza, Piazzale Aldo Moro 5, 00185 Roma.
2. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; Department of Biology (DiBio) - University of Padova, Via Ugo Bassi, 58b, 35121, Padova, Italy
3. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; University College Cork, College Road, Cork, Ireland
4. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; WWF Travel, Via Po 25/c. 00198, Roma, Italy.
5. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; Department of Experimental and Clinical Biomedical Sciences (SBSC), University of Florence, Viale Morgagni, 50 - 50134 Firenze (FI)
6. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy
7. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy.
8. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; Department of Ecoscience, section for Marine Mammal Research- Aarhus University
9. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma.
10. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; WWF Italy, Conservation Office, Via Po 25/c. 00198, Rome, Italy
11. WWF Travel, Via Po 25/c. 00198, Roma, Italy.
12. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; WWF Italy, Conservation Office, Via Po 25/c. 00198, Rome, Italy; WWF Italy, Marine Office, Via Po 25/c. 00198, Roma, Italy.
13. WWF Italy, Conservation Office, Via Po 25/c. 00198, Rome, Italy.
14. WWF Italy, Conservation Office, Via Po 25/c. 00198, Rome, Italy; WWF Italy, Marine Office, Via Po 25/c. 00198, Roma, Italy.
15. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; Department of Environmental Biology, University of Rome Sapienza, Piazzale Aldo Moro 5, 00185 Roma.
16. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; Department of Life Sciences and System Biology, University of Torino, Via Accademia Albertina 13, 10123 Torino, Italy
17. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy; WWF Travel, Via Po 25/c. 00198, Roma, Italy; WWF Italy, Conservation Office, Via Po 25/c. 00198, Rome, Italy; WWF Italy, Marine Office, Via Po



25/c. 00198, Roma, Italy; Department of Life Sciences and System Biology, University of Torino, Via
Accademia Albertina 13, 10123 Torino, Italy

In 2020 WWF Italy, in collaboration with WWF Travel, launched the project “Vele del Panda”, a Citizen Science and research initiative. The primary goal of the project is to collect data on the abundance and distribution of cetaceans in the Tyrrhenian and Ligurian Sea, while also supporting conservation efforts aimed at mitigating the impact of anthropogenic threats. Among the Mediterranean’s resident cetacean species, common bottlenose dolphins (*Tursiops truncatus*) are particularly vulnerable to human activities. A key step in monitoring bottlenose dolphins is the creation of a photo-identification catalogue. Photo-identification, a capture-recapture technique, can be used to investigate the social structure of dolphin's populations, as well as their size and temporal and spatial stability. Over the five-year monitoring period (2020 – 2024) of the “Vele del Panda” project a total of 176 sightings of *Tursiops truncatus* were recorded, resulting in the identification of 254 distinct individuals and 35 rematches. Re-sightings were mostly within the same geographical areas, the Ligurian Sea and the Tuscan archipelago, but also between the latter and northern Corsica. One individual in particular was observed all monitoring years, first in the Tuscan archipelago (2020 – 2021) and then in Corsica waters (2022 – 2023). The data collected indicates a pattern of residency for bottlenose dolphins in the Ligurian and Tyrrhenian Seas, with occasional movements outside the investigated areas. Collaboration between research groups operating in contiguous areas – particularly through the sharing and comparing of catalogues - is a crucial step toward understanding these patterns. Such collaboration will be essential for the protection and long-term conservation of bottlenose dolphins in the Mediterranean Sea.

AD-39. Common bottlenose dolphin: a species-specific aerial survey in the Tyrrhenian Sea

Costa, Marina ¹; Lauriano, Giancarlo ¹

1. Institute for Environmental Protection and Research (ISPRA), Via V. Brancati 60, 00144 Roma, Italy

Aerial surveys based on line transect distance sampling has increased in Italy since 2009 to provide cetacean abundances over wide areas as legal requirements of both Habitat and Marine Strategy Framework Directives. Hence, the survey designs adopted were mostly aimed to cover as much as possible extensive portions of the seas around the peninsula with different design classes and transects extending from coastal to pelagic areas. In this scenario, data on species typically coastal like Bottlenose dolphin (*Tursiops truncatus*), may be affected by the unbalanced effort mainly covering pelagic areas. In autumn 2023 a line-transect distance sampling aerial survey was conducted to estimate the bottlenose dolphin abundance in the coastal areas (within 200m of depth) of the Italian and French waters of the Western Mediterranean Sea. Weather conditions limited the survey to the Tyrrhenian and Ligurian Seas, with 39 strata and a total of 277 transects following an equal-spaced zig-zag design covering 7,378km across an area of 35,359km². Twentynine sighting of bottlenose dolphins were recorded over 3,911km of effort. Uncorrected abundance was estimated at 2,833 (CV=0.33; 95% CI=1,495-5,368) dolphins with a density of 0.080 individual/km². The density per individual is much higher than what was previously estimated in a slightly larger area by Lauriano et al. in 2014 (0.0051-CV=0.43%). Results also suggest that dolphin groups are consistently present along the entire coast, confirming the aerial surveys the most effective method for estimating populations over large areas. However, it seems like recording species with a coastal distribution, such as bottlenose dolphins, using transects perpendicularly extending to off shore can be particularly challenging in regions with narrow continental platform. Results suggest that adopting a survey plan that includes both coastal and offshore strata could lead to more accurate and robust estimates of the density and abundance of bottlenose dolphins in future surveys.

AD-40. Full-bandwidth recorders outperform click feature detectors in detection of broadband delphinid echolocation clicks in the Danish North Sea

Marcolin, Cristina ¹; Griffiths, Emily T. ¹; Cosentino, Mel ¹; Tougaard, Jakob ¹; Sveegaard, Signe ¹; Kyhn, Line ^{1,2}

1. Department of Ecoscience, Aarhus University, Roskilde, 4000, Denmark

2. Niras, Kæhlersbakken 5, 4700 Næstved, Denmark

For autonomous passive acoustic monitoring (PAM), two methods are generally applied for data collection: broadband recorders or real-time event-detecting data loggers. Broadband recorders collect full bandwidth acoustic data that require considerable storage capacity, extensive post-processing, and manual analysis. In contrast, data loggers that employ real-time signal detectors do not store raw data, requiring less storage capacity and less post-processing. This study compares the performances of these two methods on detecting delphinid species. In the period August 2022 – November 2023, six stations were deployed in the Danish North Sea. Each station consisted of an F-POD and a SoundTrap (ST600). Broadband data from the ST600s were analyzed with the PAMGuard click detector module and results manually audited to confirm the presence of delphinid echolocation signals. Data were then converted to detection positive periods from both ST600s and F-PODs datasets, resulting in the metrics detection positive minutes, hours and days, respectively. Diel patterns were also examined. The results showed that the ST600s rendered significantly more detections than the detections from F-PODs (8675 and 1252 detection positive minutes, respectively), across all stations. The difference between the two methods decreased with decreasing time resolution (largest difference for minutes, smallest difference for days). Although the detection positive hours were lower in the F-POD data than in the SoundTrap data, the diel pattern was similar: a peak in detections during dusk and night hours relative to daylight hours. While F-PODs do detect dolphins and are easy to use, they underestimate the presence of delphinid species in an area, as seen by the higher detection rate with the Soundtrap data. Hence, F-PODs may be sufficient to provide a general overview of the species in an area, but other devices will provide more true positive detections of delphinid species and thereby present higher value for conservation and monitoring purpose.



AD-41. Temporal variability in the acoustic presence of cetaceans outside Isfjorden, Svalbard, in relation to maritime traffic

Slavík, Petr ¹; Stoller, Alyssa M. ¹; Rasmussen, Marianne H. ²; Heide, Andreas B. ³; Ercoletti, Giulia ³; Joisa, Olli ⁴; Grove, Thomas J. ¹

1. *Whale Wise, Swansea SA3 1LB, UK*
2. *The University of Iceland's Research Center in Húsavík, 640 Húsavík, Iceland*
3. *Barba Foundation, 4020 Stavanger, Norway*
4. *Turku University of Applied Sciences, 20520 Turku, Finland*

The gradual reduction of seasonal sea ice in Isfjorden, Svalbard, has led to a surge in local shipping activity, particularly tourism-related traffic, with the number of passengers increasing fivefold since the early 2000s. This rise in vessel activity poses potential risks to cetaceans, including ship collisions and noise pollution, which could result in population-level impacts if feeding grounds overlap with shipping corridors. Despite evidence of the area's importance for various cetaceans, fine-scale acoustic studies combined with vessel activity data remain scarce. To address this gap, we collected continuous acoustic data for 44 days during July–August 2021, a period of peak vessel activity, using a vessel of opportunity to deploy a bottom-moored hydrophone (SoundTrap ST500 HF). Automatic detectors including PAMGuard's Whistle Moan, Click, Energy Sum and Spectrogram Correlation detectors were used to streamline the detection of blue, fin, and sperm whale vocalizations, supported by a validation process comparing automated methods with manual detection to address methodological inconsistencies. The resulting dataset provides a new assessment of temporal variability in the acoustic presence of the target species in the area. By integrating these findings with AIS-based vessel activity data, we aim to identify temporal overlaps between cetaceans and shipping activity, offering insights into potential risks. Preliminary results revealed the presence of blue and sperm whales in the area, listed as endangered and vulnerable, respectively, by the IUCN Red List. This underscores Isfjorden's potential as a seasonal feeding ground and highlights the urgent need for further studies to assess and mitigate the impacts of local vessel activity. With shipping activity expected to increase further, alongside the potential expansion of the Longyearbyen port, proactive monitoring and management strategies will be essential to protect these vulnerable species.



AD-42. From the Mediterranean Sea to the Atlantic Ocean: fin whale migration between two feeding grounds

Tort, Beatriu ¹; Mészáros, Dorottya ¹; Belda, Edurardo J. ²; Feliu-Tena, Blanca ²; Gallego, Victor ³; Saavedra, Camilo ⁴; Degollada, Eduard ¹

1. EDMAKTUB Association, Barcelona, Spain
2. Instituto de Investigación para la Gestión de Zonas Costeras (IGIC), Universitat Politècnica de València (UPV), C/ Paranimf 1, 46730 Grau de Gandia, Valencia, Spain
3. Instituto de Ciencia y Tecnología Animal; Universitat Politècnica de València (UPV), Camino de Vera s/n, 46022 Valencia, Spain
4. Instituto Español de Oceanografía (IEO-CSIC), Centro Oceanográfico de Vigo, Vigo 36390, Spain

The migratory movements of fin whales (*Balaenoptera physalus*) in the Mediterranean are poorly understood, both for the Mediterranean and the Northeast North Atlantic populations. Mediterranean fin whale aggregations are known in different areas and seasons, but established routes have been challenged as patterns appear to be changing. However, the seasonality of movements in and out of the Mediterranean is well established. Fin whales enter the Mediterranean through the strait of Gibraltar in winter and return to the Atlantic in summer. Studies in the Catalan (NW Mediterranean), Denia (W Mediterranean) and Galician waters (E Atlantic), have been carried out for 10, 4 and 2 years respectively. Drones have become one of the main tools for fin whale identification and behavioural studies. A drone catalogue of more than 400 individuals has been generated and the main behaviours in the three study areas have been described. The Catalan and the Galician waters were identified as spring and summer feeding areas respectively, and the coast of Denia as a summer migratory area. By comparing the drone-ID catalogues of the three regions, it was possible to match several individuals sighted in the different study areas. Intra-annual recaptures were also made off the Catalan and Galicia coasts. Inter-annual recaptures occurred in all regions. Similarities were found between Catalan and Galician feeding grounds. Fin whales were found to be similarly concentrated in the isobathy, using similar feeding strategies. A significant difference in abundance was observed, with the Atlantic being a more productive area with a higher aggregation of whales. These results prove that some fin whales feeding in the Catalan coast migrate southwards via Denia and head for the Atlantic, with the Galician feeding ground as one of their destinations. This study highlights the effectiveness of drones as a non-invasive method for high-resolution photo-identification and behavioural analysis.



AD-43. The role of the Aeolian Archipelago (Southern Tyrrhenian Sea) as a feeding and nursery area for striped dolphins (*Stenella coeruleoalba*): a 15-year study

Melato, Ilaria ^{1,2,3}; Gelippi, Michelle ¹; Blasi, Monica Francesca ¹

1. Filicudi WildLife Conservation, Località Stimpagnato Filicudi, 98055 Lipari (ME), Italy
2. Dept. Biological, Geological & Environmental Sciences, University of Bologna, Via Sant'Alberto 163, 48123 Ravenna (RA), Italy
3. Dept. of Earth and Marine Sciences, University of Palermo, Via Archirafi 22, 90123 Palermo (PA), Italy

The Mediterranean striped dolphin (*Stenella coeruleoalba*) is classified as Least Concern (IUCN, 2020), however, populations face several threats, with anthropogenic impact being the most severe and increasing. This study investigates the distribution of striped dolphins around the Aeolian Archipelago (Southern Tyrrhenian Sea, Italy), an area characterized by illegal fishing activities and heavy naval traffic. Dedicated boat surveys were performed year-round in a 400 km² study area, from 2009 to 2024, and photo-ID data of individuals were collected. GPS coordinates, group composition and behaviour patterns were also recorded. A total of 267 sightings and 616 photo-identified individuals was performed. An inter-group variation in the distribution and the dimension of striped dolphin groups was found, based on different breeding/calving periods and seasons. The dolphins were most frequently sighted at 420.6 m depth, at a mean coast distance of 2455 m. Their distribution resulted to be more homogeneous in summer than spring/autumn, with a general greater concentration in the northern-southern areas, characterised by lower boat traffic. The group size was quite constant (10-30 individuals), with the highest values in summer/spring months. Mother-calf pairs were mainly sighted during springtime (7.9%). These data, in combination with behavioural observations, could indicate that striped dolphins may move according to prey availability but also in response to breeding pattern and anthropogenic factors. Through the photo-identification analysis it was also possible to recognize new sighted, re-sighted and not identified individuals. The occurrence of re-sighted animals (25%) suggests a certain level of residency for the Aeolian population. These findings give more evidence about the importance of the Aeolian Archipelago as feeding and nursery ground for striped dolphins, an area strongly impacted by anthropogenic pressure, which may cause alterations in the dolphins' behavior and distribution. In this context, the implementation of appropriate management actions for their conservation is crucial.



AD-44. Photo-identification and seasonal occurrence of long-finned pilot whales (*Globicephala melas*) off Vesterålen, northern Norway

Catasús, Elena ¹; Similä, Tiu ¹; Jourdain, Eve ²; Morange, Zoë ³

1. *Whale2Sea, Norway*
2. *Norwegian Orca Survey & UIO*
3. *UIT & Whale2Sea, Norway*

The ecology of long-finned pilot whales (*Globicephala melas*) has been poorly documented in Norwegian waters. This study used data collected between 2008 and 2023 mainly from whale-watching vessels, to investigate the feasibility of using photo-identification to study long-finned pilot whales in the Vesterålen archipelago in northern Norway, as well as investigating potential seasonal patterns in occurrence and site fidelity. A total of 23,626 images were captured during 55 encounters, resulting in the identification of 230 individuals in the permanent catalogue and 276 individuals in the temporary catalogue. Daily and monthly re-sighting patterns were observed, with 97 individuals resighted during different days and 57 during different months, highlighting their regular occurrence in the study area. Analysis of seasonal occurrence showed highest encounter rates in June and July. Overall, the findings demonstrate the usefulness of photo-identification in long-term monitoring of the long-finned pilot whales in Vesterålen.

AD-45. ECOMMAS: What can long term cetacean acoustic monitoring show?

Tregenza, Nick ¹; Onoufriou, Joe ²

1. *Chelonia Limited, The Barkhouse, Mousehole, TR19 6PT, UK*

2. *Renewables and Ecology Team, Scottish Government, Marine Lab, 375 Victoria Road, Aberdeen AB11 9DB*

The East Coast Marine Mammal Acoustic Study aimed to assess the value of acoustic monitoring in determining changes in distribution and density of dolphins and porpoises along the east coast of Scotland. 30 C-POD loggers were deployed in 10 lines each running directly offshore with instruments at 5, 10 and 15km. The array spans 270km and the data totals 132 data years containing 196m porpoise clicks and 6m dolphin clicks. Fully automated analysis of the data from 2012-2023 was done using the KERNO classifier to find click trains and PYRA (paired-year ratio assessment) to assess trends. The data shows a surprisingly even distribution of porpoises over the 30 sites with lower detection rates further offshore, and a more complex pattern in dolphin detections that included a known major local hotspot for Bottlenose Dolphins and other species further offshore. The results show surprisingly coherent trend patterns for porpoises with an overall growth rate that averaged +7.9% per annum. There was 2.2% average annual increase in click counts in the northern half of the array while in the southern sector the growth rate averaged 12.2% per annum. There is clear coherence in the data with year-on-year trends profiles matching to some degree across both the north south, inshore-offshore and species stratifications. In some time periods positive trend values observed exceed plausible population growth rates and must reflect local redistribution. Over longer periods the results indicate that this is likely a valid and feasible method of obtaining precise information on cetacean population trends.



AD-46. Mapping humpback whale distribution and spatial overlap with anthropogenic activities in Ísafjarðardjúp, Iceland

Regoczi, Benedek ¹; Grove, Thomas James ²; Lyall, Laura ¹; Stoller, Alyssa M. ²; Samarra, Filipa ³

1. University Centre of the Westfjords, Ísafjörður, Iceland, Whale Wise, Swansea, United Kingdom, SA3 1LB
2. Whale Wise, Swansea, United Kingdom, SA3 1LB
3. Westman Islands Research Centre, University of Iceland, Vestmannaeyjar, Iceland

Anthropogenic activities in Ísafjarðardjúp, Northwest Iceland, are rapidly increasing due to the expanding tourism, aquaculture, and shipping industries, thus raising potential concerns about the impact on marine life. Although the ecological importance of Ísafjarðardjúp is recognized, little research has been conducted on the distribution of cetaceans in the area, including humpback whales, whose numbers appear to have increased locally in recent years. Anecdotal evidence from local tour operators suggests that ship strikes have occurred multiple times over the last ten years, further underscoring the need for data-driven management strategies. We aimed to map seasonal humpback whale distribution and assess spatial overlap with current and future aquaculture sites as well as with vessel traffic. A total of 90.79 hours of effort was conducted using whale-watching vessels as platforms of opportunity from June to September 2024. All humpback whale sightings within a 300-meter radius were recorded, while effort data was collected by logging the position of the survey vessel using a handheld GPS. Effort-standardized 1 km² rasters of whale density were developed (animals/km of survey effort), and generalized additive models (GAMs) were applied to identify environmental predictors of whale presence. Results of the GAMs revealed depth as the key predictor of humpback whale presence, with no significant effects from other variables. The findings presented temporal hotspots of humpback whale presence, with high densities in the deep central waters of the fjord system, extending into the southeastern region after June. August recorded the highest effort-standardized whale densities, with five 1 km² rasters indicating more than 10 animals per kilometer of survey effort. Additionally, the results showed significant spatial overlap between areas of high whale density and anthropogenic activities. These findings provide essential data to inform revisions of existing marine spatial plans, supporting strategies to balance marine traffic expansion with conservation priorities.



AD-47. Unveiling sperm whale dynamics in the Mediterranean cetacean corridor MPA: acoustic abundance estimates, distribution models and collision risks

Álvarez Chicote, Carla ¹

1. SUBMON

Acoustic surveys for sperm whales (*Physeter macrocephalus*) were conducted in the Mediterranean cetacean Corridor Marine Protected Area (MPA) in 2023 (June and September), as part of a combined visual and acoustic maritime survey. A total of 2,255.52 km of acoustic track lines (day and night) were surveyed in the study area. During these surveys, 116 acoustic detections of sperm whales were recorded on the track line, with an additional 66 individuals off-track. The model-based estimate indicated a population size of 1,053 individuals across the study area (CV = 35.2%; 95% CI = 502.1–2,209.62) and a density of 0.03296 individuals per km². Acoustic detections were used to model sperm whale habitat and distribution in the MPA. Generalized additive models were used to link the presence of sperm whales detected acoustically with different environmental variables integrated over different depth classes, encompassing the depth range used by the species for foraging. Sperm whale distribution in the study area was primarily influenced by bottom temperature, eddy kinetic energy (EKE), salinity, sea surface height (SSH), and proximity to submarine canyons. The model revealed significant non-linear relationships for EKE, SSH, and salinity, highlighting the role of mesoscale processes such as eddies, oceanic fronts, and salinity gradients in shaping sperm whale habitat. Submarine canyons, were key features associated with higher presence. These findings underscore the importance of mesoscale dynamics and underwater features in determining the species' distribution. The model identified critical sperm whale hotspots during summer along the western Balearic margin and the Catalan slope margin, confirming their reliance on submarine canyons and mesoscale features for prey aggregation. By overlaying these results with vessel density data, regions with higher collision risk were identified. Key areas, such as the Balearic margin and the Catalan slope, are prioritized for the conservation of this endangered subpopulation within the MPA.



AD-48. Cetacean biodiversity on the northern coast of Tenerife (Canary Islands): implications for the environmental impact of a harbour construction plan

Badosa, Elisabet ¹; Aguilar, Natacha ²; Martín, Marc ¹

1. Universidad de La Laguna, Departamento de Biología Animal, Tenerife, España.
2. Instituto Español de Oceanografía (IEO)

Between 2020 and 2024, the first systematic study of cetaceans off the northern coast of Tenerife was conducted in response to the proposal for a large port project in the city of Puerto de la Cruz. The objective was to study the presence, distribution and abundance of cetaceans in the area, and provide a broad estimate of the increase in underwater ambient noise that would render the operation of a large harbour in the area. During 30 days of sampling, 10 cetacean species were identified: Risso's dolphin (*Grampus griseus*), bottlenose dolphin (*Tursiops truncatus*), spotted dolphin (*Stenella frontalis*), common dolphin (*Delphinus delphis*), Bryde's whale (*Balaenoptera edeni/brydei*), Blainville's and Cuvier's beaked whales (*Mesoplodon densirostris* and *Ziphius cavirostris*), short-fin pilot whale (*Globicephala macrorhynchus*), *Kogia* spp. and sperm whale (*Physeter macrocephalus*), including a group of over 30 sperm whales, the largest recorded in the Canary Islands to date. The most frequently observed species was the Risso's dolphin, sighted on 80% of the sampling days. A photo-identification catalog of 130 individuals was developed, with over 50% showing high site fidelity to the study area. The second most observed species was the bottlenose dolphin, recorded on 60% of the surveys. The Habitats Directive requires the designation of Special Areas of Conservation to ensure the conservation of this species. Acoustic recordings performed with SoundTrap hydrophones moored outside the actual small port at Puerto de la Cruz and at a commercial harbour of Tenerife showed significant increases in the 63 and 125 Hz TOL bands designated by EU to characterise shipping noise. This study highlights the ecological importance of the northern waters of Tenerife for cetaceans and underscores the need of rigorously assessing potential environmental impacts of the planned construction of a large scale harbour, as it would have negative effects on cetaceans and their acoustic environment



AD-49. Cetaceans of the tallest mountain in Western Europe, the Gorringe Bank, Portugal

Castro, Joana ¹; Martins, Miguel ^{1,2}; Coxey, Mariana S. ³; Cid, André ¹

1. AIMM – Associação para Investigação do Meio Marinho
2. CEAUL – Centro de Estatística e Aplicações da Universidade de Lisboa
3. Mardive – Association Science and Education for the Conservation of Marine Biodiversity

Seamounts serve as biodiversity hotspots for several marine species including cetaceans. By aggregating prey in the open ocean, seamounts attract diverse whale and dolphin species. The Gorringe seamount is located in the Atlantic Ocean, southwest of the Portuguese coast. Despite previous research on this seamount, cetacean-focused studies remain very scarce. From the 8th to the 25th September 2024, a joint scientific expedition was conducted to the Gorringe Bank, with a dedicated team to cetaceans. Visual transects using distance sampling methods were done, totaling 52 hours and 35 minutes of effort. Seven cetacean species were identified, with Atlantic spotted dolphins (*Stenella frontalis*) being the most frequently observed species (with 36.59%), followed by beaked whales (Ziphiidae, 19.51%, with three species observed). Bottlenose dolphins (*Tursiops truncatus*) and unidentified rorquals (Balaenopteridae) accounted for 14.63%, each, while a single sighting of a Bryde's whale (*Balaenoptera edeni*) being recorded (2.44%). In 12.2% of the sightings, species identification was not possible. Atlantic spotted dolphins were observed both around and directly above the Gorringe Bank, with larger groups sighted near its summit, demonstrating the seamount's role in attracting oceanic dolphins. Beaked whales, however, were found exclusively in the deeper waters surrounding the seamount (900–2800 m). Given the “Data Deficient” conservation status of these species in mainland Portugal, these findings highlight the ecological significance of the Gorringe Bank for cetacean biodiversity. This study provides new insights into the cetacean diversity in the southwestern Portuguese Economic Exclusive Zone, suggesting that the Gorringe Bank may serve as an important habitat for species like beaked whales and Atlantic spotted dolphins. Further research is essential to better understand cetacean biodiversity and abundance, as well as temporal and seasonal variation, in offshore waters of Portugal.



AD-50. Connectivity of humpback whales of the Pitcairn Islands to the wider South Pacific Ocean populations

Dawson, Terence ¹; McCoy, Katherine ¹; Carroll, Emma ²; Genov, Tilen ³

1. Department of Geography, King's College London, UK
2. University of Auckland - Waipapa Taumata Rau, Auckland, Aotearoa New Zealand
3. Morigenos - Slovenian Marine Mammal Society, Slovenia

The Pitcairn Islands, a UK overseas territory located in the south-central Pacific Ocean, are one of the most remote places on earth and their exclusive economic zone (836,108 km²) was designated one of the world's largest Marine Protected Areas in 2016. The islands are visited by a small number of humpback whales, *Megaptera novaeangliae*, first observed in the area in the 1990s. The Pitcairn humpback whales are of scientific and conservation interest as they appeared to be a part of the International Whaling Commission breeding sub-stock F2, which is listed as Endangered on the International Union for Conservation of Nature (IUCN) Red List, due to intense illegal Soviet whaling in the Southern Ocean feeding grounds in the latter half of the 20th century. Since 2012, mother-calf pairs have been observed at all four of the islands, confirming the Pitcairn Islands as a calving ground.

Between July and September 2023, with a follow-up visit in September 2024, visual observations, skin biopsy samples, acoustic recordings, and photo-ID data were collected around Pitcairn Island, supported by the local community and funded by the UK Darwin Plus programme. A total of 50 humpback whale sightings were recorded in 59 hours from observation points on land and from boat. Of these, a total of 16 different individuals have been identified so far, including 4 mother-calf pairs, from a combination of tail fluke and dorsal fin photographs. Several individuals have been successfully matched using automated fluke recognition through Happywhale.com using these photographs and others uploaded to the catalogue through a citizen science program. The resighted individuals had been previously sighted in Papeete and Rurutu, French Polynesia, and Niue, an island east of Tonga. Mitochondrial DNA (mtDNA) sequencing from one biopsy collected by the authors revealed a haplotype that has been recorded in whales located over all regions of the south Pacific. Whilst inconclusive without further analysis of biopsy samples at this stage, our preliminary studies suggest that the humpback whales observed in the Pitcairn Islands have interchange with other regions of the South Pacific.

AD-51. Seasons of changes: seasonal habitat suitability for bottlenose dolphins in the Mediterranean

Pasanisi, Eugenia ^{1,2}; Gregoriotti, Martina ¹; Azzolin, Marta ^{3,4}; Campana, Ilaria ⁵; Castelli, Alberto ⁶; Carosso, Lara ⁷; Matteo, Costantino ^{3,4}; Crosti, Roberto ¹; Léa, David ⁸; Natalie, DiMeglio ⁸; Roul, Marine ⁸; Farina, Marianna ⁹; Fraija-Fernández, Natalia ¹⁰; Garcia-Garin, Odei ^{11,12}; Gazo, Manel ¹³; Grossi, Francesca ¹⁴; Maffucci, Fulvio ⁹; Miguez, Raul ¹⁰; Monti, Roberta ⁶; Moulins, Aurelie ¹⁴; Pellegrino, Giuliana ¹⁵; Pignata, Eleonora ⁶; Santini, Elena ¹; Scuderi, Alessia ¹⁶; Tepsich, Paola ¹⁴; Vighi, Morgana ¹³; Pace, Daniela ²; Sarà, Gianluca ¹⁷; Teti, Roberta ⁹; Raga, Juan Antonio ¹⁰; Arcangeli, Antonella ¹

1. ISPRA National Institution for Environmental Research and Monitoring, Rome, Italy; Department of Environmental Biology, Sapienza University of Rome, 00185 Rome, Italy.
2. ISPRA National Institution for Environmental Research and Monitoring, Rome, Italy
3. Department of Life and System Biology, University of Torino, Via Accademia Albertina 13, Torino; Gaia Research Institute Onlus, Corso Moncalieri 68B, 10133 Torino, Italy.
4. Accademia del Leviatano, Via Ospedaletto 53, 00054 Maccarese, Roma, Italy.
5. Department of Biology, University of Pisa, Via Derna 1, 56126 Pisa, Italy.
6. Marine Protected Area of Capo Carbonara, Italy.
7. ISPRA National Institution for Environmental Research and Monitoring, Rome, Italy.
8. EOI – EcoOcéan Institut, Montpellier, France.
9. Marine Turtle Research Group, Department of Marine Animal Conservation and Public Engagement, Stazione Zoologica Anton Dohrn, Napoli, Italy.
10. University of Valencia, Valencia, Spain.
11. Department of Evolutionary Biology, Ecology and Environmental Sciences, and Biodiversity Research Institute (IRBio). Faculty of Biology. University of Barcelona, 08028 Barcelona, Spain; Institute of Aquatic Ecology (IEA), Universitat de Girona; 17003 Girona, Spain.
12. Department of Evolutionary Biology, Ecology and Environmental Sciences, and Biodiversity Research Institute (IRBio). Faculty of Biology. University of Barcelona, 08028 Barcelona, Spain.
13. CIMA Research Foundation, Savona, Italy.
14. Accademia del Leviatano, Via Ospedaletto 53, 00054 Maccarese, Roma, Italy; Association Marecamp ODV, Lungomare Scardamiano 1, 95021 Aci Castello (CT), Italy
15. Association Nereide, C. Sancho IV el Bravo 19, 11380 Tarifa, Cádiz, Spain.
16. Department of Environmental Biology, Sapienza University of Rome, Rome, Italy
17. Department of Earth and Marine Sciences (DiSTeM), University of Palermo, Viale delle Scienze Ed. 16, 90128 Palermo, Italy.

The bottlenose dolphin is a key species for Mediterranean biodiversity and interacts closely with human activities. While it inhabits both coastal and oceanic zones, knowledge of its spatio-temporal patterns is yet limited. Due to logistical challenges, most studies focus on coastal habitats or single seasons and rarely



encompass the entire basin. To address this gap, the FLT Med Network, coordinated by ISPRA, uses ferries for systematic, long-term cetacean monitoring. Now part of the Life Conceptu Maris project (2022–2026), the network has conducted 2,906 surveys over 15 years, covering over 573,000 km across the Mediterranean in all seasons. This study analyses 876 bottlenose dolphin sightings recorded by the network between 2008 and 2023 to assess seasonal Encounter Rates (ER) and model habitat suitability using MaxEnt. The analysis incorporated 17 environmental variables to determine potential suitable habitats across seasons at the Mediterranean scale. The model results highlighted the importance of oceanic areas in the Alborán-Gibraltar region, where the highest ER was recorded during spring (avg: 0.009 sightings/km). Other key areas include the Balearic Islands, the coastal regions of the Tyrrhenian Sea, the Tunisian coast, the Sicily Channel and the Gulf of Lion—where suitability shifts offshore during winter—and the Adriatic Sea and Sardinia Channel, particularly favourable during summer. Although patterns vary by area, a general trend emerged, especially in the Tyrrhenian and Sardinia-Sicilian channels with habitats more confined to coastal zones during winter and expanding offshore during summer. These shifts likely reflect summer resource dispersion, though other drivers could play a role. This study emphasized the importance of considering seasonal variations for effective bottlenose dolphin protection across the Mediterranean. By adopting a comprehensive basin-scale approach, these findings will guide future conservation efforts under the Life Conceptu Maris project, ensuring coordinated and sustainable management across the entire region.

AD-52. Occurrence and anthropogenic threats affecting humpback whales (*Megaptera novaeangliae*) in the Atlantic Southern Iberia

Gennari, Ginevra ¹; Peres dos Santos, Rui ^{2,3,4}; Rodrigues, Alfredo ⁵; Magalhães, Sara ⁶; Abrantes, Gonçalo ⁷; Dias, André ⁸; Climaco, Rodrigo ⁹; Pignata, Eleonora ¹⁰; Truluck, Steve ¹¹; López-Suárez, Pedro ¹²; Lubansky, Tanya ¹³; S. Jones, Lindsey ¹⁴; Marçalo, Ana ¹⁵; Wenzel, Frederick ¹⁶; Castilho, Rita ^{2,4}

1. University of Algarve, Campus de Gambelas, Faro, Portugal
2. Marine Ecology Human Impacts and Diversity (MARDIV), Centre of Marine Sciences (CCMAR), University of Algarve, Campus de Gambelas, Faro, Portugal
3. Mingan Island Cetacean Study (MICS), Quebec, Canada
4. Pattern Institute, Faro, Portugal
5. OceanVibes, Faro, Algarve, Portugal
6. Mar Ilimitado - Science & Tourism, Porto da Baleeira, 8650-378 Sagres, Portugal
7. Sealife Algarve, Lagos, Portugal
8. Wildwatch Algarve, Ferragudo, Portugal
9. AlgarveDolphinLovers, Burgau, Portugal
10. Menkab: il respiro del mare association, Savona, Italy
11. Hebridean Whale Cruises, Gairloch
12. Bios Cabo Verde, Praça de Santa Isabel, 5110 Sal-Rei, Boa Vista, Republic of Cabo Verde
13. College of the Atlantic, Bar Harbor, ME USA 04609
14. Kraus Marine Mammal Conservation Program, Anderson Cabot Center for Ocean Life, New England Aquarium, Boston, MA, USA
15. Rede de Arrojamentos do Algarve (RAAlg), Olhão, Portugal
16. College of the Atlantic, North Atlantic Humpback Whale Catalog. (NAHWC) Bar Harbor, Maine. USA

Humpback whales are renowned for their extensive migratory behavior and crucial role in marine ecosystems, making them a focal point in conservation efforts. However, despite significant global research strategies, migration routes in many parts of the world remain poorly understood. The Algarve region in southern Portugal is one of these regions, characterized by nutrient-rich waters driven by coastal upwelling. This study represents the first comprehensive effort to catalogue humpback whales in the Algarve, focusing on their temporal presence, residency patterns, and interactions with anthropogenic activities. The collaborative research employs photo-identification techniques to document individual humpback whales, using distinctive fluke pigmentation and trailing edge serration patterns. Data has been collected from 2014 to 2024 in collaboration with local whale-watching organizations and from stranded whales reported by the Algarve Stranding Network (RAAlg). Over this period, 11 occurrences of humpback whales were documented in this region. Photo-ID images were analysed using advanced software for processing and cataloguing. After this step, they were internally compared and the first Algarve regional catalogue was created. Afterwards



this catalogue was compared with the North Atlantic Humpback Whale Catalogue (NAHWC). Matches of individual humpback whales were established within the Algarve and with other areas across the North Atlantic, including Boa Vista (Cabo Verde), Ligurian Sea (Italy), and Gairloch (Scotland), demonstrating extensive migratory connectivity. Seasonal peaks in humpback whale occurrences were observed during spring and autumn, aligning with the area's phytoplankton blooms. Anthropogenic impacts, particularly entanglement in fishing gear, were identified as significant threats to this species, with young individuals stranded exhibiting injuries linked to fisheries activities. By integrating ecological data with collaborative efforts involving stakeholders, this study will bridge gaps in understanding humpback whale movements in the North Atlantic, ultimately contributing to more effective conservation strategies and management policies in the Algarve region.



AD-53. Changes in the isotopic niche of modern male South American fur seals could indicate important environmental changes in the western South Atlantic

Cani, Alessandra ¹; Drago, Massimiliano ¹; Valdivia, Meica ²; González, Enrique M. ²; Cardona, Luis¹

1. Universitat de Barcelona

2. National Museum of Natural History (MNHN), Uruguay

South American fur seals (*Arctocephalus australis*) are distributed along the Southwestern Atlantic and Southeastern Pacific Oceans. On the Atlantic side, the northernmost breeding colonies are in Uruguay, where the population has steadily increase since the cessation of sealing in the 1940s. Due to sexual dimorphism and different life habits, differences are expected between male and female SA fur seals. Previous studies found distinct isotopic trophic niches for each sex in Uruguayan waters and a higher consumption of demersal prey over time, both reflected by an increase in the values of the stable isotopes of carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) from the 1970s to the 2010s, especially in males. While $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ inform about the trophic ecology, those of sulphur ($\delta^{34}\text{S}$) and oxygen ($\delta^{18}\text{O}$) can reflect the habitat use in areas with strong redox and salinity gradients. Here, we analysed the $\delta^{34}\text{S}$ and $\delta^{18}\text{O}$ values in bone of 23 females and 27 males dead-stranded along the Uruguayan coast during two time periods, 1971-1983 and 2006-2012, to confirm differences and changes in habitat use and isotopic niche between males and females over time. Large overlaps in the $\delta^{34}\text{S}$ - $\delta^{18}\text{O}$ isospace were found between females from both periods and males from the 1970s, whereas modern males showed significantly higher $\delta^{34}\text{S}$ and $\delta^{18}\text{O}$ values, reflecting a shift towards more offshore/pelagic foraging areas. Meanwhile, females must restrict the distance of their foraging trips to stay closer to the rookeries and likely rely on other available prey, which might explain the slight increase in $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values and the consistency of the $\delta^{34}\text{S}$ and $\delta^{18}\text{O}$ values over time. Finally, the changes observed in modern males could be to decrease competition with females due to a reduction of prey availability in the original foraging grounds, likely caused by intense fishing activities or changes in prey distribution.



AD-54. Humpback whale song and odontocete whistles at the site of a proposed port in Northeast Iceland

Laute, Amelie ¹; Grove, Thomas J. ¹; Stoller, Alyssa ¹; Fournet, Michelle ²

1. *Whale Wise*
2. *University of New Hampshire*

Finna fjörður is a small fjord in northeast Iceland, where the planned construction of a large port has the potential to meaningfully change the marine soundscape and ecosystem. Currently wind and rain dominate the underwater soundscape and anthropogenic sound sources are limited making the soundscape relatively pristine. In this study, we used one year (2021/22) of passive acoustic recordings to characterize the acoustic presence of cetaceans in this pre-construction soundscape. We performed a detailed manual analysis of the data and detected regular humpback whale and odontocete vocalizations. Humpback whale social calls were detected occasionally throughout the year. In winter between mid-December and mid-February humpback whale song was present nearly continuously with increasing and decreasing variety of vocalizations at the beginning and end of the singing period. Whistles and echolocation clicks of odontocetes were detected occasionally throughout the year. The most commonly observed odontocetes in the region are white-beaked dolphins. This study is the first description of cetacean presence in Finna fjörður. As a baseline the results can be used to inform noise management during port construction, and to monitor future changes of cetacean occurrence in the region.



AD-55. Programmed unmanned aerial vehicles (UAVs) show great potential for monitoring of harbour porpoises and other elusive marine fauna

Stedt, Johanna ¹; Hartmann, Dinah ²; Palmqvist, Valdemar ¹; Carlsson, Per ¹

1. *Department of Biology, Lund University*
2. *Department of Biology, Lund University Centre for Research into Ecological and Environmental Modelling (CREEM), University of St Andrews, Scotland*

Elusive marine mammals can be challenging to study via traditional visual methods. In this study we explore the potential use of unmanned aerial vehicles (UAVs), programmed to fly along pre-designed and standardized transects, for species monitoring and behavioural data collection. This is done by investigations of the small-scale spatiotemporal distribution of a small coastal odontocete, the harbour porpoise (*Phocoena phocoena*), within a known high-density coastal habitat for the species. Visual data, covering more than 300 ha of the area, was collected during daylight hours along pre-programmed transects twice per week over 17 weeks from June – September 2023, resulting in approximately 40 hours of visual data that was manually analysed. Porpoise density increased from June through September and decreased from mornings to afternoons, with highest activity at dawn. Also, porpoise density differed at a micro-scale (kilometres to hundred metres), with significant differences between closely neighbouring areas. In addition, presence of motor boats had a negative effect on porpoise density. Porpoise detections by UAV were not affected by wind speed or cloud cover, but there was a negative effect on detection rates at higher sea states. Also, the probability of detecting smaller body sizes (calves) might be negatively affected with increased flight height, especially at sea states higher than 2. Cross-checking UAV data against simultaneous visual eye-scans of the same area revealed that a large proportion of UAV-detections were missed by more traditional visual methods. There was no significant observer bias between two independent observers and no learning effect. We conclude that using programmed UAVs to conduct standardised collection of visual data of harbour porpoises and other small marine mammals, for e.g. species monitoring, holds great potential, especially as the method is easily implemented and can be tailored to specific needs.



AD-56. Potential overlaps and differences in suitable habitats of striped dolphin (*Stenella coeruleoalba*) and bottlenose dolphin (*Tursiops truncatus*) in the ADRION Region

Azzolin, Marta ^{1,2,3}; Arcangeli, Antonella ⁴; Costantino, Matteo ^{1,3}; Favaro, Livio ^{1,2}; Gamba, Marco ^{1,2}; Giovannini, Andrea ³; Rosestolato, Giorgio ³; Giacomini, Cristina ^{1,2}

1. Department of Life Sciences and Systems Biology, University of Torino, Torino, Italy
2. CIRCE, Centro Interuniversitario per la Ricerca sui Cetacei, University of Siena, Siena, Italy
3. Gaia Research Institute, Torino, Italy
4. ISPRA, National Institute for Environmental Protection and Research, Roma, Italy

The ADRION Region, which includes the central-southern Adriatic and northeastern Ionian seas, is crucial for the conservation of cetaceans. Since December 2014, experienced observers have regularly monitored cetacean presence in this area from the command decks of ferries along the Ancona-Patra route. As part of the LIFE Project ConCepTu Maris, the first five years of data were used to analyze the distribution of bottlenose and striped dolphins, identifying potential overlaps and differences in their suitable habitats. Year-round data were organized using QGIS, incorporating geomorphological characteristics and climate variables. A total of 73 sightings of bottlenose dolphins and 100 sightings of striped dolphins were utilized to create Species Distribution Models (SDMs) using the MaxEnt algorithm. The resulting SDMs accurately reflect the known distributions of both species; bottlenose dolphins are typically found in coastal waters and over the continental shelf, while striped dolphins prefer more offshore areas. Nonetheless, there are habitats in the Adriatic and Ionian seas where the species overlap, inshore and offshore. A review of the identified suitable habitats and the previously designated Important Marine Mammal Areas (IMMAs) has highlighted regions where additional conservation efforts are necessary for cetaceans.

AD-57. Mapping cetacean presence and abundance and establishing biological indicators in the Port of Cartagena as part of the LIFEPortSounds project

Serrano, Gala ¹; Belda, Eduardo Jorge ¹; Gallardo, Carles ¹; Feliu-Tena, Blanca ²; Espinosa, Víctor ¹; Gallego, Víctor ³; Lara, Guillermo ²; Morell-Monzó, Sergi ¹; Gosálbez, Jorge ⁴; Bosch, Ignacio ⁴; Pérez, Isabel ¹; Ardid, Miguel ¹; Miralles, Ramón ⁴

5. Instituto de Investigación para la Gestión de Zonas Costeras (IGIC), Universitat Politècnica de València (UPV), C/ Paranimf 1, 46730 Grau de Gandia, Valencia, Spain
6. Instituto Español de Oceanografía (IEO-CSIC), C. O. Murcia, C/ el Varadero 1, Lo Pagán, 30740 Murcia, Spain; Unidad Mixta de Investigación IEO-UPV, Tinglados Muelle Frutero, Grau de Gandía, 46730 Valencia, Spain
7. Instituto de Ciencia y Tecnología Animal, Universitat Politècnica de València (UPV), Camino de Vera s/n, 46022 Valencia, Spain
8. Institute of Telecommunications and Multimedia Applications (iTEAM), Universitat Politècnica de València (UPV), Camino de Vera s/n, 46022 Valencia, Spain

The Port of Cartagena is located in an area of high ecological value and is one of the busiest ports in Spain in terms of cargo handling. The project LIFEPortSounds aims to minimize the marine traffic impact on resident cetaceans by implementing under water noise mitigation measures. To evaluate the effectiveness of these actions, it is first necessary to understand the baseline status of cetacean populations in the area. We chose a BACI study (before-after-control-impact), designated the two study areas (impact and control) and selected three target species: *Globicephala melas*, *Tursiops truncatus* and *Stenella coeruleoalba*. To determine the initial status of the reference species, we collected both visual and acoustic data. Distance sampling transects were conducted from a boat and an airplane between 2022 and 2024, the data obtained was used to estimate abundance and to develop habitat use models using Generalized Additive Models (GAMs). Vocalizations were recorded using a towed array hydrophone during boat-based distance sampling surveys and an autonomous passive acoustic monitoring (PAM) device, deployed twice in 2022 and 2023 in each zone. Spectrograms were used to annotate whistle contours and identify species, extracting eight descriptors as input to a decision tree. A sound database catalog with 65 clips of vocalizations of 6 species has been created. Preliminary results suggest no significant differences in abundance nor acoustic behavior between the control and impact zones, as anticipated, given that mitigation measures have not yet been implemented. Establishing equivalence between the control and impact zones is essential for assessing changes following the application of remediation efforts. LIFEPortSounds seeks to achieve positive outcomes for resident cetaceans by mapping underwater noise from marine traffic, assessing cetacean presence and abundance, developing an underwater noise management tool, and implementing mitigation measures—results that can be replicated in other port areas.

AD-58. Longterm CPOD data indicate a stable situation of harbour porpoise (*Phocoena phocoena*) in the German Bight, North Sea

Rose, Armin ¹; Wahl, Veronika ²; Moick, Melissa ²; Schubert, Alexander ¹; Schultz, Marika ²; Freund, Anika ²; Michalik, Andreas ²; Braasch, Alexander ²; Diederichs, Ansgar ¹; Voß, Julika ¹

1. BioConsult SH GmbH & Co. KG, Schobüller Str. 36, D - 25813 Husum, Germany

2. IBL Umweltplanung GmbH, Bahnhofstr. 14a, D - 26122 Oldenburg, Germany

The increasing number of offshore wind farms (OWFs) in the German Bight, North Sea, has raised concerns about their long-term impact on the highly mobile harbour porpoise. This study analysed long-term trends in porpoise detection rates by using a Bayesian framework on passive acoustic monitoring data from 2011 to 2019, with some data extending to 2023 for specific subareas. Regarding overall trends, no overall significant trend in porpoise detection rates was observed on a yearly basis across the entire German Bight. Seasonally, positive trends or tendencies were noted in winter and spring, while summer and autumn remained stable. Trends, however, varied across five subareas. Negative trends or tendencies appeared in the Northwest (overall and winter) and Northeast (summer) of the German Bight, while a positive development was observed in the North (overall, spring and winter) and Southeast (overall, spring, summer and winter). The situation in the South remained largely unchanged. These findings suggest a partial shift in porpoise distribution within the German Bight. The North and Southeast subareas may have become more favourable, potentially due to food availability, particularly sandeels (Ammodytidae), a key prey species. This aligns with broader observations of a southward shift in harbour porpoise distribution across the North Sea over the past three decades.



AD-59. Habitat type – a driver behind harbour porpoise distribution around operational offshore wind farms?

Schultz, Marika ¹; Moick, Melissa ¹; Mercker, Moritz ²; Rose, Armin ³; Michalik, Andreas ¹; Schubert, Alexander ³; Diederichs, Ansgar ³; Voß, Julika ³; Freund, Anika ¹; Braasch, Alexander ¹; Wahl, Veronika ¹

1. IBL Umweltplanung
2. Bionum
3. BioConsult SH

Little is known about possible drivers behind the varying responses that were reported for harbour porpoises with respect to operational offshore wind farms (OWFs), such as attraction or avoidance. We hypothesise that, among other factors, the habitat an OWF is located in might play an important role in the distribution of harbour porpoise detections (detections) with spatial reference to OWF presence. In order to investigate this, we analysed a vast PAM dataset derived from 62 CPOD monitoring positions covering a total of 10 years of data and sampling 18 OWFs located in 5 different habitats within the German Bight. Habitat information was included into our data using “broad habitat types” and “other habitat types”, and combining those into one factor variable. CPOD data were cropped to 2.5 km around OWF borders and influenced periods from pile driving activities in adjacent OWFs were excluded. We used detection-positive 10-minute blocks per 5 days (DP10M/5d) as response variable and fitted GAMMs to our data. The main explanatory factor variable combined habitat type with spatial reference to OWF (within vs. in the vicinity of OWF). To our knowledge we are the first to show that OWF presence does not affect detections as much as the habitat type itself. Specifically, detections were significantly higher (posthoc tests) within OWFs than in the vicinity of OWFs for the habitat “offshore circalittoral sand”, and a trend in the same direction was found for the habitat “sandbanks”. For two habitat types, no significant differences were found with respect to OWF presence. While it is unclear which habitat trait (such as prey availability) might be responsible for the observed pattern, within the German Bight our findings point towards an attraction to OWFs throughout most habitats.



AD-60. Identification study of the bottlenose dolphin population in a fish farm of Almeria (Spain)

Caparrós, Castilla ¹

1. *The University of Girona*

Until now, the interaction between bottlenose dolphins (*Tursiops truncatus*) and fish farms has been studied, but not as much as other topics related to these species. This study focuses on a group of a specialized bottlenose dolphin population that visits very frequently the Aguadulce fish farm, located in Almeria (Spain). This population has not been fully identified or studied thoroughly before. The aim of this study was to identify individuals, study their seasonality, number of sightings in a year, age of the individuals, recaptures, marking level of individuals and lastly, their social networks that were studied using the programme UCINET. An identification catalogue has been made after analysing 7,602 photographs with the capture-recapture technique with which 82 bottlenose dolphin individuals have been identified in the area. Throughout the study, which focuses on the years 2020, 2021 and 2024 we have been able to observe that the dolphins are present all year round with an average of 8, 12 or 18 dolphins per sighting depending on the year. In addition, we have also been able to see how some dolphins come more frequently than others to the fish farm and how this has been a repeated behaviour for some individuals that have been coming for more than 17 years to the same place. The study suggest that most dolphins remain going to the fish farm recurrently over time. Finally, the groups, mainly consisting of adult individuals, form complex social networks of fusion-fission, so that the dolphins specialized in feeding in the fish farm have very close social ties. These results suggest that this population has learned to use these resources of feeding over the years, so good management of the population and its conservation is very important, since they frequent a highly anthropized area.



AD-61. Patterns and trends in cetacean occurrence along the Scottish Coast: insights from the WDC Shorewatch Programme

Rodríguez-Mendoza, Rebeca Paola ¹; Gutiérrez-Muñoz, Paula ²; Walters, Alice ³; Moscrop, Anna ³; Dyke, Katie ³; Steel, Emma ³; Palmer, Laura ³; Pierce, Graham ¹

1. Instituto de Investigaciones Marinas - Consejo Superior de Investigaciones Científicas (IIM-CSIC), 36208 Vigo, Spain
2. Instituto Español de Oceanografía - Consejo Superior de Investigaciones Científicas (IEO-CSIC), Centro Oceanográfico de Vigo, Vigo, Spain
3. Whale and Dolphin Conservation (WDC), Chippenham, United Kingdom

The Shorewatch Programme by Whale and Dolphin Conservation (WDC) engages trained community volunteers in monitoring coastal cetaceans in Scotland through standardised, effort-based watches. This study aimed to describe and quantify patterns and trends in the local and regional occurrence and relative abundance of cetaceans using Shorewatch data collected between 2012 and 2023 across the various Scottish Marine Regions (SMRs). In this period, 83 335 watches were conducted, totalling over 13 889 hours of effort, and 19 cetacean species were recorded. Generalised Additive Models (GAMs) were used to examine the occurrence of seven species: bottlenose dolphin (*Tursiops truncatus*), harbour porpoise (*Phocoena phocoena*), minke whale (*Balaenoptera acutorostrata*), Risso's dolphin (*Grampus griseus*), common dolphin (*Delphinus delphis*), humpback whale (*Megaptera novaeangliae*), and white-beaked dolphin (*Lagenorhynchus albirostris*). Covariates such as year, month, effort duration, visibility, and site characteristics informed the models. Key findings include a decline in bottlenose dolphin occurrence in the Moray Firth, possibly reflecting a southward distribution shift, and an increase in harbour porpoise occurrence, particularly in the Moray Firth and Forth and Tay regions. Minke whale sightings increased, peaking seasonally in June-July, with Tiumpán Head identified as a hotspot. Risso's dolphins displayed a seasonal peak in late summer, with occurrence increasing over the study period. Common dolphins showed an upward trend, with high probabilities of occurrence in the Outer Hebrides and West Highlands, peaking in summer and winter months. Humpback whale occurrence demonstrated an emerging upward trend, particularly in the Outer Hebrides. White-beaked dolphins peaked seasonally in June, with notable temporal fluctuations. This study highlights the value of citizen science in filling critical data gaps for cetacean monitoring, providing essential insights for conservation and management efforts, e.g. under the Marine Strategy Framework Directive (MSFD). These findings emphasise the need for sustained, broad-scale monitoring to support effective cetacean conservation in Scottish waters.



AD-62. Common and striped dolphins have distinct, but overlapping, habitats in Gouf of Capbreton

Gannier, Alexandre ¹; Gannier, Odile ¹; Boyer, Gilles ¹; Fleming, Anaïs ¹; Reichert, Catherine ¹; Gannier, Adrien ¹

1. Groupe de Recherche sur les Cétacés

Common (*Delphinus delphis*) and striped (*Stenella coeruleoalba*) dolphins jointly inhabit many regions worldwide, where they generally use distinct habitats. We studied cetaceans in the inner Gouf of Capbreton (longitude W < 2°) from 2021 to 2024 and obtained 139 cetaceans summer sightings during sailboat dedicated surveys, including 122 of common (n=96) or striped dolphins (n=26). Species were identified either by 100-m approach or by long distance photography (DSLR with 600 mm lens). Eight of these sightings were of mixed species groups. Common dolphin was almost the only species to wander inshore of 200 m isobath, 19 sightings (20% of total); 31% of the sightings were recorded in 200m-500m depth range (15% for *Stenella*) and 49% beyond 500m isobath depth range (78% for *Stenella*). Mean bottom depth for common dolphins was significantly lower than for striped dolphins: 502m (SD=259) against 715m (SD=213), one-tailed T-test p=0.5 .10-4. In the inner Gouf of Capbreton, 95% of small delphinid groups observed in water shallower than 200m were common dolphins, against 88% in water 200-500m deep, and 69% in water deeper than 500m. Main group activity was defined in a number of cases from acoustic and visual cues: striped dolphins were determined to be feeding in 61% of the cases, and common dolphins in 33%. Drone observation of mixed groups generally showed central sub-groups of calm common dolphins surrounded by smaller clusters of active striped dolphins. Group composition also showed differences: newborn calves were frequently observed in common dolphin schools (from mid-July), when none were detected in striped dolphins. Our results in the inner Gouf of Capbreton confirmed that striped dolphins are essentially oceanic animals, when common dolphins have higher affinity for upper slope and shelf waters, a situation commonly observed in regions where both species are abundant.



AD-63. Multi-scale habitat modelling reveals contractions of harbour porpoise distribution in the northeast Atlantic

Goh, Tiffany ¹; Giralt Paradell, Oriol ¹; Jessopp, Mark ¹; Rogan, Emer ²; Pirotta, Enrico ³

1. University College Cork/MaREI
2. University College Cork
3. CREEM, University of St Andrews

In the northeast Atlantic, large-scale changes in marine ecosystems are resulting in an ecological regime shift characterised by the degradation and loss of habitats, alterations to the food web, and, ultimately, the loss and redistribution of species. Given the complexity and scale of these environmental changes, there is a critical need to reliably detect and monitor changes in species' distribution. Here, we used a multi-scale modelling approach to identify the best spatio-temporal scales of oceanographic variables to model harbour porpoise (*Phocoena phocoena*) summer and winter distribution in Irish waters. Porpoise sightings data were collected during dedicated line-transect aerial surveys conducted during 2015-2017 and 2021-2023. Binary generalised additive models were used to assess the relationships between porpoise presence and oceanographic variables at different spatial (5, 20 and 40 km) and temporal (daily, monthly, and average across survey period) scales. A combined total of 67,651 km was surveyed, with 216 porpoise sightings recorded in summer and 118 sightings in winter. Important environmental predictors included sea surface temperature, sea surface height and chlorophyll-a. The predicted seasonal porpoise distributions revealed the Irish Sea to be an area of high importance across all years. Porpoises were also present in the coastal waters off the north, west and southeast of Ireland, particularly in the winter. However, models predicted a decline in the probability of occurrence and a contraction in spatial distribution for both seasons from 2015 to 2023. This result corroborates recent findings on the decline in harbour porpoise densities in Ireland's Special Areas of Conservation but also indicates that this pattern may be widespread to the broader Irish Atlantic. This poses a significant concern for the status of harbour porpoise in this region. Further studies should investigate the role of anthropogenic stressors that could be contributing to the decline of this species in Irish waters.

AD-64. Applying Bayesian preferential sampling models to assess cetacean spatial distribution from opportunistic sighting data

Fernández-Fernández, Diego ¹; Gutiérrez-Muñoz, Paula ¹; Conesa-Guillén, David ²; López-Quílez, Antonio ²; March, David ³; Pierce, Graham J. ⁴; Saavedra, Camilo ¹

1. Instituto Español de Oceanografía (IEO-CSIC), C.O. de Vigo, Vigo 36390, Spain
2. Statistics and Operations Research Department (VaBar), University of Valencia (UV), Valencia 46100, Spain
3. Cavanilles Institute of Biodiversity and Evolutionary Biology, University of Valencia, Valencia 46980, Spain 4. Centre for Ecology and Conservation, College of Life and Environmental Science, University of Exeter, Cornwall, United Kingdom.
4. Instituto de Investigaciones Marinas (IIM-CSIC), Vigo 36208, Spain

Cetacean populations in the Atlantic are exposed to various anthropogenic threats, including fisheries bycatch, chemical pollution, and acoustic disturbances. To evaluate the impact of these threats on cetacean populations, accurate distribution information is crucial. However, due to the high costs and logistic constraints associated with standardized sampling surveys, opportunistic sightings data are a useful additional source of information. These data are typically gathered through whale watching companies or citizen science programs, which can generate large amounts of data cheaply. However, the sampling process that determines both the searching effort and species detections are not independent (e.g., boat trips are conducted in locations and times to maximize sighting opportunities). To account for this bias, we constructed a Bayesian preferential sampling model using Integrated Nested Laplace Approximation (INLA), which was applied to sightings from the East Central Atlantic between 1993 and 2024, sourced from publicly available databases (OBIS, GBIF, and iNaturalist). We analysed sightings of three cetacean species: common dolphin (*Delphinus delphis*, $n = 26,073$), humpback whale (*Megaptera novaeangliae*, $n = 1,698$), and sperm whale, (*Physeter macrocephalus*, $n = 16,167$). Environmental variables were obtained from Copernicus Marine Service (e.g., sea surface temperature, salinity, mixed layer depth) and GEBCO (depth, slope). The model consists of two components: a Log-Cox Gaussian Process to model sampling intensity, and a binomial model to assess species presence in relation to the environmental covariates. Environmental variables had a relevant influence on the distribution of all three species, revealing notable spatio-temporal variability. The resulting predictive maps have several applications, including identifying areas of high conservation importance for these species. Furthermore, when combined with other data sources, such as fishing effort, marine traffic, or underwater noise, these maps can be used to perform quantitative risk assessments related to anthropogenic activities.



AD-65. 3D Oceanographic habitat modelling of fin whale (*Balaenoptera physalus*) in the Pelagos Sanctuary

Caria, Laura ¹; Tepsich, Paola ²; Moulins, Aurelie ²; Grossi, Francesca ³

1. DISTAV, University of Genoa, Genova, Italy
2. CIMA Research Foundation, via A. Magliotto 2, 17100 Savona, Italy NBFC, National Biodiversity Future Centre, 90133 Palermo, Italy
3. CIMA Research Foundation, via A. Magliotto 2, 17100 Savona, Italy

All creatures on the planet have a strong relationship with the environment and, because of this, climate change is having an increasingly pronounced impact on organisms, especially in the Mediterranean Sea. With the purpose of analyzing the correlation between changes in environmental variables and in cetacean distribution, habitat modelling techniques, such as SDMs, are very useful. In this work, data collected on board ferries within the FLT MED Network during 16 years of monitoring, from 2008 to 2023, along main shipping routes in the Pelagos Sanctuary were used, in order to investigate the oceanographic habitat of fin whale in this area, along the water column. This work tests the use of BRTs, an analytical tool that until now had found little use in studies of cetaceans, to investigate habitat selection of fin whales in the Ligurian Sea. Oceanographic variables (such as salinity, temperature, oxygen and pH) have been considered along three depth strata, to analyze species niche in superficial (0-200m), intermediate (200-600m) and deep (600-2000m) waters. Overall, 2055 sightings have been analyzed and different BRTs have been tested, resulting in the identification of some variables that better explain the distribution of fin whales than others: a strong role of pH in the deeper layer has been evidenced, specifically with 11.8% of relative influence, followed by surface salinity (7.55%) and temperature (4.86%). Our study finally pointed out that, especially since 2022, increasing temperatures and decreasing dissolved oxygen at the surface and pH at depth are leading fin whales to be more and more aggregated. From these results, habitat studies and distributional predictions in the Pelagos Sanctuary, as well as further investigation of variables in depth, could lead to a better understanding of the complex relationships between these organisms and the environment, which is increasingly subject to strong alterations.



AD-66. Modelling the distribution of humpback whales (*Megaptera novaeangliae*) in Greenland (2024)

Nørgaard, Nicoline ¹; Chambault, Philippine ²; Hansen, Rikke Guldborg ³; Olsen, Morten Tange ¹; Tervo, Outi ²

1. Globe Institute, University of Copenhagen, DK-1353 Copenhagen K, Denmark
2. Department of Mammals and Birds, Greenland Institute of Natural Resources, Greenland
3. Department of Ecoscience, Aarhus University

Identifying favorable habitat for cetaceans is crucial for wildlife management and conservation, and habitat modeling can help identify key areas for marine species. This study aims to determine the environmental factors influencing the distribution of humpback whales (*Megaptera novaeangliae*) in West and East Greenland, focusing on the potential changes in their habitat range due to climate change. We hypothesized to see a shift in humpback whale distribution (West and East Greenland) in relation to oceanographic and physiographic features. Sightings of humpback whales (n=176) collected from aerial surveys in 2015 and 2024, using standard distance line transect modelling, were coupled with environmental covariates to estimate their spatial distribution in Greenland. This was done with generalized additive models within Density Surface modeling (DSM). To identify the key covariates driving humpback whales' distribution, several combinations of covariates were tested within the DSM. Humpback whales' distribution was mostly driven by physiographic variables (bathymetry and distance to coast), and oceanographic features (chlorophyll a concentration and sea surface temperature). As climate change accelerates, understanding the environmental drivers of humpback whale distribution is critical for predicting future habitat distribution in the Arctic and better understand how this sub-Arctic species is going to behave with rising sea temperatures and the derivatives thereof. This study shows how environmental variables possibly influence feeding areas and northward limitations of humpback whales. Our findings also highlight the benefits of interdisciplinary research, where distance sampling and remote sensing can be combined to modelling species ecological niche.



AD-67. Trends in cetacean presence in the Pelagos Sanctuary

Costantini, Lara ¹; de Afonso Cerqueira e Miranda Ramos, Ana Beatriz ²; Grossi, Francesca ³; Moulins, Aurelie ^{3,4}; Tepsich, Paola ^{3,4}

1. Department of Biology, Viale Giuseppe Colombo, 3, 35131, University of Padova, Padova, Italy
2. Department of Biology, Campus de Santiago 3810-193, University of Aveiro, Aveiro, Portugal
3. CIMA Research Foundation, via A. Magliotto 2, 17100 Savona, Italy
4. National Biodiversity Future Center, Palermo 90133, Italy

Several National and international legislative frameworks have recognized cetaceans as suitable indicators of ecosystem health. For the MSFD, trends in cetacean presence and distribution are used to evaluate the Good Environmental Status. In this work we use data collected within FLT Med Network from 2008 to 2024 along different fixed transects crossing the Ligurian Sea, to evaluate cetacean presence trends in the offshore areas of Pelagos Sanctuary. Applying the methodology developed in Tepsich et al. 2020, a strip-transect analysis framework has been established and density index for the 7 cetacean species encountered have been computed, for the 3 reporting periods (2007-2012; 2013-2018; 2019-2024). Anomalous years have also been identified. Overall, 865 surveys have been performed accounting for over 5000 cetacean sightings. Results show a strong interannual variability for fin whales, striped dolphins and goose-beaked whales, while sperm whale presence has been rather constant along the survey period. Common dolphin, Risso's dolphin and long finned pilot whale presence was more occasional. Fin whales showed an increasing trend from 2008 to 2012, followed by a stable trend and a further increasing trend over the last period. For striped dolphins and sperm whales the general trend was found to be stable over the three periods, while goose-beaked whales are the only species showing a constant positive trend. Anomalous years have also been identified, specifically negative years were 2009 and 2014 for fin whales (2014 density index=0,03 versus a mean DI=0,34) and 2016 (2016 DI=0,7 versus a mean DI=1.4) for striped dolphins, while 2023 has been an anomalous positive year for fin whales (DI=0,8). No anomaly has been identified for sperm whales. Our results confirmed the effectiveness of the methodology for assessment of trends of species presence in offshore areas, highlighting the importance of a yearly monitoring program.



AD-68. Modeling the impact of dolphin morbillivirus epidemics on the western Mediterranean striped dolphin population

Ten, Sofía ¹; Dupont, Gates ²; Raga, Juan Antonio ¹; Aznar, Francisco Javier ¹

1. Marine Zoology Unit, Cavanilles Institute of Biodiversity and Evolutionary Biology, Universitat de València, Spain
2. Department of Ecology & Evolutionary Biology, Princeton University, USA

Mediterranean striped dolphins, *Stenella coeruleoalba*, have suffered two epidemics caused by dolphin morbillivirus (DMV) in the Mediterranean Sea in 1990 and 2007. A higher mortality rate, also associated with DMV, was detected along the coast of Valencia, western Mediterranean, in 2011. The population impact of these outbreaks remains unclear because abundance estimates are spatio-temporally sparse and the epidemiology of the virus is largely unknown. We develop a Susceptible-Infected-Recovered (SIR) epidemiological model to provide tentative estimates of the impact of DMV on the striped dolphin population off the Valencian coast for the first time. To account for the substantial uncertainty in the epidemiology of DMV, we compare two scenarios that differ in virus-induced mortality rate and duration of the infectious period. These scenarios lead to an estimated range of striped dolphin loss in the study area of approximately 25-70% for the 1990 epidemic, 6-40% for that in 2007, and 3-25% for the 2011 outbreak. Both scenarios clearly captured the core dynamics of the system: the greater severity of the first epidemic, the inter-epidemic time interval, and the abundance shifts expected from pod size estimates and visual surveys. The results show that a broad range of model input parameters can recover the observed trends in dolphin populations, emphasizing the need to obtain more data on DMV epidemiology and dolphin abundance for transitioning from a theoretical to a predictive model that can forecast the impact of future DMV outbreaks and inform conservation plans.



AD-69. Preliminary demographic data on the Mediterranean monk seal sub-population in the central Ionian Sea, Greece

Bundone, Luigi ¹; Panou, Alik ²

1. *Archipelagos - ambiente e sviluppo, Italy University Ca' Foscari of Venice*
2. *Archipelagos - environment and development*

Information regarding population dynamics, animal movements and home ranges is essential for effective species conservation. Systematic long-term monitoring is required to obtain this information and avoid inaccurate assessments, particularly for elusive and threatened species such as the Mediterranean monk seal (*Monachus monachus*). Current data on this species largely rely on extrapolations from pup counts in specific areas to estimate population size and on telemetry studies involving mainly rehabilitated individuals to assess movement patterns. To obtain reliable and low-biased population estimates, a long-term photo-identification project was launched in 2018, targeting the extensively studied Mediterranean monk seal sub-population in the central Ionian Sea in Greece. Data collection is based primarily on infrared cameras installed in marine caves at strategically selected sites, as well as on pup encounters while exchanging cameras, opportunistic seal encounters via citizen science, and seal strandings recorded by the authors or reported by others to the authorities. Marine cave monitoring is being conducted year-round, with pictures extracted from the cameras 2-3 times a year. Data analysis has so far focused on creating a reliable photo-identification catalogue of subadult and adult individuals - juveniles and pups will follow. Preliminary demographic results suggest a population size of approximately 40-50 individuals, with 28 subadult/adult seals identified so far: 13 females, 10 males, and 5 animals of undetermined gender and an annual birth rate of 7. The annual mortality rate is 2,86 suggesting a viable monk seal sub-population in the study area. The sub-population appears to be semi-closed, with animals exhibiting site fidelity to specific locations within the main area to a certain extent. However, changes in cave preferences over time and movements of seals within and beyond the core study area have also been recorded. Future statistical analysis will provide deeper insights and strengthen these preliminary findings as the study progresses.



AD-70. Deep diving cetaceans detected in the designated mining area of the Norwegian Sea during survey, August 2024

Rossi, Marion ¹; Lomas, Alexander C. ¹; Webber, Thomas ¹; Saalman, Franziska ²; Østfold, Oscar ³; Young, Kirsten F. ⁴

1. Biosciences, Faculty of Health and Life Sciences, University of Exeter, Exeter, United Kingdom
2. Greenpeace Germany, Hamburg, Germany
3. Greenpeace Norge, Myrens Verksted 3C, 5. etasje, 0476 Oslo, Norway
4. Biosciences, Faculty of Health and Life Sciences, University of Exeter, Exeter, United Kingdom, Greenpeace Research Laboratories, University of Exeter, Exeter, United Kingdom

The Norwegian Sea includes vast regions of deep-water geological structures like seamounts, ridges, abyssal plains, and trenches bounded by slopes, providing important habitat for deep diving cetaceans. The area also provides feeding habitat for many cetaceans and is a significant migration corridor for baleen whales. Some regions within the Norwegian Sea have been the first proposed licensing areas to undergo commercial deep-sea mining. Deep sea mining has the potential to cause disturbance to cetaceans. In August 2024, we conducted a visual-acoustic survey in the Norwegian Sea designated mining area. The survey was conducted using the SY Witness from Bergen, Norway, to Longyearbyen, Svalbard. A total of 206 hours of acoustic data were recorded, over ~2707 km. We recorded 42 acoustic encounters, of which 21 were also visually sighted. In total six species were recorded: sperm whales (*Physeter macrocephalus*) (22 acoustic encounters, eight sightings), white-beaked dolphins (*Lagenorhynchus albirostris*) (15 groups detected, 12 visually sighted), northern bottlenose whales (*Hyperoodon ampullatus*) (four groups detected acoustically), and killer whales (*Orcinus orca*) (two males visually and acoustically detected). Sperm whales were assumed to be foraging due to the presence of ‘creaks’ and were tracked where possible, with three unique individuals photo-identified. In addition, eight minke whales (*Balaenoptera acutorostrata*), one fin whale (*Balaenoptera physalus*) and one unidentified whale were also visually recorded. Sperm whales were detected along the track line and throughout the mining area. Detections of northern bottlenose whales were near ridges and seamounts east of Jan Mayen, a location that is known to be important habitat for this species and within the designated mining area. Our survey aims to complement those gathered by local researchers and provide additional information on the presence of cetaceans in a region that could be earmarked for future commercial deep-sea mining activities.



AD-71. Trends in cetacean sightings from Bardsey Island in Northwest Wales: insights from a long-term study (2001 – 2024)

Moss, Phoebe ¹; Green, Mick ¹; Simmonds, Mark P. ^{1,2}; Stansfield, Steven ^{1,3}; Eisfeld-Pierantonio, Sonja M. ⁴

1. Bardsey Marine Mammal Project, Cristin, Bardsey Island, Gwynedd, LL53 8DE
2. University of Bristol, Beacon House, Queens Rd, Bristol BS8 1QU
3. Field Observatory, Cristin, Bardsey Island, Gwynedd, LL53 8DE
4. Whale and Dolphin Conservation (WDC), Brookfield House, 38 St. Paul Street, Chippenham, SN 15 1LJ, UK.

The west coast of the United Kingdom is considered an important region for cetaceans in the North-East Atlantic. Bardsey Island, located off the Llŷn Peninsula in northwest Wales, lies within the Central Irish Sea Important Marine Mammal Area (IMMA) and two Special Areas of Conservation (SAC) for harbour porpoises (*Phocoena phocoena*) and bottlenose dolphins (*Tursiops truncatus*). The island has been a site of long-term cetacean monitoring since 2001, primarily focused on Risso's dolphins (*Grampus griseus*) regularly observed from shore. This study utilises data from 2001 to 2024, including 1896 hours of effort and 1433 cetacean sightings, to investigate trends in land-based cetacean sightings from Bardsey Island. Visual surveys employed a scan method from fixed locations during summer and autumn months. Data analysis excluded years with fewer than seven days of survey effort. A linear regression analysis revealed a significant decline in porpoise sightings (1107 in total) over time, despite increased conservation designations in the region, including the establishment of SACs in 2004 and 2019. Sporadic sightings of bottlenose dolphins (9 sightings) and common dolphins (*Delphinus delphis*) (5 sightings) were recorded over the 23 years, but the infrequency of these sightings suggests interspecific competitive displacement of porpoises was unlikely in this area. Sightings of Risso's dolphins (332 in total) displayed no significant trends over time, with the variance in sightings likely driven by other factors. Previous studies have linked sightings of these cetaceans to topographical and dynamic cyclic variables, with further research required into ecological and anthropogenic drivers. Notably, 18.98% of Risso's dolphin and 26.91% of harbour porpoise sightings included calves or juveniles, highlighting the potential value of the area for the reproductive success of both species. This study emphasises the importance of continuous, long-term cetacean monitoring to better understand populations and to assess the effectiveness of conservation measures.



AD-72. First photo-identification study of the sperm whale (*Physeter macrocephalus*) in the Aeolian archipelago and the Northern coast of Sicily (Southern Tyrrhenian Sea, Italy)

Di Paola, Agata Irene ¹; Gelippi, Michelle ¹; Blasi, Monica Francesca ¹

1. *Filicudi Wildlife Conservation, Stimpagnato Filicudi, 98055 Lipari (ME), Italy; info@filicudiconservation.com*

¹Photo-identification has been used to study sperm whales worldwide, but as it regards the Mediterranean Endangered population, no long-term photo-id studies are available from the Southern Tyrrhenian Sea. ²Here, sperm whale occurrence, group size, and type of encounters were investigated off the Aeolian archipelago (Southern Italy) by photo-id data collected between 2013-2024. Data obtained through dedicated boat surveys and recreational sailors' reports were used for the study. ³ During 58 sightings 125 sperm whales were encountered, 60 of which were photo-identified and catalogued. Only five individuals were re-sighted in later years or seasons. The mean group size was higher in summer, and encounters consisted mainly of solitary individuals (53.4%, n = 31) and aggregations of clustered often not-sexed individuals (23.5%, n = 8), but social units of females and calves were also encountered (8.6%, n = 5). ⁴ The low site fidelity and the type of group encountered suggest that the area could be interested by passages of young males in dispersal and host also social groups. ⁴ Photo-id data combined with acoustic surveys and enhanced age class analysis, as the matching of individuals with data from closer areas, could better define the ecological role of the area for the population.



AD-74. Winter foraging patterns and habitat use of deep-diving cetaceans in the Azores: implications for conservation and management

Onieva, Carmen ¹; Barreiros, João Pedro ²; Barcelos, Luis ²; Visser, Fleur ³

1. *Master in Management and Conservation of Nature, University of Azores.*
2. *Azorean Biodiversity Group & cE3c - Center for Ecology, Evolution and Environmental Changes & CHANGE - Global Change and Sustainability Institute, Universidade dos Açores - Faculdade de Ciências Agrárias e do Ambiente (FCAA), 9700-042 Angra do Heroísmo.*
3. *Royal Netherlands Institute for Sea Research*

The distribution and habitat use of cetaceans in the Azores remains insufficiently understood, particularly outside of the summer season. This issue is even more pronounced for deep-diving cetaceans, which are difficult to study due to their elusive behaviour and foraging in deep waters. Understanding how these species relate to their habitat and their annual distribution patterns is critical for developing effective conservation and management strategies. The aim of this study is to identify the foraging areas of three deep-diving cetacean species along the southwest coast of Terceira, Azores, across the year. Shore-based observations were conducted from June 2024 to March 2025, covering an area of nearly 1200 km². Occasional boat-based observations were also carried out. The species studied were sperm whale (*Physeter macrocephalus*), Risso's dolphin (*Grampus griseus*), and beaked whales (*Mesoplodon* spp.). Preliminary results highlight that sperm whales and Risso's dolphins are observed year-round, with foraging behaviour observed consistently in the same areas across the different seasons. Sperm whales show a preference for areas around the 1000-meter depth contour, while Risso's dolphins are more dispersed between 500- and 1000-meters deep waters. Interestingly, similarities in habitat use between summer and winter suggest that prey distribution, or at least location of habitat suitable for foraging, remains relatively comparable throughout the year. Beaked whales, on the other hand, were only observed during summer, predominantly in waters deeper than 1000 meters. These findings, particularly the first winter data collected in this area, provide valuable insights into the year-round distribution, habitat use, and foraging behaviours of deep-diving cetaceans. The observed patterns underscore the ecological importance of the waters surrounding Terceira and contribute critical information for conservation strategies aimed at protecting these species and their habitats.



AD-75. Environmental predictors of bottlenose dolphin (*Tursiops truncatus*) abundance in the Algarve, Portugal

Vizeu Pinheiro, Margarida ¹; Rogan, Emer ¹; Cid, André ²; Quirin, Alicia ²; Estrela, Guilherme ²; Castro, Joana ³; O. Borges, Francisco ³

1. School of Biological, Earth and Environmental Sciences, Department of Zoology and Ecology, University College Cork, Cork, Ireland.
2. AIMM – Associação para Investigação do Meio Marinho, Lisboa, Portugal.
3. AIMM – Associação para Investigação do Meio Marinho, Lisboa, Portugal. MARE – Marine and Environmental Sciences Centre / ARNET - Aquatic Research Network, Universidade de Lisboa, Cascais, Portugal.

Bottlenose dolphins (*Tursiops truncatus*) are a keystone species and vital bioindicators of marine ecosystem health. In southern Portugal's Algarve region, where they are the second most frequently observed cetacean, the environmental factors influencing their abundance remain insufficiently understood. This study analysed nine years (2015–2023) of sighting data (n = 13,910 individuals observed across 1,097 sightings), gathered through platforms of opportunity and a dedicated research vessel, to investigate the relationships between monthly dolphin abundance and two key predictors: sea surface temperature (SST) and chlorophyll-a concentration (Chl-a). Using ecological modelling (Generalized Additive Models and Generalized Linear Mixed Models), their effect on dolphins' monthly abundance rates was assessed across four age classes: adults, juveniles, calves, and neonates. The results showed a positive association between Chl-a and adult abundance, while SST positively influenced neonates but negatively correlated with adults and juveniles; suggesting that prey availability, mediated by Chl-a, and thermal regulation driven by SST changes, may be key factors shaping population dynamics. Warmer waters, likely acting as a thermal barrier, reducing the presence of older dolphins, while creating a thermal 'cushion' for neonates that boosts their abundance and survival prospects. These findings highlight the Algarve's potential role as a critical breeding and nursery ground for this species, offering essential age-specific insights that may help strengthen the conservation measures at the current local Site of Community Importance (SCI), designated in 2019 to protect Annex II species, including the bottlenose dolphin.



AD-76. Occurrence of *Kogia* spp. in Madeira Archipelago

Ferreira, Rita ¹; Moura, Filipe ²; Thake, Paula ³; Alves, Filipe ¹

1. MARE-Madeira/ARDITI
2. H2O Madeira
3. Lobosonda Madeira Whale Watching

Pygmy (*Kogia breviceps*) and dwarf sperm whales (*K. sima*) are among the least known cetacean species despite their global distribution. Although they have overlapping ranges, pygmy sperm whales associate more with temperate waters, while dwarf sperm whales prefer more tropical and subtropical waters. Their elusive behaviour on the surface, with little to no movement, no visible blow and diving without tail fluking, makes them relatively inconspicuous except in very calm seas. This and the high morphological resemblances between both species make at-sea observations challenging. Oceanic islands, such as the Madeira Archipelago (Eastern North Atlantic), may constitute suitable habitats for these species due to their surrounding deep waters and abyssal plains, where they forage. However, little information exists in this area of Macaronesia, where both species are confirmed. A dataset of photos and sightings from whale-watching companies operating year-round was compiled from 2005 to 2024, comprising 53 events: 15 photographic events (11 confirmed as *K. breviceps*, two as *K. sima* and two as unidentified *Kogia*) and 38 sightings (32 visually confirmed as *K. breviceps* and six as unidentified *Kogia*). *Kogia* spp. were recorded from April until December, with a high peak in June and July, with group size varying from one to six individuals (mean + SD = 1.8 ± 1.2 individuals). This agrees with recent studies from the neighbouring archipelagos of the Azores and Canaries, which indicate that *Kogia* spp. use these waters regularly. The low number of records registered along the 20-year dataset can be due to the species' low abundance and/or their elusive behaviour. Although classified as "Least Concern" by the IUCN, evaluating the species' population trend and conservation status throughout their range is crucial.

AD-77. Seasonal and interannual variation of common dolphin's densities in Portuguese waters

Martins, Miguel ^{1,2}; Fernandéz, Marc ³; Marçalo, Ana ⁴; Oliveira, Nuno ⁵; Marques, Tiago ^{6,7}

1. Centro de Estatística e Aplicações da Universidade de Lisboa (CEAUL), Faculdade de Ciências, Universidade de Lisboa, Portugal
2. AIMM - Associação para a Investigação do Meio Marinho, Rua Maestro Fred. Freitas N 15-1, 1500-399 Lisboa, Portugal
3. MARE – Marine and Environmental Sciences Centre, ARNET – Aquatic Research Network, Regional Agency for the Development of Research, Technology and Innovation (ARDITI), Funchal, Madeira, Portugal University of Madeira, Funchal, Portugal
4. Centre of Marine Sciences (CCMAR), University of the Algarve, Faro, Portugal
5. Sociedade Portuguesa para o Estudo das Aves – SPEA, Marine Conservation Department, Lisboa, Portugal
6. Departamento de Biologia Animal, Centro de Estatística e Aplicações, Faculdade de Ciências da Universidade de Lisboa, Portugal
7. Centre for Research into Ecological and Environmental Modelling, The Observatory, University of St Andrews, St Andrews, KY16 9LZ, Scotland

Modelling a species ecology and abundance provides important insights into its habitat preferences, population trends and distribution. This can be used to inform conservation efforts, highlighting populations at risk of extinction and regions in need of protection. Here, we studied how environmental factors relate to common dolphin's (*Delphinus delphis*) densities in the waters off mainland Portugal. We analyzed an opportunistic dataset collected using European Seabirds At Sea (ESAS) methodology with distance sampling, spanning from 2004 to 2020. There were 1151 sightings of common dolphins, 737 of which were during effort. Detection functions were fitted to model the dolphin's detectability as a function of the distance to the track line. We used smooths of static (depth, slope, and distance to the coast, 200m and 1000m isobaths) and dynamic (sea surface temperature, salinity, chlorophyll-a concentration with and without a time lag, zooplankton, and sardine biomass) environmental factors, relating them to counts corrected for detectability and survey effort, to fit habitat-based Density Surface Models. We then predicted and mapped common dolphin densities seasonally (winter, spring, summer autumn) throughout the sample years. The results show how different environment variables relate to dynamic common dolphin densities. In general, common dolphins had higher densities in coastal environments, especially during the summer due to high productivity and lower sea surface temperature in shelf waters, associated with seasonal upwelling. During the summer, there were predicted local peaks in common dolphin densities, in areas with high zooplankton concentration. In the other seasons, its range expands to more offshore waters, with less local density peaks. The interannual variation of this species' densities is mostly explained by the annual sardine biomass. Overall, this brings important insights into this species conservation and potential impacts from anthropogenic activities, such as climate change and overfishing.



AD-78. Where are the Minkes? Influence of present and future environmental conditions on the abundance and distribution of the common minke whale (*Balaenoptera acutorostrata*)

Rampinini, Cristina ^{1,2}

1. AIMM – Associação para a Investigação do Meio Marinho, Rua Maestro Frederico de Freitas N15-1º, 1500-399 Lisboa, Portugal
2. Università degli Studi di Milano-Bicocca, Piazza dell'Ateneo Nuovo, 1 - 20126, Milano, Italy.

Marine climate change presents an everlasting threat to the ocean system, and impacts can already be observed in many species. The common minke whale (*Balaenoptera acutorostrata*) is a key species in global ocean food webs, however very little is known regarding the potential for changing conditions to impact whale stocks and their future distribution. The present study explores the minke whale population occurring in the Algarve (South of Portugal) and assesses how environmental predictors – i.e., sea surface temperature (SST) and chlorophyll-a concentration (Chl-a); can potentially influence its abundance, using a time-series of 9 years of sighting data (from 2015 to 2023). At the same time, Species Distribution Models project habitat suitability across different time frames (i.e., 2030, 2040, 2050) and under four different Shared Socioeconomic Pathways (i.e., SSP1-1.9, 1-2.6, 4-6.0, and 5-8.5; CMIP6). These projections provide a better understanding of the repercussions of climate change in the future distribution of this species within an area of the North-Eastern Atlantic. The results show a relatively small population (~44 individuals), where most individuals are re-sighted various times. Both, SST and Chl-a were shown to influence the species' abundance and habitat suitability strongly. Due to changing conditions, future projections suggest a likely range shift over time towards higher latitudes. These findings enhance our understanding of how environmental factors play a critical role in predicting future behaviors of the species and protecting their habitats.



AD-79. Citizen-science monitoring of dolphin species in the Tagus estuary: insights into urban marine conservation in Portugal

Rachinas-Lopes, Patrícia ¹; Erber, Claudia ²; Henriques, Ana Catarina ³; dos Santos, Manuel Eduardo ²

1. MARE—Marine and Environmental Sciences Centre/ARTNET—Aquatic Research Network, Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal
2. MARE—Marine and Environmental Sciences Centre/ARTNET—Aquatic Research Network, Ispa—Instituto Universitário, 1149-041 Lisboa, Portugal
3. ANP|WWF - AUDAX - Labs. ISCTE-IUL, 1600-312 Lisboa, Portugal

This study presents a citizen science initiative conducted in the Tagus River estuary, Lisbon, Portugal, to monitor dolphin species and promote conservation awareness. The Tagus estuary, one of Europe's largest and most productive estuaries, is surrounded by a densely populated urban area and hosts the Lisbon Port, an area of significant human activity. Despite historical informal reports of dolphin sightings, systematic monitoring efforts only began in 2022 with the launch of a land-based observation program in the lower section of the estuary to collect information about these occurrences regularly, the “Observatório Golfinhos no Tejo”. This project aims to engage local volunteers in increasing knowledge of cetacean occurrence and advancing marine conservation efforts in this important urbanized ecosystem. The project trained more than 60 volunteers in marine mammal observation techniques, including species identification and behavioural assessment, using tools such as telescopes and binoculars. Volunteers also evaluated dolphins’ reactions to tour boats, adding a critical layer to understanding human impact on local populations. From March 2022 to December 2024, the program conducted 2096 hours of effort over 350 days, resulting in detailed records of dolphin sightings. Short-beaked common dolphins (*Delphinus delphis*) accounted for 75% of observations, followed by common bottlenose dolphins (*Tursiops truncatus*, 8.5%) and harbour porpoises (*Phocoena phocoena*, 11%), with the remaining percentage as non-identified. The data collected resulted in various master’s theses and one scientific paper so far. These projects explored habitat use, the impact of tourism activities, and other topics related to these transient species. Beyond data collection, this initiative fostered public engagement, particularly among young students, empowering them to participate in marine conservation efforts.

AD-80. Results of the study of the western gray whale population in the Piltun Lagoon area (Sakhalin Island, Russia) in 2014–2024

Koroleva, Anastasia ¹; Burdin, Alexander ²

1. Lomonosov Moscow State University, Russia
2. Kamchatka Branch of PGI FEB RAS (Pacific Geographical Institute), Russia

Every year, endangered western gray whale population (*Eschrichtius robustus*) in the summer-autumn period comes to the waters of the north-eastern coast of Sakhalin Island in the Sea of Okhotsk to feed. The Piltun Lagoon area (Sakhalin Island) is the main feeding area for females and calves. This area overlaps with oil and gas production, raising concerns about survival and recovery of the western population. Since 1995 scientists have been conducting long-term monitoring project (RGWP), using the photo-identification method to identify whales and create the Photo ID catalog of this population. The purpose of this work is to analyze the dynamics of the number of gray whales in the feeding area, to identify trends and to hypothesize the factors influencing population fluctuations. During the period of 2014–2024, 454 unique gray whales were identified, and 145 whales identified in 10 years were new (31.9%). The number of gray whales in the feeding area contains interannual fluctuations. During the study period 2014–2024, the maximum number of whales was observed in 2014 ($n=78$), and the minimum in 2022 ($n=7$). In the first five-year period, there is a trend towards a noticeable decrease in the number of whales in the feeding area, starting from 78 individuals in 2014, ending with 23 individuals in 2018, the median was 56 ($\pm SD=20.2$). In subsequent years from 2019–2024, the number of whales shows extremely unstable dynamics, characterized by significant declines and subsequent recovery. In 2019–2021, there is a tendency towards reasonable fluctuations, median 42 ($\pm SD=6.98$). In 2022, the number falls catastrophically ($n=7$); in the subsequent years 2023–2024, a recovery period began, first to 19 individuals (2023), and then to 42 (2024). During the monitoring period of all whales encountered, mother-calf pairs ranged from 21% (2016) to 84% (2023). The number of mother-calf pairs also undergoes interannual fluctuations. In 2014, 9 pairs were recorded, then in 2018 the number had decreased by half - to 5 pairs (median was 7, $\pm SD = 1.6$). In the period 2019–2024, the dynamics became more unstable, there were an increase in the number of couples in 2019 ($n=20$) and 2024 ($n=17$), and a critical decline in 2022 ($n=1$), the median was 11 ($\pm SD = 7$). Correlation coefficient of Spearman ($r = 0.39$) indicates a weak positive dependence between the total number of whales and the number of mother-calf pairs, which indicates that in addition to the size of the population itself, there are other factors influencing the number of mother-calf pairs. Fluctuations in the size of the western gray whale population may be associated with the depletion of benthos, which does not have time to recover, and also with anthropogenic pressure in the region. Along with this, in recent years, whales have begun to find new feeding grounds, in particular, off the coast of Kamchatka, which may affect their numbers in their usual habitats. Studying the



population dynamics of gray whales in feeding areas is necessary to assess the status of their population and develop effective conservation measures.

AD-81. Encounter rates and habitat use of common bottlenose dolphins in Malta's coastal waters

Soster, Francesca ¹; Awbery, Tim ²; Verité, Nina ³; Zammit, Timothy ³; Terribile, Kimberly ¹

1. Malta College of Arts Science & Technology (MCAST), Triq Kordin, Paola, PLA 9032, Malta
2. Scottish Association for Marine Science (SAMS), Oban PA37 1QA, United Kingdom
3. Discover the Blu, 76 Triq il-Lampuki, San Pawl il-Baħar SPB 3061, Malta

Previous research on common bottlenose dolphins (*Tursiops truncatus*) in Malta has primarily focused on their possible association with the location of aquaculture sites. However, increasing tourism and media coverage have drawn attention to a rising number of sightings in areas beyond these sites, suggesting the ecological importance of Malta's coastal habitats for the species. This pilot study aims to demonstrate the presence of bottlenose dolphins in the Special Area of Conservation MT0000105, with a focus on habitat use within and beyond aquaculture sites. During 17 opportunistic vessel-based surveys conducted between June and September 2024, a total of 20 groups and 96 individuals were recorded over 484.80 km of effort. Their predominant activity was assessed during focal follows and 1924 photos were collected for photo-identification. This resulted in an encounter rate of 4.12 groups and 19.8 individuals per 100 km. Group sizes ranged from 1 to 10 individuals, with a mean of 4.7 (SE ± 0.56). Juveniles, calves, and newborns constituted 12.8, 7.4 and 6.4% of the observed population, respectively. Behavioural observations revealed a significant association between dolphin behaviour and the presence or absence of aquaculture sites (Fisher's Exact Test, $p < 0.001$). Feeding was observed both near aquaculture sites (93.1%) and in non-aquaculture areas (37.5%), with the latter supporting a wider range of behaviours, including resting (4.2%), socialising (20.8%), and traveling (37.5%). Photo-identification further highlighted high site fidelity, with 14 of the 17 identified individuals being resighted. These initial results provide clear evidence of the regular presence of dolphins in the region during the summer months, highlighting its ecological importance and the complementary roles of both aquaculture and non-aquaculture sites in shaping their habitat use. Conservation strategies should prioritise protecting the habitat critical for the species' survival in Malta, extending beyond their association with aquaculture sites.

AD-82. Humpback whale – breaking news

Chosson, Valerie ¹; Conne, Arnaud ²; Wyss, Virginie ²; Jam, Beatrice ³; Suarez, Pedro López ⁴; Jóhannesdóttir, Jasmín Luana ¹; Samuelson, Hedda ⁵; Sigurðsson, Guðjón Már ¹; Simon, Malene ⁶; Lubansky, Tanya ⁵; Wenzel, Frederick W ⁵; Jones, Lindsey S. ⁵

1. *Marine and Freshwater Research Institute, Hafnarfjörður, Iceland*
2. *ATLAS EXPEDITIONS Suisse.*
3. *12. Swiss Whale Society, Astano, Switzerland*
4. *15. Bios CV, Sal-Rei, Boa Vista, Republic of Cape Verde*
5. *Allied Whale, College of the Atlantic, Bar Harbor, Maine, USA*
6. *Greenland Climate Research Centre, Greenland Institute of Natural Resources, Nuuk, Greenland*

In the North Atlantic, humpback whales (*Megaptera novaeangliae*) undertake annual migration from tropical breeding grounds to Arctic and sub-Arctic feeding grounds. In 1992-1993 the Year of the North Atlantic Hump-back (YoNAH) project united the scientific community of the North Atlantic basin to extensively study the humpback whale population dynamic throughout the North Atlantic Ocean. Among other projects, a photo-identification effort was engaged to create the baseline of the North Atlantic Humpback Whale Catalog (NAHWC). Since 1972, more than 12,000 individuals have been identified via ventral fluke image. Based on these historic records, humpback whales from Cabo Verde Islands (CVI) migrate exclusively to the Northeast Atlantic feeding grounds (Iceland and Norway). No observation of humpback whales from that breeding aggregation has ever been reported in any Northwestern Atlantic feeding grounds (Gulf of Maine, Canada, and West Greenland). In 2021, the first connection between the CVI breeding population and the Northwestern Atlantic feeding ground off the coast of West Greenland was documented. Since then, three additional individuals of the CVI population have been photographed in this feeding ground where a subsistence hunt occurs. This drastic increase in interconnections between those two areas (+300%) raises concerns about potential risks to the endangered CVI population. It is worth mentioning that each of the feeding ground sightings were recorded during two opportunistic surveys (2021 and 2023) highlighting the need for further investigations in understudied areas. Rugged landscapes, difficult environmental conditions and a lack of qualified observers make routine surveys challenging, but an increased effort could reveal undocumented groups or trends. However, the possibility of a “new norm” emerging cannot be ruled out. This makes it essential to closely monitor this connectivity and expand efforts to better understand the West Greenland feeding aggregation and address potential conservation challenges of the CVI humpback whales.



AD-83. Report of a Bryde's whale (*Balaenoptera edeni*) offshore Lisbon waters

Quinta, Martim ¹; Quinta, Luís ²; Varanda, Vasco ²

1. FCUL, Faculdade de Ciências da Universidade de Lisboa Feathers & Scales – Bird watching/Dolphin watching, Lisboa, Portugal
2. Feathers & Scales – Bird watching/Dolphin watching, Lisboa, Portugal

Bryde's whales (*Balaenoptera edeni*) are known for their tropical to subtropical distribution around the globe between 40°S and 40°N. In the Atlantic, the northern limit described to the west is the Chesapeake Bay in the USA, to the center is the Azores and to the east is the Algarve region in continental Portugal. Despite this, little is known about the elusive occurrence of this species in the mainland of the latter country. This study seeks to describe the encounter with an individual Bryde's whale in two moments off the Lisbon region, between Cabo da Roca and Cabo Espichel, Portugal. Besides recording the location and date of both occurrences, photographic evidence was collected, allowing for species identification and confirming that the same individual was resighted. The data was obtained during dolphin and whale watching tours, on board of a commercial dolphin-watching vessel. The first sighting was on August 27, 2024. In the following month, on September 22, it was seen for the second time. On both days, this individual was observed in a feeding frenzy of sardines (*Sardina pilchardus*) with common dolphins (*Delphinus delphis*) and seabirds, in the Lisbon canyon area, SW of Fonte da Telha. It is known that some whales of this species move further north, to mid-latitudes, during the summer. This is the first record of this species in the literature for the Lisbon region and the northernmost live sighting to the eastern Atlantic to date. The present work reveals the potential for studying cetaceans in this area and contributes to the knowledge of the geographic range of this species.



AD-84. Modelling the influence of environmental factors on the acoustic presence of blue whale populations in the Southern Indian Ocean

Michel, Mathilde ¹; Algave, Baptiste ²; Olmos, Maxime ³; Torterotot, Maëlle ¹; Virgili, Auriane ⁴; Martin-Marin, Salomé ¹; Royer, Jean-Yves ⁵; Samaran, Flore ¹

1. ENSTA, IPP, CNRS Lab-STICC, Brest, 29200, France
2. Université Bretagne Sud, CNRS Lab-STICC, Vannes, 56000, France
3. DECOD, Institut Agro, Ifremer, INRAE, Plouzane, 29280, France
4. Share the Ocean, Larmor-Baden, 56400, France
5. Geo-Ocean, CNRS, UBO, Ifremer, Plouzane, 29280, France

Understanding the relationships between blue whale populations and their environment is crucial for effective conservation. Specially, Blue whale (*Balaenoptera musculus*) populations in the southern hemisphere have been severely depleted by previous extensive commercial whaling. A good understanding of their spatio-temporal distribution is needed to provide conservation advices in order to protect critical blue whale habitats in a rapidly changing ocean. This study investigates the seasonal spatiotemporal distribution of three acoustic populations of blue whales—Antarctic blue whales (*Balaenoptera musculus intermedia*, ANT BW) and pygmy blue whales (*B. musculus breviceauda*) from the Southeast (SEIO PBW) and Southwest Indian Ocean (SWIO PBW)—using 13 years of acoustic recordings from 10 sites in the southwest Indian Ocean. Using generalized additive models (GAMs) and empirical orthogonal functions (EOFs), we identified key relationships between acoustic presence and environmental variables. ANT BW activity was strongly associated with low sea surface temperatures, high chlorophyll-a concentrations, and extensive sea-ice cover, primarily during the austral winter and spring. In contrast, SEIO and SWIO PBW populations displayed peak activity in temperate waters (12–15°C) with intermediate chlorophyll-a concentrations, revealing distinct ecological niches. Three critical habitats were identified in the Southern Indian Ocean: ¹ Madagascar, which serves as a significant during austral winter resting area; ² the Kerguelen Plateau, an essential austral summer and fall habitat characterized by high primary productivity, that supports both feeding and resting; and ³ an overlap zone for SEIO and SWIO PBW populations in austral summer in the Kerguelen Plateau, suggesting possible interactions such as hybridization or competition. Our approach combines the flexibility of GAMs with the dimensionality-reduction power of EOFs. These methods, coupled with the extensive spatial and temporal scales of the dataset, provide novel insights into the migratory patterns, habitat use, and ecological drivers of blue whale distributions.

AD-85. Ferries for science: monitoring cetaceans in the Western Mediterranean Sea

Garcia-Garin, Odei ¹; Gazo, Manel ²; Fernández-Suárez, Laura ²; Guitart, Mar ²; Martínez, Arnau ²; Piquer, Iván ²; Romero, Timur ²; Arcangeli, Antonella ³; Vighi, Morgana ²

1. *Institute of Aquatic Ecology (IEA), Universitat de Girona; Girona (Spain) Institute of Biodiversity Research (IRBio) and Department of Evolutionary Biology, Ecology and Environmental Sciences, Universitat de Barcelona; Barcelona (Spain)*
2. *Institute of Biodiversity Research (IRBio) and Department of Evolutionary Biology, Ecology and Environmental Sciences, Universitat de Barcelona; Barcelona (Spain)*
3. *ISPRA, Via Brancati 48, 00144 Rome, Italy*

The Mediterranean Sea is among the most polluted marine regions globally, yet it hosts several threatened species, including sea turtles and cetaceans. Numerous monitoring programmes operate across the basin to estimate the abundance, distribution, and trends of these populations. The Fixed Line Transect (FLT) Mediterranean Network brings together international research organisations (e.g., universities and NGOs) to systematically monitor marine megafauna (i.e., cetaceans, sea turtles, and seabirds) and associated threats, such as marine litter, using passenger ferries. This study presents findings from the transboundary fixed transect recently established in November 2018 in the Western Mediterranean Sea along the Barcelona-Tangier-Barcelona route. Implemented in collaboration with the Grimaldi Lines (2018-2020) and GNV (2023 onwards) companies, this transect spans approximately 1,200 nautical miles round trip and is completed within four days. Notably, this route traverses the Mediterranean Cetacean Migration Corridor, a critical habitat recently designated as a Particularly Sensitive Species Area. 15 and 12 surveys were conducted, respectively, between September 2018 and February 2020 and between May 2023 and May 2024. In the first period, 6,885.8 linear Kms were covered under favourable conditions (Beaufort scale ≤ 3), and sightings of 107 striped dolphins (*Stenella coeruleoalba*), 15 common dolphins (*Delphinus delphis*), 15 Risso's dolphins (*Grampus griseus*), 12 long-finned pilot whales (*Globicephala melas*), 4 bottlenose dolphins (*Tursiops truncatus*), 2 fin whales (*Balaenoptera physalus*), and 1 sperm whale (*Physeter macrocephalus*) were recorded. In the second period, 7,884 linear Kms were covered and sightings of 156 striped dolphins, 58 common dolphins, 29 bottlenose dolphins, 16 long-finned pilot whales, 11 Risso's dolphins, 8 Cuvier's beaked whales (*Ziphius cavirostris*), 2 fin whales, and 2 sperm whales were recorded. These results contribute to fill existing gaps regarding cetacean distribution and trends in this region. Such information is vital for the development of effective conservation strategies and mitigation measures in the Western Mediterranean Sea, a region under significant anthropogenic pressure.



Anatomy and Physiology



AP-01. From archives to anatomy: investigating historical body size changes in harbour porpoises

Rahman, Shirin N. ¹; Sabin, Richard ²; Timmons, Zena ³; Langeveld, Bram ⁴; Speed, Garrett ⁵; IJsseldijk, Lonneke ⁶; Jarochowska, Emilia ¹

1. *Department of Earth Sciences, Utrecht University, Netherlands*
2. *The Natural History Museum, London, UK*
3. *National Museums Scotland, Edinburgh, UK*
4. *The Natural History Museum, Rotterdam, Netherlands*
5. *Faculty of Geosciences, Utrecht University, Netherlands*
6. *Department of Biomolecular Health Sciences, Utrecht University, Netherlands*

Across species, body size plays a critical role in life-history events such as reproduction. Shifts in species body size over time can indicate changes in ecology, physiology and stressors, ultimately influencing population structures. While baleen whales have been observed to shrink due to anthropogenic stressors such as whaling and climate change, such data for toothed whales remains scarce. Here, we analyze skulls ($N = 27$) from harbour porpoises (*Phocoena phocoena*) housed in the Natural History Museum in London, ranging in collection dates from 1846 until 1989. By measuring the maxillae, rostrum and condylobasal lengths, as well as the width of the occipital condyles, we aim to assess whether skull sizes have decreased over time. Our results show a significant decrease in condylobasal lengths over time (p -value: 0.0256), which could be indicative of a decrease in total body size over the investigated 143-year time span.

AP-02. Morphophysiological alterations in the muscle of *Stenella coeruleoalba* associated with decreased body condition

Iglesias Basanta, Andrea ¹; Sierra, Eva¹; Arbelo, Manuel¹; Arregui-Gil, Manuel¹; García-Álvarez; Natalia²; Iglesias-González, Claudia¹; Rivero, Miguel¹; Fernández, Antonio¹; Bernaldo de Quirós, Yara¹

1. *Veterinary Histology and Pathology, Atlantic Center for Cetacean Research (CAIC). University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC). Trasmontaña s/n, 35413, Arucas, Canary Islands, Spain.*
2. *Division of Histology and Veterinary Pathology, Animal Health Department, Veterinary School, University of León, Spain.*

The deterioration of body condition (BC) in cetaceans is associated with a reduction in skeletal muscle mass. Skeletal muscle comprises two primary fiber types: type I, smaller oxidative fibers with slow contraction and fatigue resistance, and type II, larger glycolytic fibers with fast contraction and greater fatigue susceptibility. While muscle fiber changes in humans have been linked to disuse, aging, starvation, or cachexia, the relationship between muscle fiber alterations and BC decline in cetaceans remains unclear. This study aimed to quantify and measure type I and type II muscle fibers in the Longissimus dorsi muscle (the main locomotor muscle) of subadult and adult *Stenella coeruleoalba*, correlating these findings with BC index (mass/length²). Muscle samples were collected from 20 fresh dead stranded dolphins in the Canary Islands (2000-2023). Fiber muscles were immunohistochemically characterized and measured and sized with ImageJ software (perimeter, area, and aspect ratio). Statistical analyses (T-test and regression analyses with BC) were performed using GraphPad Prism. Type II fibers were more abundant (52.8%, $P<0.001$) and had larger perimeter (60.74%; $P<0.001$) and area (42.54%; $P<0.001$) than type I fibers. As BC declined, the proportion of type II fibers increased ($R^2=0.392$, $P=0.003$), while that of type I fibers decreased ($R^2=0.398$, $P=0.003$). No significant relationships between fiber size and BC were found, and aging or sex did not influence these results. The increase in type II fibers and decrease in type I fibers may reflect an adaptive response to conserve energy, considering the higher oxygen demand of type I fibers. However, the decrease in type I fibers could compromise swimming endurance and fitness. Understanding these changes is critical for assessing how environmental and anthropogenic stressors, such as climate change, overfishing, and disease), impact cetacean populations. Further research should explore the broader ecological and physiological consequences of muscle mass reduction in cetaceans.



AP-03. Updated estimates of Northeast Atlantic sperm whale (*Physeter macrocephalus*) lengths using aerial photogrammetry

O'Callaghan, Seán A. ¹; Al Abbar, Fadia ²; Costa, Helena ³; Prieto, Rui ⁴; Gammell, Martin ¹; O'Brien, Joanne ¹

1. Marine and Freshwater Research Centre, Atlantic Technological University, Galway City, Ireland
2. Wildlife Ecology and Conservation Group & Behavioural Ecology Group, Wageningen University and Research, Wageningen, Netherlands
3. Faculty of Biosciences and Aquaculture, Nord University, 7713 Steinkjer, Bodø, Norway
4. Institute of Marine Sciences – OKEANOS, University of the Azores, Horta, Portugal

Sperm whales are the largest odontocete species and exhibit markedly differing social behaviours and sexual dimorphism. Sexually mature males use higher latitudes as foraging grounds, to grow in size and attain physical maturity, before returning to mid-latitudes once sociosexually mature to engage in reproductive behaviour. Females, on the other hand, usually remain within mid-latitude waters throughout their lives, these areas are used for foraging, mating and nursing behaviours. In the Northeastern Atlantic, as in most parts of the species distribution, data on population size distribution and growth rates is mostly based on whaling records. Since the cessation of whaling, however, obtaining these data became more challenging and has chiefly relied on chance measurements taken from stranded animals. To investigate sperm whale size distributions in the Northeast Atlantic, aerial photogrammetry data were gathered using an unoccupied aerial system (UAS) between 2020 – 2024. Data were collected during dedicated research and commercial whale watching trips in mid-latitude nursery and high latitude foraging grounds. A total of 324 individual whales were flown over: 167 from São Miguel, Azores at ~37°N, 1 off Ireland at ~54°N and 168 off Andenes, Norway at ~69°N. Measured whales included 169 adult males (>11 m) and 74 females/immature sized males (≤ 10 m). In the Azores, 25 juvenile and 40 calves, including 6 neonates displaying foetal folds were recorded. A total of 12 whales were recaptured in different seasons between 1 – 3 years apart, 8 in Andenes and 4 in São Miguel. Preliminary length estimates in Norway ranged from 11.01 – 14.25 m; while Azores estimates, ranged from 3.0 – 14.97 m. This study provides up to date baseline data on sperm whale population size structure latitudinally in the Northeastern Atlantic. Furthermore the inter-annual recapture of individuals indicates that the methodology can also be used to study individual growth rates overtime.



AP-04. Linking life history traits and bycatch vulnerability in the Southern Iberian Atlantic common dolphin population

Hofman, Jan ¹; Pinto, Ana ¹; Silva, Ana ²; Esteves, Carolina ²; Fialho, Ana ²; Marçalo, Ana ²; Gregório, Sílvia ²

1. *Universidade do Algarve, Faculdade de Ciências e Tecnologia, Campus de Gambelas, Faro 8005-139, Portugal*
2. *CCMAR, Centre of Marine Sciences, University of Algarve, Campus de Gambelas, Ed 7, 8005-139, Faro, Portugal*

The common dolphin (*Delphinus delphis*) is the most frequently stranded cetacean along the southern Iberian Atlantic coast. In the south of mainland Portugal, also known as the Algarve, approximately half of these strandings are attributed to bycatch by regional fisheries. However, the relationship between bycatch-related strandings and life history parameter trends for this species remains unexplored in this region. Using samples collected post-mortem from stranded common dolphins over a 4-year period (2021-2024), we aimed to study sexual maturity in relation to size, age, and cause of death. Age and straight body length were determined for 56 animals and Gompertz growth curves were fitted to assess age-at-length relationships. Sexual maturity was evaluated histologically by examining reproductive structures, including follicle development and resulting scarring in females, and seminiferous tubule development and spermatogenesis in males. Preliminary results indicate that of the 56 individuals (29 females and 27 males), female sexual maturity occurred at sizes between 173-180cm (n = 20), and more than half of the sampled females were immature. Male sexual maturity occurred at >200 cm in length (n = 9) and almost all analyzed male individuals were either immature or pubescent, showing little signs of spermatogenesis. Comparative analysis revealed that immature individuals were disproportionately affected by fisheries bycatch, highlighting a demographic vulnerability. These findings underscore the reproductive status and bycatch susceptibility of common dolphins in southern Iberian Atlantic waters, with implications for the population's conservation and management. By identifying demographic groups at higher risk, this study provides essential data to inform targeted mitigation strategies and improve the sustainability of regional fisheries.

AP-05. Exploring the HPA axis of dolphins: morphological and ultrastructural characterization of the pituitary and adrenal glands

Alonso Almorox, Paula ¹; Blanco, Alfonso ²; Fiorito, Carla ³; Suárez-Santana, Cristian ⁴; Consolli, Francesco ⁴; Molpeceres de Diego, Ignacio ⁴; Arbelo, Manuel ⁴; Grandía Guzman, Raiden ⁴; Almunia, Javier ⁵; Castro, Ayoze ⁶; Sierra, Eva ⁷; Fernandez, Antonio ⁶

1. *Veterinary Histology and Pathology, Atlantic Center for Cetacean Research (CAIC), University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC). Trasmontaña s/n, 35413 Arucas. Canary Islands, Spain;*
2. *Dept. of Anatomy and Comparative Pathology and Anatomy, University of Cordoba, 14014, Cordoba, Spain*
3. *Laboratorio de Ecofisiología Aplicada al Manejo y Conservación, Centro Nacional Patagónico, CONICET, 9120 Puerto Madryn, Chubut, Argentina*
4. *1Veterinary Histology and Pathology, Atlantic Center for Cetacean Research (CAIC), University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC). Trasmontaña s/n, 35413 Arucas. Canary Islands, Spain*
5. *Loro Parque Fundación, Avda. Loro Parque s/n, 38400 Puerto de la Cruz, Spain*
6. *Veterinary Histology and Pathology, Atlantic Center for Cetacean Research (CAIC), University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC). Trasmontaña s/n, 35413 Arucas. Canary Islands, Spain*
7. *Eva Sierra*

The hypothalamic-pituitary-adrenal (HPA) axis is a cornerstone of the neuroendocrine system, regulating various physiological processes, including the stress response, metabolism, immune function, and homeostasis. Despite its central role in numerous adaptive processes, the morphology and ultrastructure of its key components—the pituitary and adrenal glands—remain underexplored in cetaceans. This study provides a comprehensive morphological evaluation of these neuroendocrine organs using histochemical techniques, along with the first in-depth ultrastructural characterization through transmission electron microscopy (TEM) in cetaceans. Pituitary and adrenal glands were obtained from 5 common dolphins (*Delphinus delphis*) and 5 common bottlenose dolphins (*Tursiops truncatus*) using advanced necropsy protocols hereby described. These individuals had either stranded in the Canary Archipelago (Spain) during the 2020 to 2023 period, or had been under human care at Loro Parque, Tenerife (Spain). TEM revealed ultrastructural details of adenohypophyseal cells, including corticotrophs, somatotrophs, gonadotrophs, lactotrophs, thyrotrophs, melanotrophs, follicular cells, and capsular cells. In the adrenal glands, the ultrastructure of both the adrenal medulla and cortex, including the zona glomerulosa, zona fasciculata, and zona reticularis, was highlighted, emphasizing their role in hormone synthesis. These findings provide cellular and subcellular insights into the regulation of key physiological processes by the HPA axis. This research underscores the significance of ultrastructural analysis in understanding cetacean-specific



adaptations. It offers foundational knowledge of the HPA axis in *Delphinus delphis* and *Tursiops truncatus*, enhancing our understanding of their neuroendocrine adaptations and health. By integrating ultrastructural, morphological, and functional perspectives, this study contributes to advancing cetacean physiology, with important implications for conservation, health, and welfare efforts.

AP-06. Marine mammal neuroscience—an open science framework project to promote best practices

Orekhova, Ksenia ¹; Dagleish, Mark ²; Patzke, Nina ³; Sacchini, Simona ⁴; Giorda, Federica ⁵; Di Guardo, Giovanni ⁶; Testori, Camilla ⁵; Affatati, Alice ⁷; Gerussi, Tommaso ¹; Ochiai, Mari ⁸; Centelleghes, Cinzia ¹; Mazzariol, Sandro ¹; Graïc, Jean-Marie ¹

1. *Department of Comparative Biomedicine and Food Science, University of Padova, Legnaro (Padova), Italy*
2. *Division of Veterinary Pathology, Public Health and Disease Investigation, School of Biodiversity, One Health and Veterinary Medicine, University of Glasgow, UK*
3. *Faculty of Medicine, Institute of Mind, Brain and Behavior, Health and Medical University, Olympischer Weg 1, 14471, Potsdam, Germany*
4. *Department of Morphology, Faculty of Health Sciences, Universidad de Las Palmas de Gran Canaria (ULPGC), Campus Universitario de San Cristóbal, c/ Blas Cabrera Felipe s/n, 35016 Las Palmas de Gran Canaria, Spain*
5. *Istituto Zooprofilattico Sperimentale del Piemonte, Liguria e Valle d'Aosta - WOA Collaborating Centre for the Health of Marine Mammals, Turin, Italy*
6. *Former Professor of General Pathology and Veterinary Pathophysiology at the Veterinary Medical Faculty of the University of Teramo, Teramo, Italy*
7. *National Institute of Oceanography and Applied Geophysics - OGS, Trieste, Italy; Department of Mathematics, Informatics and Geosciences, University of Trieste, Trieste, Italy*
8. *School of Life and Environmental Science, Azabu University, Sagami-hara, Kanagawa, Japan*

Multidisciplinary study of marine mammals' central nervous systems (CNS) can provide unique insights into their health and evolutionary biology, and helps establish them as comparative models for human neurodegenerative disease. However, the logistics of obtaining, storing, and efficiently managing high-quality nervous tissue samples is harrowing, requiring efficient collaboration and the sharing of specific know-how, resources, and infrastructure across regional and international borders. During the 35th European Cetacean Society congress, an interdisciplinary group of international scientists participated in the half-day workshop “Neuroscience as an Emerging Field in Marine Mammalogy”, expressing the willingness to collaborate on best practices for the sampling, storage, and multisectoral analyses on the marine mammal CNS. Given the diverse geographical backgrounds of the scientific community, we decided to use the Open Science Framework (OSF), an open and free online platform for planning, organizing, and disseminating best practice protocols. The OSF project “Marine Mammal Neuroscience” has been created, and the component “Best Practices in Sampling, Storage, and Analyses of Marine Mammal Nervous Tissues” is now available for uploads of the best available protocols that can then be used by scientists interested in contributing to the growing knowledge on marine neuroscientific topics. Within 2025, uploaded protocols will be discussed among the contributors and combined into a vademecum that will be proposed as an addendum to the next edition of ACCOBAMS/ASCOBANS best practice protocols for cetacean post-mortem investigation and tissue sampling.



This platform is a significant step forward in unifying and standardizing the techniques used to sample the delicate tissues of marine mammals' CNS that is very prone to decomposition, particularly in wild-stranded individuals. By working together on the OSF project and implementing best practice protocols, we can share essential know-how, resources, and a network of specialists, effectively creating a multicentric, global hub for marine mammal neuroscience.

AP-07. The use of diffusion tractography to reveal connections of the elliptic nucleus of bottlenose dolphin (*T. truncatus*)

Gerussi, Tommaso ¹; Orekhova, Ksenia ¹; Hof, Patrick R. ²; Seifert, Alan ³; Alipour, Akbar ³; Balchandani, Priti ³; Centelleghé, Cinzia ¹; Mazzariol, Sandro ¹; Graïc, Jean-Marie ¹

1. Department of Comparative Biomedicine and Food Science, University of Padova, Italy.
2. Nash Family Department of Neuroscience, Friedman Brain Institute, Icahn School of Medicine at Mount Sinai, New York, USA
3. Department of Radiology, BioMedical Engineering and Imaging Institute (BMEII), Graduate School of Biomedical Sciences, Icahn School of Medicine at Mount Sinai, New York, USA

Subcortical structures in cetaceans are still poorly understood and described. The sensory-motor integration allowing auditory input to be translated to motor outputs is of particular interest. Assumptions on the functions of the audiomotor system are based on speculations from other mammals in which most of this circuit is vision-related. One of the key structures in this system is the elliptic nucleus (EN), a supposed homologue of the nuclei of Darkschewitsch and Cajal, which is thought to be involved in supporting echolocation, vocalizations, and motor coordination. It forms part of a feedback loop with the olivary nucleus and the cerebellum, and may represent an alternative motor pathway to the red nucleus in other mammals. In this study, we observed the tractography and connections of the EN by the use of MRI-tractography on an ex-vivo brain of a bottlenose dolphin (*Tursiops truncatus*). The brain was scanned with a 7T MRI scanner (Magnetom, Siemens Healthineers, Erlangen, Germany) and a 1-channel-transmit 32-channel-receive radiofrequency head coil (Nova Medical, Wilmington, MA, USA). High-resolution anatomical and Diffusion-weighted images were acquired. The EN was manually drawn and used as a region of interest for diffusion tractography. Strong connections with somatomotor neocortical areas, anterior cingulate cortex were found and were possibly descending. Putative ascending fibers came mostly from the dorsal and ventral paraflocculus, passing by the posterior interposed nucleus and the anterior cerebellar peduncle; the ventral cochlear nucleus and vestibulocochlear nerve; while other possible descending pathways reached the inferior olive and the spinal cord. Tractography showed that EN plays a key role for the integration of sensory and motor pathways, particularly in relation to echolocation and vocal-motor coordination. These pathways, only hypothesized but never investigated, highlighted a specialized adaptation, shedding light on the unique evolution of the cetacean audiomotor system compared to other mammals.



AP-08. The cartilage canals in three species of dolphins: a histochemical, immunohistochemical and EM study

Iglesias-González, Claudia ¹; Sierra, Eva ¹; Fiorito, Carla ²; Rodríguez-Armas, Iván ¹; Consoli, Francesco ¹; Puig-Lozano, Raquel ¹; Arbelo, Manuel ¹; Fernández, Antonio ¹; Rivero, Miguel A. ¹

1. *Atlantic Cetacean Research Center, Institute of Animal Health, University of Las Palmas de Gran Canaria, Spain*
2. *Centro Nacional Patagónico, Centro para el Estudio de Sistemas Marinos. Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Puerto Madryn, Chubut, Argentina*

Cartilage canals are vascular structures commonly identified in bone during embryonic development, where they play a critical role in the ossification process. However, their presence in permanent cartilage is considered rare. This study aims to document the occurrence of cartilage canals in the laryngeal cartilages of odontocete cetaceans. Six stranded animals from three species within the Delphinidae family were analyzed. Following standardized necropsy procedures, the larynxes were collected. Samples of the different cartilages were then routinely processed, serially sectioned, and stained with hematoxylin and eosin (HE). Besides, histochemical techniques (PTAH), immunohistochemistry, and electron microscopy were employed for further examination. Cartilage canals were predominantly observed in the peripheral regions of the laryngeal cartilage. Histological analysis revealed these round structures contained blood vessels and perivascular cells, some of which secreted cartilage matrix and differentiated into chondrocytes. These features were most frequently observed in newborn and calf specimens, but they were also detected in a mature male. To our knowledge, this is the first report describing the structure and distribution of cartilage canals in odontocete cetaceans.

AP-09. Respiration rates and inferred mass-specific field metabolic rates decline with body size among five sympatric cetaceans

Glarou, Maria ¹; Christiansen, Fredrik ²; Iwata, Takashi ³; Basran, Charla J. ¹; Ruppert, Silva Naomi Sophie ⁴; Sotiropoulou, Dido ⁵; Iversen, Maria Refsgaard ¹; Akamatsu, Tomonari ⁶; Schnitzler, Joseph ⁷; Siebert, Ursula ⁷; Rasmussen, Marianne Helene ¹

1. Húsavík Research Centre, University of Iceland, Húsavík, Iceland
2. Marine Mammal Research, Department of Ecoscience, Aarhus University, Roskilde, Denmark
3. Graduate School of Maritime Sciences, Kobe University, Kobe, Japan
4. Institute for Biology and Environmental Sciences, Carl von Ossietzky University Oldenburg, Oldenburg, Germany & Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany
5. Behavioural Ecology Group, Section for Ecology and Evolution, Department of Biology, University of Copenhagen, Copenhagen, Denmark
6. Research Organization for Nano & Life Innovation, Waseda University, Tokyo Japan
7. Institute for Terrestrial and Aquatic Wildlife Research (ITAW), University of Veterinary Medicine Hannover Foundation, Germany

Metabolic rates in animals scale allometrically with body mass, a relationship well-established across terrestrial mammals. While it is tempting to apply these scaling laws to cetaceans, their aquatic adaptations complicate direct comparisons. Previous studies suggest that marine mammals have higher field metabolic rates (FMRs) than predicted by terrestrial scaling laws, likely due to increased heat loss in the marine environment. In this study, we examined the effect of body size on FMRs of five sympatric cetaceans of varying sizes inhabiting the northern Icelandic waters, including harbour porpoises (*Phocoena phocoena*; 1.35 ± 0.19 m), white-beaked dolphins (*Lagenorhynchus albirostris*; 2.42 ± 0.17 m), minke whales (*Balaenoptera acutorostrata*; 7.52 ± 0.61 m), humpback whales (*Megaptera novaeangliae*; 9.39 ± 1.17 m) and blue whales (*Balaenoptera musculus*; 21.45 ± 2.17 m). Body size was estimated using published data and UAV photogrammetry, while we used a combination of published data, UAV focal follows and biologging tags to obtain the average respiration rate (breaths min⁻¹) for each species. We then used existing bioenergetic models to convert the respiration rates to oxygen consumption rates, and ultimately daily FMRs (MJ day⁻¹) for each species. FMRs increased with increasing body size, with harbour porpoises having the lowest daily FMR (13.3 MJ day⁻¹) and blue whales having the highest (2637.8 MJ day⁻¹). Conversely, mass-specific FMRs decreased with increasing body size, as predicted by scaling laws. Larger mysticetes benefit from significantly lower mass-specific FMRs, enabling them to undertake long migrations, endure prolonged fasting and exploit diverse habitats. In comparison, smaller cetaceans are more restricted to areas with abundant and accessible prey in order to sustain their higher metabolic demands. Interestingly, all species had higher FMRs compared to what body mass alone would suggest, as predicted by Kleiber's law,



supporting further the hypothesis that marine mammals have elevated metabolic costs compared to similarly-sized terrestrial mammals.

AP-10. Steroid hormones in Grey Seal Fur: differences between rehabilitated and healthy pups

Radzevičiūtė, Aistė ¹; Mazgelytė, Eglė ²; Jüssi, Mart ³; Grušas, Arūnas ⁴

1. *Institute of Biosciences, Life Sciences Center, Vilnius University, Vilnius, Lithuania*
2. *Faculty of Medicine, Vilnius University, Vilnius, Lithuania*
3. *PRO MARE MTÜ, Harju maakond, Kose vald, Saula küla, Vintriku, 75121, Estonia*
4. *Lithuanian Sea Museum, Klaipėda, Lithuania*

Grey seals are top predators and important indicators of marine ecosystem health. Exposure to pollutants in the Baltic Sea may disrupt their endocrine system. Steroid hormones measurement in fur offers a minimally invasive tool for monitoring health, though this method remains unexplored in grey seal pups. This study examines cortisol (COR), cortisone (CORNE), estradiol (E2), testosterone (T2), dehydroepiandrosterone (DHEA), progesterone (P4), and 17-hydroxyprogesterone (17-OHP4) levels in rehabilitated (Lithuanian Sea Museum) and wild (Estonia) grey seal pups during early development. Fur samples from 24 seals (14 males, 10 females) were analyzed using LC-MS/MS. Generalized Linear Mixed Models (GLMMs) assessed the effects of sex, body mass, fur type (lanugo vs. regular), and life history (rehabilitated vs. wild). Rehabilitated pups had 1.6 times higher COR levels and reduced DHEA, T2, E2, and 17-OHP4 levels compared to wild pups. Sex significantly influenced COR, P4, and 17-OHP4: males exhibited 2.1 times higher COR levels, while females had 7.4 times higher P4 and 2.8 times higher 17-OHP4 levels than males. Body mass was positively associated with T2 and 17-OHP4 levels. Fur type significantly affected CORNE and DHEA: pups with permanent dark fur had higher CORNE levels and 60% lower DHEA levels compared to lanugo. This study demonstrates the value of fur as a tool for assessing steroid hormones in grey seal pups. Monitoring these hormones provides insights into the health of seals in polluted environments, emphasizing the need for continued endocrine monitoring in conservation efforts.



AP-11. Diving depth decreases heart rate in common bottlenose dolphins (*Tursiops truncatus*)

Oliveira, Filipa C.^{1,2}; Martínez, Natalia^{2,3}; Rodríguez, Loreto², Torrente, Angelo, G.⁴; Fahlman, Andreas^{1,2,5}

1. Linköping University, Sweden
2. Fundació Oceanogràfic de la Comunitat Valenciana, Spain
3. Catòlica de Valencia San Vicente Màrtir University, Spain
4. University of Montpellier, CNRS, INSERM, Montpellier, France
5. Global Diving Research SL, Spain

Marine mammals forage underwater but must return to the surface to breathe. Managing the limited O₂ during diving is important to improve foraging efficiency by extending the dive duration. The dive response, including bradycardia and peripheral vasoconstriction, is important to help conserve O₂ for vital organs such as the brain and heart. Previous studies indicate that longer dives result in a lower diving heart rate (HR). Additionally, it has been suggested that lung compression, such as that caused by dive depth, reduces HR. However, these results are contradictory because deeper dives are generally longer. Between May and December 2024, we measured the impact of dive depth on diving HR in seven bottlenose dolphins (*Tursiops truncatus*) housed at the Oceanogràfic of Valencia (ES). Dolphins performed voluntary breath-hold dives to depths of 0.5m, 5m, and 10m. A non-invasive physio-logging device measured HR and activity before, during, and after each dive. The average HR while diving to 0.5m (44±8 bpm) was significantly lower than at the surface (78±13 bpm, n=7; p<0.0001). Surprisingly, dive duration did not significantly affect diving HR (e.g., 38±4 bpm at 10m for 60 s vs. 37±5 at 10m for 120 s; n=3; p=0.48). Nevertheless, HR significantly decreased with increasing dive depth (44±8 bpm at 0.5m, 43±9 bpm at 5m, and 38±6 bpm at 10m; p=0.0004 by One-way ANOVA). These findings support our hypothesis that dive depth increases bradycardia, likely due to the effect of pressure on lung volume and cardiac function. These results improve our understanding of the eco-physiology of dolphins and are important to evaluate whether climate change, which pushes prey to colder and deeper waters, may affect and possibly limit foraging efficiency in cetaceans.

AP-12. Repigmentation variation in full-thickness wound healing in cetaceans: a histological and immunohistochemical study

Huang, Wun-Yu ¹; Chuang, Li-Ting ¹; Su, Chen-Yi ¹; Liu, Tzu-Yu ^{2,3}; Liao, Bo-Jui ¹; Wang, Hao-Ven ^{2,4}; Hughes, Michael W. ^{5,6}; Chuong, Cheng-Ming ²; Yang, Wei-Cheng ¹

1. School of Veterinary Medicine, National Taiwan University, Taipei, 10617, Taiwan
2. Department of Life Sciences, National Cheng Kung University, Tainan, 70101, Taiwan
3. Department of Pathology, Keck School of Medicine, University of Southern California, Los Angeles, CA, 90089, United States
4. Marine Biology and Cetacean Research Center, National Cheng Kung University, Tainan, 70101, Taiwan
5. Institute of Clinical Medicine, National Cheng Kung University, Tainan, 70101, Taiwan
6. International Center for Wound Repair and Regeneration, National Cheng Kung University, Tainan, 70101, Taiwan

Field investigations on cetacean skin wounds reveal a remarkable capacity for full-thickness wound recovery, with wounds of some cetacean species returning to skin colorations similar to the surrounding normal skin pigmentation without scarring. For example, the cutaneous injuries in Fraser's dolphins (*Lagenodelphis hosei*) possess extraordinary skin repigmentation ability to restore nearly normal pigmentation. In contrast, most healed wounds in Risso's dolphins (*Grampus griseus*) exhibit a white depigmented pattern, especially in adult individuals. Moreover, pygmy killer whales (*Feresa attenuata*) and rough-toothed dolphins (*Steno bredanensis*) show both repigmented and depigmented healed wounds, with dorsal wounds successfully repigmented, but ventral wounds often hypopigmented. This study aims to investigate the differences in the regulation of melanocyte activity between depigmented and repigmented wounds in cetaceans. Skin samples were collected from normal skin and cookiecutter sharks (*Isistius brasiliensis*) bite wounds on stranded carcasses in Taiwan between 2019 and 2024. In the normal skin of Fraser's dolphins, Risso's dolphins, rough-toothed dolphins, and pygmy killer whales, black skin areas had the highest number of melanocytes per millimeter of the basement membrane, followed by dark-grey skin, light-grey skin, and white skin, which had the fewest melanocytes. However, no melanocytes were found at the center of healed wounds in Risso's dolphins, rough-toothed dolphins, and pygmy killer whales. Depigmented healing wounds in these species exhibited melanocyte detachment, and strong signals of the melanocyte inhibitor dickkopf-1 were detected in fibroblasts of the reticular dermis, which may contribute to melanocyte deficiency. This research highlights species-specific mechanisms of wound repigmentation in cetaceans, offering valuable insights into their unique biology and contributing to our understanding of skin regeneration in marine mammals.



AP-13. Internal organ morphometrics useful for identifying pregnancy in North Atlantic fin whales

Ruiz-Sagalés, Marc ¹; Chosson, Valerie ²; Halldórsson, Sverrir Daníel ²; Sigurðsson, Guðjón Már ²; Borrell, Asunción ¹; Aguilar, Alex ¹

1. Department of Evolutionary Biology, Ecology and Environmental Sciences, and IRBio, Faculty of Biology, University of Barcelona, 08028 Barcelona, Spain
2. Marine and Freshwater Research Institute, Fornubúðir 5, 220, Hafnarfjörður, Iceland

Determining the reproductive status of deceased cetaceans found stranded, entangled in fishing nets, or hunted poses a significant challenge. However, in females, factors such as disease, trauma from entanglement, boat collisions, or hunting and towing operations may result in foetal loss, complicating the assessment of their reproductive status. Using long-term biological datasets from whaling in Spain and Iceland, we investigated the morphometrics of major internal organs in fin whale (*Balaenoptera physalus*) females with confirmed pregnancies, verified by the presence of a foetus. The most informative measurements for indicating pregnancy were the size of the largest ovarian corpora, the mean diameter of the largest ovarian follicles, the width of the uterine horns, and the thickness of the mammary glands. Together, in the absence of a foetus, these factors may suggest cases of a previous spontaneous abortion. However, the width of the uterine horns was found to have the strongest correlation with foetal body length, making it the most useful diagnostic feature for determining both the pregnancy stage and potential foetal loss. Funding provided by project PID2020119712GB I00, MCIN/AEI/10.13039 /501100011033.



AP-14. Shape variation in the eye patch and dorsal fin of Southern Hemisphere killer whales (*Orcinus orca*)

Hutchings, Marissa ¹; Wellard, Rebecca ²; Donnelly, David ³; Totterdell, John ⁴; Parra, Guido ¹; Möller, Luciana ¹

1. *The Cetacean Ecology Behaviour and Evolution Laboratory of Flinders University*
2. *Project ORCA and Curtin University*
3. *Killer Whales Australia and the Dolphin Research Institute*
4. *The Cetacean Research Centre of Western Australia*

Morphological variation within and among species plays a critical role in evolutionary processes, influencing adaptation, survival and reproductive success. Killer whale morphology varies on both an individual and population level with several ecotypes or forms documented worldwide. However, this variability remains difficult to quantify and is poorly understood for killer whales in the southern hemisphere. This study assessed shape variation in the eye patch and dorsal fin of Australian and Antarctic killer whale populations to shed light on the evolutionary relationships among them. A large dataset of imagery was compiled and processed to achieve this, resulting in considerable and representative sample sizes for five separate study groups: Northwest Australia, Southwest Australia, Southeast Australia, Antarctic Type A and Antarctic Type B. Elliptical Fourier analysis was used to extract the outlines of both features which allowed for multivariate data analyses. Principal component analysis and pairwise comparisons revealed statistically significant differences in morphology both within and between Australian and Antarctic killer whale populations. Eye patch shape variation was driven by the degree of taper and overall width whereas dorsal fin shape variation was driven by falcateness and broadness at its base. Hierarchical cluster analysis further revealed a high degree of variation amongst these features, but linear discriminate analysis suggested that individuals cannot be classified into their respective study groups based on morphology alone. Nonetheless, these findings provide additional evidence of a tropical and temperate ecotype or form of killer whale in Australia, the latter of which showed resemblance to both the Antarctic Type A and B2s. To increase our understanding of their connectivity and divergence, dedicated research is now needed to assess the evolutionary history of these populations. Such knowledge will be vital in defining conservation management units for killer whales which are still considered a single, data deficient species by the IUCN.



Behaviour



BE-01. Adaptive strategies and behavior of Black Sea common dolphin (*Delphinus delphis ponticus*) in Bulgarian waters of Black Sea

Delov, Ventseslav ¹; Krastio, Dimitrov ¹; Vulchev, Kiril ¹; Nikolova, Gergana ¹

1. Sofia University, Faculty of Biology, 8, Dragan Tzankov str., 1164 Sofia, Bulgaria

The Black Sea Common dolphin (*Delphinus delphis ponticus*) occurs year-round in the Bulgarian Black Sea area, being the most numerous during the spring and summer seasons. The present work describes various patterns of behavior and strategies of the species in the area. The data have been collected during 1992-2024. The Black Sea Common dolphin is found preliminary in the open sea but inhabits also coastal waters. Along the coast, the species specific feeding strategy includes active interactions with fisheries mainly by following the trawlers. This strategy includes formation of specific assembles with other species - sea birds and Black Sea Bottlenose dolphins Vulchev et al. (2022). Because the dolphins are generally not given casualties during their interactions with this fishing practice, the ratio of benefits to costs seems to be in favor of dolphins. Here the strategies of both dolphin species are quite different. Unlike the bottlenose dolphins, the common dolphins never feed on dead fish, but instead chase and surround weaker fish, mostly small Mediterranean horse mackerel. Common dolphins were found only occasionally to use dalyan-type fishing gears to feed. The species approaches non-fishing vessels and exhibits its typical escorting behavior mainly in the open sea. Some behavioral patterns are examined also in this study.



BE-02. Coda repertoires and vocal clans of sperm whales (*Physeter macrocephalus*) in the Azores

Soares, Maria Beatriz ¹; Oliveira, Cláudia ²; Kather, Sarah ³; Prieto, Rui ²; Steiner, Lisa ⁴; Silva, Mónica A. ²

1. Institute of Marine Sciences - Okeanos, University of the Azores, Horta, Portugal
2. Institute of Marine Sciences - Okeanos and Institute of Marine Research - IMAR, University of the Azores, Horta, Portugal
3. University of the Azores
4. Whale Watch Azores, Estrada da Caldeira, 2, 9900-089, Horta, Azores, Portugal

Sperm whales (*Physeter macrocephalus*) communicate using socially learned, stereotyped patterns of broadband clicks, termed codas, which are typically classified into distinct types based on the number of clicks, their rhythm and tempo. Whales from the same matrilineally-based social unit share a common repertoire of coda types and only associate with other social units that use similar coda repertoires, creating a higher level in sperm whale social organization, the vocal clan. Here, we applied the IDcall method to a dataset of 11,213 codas (extracted from acoustic recordings from 43 DTAGs and towed hydrophone arrays) collected over 32 years (1988-2020) in the Azores to: 1) identify vocal clans by clustering coda repertoires, based on the similarities in coda type usage, and 2) investigate repertoire similarities within and among clans, and over time. The results suggest the presence of four potential vocal clans in the area. One clan emitted 3-click codas more frequently and showed greater consistency in coda type usage among its groups of repertoires (GrpReps) than the other clans, that were dominated by 5-click codas. In the clan with 32 GrpReps, a higher correlation was found between two groups with a 22-year difference and one coda type, classified as an identity coda by the method, was emitted by all the GrpReps. Furthermore, in this clan, some groups showed greater consistency in coda type usage in their respective recording year compared to the coda type usage between the different years of the clan. Thus, this work provided new insights into the hierarchical organization of sperm whales in the Azores, supporting the presence of sympatric vocal clans and demonstrating how the association pattern among repertoires from the same clan can persist over decades, which is essential to define conservation strategies for this species in the region.



BE-03. Epimeletic behavior in free-ranging rough-toothed dolphins (*Steno bredanensis*) in the Canary Islands

Yzoard, Chloe ¹; Gil, Marc ²; Aguilar de Soto, Natacha ³

1. Dpto. Biología Animal, Edafología y Geología, Universidad de la Laguna, Canary Islands, Spain. Grupo de Investigación de Cetáceos, Canary Islands, Spain
2. Cory's, Barcelona, Spain
3. CSIC Instituto Español de Oceanografía, Canary Islands, Spain.

Here we describe a case of epimeletic behaviour showed by members of a group of free-ranging rough-toothed dolphins *Steno bredanensis*, off El Hierro, in the Canary Islands (Spain), with photographs and video recordings. A seasonal survey to monitor cetaceans focusing on beaked whales was conducted from the 3rd to the 16th of February 2013, off El Hierro. During this period free-ranging rough-toothed dolphins were encountered from a boat-based platform on the 7th, 9th, 13th, 14th, 15th and 16th of February. On the 9th of February, we sighted a small group of 5-10 individuals in El Mar de Las Calmas (27.669998, -18.064441) and a deceased individual floating laterally on the surface. The social interactions with evidence of care-giving behaviour were documented with 5 video recordings (88'') and 180 photographs. Four members of the group showed epimeletic behaviour towards the deceased individual during the period of observation from 15h42 to 15h52. Individuals showed a wide range of behavioural patterns at close or physical range of the carcass included surfacing in a synchronized manner, individual surfacing, physical contact with the rostrum, lateral push, push from backwards, sinking of the body by swimming over it, righting of the carcass, spy-hopping and interaction with *Larus michahellis*, as well as breaches at a short distance from the carcass localization. Although rough-toothed dolphins is a delphinid found year-round in El Hierro, it remains poorly known. This is the first case of epimeletic behaviour described in *Steno bredanensis* in Europe. This type of record helps further understand this species. It provides a valuable insight into the complex social interactions of highly-mobile top predators and helps document better the occurrence of care-giving behaviour in cetaceans.



BE-04. Rare-antagonistic interspecies interactions between humpback whales and other cetaceans in the Gulf of Tribugá, Colombian Pacific

Vallejo, Ann Carole ¹; Barragan Barrera, Dalia C. ¹; Hernandez, Marcela ¹

1. R&E Ocean Community Conservation

This study aimed to document and describe rare antagonistic interspecies interactions between humpback whales (*Megaptera novaeangliae*) and other cetaceans in the Gulf of Tribugá, a breeding and nursing ground for the G breeding stock of humpback whales. Observations were conducted during the 2022 and 2023 breeding seasons using two distinct methods: systematic surveys with community science teams and opportunistic observations aboard whale-watching boats. Two rare interspecies interactions with other cetaceans were reported. The first one was an encounter with a Bryde's whale (*Balaenoptera edeni*), recorded during a systematic survey in July 2022, involved a humpback mother-calf pair and an additional adult humpback. The mother-calf pair initially displayed avoidance behaviors, followed by protective and competitive responses from the adult humpback, suggesting possible territorial or breeding-related dynamics. The second encounter, recorded in August 2023, involved the interaction with a pod of 8–10 false killer whales (*Pseudorca crassidens*), which was observed opportunistically aboard a whale-watching vessel. During this interaction, a humpback mother exhibited antagonistic behaviors, including forceful movements and vocalizations, effectively halting the pod's approach and demonstrating protective strategies for her calf. These observations are significant as they represent the first documented interspecies interactions involving Bryde's and false killer whales in the Gulf of Tribugá, where these species are rarely observed nearshore. The defensive and antagonistic behaviors exhibited by humpback whales during these rare encounters highlight their ecological adaptability and the importance of calf protection in breeding areas. Additionally, this interaction with false killer whales raises questions about the diet of false killer whales (potentially based on marine mammals) in the Colombian Pacific. This work underscores the value of combining community science and opportunistic data collection in documenting rare events, contributing to our understanding of cetacean behavior and interactions in this biodiverse yet understudied region.



BE-05. Acoustic recordings indicate seasonal changes in social behavior of male sperm whales in their foraging grounds in northern Norway

Pedersen, Ove Mikal ¹; Gordon, Jonathan ²; Similä, Tiu ¹; Morange, Zoé ³

1. Whale2Sea
2. Marine Ecological Research Ltd
3. Whale2Sea/UiT

Sound recordings of male sperm whales (*Physeter macrocephalus*) have been made opportunistically throughout the year in combination with behavioral observations of surface behavior from whale-watching boats off Andøya, Northern Norway (2020-2024). The recordings and behavioral observations show that May - September, sperm whales are mostly encountered alone. Recordings during this season were dominated by echolocation clicks and creaks. Few communication sounds (clangs and codas) were heard, except when the sperm whales were depredating on Greenland Halibut (*Reinhardtius hippoglossoides*), suggesting that social interactions between individuals were generally rare. Through winter and spring (specifically January-April), sperm whales were commonly encountered in groups (>2 individuals within 500m) and in tighter units of 2 up to 12. In acoustic recordings made near these gatherings, clangs were frequent. In addition, we recorded chirrup, usually followed by clangs, suggesting increased social interactions between individuals during this period. The inter-click interval (ICI) of the recorded chirrups ranged between 0.01 and 0.03 seconds with a center frequency varying between 1.7 kHz and up to 4 kHz, considerably lower than the 12-15 kHz range of regular clicks. In one recorded event, two individuals produced the sounds at the same time. The seasonal changes in the vocal behavior of the male sperm whales in the study area suggest that January – April could represent a period with increased social interactions between male sperm whales in their foraging grounds in northern Norway.

BE-06. Unraveling the social structures of long-finned pilot whales (*Globicephala melas*) in the Strait of Gibraltar (2016–2024)

López-Velasco, Marta ¹; Company-Mariño, Mara ¹; González-Tapia, Ángela María ¹; Grande-Cid, Rocío ¹; Bizarro-Maia, Ana-Beatriz ¹; Mamblona-Bordonada, Javier ¹; Pelayo, Jesus ¹; Ruiz-Ojeda, Laura ¹; Rivas-García, Inmaculada ¹; Santilario-Berthilier, Tomás ¹; Silgado-Calderón, David ¹; Salazar-Sierra, Juan Manuel ¹; Viladés-Santos, Paula ¹; de Stephanis, Renaud ¹

1. CIRCE (Conservation, Information and Research on Cetaceans), Cabeza de Manzaneda 3, Pelayo, 11390 Algeciras, Cádiz, Spain

This study investigates the social structures of long-finned pilot whales (*Globicephala melas*) in the Strait of Gibraltar, focusing on changes in their social dynamics over nearly a decade (2016–2024). Over 400 dedicated surveys were conducted, resulting in the collection of more than 120,000 photographs of pilot whales, enabling advanced photo-identification and social network analyses through the specialized software SOCPROG. The analysis identified more than 10 distinct social groups with strong and stable associations, suggesting the presence of dynamic yet cohesive matrilineal units. Typical social network statistics, including measures of centrality, clustering, and modularity, were applied to explore the complexities of group structure and their ecological implications. Temporal variations in association patterns were observed, pointing to adaptive responses to environmental and anthropogenic pressures, while raising questions about the broader definition and function of social groups within this population. These findings emphasize the importance of social resilience in maintaining population viability and highlight the need for conservation strategies that integrate ecological and social factors. This work underscores the critical role of long-term monitoring and social structure analysis for the effective conservation of this vulnerable population in the Strait of Gibraltar.



BE-07. Seasonal differences in whistle characteristics of the common bottlenose dolphin (*Tursiops truncatus*) in the Gulf of Oristano, Sardinia (Western Mediterranean Sea)

Corrias, Valentina ¹; Piga, Roberta ²; Giardina, Fabio ²

1. CNR-IAS, National Research Council, Institute of Anthropic Impacts and Sustainability in the Marine Environment Località Sa Mardini, 09170 Torregrande, Oristano, Italy
2. Mar.Eco Osservatorio della Natura Association, 92010 Lampedusa, Italy

The common bottlenose dolphin has developed a large vocal repertoire consisting of impulsive and tonal signals including whistles. Whistles are key to understanding dolphin communication and social behavior. The objective of this study is to describe the seasonal acoustic presence of bottlenose dolphins and the acoustic parameters detected in the spectral contours of their whistles. The study was conducted in the Gulf of Oristano which is located on the western side of Sardinia (Western Mediterranean Sea). Data were collected using passive acoustic monitoring (PAM) with a fixed hydrophone placed on the seabed. This spot borders a special area of conservation (SAC) and a national marine protected area (MPA). A total of n. 12,591 .wav files included in 263 hours of recordings (frequency range of 0.1-48 kHz), collected between the summer and winter of 2019, and the spring of 2020 (post-COVID), were analyzed. The acoustic parameters of n. 1,236 whistles, along with their contours, were analyzed and classified using Raven Pro software. The results revealed 9 types of whistle contours: up-sweep (27%), up-down-sweep (15%), down-sweep (4%), down-up-sweep (30%), flat (3%), step (0.56%), and loop (20%). The following acoustic parameters were calculated: total duration (Dr) 0.85 ± 0.57 s, maximum frequency (fmax) 14.89 ± 3.48 kHz, minimum frequency (fmin) 8.02 ± 1.9 kHz, central frequency (fc) 2.65 ± 4.76 kHz and bandwidth (BW) 6.90 ± 2.64 kHz. Within the dataset, n. 477 signature whistles were identified (Signature IDentification method), distributed across 5 types of contours: up-sweep (35%), up-down-sweep (16%), down-up-sweep (38%), flat (2%), and loop (9%). The occurrence of dolphins' whistles showed significant seasonal differences, with 1.70% of presence in winter, 1.50% in summer, and 7.29% in spring. This study complements other research on this topic, enhancing the understanding of dolphin acoustic activity in this under-explorer area of Sardinia.



BE-08. Pod and prejudice: agonistic dynamics between bottlenose dolphins and sperm whales in São Miguel Island

Malato, Pedro ¹; Builly, Anaïs ¹; González, Laura ^{1,2}

1. Futurismo Azores Adventures
2. Institute of Marine Sciences - OKEANOS

Agonistic interactions between sperm whales (*Physeter macrocephalus*) and bottlenose dolphins (*Tursiops truncatus*) have been occasionally observed near São Miguel Island, Azores. The Azores archipelago, a critical biodiversity hotspot, provides an ideal setting to study these interactions due to its rich marine fauna and the availability of whale-watching activities that enable opportunistic data collection year-round on a daily basis. Between 2008 and 2024, 109 encounters between sperm whales and bottlenose dolphins were documented off São Miguel Island, most of them happening during the months of June and July. From those encounters, 17 were considered to be agonistic, as they included aggressive behaviors by bottlenose dolphins towards the sperm whales such as ramming, chasing, and tail-slapping. On the 1st of July of 2024, bottlenose dolphins displayed these behaviors against a group of five sperm whales, two of which were calves. Defensive responses by the sperm whales included group cohesion, synchronized diving, and defecation, aligning with documented anti-predator strategies. While this interaction is non-predatory, it underscores the complexity of cetacean social dynamics, where aggression may serve as a dominance display or opportunistic kleptoparasitism. This has been previously reported in sperm whale interactions with Risso's dolphins and Northern right whale dolphins in the Southern California Bight. This study adds insights to understand potential motivations behind dolphin aggression and sperm whale defensive tactics, contributing to the limited baseline data on these interspecies dynamics.



BE-09. A week in the life of the sperm whales in the Gulf of Catania (Ionian Sea)

Sciacca, Virginia ¹; Briguglio, Andrea S. ¹; Caron, Robin ²; Caruso, Francesco ²; Di Mauro, Letizia S. ³; Filiciotto, Francesco ¹; Pellegrino, Carmelo ⁴; Riccobene, Giorgio ³; Simeone, Francesco ⁵; Viola, Salvatore ³

1. Istituto di Scienze Polari, Consiglio Nazionale delle Ricerche (ISP-CNR), Messina, Italy.
2. Stazione Zoologica Anton Dohrn (SZN), Naples, Italy.
3. Istituto Nazionale di Fisica Nucleare - Laboratori Nazionali del Sud (INFN-LNS), Catania, Italy.
4. Istituto Nazionale di Fisica Nucleare, CNAF, Bologna, Italy.
5. Istituto Nazionale di Geofisica e Vulcanologia (INGV), Sede di Roma, Roma, Italy.

The Mediterranean sperm whale (*Physeter macrocephalus*) is listed as Endangered by the IUCN and cabled acoustic observatories in the Ionian Sea offer the unique opportunity to study and monitor this population since the early 2000'. The underwater acoustic antenna SMO-OvDE, operating in the Gulf of Catania at a depth of 2100 m, consisted of a tetrahedron of 4 synchronized hydrophones sampling at 192 kHz. For this study, acoustic data were saved with a duty cycle of 5 minutes/hour, from 02/02 to 30/04, 2017. Additional data were acquired continuously for one week (22-28/02/2017), to study the behavior of detected sperm whales. Custom algorithms allowed the acoustic detection and tracking of sperm whales' in a range of approximately 15 km around the observatory. Sperm whales were detected almost daily over all three months (89% monthly mean occurrence) and different sound types including regular clicks, 3+1codas, and creaks were found throughout the continuous recording week. Diving sperm whales movements were reconstructed by acoustically tracking their positions. 47 acoustic tracks were studied and in 60% of cases the animals dived between 450 and 750 m. The maximum depth of detection was about 1300 m. Based on Inter-Pulse-Intervals (IPIs) measurement and according to Growcott's formula, detected sperm whales' sizes were estimated between 10 m and 13.5 m. Our results confirm the presence of the species about ten years after the previous study in the area and show the very first simultaneous underwater tracking of communicating sperm whales. Developed under the PRIN DIVES 2022 funded by Next Generation EU, this study reveals essential information on this deep-diver behavior and provides major tools for the conservation of this species.

BE-10. Whistle behaviour of free-ranging common dolphins (*Delphinus delphis*) along the northern coast of Portugal

Oliveira-Rodrigues, Cláudia ^{1,2}; Bio, Ana ¹; Maslov, Dmytro ³; Valente, Raul ²; Afonso, Luís ^{1,4}; Sousa-Pinto, Isabel ^{1,2}; A. Marques, Tiago ^{5,6}; Mafalda Correia, Ana ¹

1. CIIMAR/CIMAR LA – Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal
2. Department of Biology, FCUP – Faculty of Sciences of the University of Porto, 4169-007, Porto, Portugal.
3. CEiiA – Centre of Engineering and Product Development, 4450-017, Matosinhos, Portugal.
4. ICBAS – School of Medicine and Biomedical Sciences of the University of Porto, 4050-313, Porto, Portugal.
5. Centre for Statistics and Applications / Department of Animal Biology, FCUL – Faculty of Sciences of the University of Lisbon, 1749-016, Lisbon, Portugal
6. University of St Andrews, Scotland, United Kingdom.

Cetaceans rely heavily on sound for communication, navigation, and foraging, making their vocalisations a valuable source of information about their behaviour, distribution, abundance and population dynamics. Among delphinids, many species use unique signature whistles to convey individual identity. This behaviour has been extensively studied in the bottlenose dolphin (*Tursiops truncatus*), serving as a model for understanding dolphins' communication. In this study, we focused on characterising the whistle repertoire of common dolphins (*Delphinus delphis*) inhabiting the northern coast of Continental Portugal, with an emphasis on identifying potential signature whistles of this population. To achieve this, we employed the SIGnature IDentification (SIG ID) method developed by Janik et al. (2013). Data collection was conducted during 16 at-sea campaigns carried out between 2022 and 2024 as part of the ATLANTIDA project. Over the course of these campaigns, a total of 3 hours and 21 minutes of acoustic recordings of *Delphinus delphis* were obtained and subsequently analysed. Whistles were identified and classified into six broad categories – constant, ascending, descending, convex, concave and multiple. For each whistle, 10 acoustic parameters were determined – including duration, frequency and modulation characteristics. The fundamental frequency of whistles ranged between 3.2 and 28.4 kHz, with ascending and descending whistle types being the most common. Signature whistles were identified in the study area but did not account for the majority of vocalisations. These whistles, meeting the SIG ID criteria, spanned frequency ranges from 5.8 to 28.4 kHz and were often produced in socializing contexts. Overall, the whistle repertoire exhibited high variability, highlighting the complex acoustic behaviour of the species. This study provides valuable insights into the acoustic behaviour and potential signature whistle use of *Delphinus delphis* along the northern coast of Portugal, contributing to a better understanding of their communication strategies and social dynamics.



BE-11. New perspectives on wild seal population dynamics: integrating eGenomics with facial recognition technology

Ingram, Krista K ¹

1. Colgate University

A common ‘holy grail’ in marine conservation science is the non-invasive estimation of critical population parameters in wild populations. In this study, we use AI-driven, facial recognition technology—SealNet 2.0—and environmental DNA (eDNA)-informed population genomics to estimate local population parameters of harbor seals (*Phoca vitulina*) in Casco Bay, Maine. Over five summers, we identified 600+ seals using photo ID and facial recognition and created a gallery of seals in the population. For two summers, we photographed and identified seals present at haul-out sites in a single bay daily for 2-3 weeks to estimate site fidelity and connectivity between sites. Using matrices of individuals identified across days, we created weighted association networks of seals and measured the centrality and community detection metrics of these networks. Interestingly, although we found variability across individuals in site fidelity, we detected high levels of network community of specific individuals, suggesting a relatively high level of seasonal and annual site fidelity to sites in this study area. At the same sites, we also collected eDNA from water samples to estimate genetic diversity and connectivity. We optimized eDNA capture from water samples and used Next Generation Sequencing (NGS) to measure the mtDNA haplotype frequencies at each haul-out site. Using parallel ecological (face recognition) and our pilot genetic (eDNA) datasets, we show that haplotype abundance and diversity are positively correlated with the number of seals on the respective haul-out sites, validating the further use of marine eDNA to estimate genetic diversity and population structure. Our results help characterize the local movement patterns of a wild seal population and facilitate our understanding of how seals use resources in Casco Bay. In addition, this study demonstrates the utility of facial recognition technology and eDNA analyses as effective methods to monitor dynamic or elusive marine species.



BE-12. Sex-specific social patterns and male alliance formation in a Mediterranean bottlenose dolphin population

Mattiussi, Alex ^{1,2}; Pedrazzi, Giulia ^{1,2}; Labriola, Maria Silvia ^{2,3,4}; Turchi, Alice ^{2,3}; Rinalduzzi, Sofia ^{2,4}; Giacomini, Giancarlo ¹; Pace, Daniela Silvia ⁵

1. Department of Environmental Biology, Sapienza University of Rome, Italy
2. Echoes – Capitoline Centre for Marine Research (ETS), Rome, Italy
3. PhD program in Evolutionary Biology and Ecology, University of Rome Tor Vergata, Italy
4. Department of Biology, University of Rome Tor Vergata, Italy
5. CNR – Institute of the Study of Anthropogenic Impacts and Sustainability in the Marine Environment – Capo Granitola Unit, Torretta Granitola, Trapani, Italy

Bottlenose dolphins (*Tursiops truncatus*, BD) live in fission-fusion societies, where individuals frequently separate and switch groups, but can still form stable associations. However, less is known about the sex-specific organization of these societies at the population level. This study investigates association patterns in a BD population inhabiting the Roman seas near the Tiber River estuary (central Tyrrhenian Sea, Italy), focusing on sex-specific dynamics. Over 450,000 photographs taken between 2016-2023 were analyzed using photo-identification techniques. Four types of association were assessed with the Half Weight Index (HWI) using SOCPROG: all individuals sighted more than five times (AI, $n=123$), male-male (MM, $n=12$), female-female (FF, $n=64$), and male-female (MF, $n=76$). A mean linkage hierarchical cluster analysis was performed to visualize the degree of association between individuals. Overall, the AI dataset showed a low mean HWI ($\text{HWI}_{\text{ave}}=0.11\pm0.04$) but a higher maximum HWI ($\text{HWI}_{\text{max}}=0.51\pm0.14$), indicating associations ranging from very weak to strong. FF and MF associations showed similar patterns (FF: $\text{HWI}_{\text{ave}}=0.13\pm0.05$, $\text{HWI}_{\text{max}}=0.48\pm0.15$; MF: $\text{HWI}_{\text{ave}}=0.14\pm0.05$, $\text{HWI}_{\text{max}}=0.49\pm0.15$), likely due to the sex ratio imbalance. MM associations exhibited a higher HWI_{ave} (0.20 ± 0.11) but a slightly lower HWI_{max} (0.42 ± 0.24), indicating males associate more frequently with other males. Sociograms and cluster analysis ($\text{CCC}>0.9$) identified two strong male dyads and one triad, marking the first evidence of male alliance formation in a Mediterranean population possibly driven by cooperative needs to gain reproductive advantages. This result was further supported by the detection of pop trains—narrow-band low-frequency pulsed calls produced by males during consortships—in sightings of strongly associated males. These findings improve our understanding of BD social structures at the population level and highlight the need to monitor possible changes in sex-specific dynamics in response to anthropogenic pressures. How human activities may disrupt social bonds and alter essential patterns of cooperation are important questions that require study.



BE-14. Blue whale behavior in northwestern Iberian waters: insights on phenology, site fidelity, and social dynamics

Methion, Severine ¹; López, Díaz ¹

1. Bottlenose Dolphin Research Institute BDRI

The aim of this study is to provide insights into the phenology and behavior of blue whales (*Balaenoptera musculus*) in the Northwestern waters of the Iberian Peninsula, an area with limited data. This region holds historical significance as a former whaling ground, where blue whales were hunted to near extinction. Out of 123 daily trips conducted from January to October annually between 2017 to 2022, we observed blue whales on 32 days. Blue whales were consistently observed from July to October annually, with a peak in abundance occurring in September. Agglomerations ranged from 1 to 5 individuals. Blue whales were predominantly engaged in feeding behavior, confirmed by regular observation of feces and northern krill swarms. The longest recorded dive lasted 20 minutes and 31 seconds. Interestingly, 10% of the observed individuals exhibited their flukes out of the water when diving. Other cetacean species were often observed feeding in close proximity to blue whales including fin whales and short-beaked common dolphins, and various bird species. Photographic identification distinguished 21 individuals ranging from 15 to 24 meters in size (median 18 meters). The presence of small-sized individuals suggests the utilization of this area as a feeding ground for recently weaned calves. The findings revealed individual variability in site fidelity, with certain blue whales exhibiting strong fidelity to the study area through repeated sightings over consecutive weeks and across multiple years. Social behaviors, including high-speed racing, porpoising, and explosive bow wave splashes, were observed when 3 blue whales were in the same area, lasting up to 20 minutes, indicating complex social dynamics. Overall, our findings provide valuable insights into the behavior and ecology of blue whales in the Northwestern waters of the Iberian Peninsula, emphasizing the importance of continued monitoring and conservation efforts to safeguard this endangered species.



BE-15. Signature whistles in the wild: how group size and location shape bottlenose dolphin communication

Mosca, Olga ¹; Methion, Séverine ¹; Díaz López, Bruno ¹

1. *Bottlenose Dolphin Research Institute (BDRI)*

In many socially complex species, signature vocalizations are critical for conveying individual identity, especially in dynamic and acoustically challenging contexts. These signals facilitate individual recognition and coordination within groups, playing important roles in taxa such as birds, bats, and marine mammals. Bottlenose dolphins, renowned for their fission-fusion societies, produce signature whistles primarily to maintain group cohesion; however, little is known about the factors shaping signature whistle use in wild populations across diverse ecological contexts. This study explores several potential drivers of signature whistle production in wild bottlenose dolphins. Acoustic recordings spanning 15 years from two distinct monitoring sites were analyzed, integrating SIGID methodology to identify signature whistles from 1,119 randomly selected acoustic samples of 464 dolphin encounters. A generalized linear mixed model (GLMM) was employed to assess the effects of variables such as location, group size, behavior, group composition, seasonality, and time of day on signature whistle production. Our findings reveal differences between locations, with signature whistle production significantly higher in areas with larger groups, highlighting group size as a key driver of signature whistle use. These results suggest that the social organization within each location shapes signature whistle use, reflecting adaptations to the ecological and acoustic conditions of each habitat. Furthermore, dolphin behavior did not show a significant effect on signature whistle production, suggesting a potential functional distinction between signature and other whistles, given the specific role of individual identification associated with this signal type.



BE-16. Local concentration of fin whales off Barcelona in 2024, with repeated observation of an animal in poor body condition

Gostischa, Julia ¹; Orri Brandi, Àlex ²

1. *Mar a la Vista*
2. *University of Barcelona*

In spring 2024, overall few fin whales (*Balaenoptera physalus*) were observed along the Catalan coast. However, onboard the whale watching vessel Ría de Ferrol we had a total of 17 fin whale sightings on 18 trips in April and May. One solitary adult whale was repeatedly observed in front of Barcelona on five consecutive days. Given its poor body condition (prominent vertebrae and ribs, as well as multiple ectoparasites) we took particular notice of its behaviour, in addition to photo-identification imagery. Blow and diving intervals were recorded on all occasions, using the application Cronómetro Pro. The swimming trajectories of the animal were registered using the boat's track during the sighting as a proxy, which was plotted through the Navionics Boating App. Blow intervals varied between 11 and 89 seconds (mean: 24.2). Diving times ranged from 02:10 to 15:25 minutes (mean: 6:20). ARS-like swimming patterns, associated with potential food patches detected by our echosounder suggest the animal was engaged in feeding activity. Overlay of sighting positions and approximated tracks with chlorophyll imagery one, two, four and six weeks prior to the sightings suggest it was exploiting a local hotspot of productivity. While this observation is clearly anecdotal, the relatively high number of sightings compared to surrounding areas may also be linked to this difference in productivity. Comparison of catalogues with other entities along the Spanish Mediterranean coast showed this animal has also been sighted off Denia. The causes of its body condition are unknown but could be related to lack of food resources prior to our observations, diseases and/or age. Morphometric studies associated with photo-identification recapture would be necessary to shed light on these causes. We invite anyone observing fin whales in the Western Mediterranean and contiguous Atlantic area to communicate potential matches to allow further monitoring of this individual.



BE-17. Seasonal behavior of the striped dolphin (*Stenella coeruleoalba*) in the Adriatic and Ionian Sea

Rosestolato, Giorgio ^{1,2}; Arcangeli, Antonella ³; Costantino, Matteo ^{1,2}; Crosti, Roberto ³; Favaro, Livio ^{1,4}; Gamba, Marco ^{1,4}; Giovannini, Andrea ²; Giacomina, Cristina ^{1,4}; Azzolin, Marta ^{1,2,4}

1. Department of Life Sciences and Systems Biology, University of Torino, Torino, Italy
2. Gaia Research Institute, Torino, Italy
3. ISPRA, National Institute for Environmental Protection and Research, Roma, Italy
4. CIRCE, Centro Interuniversitario per la Ricerca sui Cetacei, University of Siena, Siena, Italy

In marine fauna conservation, studying the behaviors of a species, their occurrence, and duration is essential to prevent human activities from disturbing the delicate equilibrium of marine ecosystems. As part of the Life "CONCEPTU Maris" project, researchers regularly monitored the presence and behavior of cetaceans in the Adriatic Region (Adriatic and Ionian Sea). The team conducted their observations while on the Minoan Grimaldi Line company ferries, specifically along the Ancona-Patras route. Of the seven cetacean species sighted in the region, the striped dolphin (*Stenella coeruleoalba*) was one of the most commonly observed. We analyzed behaviors observed during 163 sightings, categorizing them into macro-categories and examining factors such as group size, the presence or absence of calves and juveniles, and the season. The results revealed that "travel" was the most frequently observed behavior, accounting for 56% of sightings. This was closely followed by "play," which comprised 31%. The remaining behaviors included feeding (5%), milling (3%), resting (2%), socializing (2%), and mating (1%). Our results show that striped dolphins are particularly present in the region during the summer, which is also when calves are more commonly sighted. Seasonal variations in behavior were also noted, with "travel" occurring more frequently in summer (64%) and autumn (60%) compared to other seasons. Regarding group size, both "travel" and "play" behaviors were observed at the highest frequency across all analyzed groups. Considering the presence or absence of calves, it appears that in the first case there's no difference in the frequency of travel and play behaviours. A better understanding of striped dolphins' behavioural seasonality and relationship with human activities is crucial to minimize disturbances to this and other cetacean species for their conservation.



BE-18. The usual suspects: repeated approaches and inquisitive behavior towards boats by individual minke whales in southern Portugal

Quirin, Alicia ¹; Rampinini, Cristina ^{1,2}; Borges, Francisco O. ^{1,3}; Estrela, Guilherme ¹; Cid, André ¹; Castro, Joana ^{1,3}

1. AIMM – Associação para a Investigação do Meio Marinho, Rua Maestro Fred. Freitas N15-1, 1500-399 Lisboa, Portugal
2. Università degli Studi di Milano-Bicocca, Piazza dell'Ateneo Nuovo, 1 - 20126, Milano, Italy
3. MARE – Marine and Environmental Sciences Centre / ARNET - Aquatic Research Network, Laboratório Marítimo da Guia, Faculdade de Ciências, Universidade de Lisboa, Cascais, Portugal

While baleen whales opportunistically approach vessels, repeated inquisitive behavior towards boats is less frequently documented. In areas where whales display apparent curiosity, few reports include an individual-based analysis. Here we present long-term photo-identification of common minke whales (*Balaenoptera acutorostrata*) off southern Portugal and describe inquisitive behavior on an individual level. Pictures, underwater footage, and behavioral data were collected during dedicated and opportunistic boat-based surveys between 2011 and 2024. In 238 sightings 48 individuals were identified, 31 of which recurred, resulting in a re-sighting rate of 64.58%. The most frequently sighted whale was seen on 13 occasions. The presence of an individual was marked in as many as 6 years and the longest time between re-sightings of an individual was 12 years. Inquisitive behavior towards the vessel was recorded in 38 encounters. These behaviors were initiated by the whale and included actively approaching, circling and crossing the still-standing vessel, turning the belly towards it, spy-hopping/lifting the head out of the water for a prolonged period, as well as apparent observation from underwater, and maintaining contact. In total 18 different individuals engaged in these inquisitive interactions, 5 out of which did so on more than one occasion. Notably, one individual continuously approached in 8 different encounters - the individual with the most re-sightings overall. Both sexes participated in this behavior, 4 males and one female were identified. We highlight the long-term presence and general inquisitiveness of multiple minke whales off southern Portugal and show differences on an individual level. The continued participation of few animals in this interactive behavior may raise management concerns. In this area, which features intense whale-watching activities, these individuals may suffer from increased vessel exposure and its implications. Further investigation of the apparent curiosity of individual minke whales may aid in identifying and addressing unevenly distributed anthropogenic pressure.



BE-19. A dataset of acoustic recordings of wild free-ranging short-beaked common dolphins

Lehnhoff, Loïc ¹; Glotin, Hervé ²; Le Gall, Yves ³; Menut, Eric ³; Meheust, Eleonore ⁴; Peltier, Hélène ⁴; Spitz, Jérôme ⁴; Mérigot, Bastien ⁵

1. University of Montpellier, Marine Biodiversity, Exploitation & Conservation lab University of Toulon, UMR Laboratory of Computer Science and Systems (LIS)
2. University of Toulon, UMR Laboratory of Computer Science and Systems (LIS)
3. French Research Institute for Exploitation of the Sea (IFREMER)
4. Observatoire Pelagis, La Rochelle Université, CNRS
5. University of Montpellier - Marine Biodiversity, Exploitation and conservation laboratory (MARBEC)

Dolphins are highly vocal cetaceans with a complex acoustic repertoire. These marine mammals rely heavily on sound for critical activities: echolocation clicks for navigation and prey detection, whistles for social communication, and pulsed sounds for less well-documented purposes. Understanding their acoustic behaviour is essential for insights into their ecology, social structure, and responses to anthropogenic noise. Here, we present a dataset collected in the northern Bay of Biscay, France, from 2020 to 2022 during surveys conducted as part of the DOLPHINFREE project. The dataset contains high resolution acoustic recordings of wild free-ranging short-beaked common dolphins (*Delphinus delphis*) sampled at 512 kHz and observed during various behavioural states, including foraging, travelling, socializing, milling, and attraction to the boat. Audio recordings were collected during opportunistic encounters using two devices: a single high-quality hydrophone and a compact array of four hydrophones for localization purposes. The dataset comprises over 400 minutes of unedited audio recordings of *D. delphis* accompanied by visual observations. This comprehensive resource is valuable for detailed studies of the acoustic repertoire of common dolphins and their two-dimensional movements.

BE-20. Clash of the Titans: global occurrence of agonistic interactions initiated by pilot whales (*Globicephala* spp.) with other cetaceans

Samarra, Filipa ¹; Alves, Filipe ²; Anderson, R Charles ³; Brouste, Clement ⁴; de Montgolfier, Benjamin ⁵; Fernandez, Marc ²; Gaspard, David ⁶; Hooker, Sascha ⁷; Jourdain, Eve ⁸; Marrero-Pérez, Jacobo ⁹; Pedersen, Ove ¹⁰; Rikardsen, Audun H. ¹¹; Similä, Tiu ¹⁰; Tixier, Paul ¹²; Totterdell, John ¹³; Towers, Jared ¹⁴; Vongraven, Dag ¹⁵; Wellard, Rebecca ¹⁶; Zwamborn, Elizabeth ¹⁷; Kiszka, Jeremy ¹⁸

1. Westman Islands Research Centre, University of Iceland, Vestmannaeyjar, Iceland
2. MARE – Marine and Environmental Sciences Centre /ARNET – Aquatic Research Network, ARDITI. University of Madeira, Portugal
3. Manta Marine, Malé, Republic of Maldives
4. Apex Cetacea, Capbreton, France
5. Aquasearch, Sainte-Luce, Martinique ISMER-Université du Québec à Rimouski, Rimouski, QC, Canada
6. Dalhousie University, Halifax, Nova-Scotia, Canada
7. Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, Scotland, UK
8. Norwegian Orca Survey, Andenes, Norway
9. Tonina Association, Research and Outreach of the Marine Natural Environment, Santa Cruz de Tenerife, Spain
10. Whale2Sea, Hamnegata 9, Andenes, Norway
11. UiT The Arctic University of Norway, Tromsø, Norway
12. MARBEC, Université de Montpellier-CNRS-IFREMER-IRD, Sète, France
13. CETREC WA - Cetacean Research Centre, Exmouth, Western Australia
14. Bay Cetology, Alert Bay, BC, Canada
15. Norwegian Polar Institute, Fram Center, N-9296 Tromsø, Norway
16. Project ORCA, Perth, Western Australia
17. Dalhousie University, Halifax, Nova-Scotia, Canada Trinity Western University, Langley, British Columbia, Canada
18. Florida International University, Department of Biological Sciences, Miami, Florida, USA

A wide range of animal species, such as birds, fish, and mammals form mixed-species groups (MSGs), including cetaceans. By forming MSGs, cetaceans may reduce predation risk, improve foraging success, and gain social benefits. The formation of MSGs often involve affiliative, neutral, or aggressive behaviors. However, the function and mechanisms driving agonistic interactions remain unclear. Several odontocetes appear to be more frequently involved in initiating agonistic interactions, such as common bottlenose dolphins (*Tursiops truncatus*) and pilot whales (*Globicephala* spp.). Here, we review the published literature and compile previously unpublished observations of agonistic interactions initiated by long-finned (*G. melas*) and short-finned pilot whales (*G. macrorhynchus*) with other cetaceans. Interactions recorded involve at



least eight species: two mysticetes (*Eubalaena glacialis*, *Megaptera novaengliae*) and six odontocetes (*Physeter macrocephalus*, *Orcinus orca*, *Grampus griseus*, *T. truncatus*, *Hyperoodon ampullatus*, and *Indopacetus pacificus*). Pilot whales are the species most commonly initiating an interaction, which resulted in a range of responses from the “receiver” species, including increased group cohesion, avoidance, flight responses, and mobbing. The Risso’s dolphin was the only species initiating agonistic interactions towards pilot whales (*G. macrorhynchus*). Observations were reported globally from tropical to Arctic waters, including the North and South Atlantic and the Indo-Pacific region. The drivers of these interactions remain unclear, but in some cases, might be associated with kleptoparasitism, particularly when involving *G. macrorhynchus* towards beaked and sperm whales. We also propose a methodological framework to examine the functional origin of these agonistic interactions. As climate change impacts intensify, several cetacean species are undergoing distribution shifts, likely increasing such interactions. Lastly, we propose new hypotheses based on ecological theory to predict how new species distributions might affect cetacean community dynamics based on future climate scenarios.



BE-21. Complex social and acoustic response of adult male sperm whales when harassed by orcas in high latitudes

Griffiths, Emily T ¹; Costentino, Mel ^{1,2}; van Dam, Jade A. ²; van Dongen, Ceres H. ²

1. Section for Marine Mammal Research, Department of Ecoscience, Aarhus University, Denmark
2. Whalesafari, Andenes, Norway

Adult male sperm whales (*Physeter macrocephalus*) are typically solitary creatures. After leaving their natal clans, only adult males are typically seen beyond 40° N or S. While loose social interactions are documented, they do not have the same strength nor dynamics as the matriarchal social groups present in warmer waters. Orcas (*Orcinus orca*) are known to prey on sperm whales and other great whales. When attacked by orcas, sperm whale clans can remain tightly clustered and adopt defensive positioning, such as the Rosette or Flotilla formations, to avoid predation on juveniles or weak adults. Sperm whales produce a variety of short echolocation pulses, including codas and clangs. Codas are primarily used for communication and social purposes and are therefore not thought to be common among solitary males, while clangs can be used for both communication and potentially male-male competition. Here, we report visual and acoustic observations of three adult males grouping to defend themselves against an orca attack, near the Norwegian island Andøya on 23 July 2011. Initially, two sperm whales used clangs to signal to one another as an approaching group of at least three orcas were seen and heard. As the orcas circled one whale, the males remained close, engaging in shallow dives, nose-lifting, and producing social codas and clangs. A third sperm whale was acoustically detected, and the three males engaged in physical contact. Together, these whales produced clangs, codas, and other unclassified click bouts. While the orcas were not always seen, they were acoustically present in the area. The whales surfaced parallel to each other in a triangular position, with one slightly at the lead, for 8 minutes, before shallow diving and leaving. To the authors' knowledge, this is the first report of witnessed orca aggression towards sperm whales in high latitudes.



BE-22. Calf-snatching among cetaceans: inter-specific associations of adult bottlenose dolphins with common and striped dolphin calves in Southern Portugal

den Hollander, Janneke ¹; Quirin, Alicia ¹; Martins, Miguel ²; Cid, André ¹; Castro, Joana ³

1. AIMM - Associação para a Investigação do Meio Marinho, Rua Maestro Fred. Freitas N15-1, 1500-399 Lisboa, Portugal.
2. AIMM - Associação para a Investigação do Meio Marinho, Rua Maestro Fred. Freitas N15-1, 1500-399 Lisboa, Portugal. CEAUL - Centro de Estatística e Aplicações da Universidade de Lisboa, Faculdade de Ciências, Universidade de Lisboa, Portugal.
3. AIMM - Associação para a Investigação do Meio Marinho, Rua Maestro Fred. Freitas N15-1, 1500-399 Lisboa, Portugal. MARE - Marine and Environmental Sciences Centre / ARNET - Aquatic Research Network, Laboratório Marítimo da Guia, Faculdade de Ciências, Universidade de Lisboa, Cascais, Portugal.

Inter-specific interactions among cetaceans are diverse and have been reported on numerous occasions. However, inter-specific alloparental care (an adult exhibiting nurturant behavior towards a non-descendant young of a different species) is rarely documented. Here, we describe multiple calf-directed inter-specific associations, including one apparent instance of prolonged inter-specific alloparental care, along the southern coast of Portugal. This behavior was directed by adult common bottlenose dolphins (*Tursiops truncatus*) towards 4 common dolphin (*Delphinus delphis*) calves and one striped dolphin (*Stenella coeruleoalba*) calf. Out of these calves 3 were classified as neonates (i.e., ≤ 3 months old). Observations occurred during both dedicated and opportunistic boat-based surveys. In total, 11 sightings were documented between 2016 and 2024, in 9 of which the heterospecific calf was observed swimming in echelon position alongside an adult bottlenose dolphin. Additionally, antagonistic behaviors by adult bottlenose dolphins towards the calves were observed during 3 encounters. These behaviors included pushing, tossing, and ramming the calf. Photo identification confirmed the involvement of 66 adult bottlenose dolphins throughout all encounters, with the recurring presence of 26 individuals (22 animals within the same year and 9 between different years). Notably, 3 observations revealed a consistent pairing between one adult bottlenose dolphin and a common dolphin neonate, which persisted for nearly one month in 2024. This neonate was identified as the same individual by its distinctive coloration patterns and consistent size across these encounters. Further analysis revealed that, apart from this case, no other adult was seen swimming with a heterospecific calf more than once. Although the exact reasons behind these interactions remain unclear, this study provides a unique insight into the social dynamics between different cetacean species, spanning from antagonistic to seemingly care-giving behavior. Moreover, it documents the first instance of prolonged inter-specific alloparental care among cetaceans along the coast of mainland Portugal.



BE-23. Repeated stereotyped calls produced by free-ranging rough-toothed dolphins (*Steno bredanensis*)

Redaelli, Laura ¹; Caruso, Francesco ²; Alves, Filipe ¹; Fernandez, Marc ¹; Hamard, Eliette ¹; Sayigh, Laela ³; Janik, Vincent ⁴; dos Santos, Manuel ⁵; Dinis, Ana ¹

1. MARE – Marine and Environmental Sciences Centre / ARDITI, Funchal, Madeira, Portugal
2. Stazione Zoologica Anton Dohrn, Naples, Italy
3. Biology Department, Woods Hole Oceanographic Institution, Woods Hole, MA, USA; School of Cognitive Science, Hampshire College, Amherst, MA, USA
4. Sea Mammal Research Unit, School of Biology, University of St. Andrews, Fife, UK
5. MARE – Marine and Environmental Sciences Centre/ISPA - Instituto Universitário, Lisboa, Portugal

Acoustic communication is vital for marine mammals, especially for delphinids, which rely on various sounds including frequency-modulated tonal signals known as whistles, generally used as primary tools for social communication. Among these, individually distinctive calls, termed "signature whistles," have been extensively studied in bottlenose dolphins (*Tursiops truncatus*) and are known to convey identity and motivational information. While similar signals have been reported in other delphinids, this study provides a novel indication of individual distinctive calls in free-ranging rough-toothed dolphins (*Steno bredanensis*). Using acoustic recordings collected from a group of animals off Madeira Island (Eastern North Atlantic) sighted over different days in the summer of 2023, we analyzed 4928 whistles, identifying 1147 repeated stereotyped calls. These were manually classified into 30 categories based on frequency modulation contours, with categorization verified using an unsupervised neural network (ARTwarp). The high stereotypy observed in whistle contours and temporal patterns suggests these calls may serve a similar role to signature whistles in bottlenose dolphins, potentially facilitating individual recognition, maintaining social bonds, and coordinating group activities. This aligns with the species' fission-fusion social structure, where such signals likely play a crucial role in overcoming the challenges of group fluidity and spatial dispersion. This study highlights the importance of acoustic communication in the complex social lives of rough-toothed dolphins and provides new insights into their vocal repertoire. Future research should explore the production context and perception of these signals to deepen our understanding of their role in the communication of this species.



BE-24. A study on narwhal (*Monodon monoceros*) social network structure

Rasmussen, Ida ¹; Floriane Briefer, Elodie ¹; Bohr Brask, Josefine ²; Heide-Jørgensen, Mads Peter ³; Tervo, Outi ³

1. Department of Biology, University of Copenhagen
2. Copenhagen Center for Social Data Science (SODAS), University of Copenhagen
3. Department of Mammals and Birds, Greenland Institute of Natural Resources, Greenland

Group-living can be highly beneficial for an animal's lifetime fitness. Narwhals (*Monodon monoceros*) are social cetaceans that tend to form large herds of hundreds of individuals during their migrations, which then divide into smaller clusters once in the fjords. Currently, several narwhal populations are declining, and in some areas, hunting is causing an overrepresentation of males and a shortage of females, putting them at risk of local extinction. A good understanding of their social relationships would allow us to better grasp the threats these animals face and foresee potential conservation actions. However, studying these strictly arctic cetaceans is extremely challenging due to their year-round high latitude distribution, occurrence in consolidated pack ice, and because their relevant social interactions happen underwater. As a result, their social structure remains largely unknown. The aim of this study is to investigate the social network structure of narwhals using location data from individuals instrumented with satellite transmitters ($n \sim 150$) during 1993-1994, 1997-2001, 2003-2008 and 2010-2019 in both Eastern and Western Greenland and Canada. We hypothesize that narwhal social networks show differences in associations between sexes and predict that there will be stronger ties within same sex individuals. Social associations were based on spatio-temporal co-occurrence of individuals within the distance which narwhals can communicate with each other. As aligned with our predictions, the results indicate extraordinarily strong tie strengths within same sex individuals. Furthermore, the network showed a structure with several clusters, indicating the presence of social subgroups and significant individuals. Our findings highlight the importance of understanding narwhal social structure, and the significance of certain group members and relationships. Hence, this study can inform narwhal conservation and management by, for example, recommending which individuals to catch in narwhal hunting practices while maintaining the population growth.



BE-25. Under Pressure – Unveiling an interaction between sperm whales (*Physeter macrocephalus*) and false killer whales (*Pseudorca crassidens*) in the Azores

Rolim, Margarida ^{1,2}; Jacob, Dinis ¹; Martins, Rafael ¹; Malato, Pedro ¹; González García, Laura ^{1,2}

1. Futurismo Azores Adventures Portas do Mar, 9500-771, Ponta Delgada, São Miguel, Azores
2. Institute of Marine Sciences - OKEANOS, University of the Azores, Rua da Mãe de Deus, 9500-321 Ponta Delgada, Portugal

Interspecies interactions among cetaceans are often documented, especially in regions where multiple species co-occur. In the Azores, sperm whales (*Physeter macrocephalus*) are regularly sighted year-round and have been observed interacting with other species like bottlenose dolphins (*Tursiops truncatus*) or Risso's dolphins (*Grampus griseus*). However, interactions with false killer whales (*Pseudorca crassidens*), occasional visitors in the Archipelago, are notably rare, with only a few reports globally. On August 21, 2024, an interaction between these species was observed northwest of São Miguel Island during a whale-watching trip. Data collected included visual observations, video and acoustic recordings. The interaction involved a group of up to 20 sperm whales, and around 40 false killer whales. Only a subset of 10–15 false killer whales closely approached the sperm whales, circling the group, while the remainder continued travelling east. As a response, sperm whales exhibited defensive behaviours such as tight grouping, reduced swimming speed, erratic movements, and fluke slashing; and kept the three calves present in the middle of the group. Acoustic data captured sperm whale codas and burst-pulse sounds, while false killer whales produced numerous high-pitched whistles. The whistles (n=174) were characterised and compared with other recordings of false killer whales during other behaviours such as travelling, socialising and foraging. Significant differences in whistle frequency and duration were detected across behavioural states, suggesting these acoustic features may help predict or indicate behavioural context. The interaction lasted 18 minutes and ended with the false killer whales moving away. No injuries or signs of aggression were observed in the sperm whales as viewed from the surface, suggesting a cautious rather than overtly aggressive interaction. This observation, the first reported in the Region between these species, contributes to understanding interspecies cetacean interactions and underscores the value of opportunistic whale-watching data to obtain unique insights into rare events.



BE-26. Behavioural patterns of common dolphins (*Delphinus delphis*) in the Algarve: effects of calf presence, anthropogenic pressure, and environmental conditions

Araújo, Sara M. ¹; Castro, Joana ²; Cid, André ³; Cunha, Marina R. ⁴; Matos, Fábio L. ³

1. Departamento de Biologia, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal; AIMM – Associação para Investigação do Meio Marinho, Rua Maestro Frederico de Freitas N15-1º, 1500-399 Lisboa, Portugal
2. AIMM – Associação para Investigação do Meio Marinho, Rua Maestro Frederico de Freitas N15-1º, 1500-399 Lisboa, Portugal; MARE – Marine and Environmental Sciences Centre/ ARNET - Aquatic Research Network, Laboratório Marítimo da Guia, Faculdade de Ciências da Universidade de Lisboa, 2750-374 Cascais, Portugal
3. AIMM – Associação para Investigação do Meio Marinho, Rua Maestro Frederico de Freitas N15-1º, 1500-399 Lisboa, Portugal
4. Departamento de Biologia, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal

The southern coast of Portugal is an important nursery ground for common dolphins (*Delphinus delphis*), while being impacted by various anthropogenic activities, particularly the recent increase in marine tourism. Touristic activities and fisheries pose a risk for the occurrence of dolphins but their behaviour is still poorly understood. Thus, this work aimed to identify relevant factors to predict the behaviour of common dolphins. A multinomial logistic regression was applied to behavioural data (n = 680) collected from 2016 to 2023 at the continental shelf of Algarve. Sea surface temperature, sea surface height, two-month lagged chlorophyll concentration, salinity, distance to coast, slope, number of boats, presence of calves, and the year were significant in predicting common dolphins' behaviour. Travelling was the most observed behavioural state. Most groups included calves, which was related to higher odds of foraging and lower odds of socialising (in relation to travelling). Results show that dolphins tend to forage further from coast, in cooler waters, and in locations with higher productivity. Socialising probabilities were higher in flatter areas and closer to coast. An increase in the number of boats present showed a negative effect on foraging likelihood, while increasing socialising probabilities. Foraging odds (in relation to travelling) were also higher in the years marked by the COVID-19 pandemic restrictions compared to years without lockdowns. Understanding the factors that influence dolphin behaviour is essential for informing conservation and management efforts. The results advance our understanding of the behavioural pattern of common dolphins in the Algarve by highlighting the impact of calf presence, particularly in foraging behaviour, as well as potential impacts of climate change.



The underlined effects of boat densities on the behaviour of dolphins suggests the necessity of adapting management regulations or their enforcement in the study area.

BE-27. Social association of Risso's dolphins in the Ligurian Sea (North-Western Mediterranean Sea): insights from long-term photo-ID data

Fornaroli, Arianna ¹; Hartman, Karin L. ²; van der Harst, Pieter ²; Airoidi, Sabina ¹

1. Tethys Research Institute (Viale G. B. Gadio 2, 20121, Milano, Italy)

2. Nova Atlantis Foundation (Risso's Dolphin Research Center, Rua Dr. Freitas Pimentel 11, 9930-309 Santa Cruz das Ribeiras, Lajes do Pico, Azores, Portugal)

This study investigates the social structure of Risso's dolphins (*Grampus griseus*) in the Ligurian Sea, within the Pelagos Sanctuary. Using photo-identification data collected by the Tethys Research Institute from 1990 to 2013, we analyzed association patterns among 81 highly marked individuals, each observed at least four times during 101 sightings. Individuals were categorized as adult females (AF: 27%) or of unknown sex (US: 73%) based on calf association criteria, with calves excluded from the analysis to avoid potential bias. The Half-Weight Association Index (HWI) was applied to assess social relationships and analyzed through SOCPROG 2.9. Our results revealed a well-differentiated social structure ($S = 0.65$, $SE = 0.04$, $n = 100$ bootstrap replicates) without any segregation of units ($Q = 0.216$). The average HWI (HWI_{ave}) across all individuals was 0.10 ± 0.03 , indicating low overall association levels, whereas the mean maximum HWI (HWI_{max}) reached 0.54 ± 0.15 , with 19% of individuals showing $HWI_{max} \geq 0.70$. Notably, individuals in the US category exhibited a higher HWI_{max} (0.55 ± 0.15) compared to AF (0.40 ± 0.12). The best-fitting model for the Standardized Lagged Association Rate (SLAR) identified Two levels of casual acquaintances, reflecting both short-term and longer-term associations. Permutation tests highlighted that the social structure was mainly influenced by short-term relationships ($n = 10,000$, $flips = 1000$, $p < 0.05$). However, some individuals formed longer-term associations, as demonstrated by two likely adult males consistently observed together from 1991 to 2005 (HWI_{ave} = 0.91), indicating a stable association. Our findings suggest a social structure characterized by fluid interactions and preferred, long-lasting associations, as observed in other regions. This research offers interesting insights into the social dynamics of the Mediterranean subpopulation of *Grampus griseus*, recently listed as Endangered on the IUCN Red List, underscoring the urgency for further studies to support conservation efforts.

BE-28. Harbour porpoise occurrence and behaviour in the Douro river estuary: implications for conservation

Silva, Iolanda ¹; Afonso, Luís ^{1,2}; Valente, Raul ¹; Oliveira-Rodrigues, Cláudia ^{1,3}; Artilheiro, Nádia ¹; Gil, Ágatha ^{1,3,4,5}; Correia, Ana Mafalda ¹

1. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Terminal de Cruzeiros do Porto de Leixões, 4450-208 Matosinhos, Portugal
2. ICBAS – School of Medicine and Biomedical Sciences, University of Porto, 4050-313, Porto, Portugal
3. FCUP – Department of Biology, Faculty of Sciences, University of Porto (U. Porto), Rua do Campo Alegre, Porto, Portugal
4. Instituto de Investigacións Mariñas (CSIC). 36208 Vigo, Pontevedra, Spain
5. Department of Biology and Environmental, Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), University of Trás-os-Montes and Alto Douro, Quinta de Prados, Vila Real 5001-801, Portugal

The harbour porpoise (*Phocoena phocoena*), classified as “Critically ~~Endangered~~Endangered” under the Red Book of Mammals of Mainland Portugal, faces increasing threats due to its coastal distribution and overlap with human activities, particularly bycatch. Despite its ecological importance, significant knowledge gaps remain regarding its behaviour and interactions with anthropogenic pressures in key habitats. This study addresses these gaps by investigating the occurrence, behaviour, and responses of harbour porpoises to marine traffic in the Douro River mouth, northern Portugal. Between 2017 and 2024, land-based observations were carried out at the pier located at mouth of the river. Surveys were performed during daylight hours by 1-2 trained observers, using naked-eye scans and binoculars to monitor a 180° field of view. Behavioural patterns and vessel interactions (categorised as positive, neutral and negative) were assessed using the focal-scanning method. Over 347 days of monitoring, 174 confirmed sightings of harbour porpoises were recorded, with group sizes ranging from one to five individuals. Behavioural analysis revealed that travelling was the most frequently observed activity (59.6%), followed by feeding (25.3%). Vessel presence was recorded in 30.5% of sightings, and 73.6% of these interactions resulted in negative behavioural responses. These findings highlight the Douro River mouth as a key habitat for harbour porpoises, supporting essential behaviours such as travelling and feeding across seasons and years. The frequent negative responses to vessel presence underscore the urgent need to mitigate anthropogenic pressures in the region. By combining robust scientific methods with actionable outcomes, this research sets the foundation for long-term monitoring and management efforts, contributing to the conservation of one of Europe’s most vulnerable cetacean populations.



BE-29. Quantifying fear: do sperm whale responses during interspecies interactions reflect potential threats?

Eguiguren, Ana ¹; Gutierrez-Munizaga, Belén ²; Rendell, Luke ²; Zwamborn, Elizabeth ³; Whitehead, Hal ¹

1. Dalhousie University
2. St. Andrews University
3. Trinity Western University

Predation pressure is hypothesized to be a key driver of sperm whale sociality. Specifically for this deep-diving and nomadic species, communal protection of vulnerable young may be a valuable benefit of maintaining social bonds within, and occasionally between, social units. Sperm whales may have diverse responses depending on the perceived severity of the threat faced, some of which come at a high individual cost (e.g., adopting protective formations, chasing antagonists away, diving). Behavioural responses of a group likely vary in response to several factors, including the social context (group size, presence of neonates and calves), the other species' identity, behaviour, and group size. Here, we determine whether sperm whale behaviours observed through aerial footage collected via drone videography correlate with threat levels and social context. For this, we examine aerial footage of sperm whale groups collected off the Galapagos Islands in 2023 before, during and after interactions of different valence and with different odontocete species, including *Tursiops* spp., *Orcinus orca*, *Delphinus* spp., and *Globicephala macrorhynchus* (n=12 interactions, 11 days). Specifically, we analyze sperm whales' spatial configuration, aversive behaviours, breath rates, acoustic behaviour, and group size and composition. We explore the association between variables using a principal components analysis. Additionally, we assess whether the relative position of calves—i.e., central or peripheral—shifts in response to risk levels. This work presents the first quantitative comparison of the behavioural responses of sperm whales to interspecies interactions. Our analyses provide empirical support for the hypothesis that sperm whales form larger groups in the Pacific Ocean, when compared with the North Atlantic, in response to increased predation pressure. We also generate a distribution of behavioural metrics that can be compared with those recorded during human interactions to infer perceived threat levels in sperm whale groups.



BE-30. Short-term behavioral responses of bottlenose dolphins *Tursiops truncatus* to remote biopsy darting

Hofs, Jeroen ^{1,2,3,4}; Bérubé, Martine ^{4,5}; Blazinić Vučur, Tihana ¹; Cukrov-Car, Marinela ¹; Frleta-Valić, Maša ^{1,2,3}; Hartman, Esther ⁶; Miočić-Stošić, Jure ¹; Pleslić, Grgur ¹; Radulović, Marko ¹; Holcer, Draško ^{1,7}

1. Blue World Institute of Marine Research and Conservation, Kaštel 24, HR-51551 Veli Lošinj, Croatia.
2. Blue World Vis, Put Batude 2, HR-21485 Komiža, Croatia.
3. Faculty of Mathematics, Natural Sciences and Information Technologies, University of Primorska, Glagoljaška 8, SI-6000 Koper, Slovenia.
4. Groningen Institute of Evolutionary Life Sciences, University of Groningen, P.O. Box 11103, 9700 CC, Groningen, The Netherlands.
5. Center for Coastal Studies, 5 Holway Avenue, Provincetown, Massachusetts 02657, USA.
6. Wildlife Ecology and Conservation Group, Wageningen University & Research, P.O. Box 9101, 6700HB, Wageningen, The Netherlands.
7. Croatian Natural History Museum, Demetrova 1, HR-10000 Zagreb, Croatia.

Biopsy samples collected from cetaceans can provide valuable scientific information on genetics, pollutants, hormone levels and diet. In the wild, biopsy samples are commonly collected using a remote biopsy system, consisting of an air rifle or crossbow and specialized darts. Despite the benefits, this method of sample collection is characterized as intrusive, and adequate monitoring of its impact on the health and behavior of the targeted animals is recommended. In the North-East Adriatic Sea, from 2021 until 2024, biopsy samples were collected from bottlenose dolphins using a crossbow. Short-term reactions and specific behaviors of the targeted animal were documented. Furthermore, changes in the group's behavioral state were recorded. The 260 biopsy attempts resulted in 174 (66.9%) direct hits, and 19 (7.31%) indirect hits (dart hits the animal after bouncing off the sea surface). Short-term reactions (<10 minutes) were characterized as low (111 times, 42.7%), medium (115 times, 44.2%), or high (34 times, 13.1%). The targeted animals' short-term reactions, and the chance of the group to change behavioral state were not significantly affected by the dart hitting or missing. This suggests that the behavioral reaction was a scare response towards the dart splashing the water or touching the animal rather than to the physical effect of the biopsy. However, the targeted animal was significantly more likely to sweep its tail in response to a hit than to a miss. The short-term reactions of females were significantly higher than those of males, but were not significantly affected by an individual's age. Biopsies in larger groups were followed by lower short-term reactions, and larger groups were less likely to change behavioral state. Although not explicitly analyzed, no obvious long-term behavioral or physical reactions were noticed, despite regular resighting of most of the animals after the biopsy attempts.



BE-31. Acoustic characteristics of Mediterranean rough-toothed dolphins

Lyne, Patrick ¹; Dilkilic, Atakan ¹; Ozdemir, Ceyda ¹; Akkaya, Aylin ¹

1. DMAD

In 2024 DMAD encountered a small pod of rough-toothed dolphins (*Steno bredanensis*) during a survey off the Mediterranean coast of South West Turkey. A passive acoustic towed array was deployed and recording during the entire encounter and here we will describe the characteristics of these dolphins in the Mediterranean during a 1 hour period of the survey. Here we describe the characteristics whistles produced by rough-toothed dolphins and describe click characteristics in detail. Whistles have a segmented structure and those in the Mediterranean appear very similar to those recorded elsewhere in the world. Clicks are not well described for rough-toothed dolphins and here we describe the clicks analysed using PAMguard and PAMpal show a typical peak frequency of 40 to 42 kHz with occasional peak low frequency component (below 2 kHz) believed to be due to directionality in the click, additionally occasional multi-modal frequency clicks also showing a 85-87 kHz peak. Variations in click characteristics occur within the same click train at the same angle to the hydrophone at the same amplitude with typically 200 to 500 milliseconds between clicks in a click train. It is postulated that such changes in signal are likely the result of change in directionality of the clicks as the animal scans it's surroundings. The click characteristics in this sighting while recorded under similar circumstances to those described by Rankin et al (2015) in the Eastern and Central Pacific are very different with a maximum peak frequency of 32 kHz and this may be attributed to context, location or simply distance from animals.



BE-32. Calf-directed agonistic behavior in dusky dolphins

Orbach, Dara ¹; Fiori, Lorenzo ¹; Piwetz, Sarah ¹; Weir, Jody ²; Würsig, Bernd ³

1. *Texas A&M University-Corpus Christi*
2. *Kaikōura Ocean Research Institute Inc. (KORI)*
3. *Texas A&M University at Galveston*

Calf-directed aggression and/or infanticide (intentional killing of young that are not direct offspring) has been increasingly documented in cetaceans, including in at least six species of odontocetes, and generally consists of qualitative descriptions. We report observations of calf-directed aggression in a seventh species, the dusky dolphin (*Lagenorhynchus obscurus*). We used an unoccupied aerial system (UAS) to opportunistically video-record group-attempted infanticide off Kaikōura, New Zealand that persisted over 40 minutes. The group of dusky dolphins (ranging from 13- 27 individuals) attempted to ram and submerge the calf, and to separate the calf from its presumed mother. Post hoc video analysis enabled individual tracking of the mother and calf and the first quantification of cetacean breathing and swimming parameters during calf-directed aggression. Agonistic behaviors were directed primary towards the calf but also towards the mother. The mother swam at a mean speed of 4.1 km/h and had a mean bearing change of 58.2 deg/min. The mother's breathing rate (5.4 breaths/min) was slightly less than that of her calf (6.1 breaths/min). Dusky dolphins engaged in this incident of calf-directed agonistic behavior had a larger group size than dusky dolphins in mating groups in the same population, although females in both contexts had similar travel speeds, bearing changes, breathing rates, and behavioral repertoires. Our data support the sexual selection functional hypothesis for infanticide in which males attempt to induce a female to resume estrus more rapidly. Dusky dolphin nursery group formations in shallow waters and female matings with multiple males may be tactics to prevent infanticide.



BE-33. Exploring geographic variations and assessing effects of dolphin-watching boats on whistle emissions of common bottlenose dolphins in coastal (Algarve) and estuarine (Sado) populations of Portugal

Erber, Claudia ^{1,2}; Castro, Joana ^{2,3}; Cid, André ²; dos Santos, Manuel Eduardo ¹

1. MARE – Marine and Environmental Science Centre / ARNET - Aquatic Research Network; Ispa – Instituto Universitário, Lisboa, Portugal
2. AIMM – Marine Environment Research Association, Lisboa, Portugal.
3. MARE – Marine and Environmental Science Centre / ARNET - Aquatic Research Network, Laboratório Marítimo da Guia, Faculdade de Ciências, Universidade de Lisboa, Portugal.

This study investigates the whistle emissions of common bottlenose dolphins in two areas of Continental Portugal: the Algarve (coastal groups) and the Sado Estuary (a resident population). Data were collected from May 2023 to November 2024. In the Algarve, 3983 whistles were recorded in 66 hours of fieldwork, with the highest rates during Feeding (2.6 whistles/min/dolphin) and Foraging (1.6 whistles/min/dolphin) behaviors. In the Sado Estuary, 1454 whistles were recorded in 18 hours of fieldwork. Socializing (1.5 whistles/min/dolphin) and Foraging (0.9 whistles/min/dolphin) behaviors showed the highest rates, while Feeding behavior was not observed in this area. During traveling behavior, whistle rates were lower in both locations (0.8 whistles/min/dolphin in Algarve and 0.7 whistles/min/dolphin in Sado). Mann-Whitney U test revealed statistically significant differences in whistle frequency parameters between the two locations, indicating geographic variation in whistle usage between the populations. Whistle rates were higher without dolphin-watching boats in both locations: 1.2 whistles/min/dolphin. In the presence of boats, the rates dropped to 1.0 in the Algarve and 0.8 in the Sado. Additionally, 42% of whistles registered in the presence of boats in the Algarve and 62% in Sado exhibited poor signal-to-noise ratios. This suggests that boat noise is masking the dolphins' whistles, essential for coordinating social interactions and feeding-related activities. The presence of dolphin-watching boats may disrupt these behaviors, causing an impact on the animals' well-being. These results provide insights into bottlenose dolphin whistle plasticity and how they adjust their communication signals to the environment and human activities.



BE-34. Development of the early social behavior in Baltic grey seals

Lenko, Karina ^{1,2}; Staponkus, Robertas ¹; Kulikov, P. ² ; Survilienė, Vaida ³

1. Klaipėda University, Marine Research Institute, Klaipėda, Lithuania
2. Lithuanian Sea Museum, Smiltynės g. 3, LT-93100 Klaipėda, Lithuania
3. Vilnius University, Life Sciences Center, Saulėtekio av. 7, Vilnius, Lithuania

The Baltic grey seal (*Halichoerus grypus*), the largest mammal in the Baltic Sea, faces numerous challenges due to urbanization, marine pollution, climate change, and overfishing. Although the population has reached around 55,000 individuals, the loss of haul-out sites and reduced ice cover threaten the species' ability to rest, breed, and molt, and the population's growth rate remains insufficient for long-term sustainability. Understanding the impact of these stressors on the population requires a deeper knowledge of seal behavior, especially in young individuals. This study investigates the social behavior of six same age grey seal pups in captivity, focusing on their social interactions during a key developmental period, 2-3 months after weaning. Behavior was monitored from video recordings taken at the Lithuanian Sea Museum's animal rehabilitation facility in 2011 and 2012. Different behavioral categories were registered using focal sampling, while scan sampling was used to measure the distance between the pups every 30 minutes. Results show that the majority of behaviors observed in the pups were states of rest and alertness (70–81%). Active behaviors primarily involved individual locomotion and social interactions (up to 25%). When introduced to another peer, resting behavior in isolated pups decreased significantly (up to 40%), while social behavior and activity increased and predominated. The study also found that pups raised together exhibited stronger social bonds, with an average proximity being 30% closer compared to unfamiliar pups. Social behavior frequency and duration were notably higher in pairs that spent more time together during early development. These findings underscore the importance of understanding seal social behavior to assess the impacts of environmental changes and human activities on this species, particularly during the vulnerable early stages of development. This knowledge is also crucial for monitoring the social well-being of seals in captive environments.



Conservation and Management

CM-01. Monitoring marine macro-fauna using ferries/large vessels as multidisciplinary research platforms: a handbook

Crosti, Roberto ¹; Arcangeli, Antonella ¹; Babey, Lucy ²; Correia, Ana Mafalda ³; David, Lea ⁴; Garcia-Garin, Odei ⁵; Gregoriotti, Martina ¹; Maffucci, Fulvio ⁶; Mifsud, Carmen ⁷; Osinga, Nynke ⁸; Pasanisi, Eugenia ¹; Santini, Elena ¹; Scuderi, Alessia ⁹; Tepsich, Paola ¹⁰; Vighi, Morgana ¹¹; Wall, Dave ¹²; Campana, Ilaria ¹³

1. ISPRA, Istituto Superiore Protezione e Ricerca Ambientale-Dip. Biodiversità, Italy
2. ORCA, Brittany Centre, Wharf Road, Portsmouth, PO2 8RU, United Kingdom
3. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal.
4. EcoOcéan Institut, Montpellier, France
5. Institute of Aquatic Ecology (IEA), Universitat de Girona; 17003 Girona, Spain
6. Marine Turtle Research Group, CAPE Department, Stazione Zoologica Anton Dohrn, Naples, Italy
7. Environment & Resources Authority, ERA, Malta
8. Rugvin Foundation, Jeruzalem 31a, 6881 JL Velp, The Netherlands
9. Association Nereide, C. Sancho IV el Bravo 19, 11380 Tarifa, Cádiz, Spain
10. Fondazione CIMA CIMA, Via Magliotto 2 17100 Savona Italy
11. Department of Evolutionary Biology, Ecology and Environmental Sciences. Faculty of Biology. University of Barcelona, 08028, Barcelona, Spain
12. Irish Whale and Dolphin Group. Merchants Quay, Kilrush, Co. Clare, Ireland
13. Accademia del Leviatano APS, Via dell'Ospedaletto 53, 00054, (RM), Italy

Since 2000, there has been an increase in at-sea research programs aimed at investigating the presence and distribution of marine macro-vertebrates, such as cetaceans, turtles, and birds, using large vessels like ferries and cargo ships as platforms for systematic, continuous observations. Additionally, with the collection of water samples, new opportunities for investigation emerged. Currently, there are research "networks" in Europe: in the EU Northeast-Atlantic, in the Macaronesia region and in the Western Mediterranean Sea, which conduct studies using large vessels as platforms for systematic surveys. Additionally, several workshops on this topic have been held at ECS conferences over the years, with more than 200 conference papers presenting studies related to surveys conducted from ferries/cargo ships. Since 2021, a project funded by the IMPEL Network (EU Mediterranean-Transborder-Transects) started harmonizing data stewardship across different research bodies. In 2022, the project joined initiatives with LIFE Conceptu-Maris to reach a broader audience. Shared guidelines were created to address issues such as the state-of-the-art data collection protocols, data validation, formatting and storage, interoperability, and data analysis, also to meet the requirements of the EU regulatory environmental framework. The published guidelines (<https://www.isprambiente.gov.it/en/publications/handbooks-and-guidelines>) are



a valuable resource not only for well-established networks with experience but also for new research bodies interested in using ferries for research. They can benefit from existing agreements with ferry's companies of current networks. This will help expand covered areas for continuous surveys, such as southern and eastern Mediterranean Sea, with high standards for data collection, involvement of stakeholders and minimisation of cost and carbon-print.



CM-02. Institutional change of a marine protected area for harbour porpoise conservation: The case of the Whale Sanctuary in the German North Sea

Homes, Wiebke ¹

1. *Leibniz Centre for Tropical Marine Research (ZMT), Bremen, Germany*

Marine ecosystems face significant challenges from anthropogenic pressures, requiring marine protected areas (MPAs) to have in place effective governance systems to ensure biodiversity conservation. In the German North Sea, a Whale Sanctuary (WS) was designated to protect the only endemic whale species in the North Sea, the harbour porpoise (*Phocoena phocoena*), but its effectiveness remains uncertain. This study follows up on prior research by examining institutional changes in the WS using the Combined Institutional Analysis Development and Socio-Ecological Systems (Combined IAD-SES) framework. The Combined IAD-SES framework integrates resource systems, resource units, governance systems, and actors to analyze the relationships and interactions shaping conservation outcomes in the MPA over time. 1985, 1994, 1999 and 2009 were identified as time periods, during which significant institutional or ecological changes occurred in the WS. The discovery of the region as calving and nursing site for harbour porpoises initiated lobbying among various actors involved in conservation and policy, which in turn was followed by the creation of a range of formal rules and informal norms. The subsequent amendment of the National Park Law led to changes in the governance system of the WS, which remained relatively stable since. Relationships between actors have varied and strongly influenced the degree to which harbour porpoise populations were being monitored and violations against rules of the WS being sanctioned. Today, harbour porpoise abundance is declining and their distribution shifting, which necessitates the urgent need for a transformative shift towards more effective conservation governance arrangements. The application of the Combined IAD-SES to this MPA offers a historical lens and can thus reveal factors to increase the social resilience of marine biodiversity conservation, which is particularly important for migrating species such as harbour porpoises. It further allows prediction of social and ecological consequences of similar institutional changes in similar institutional circumstances.



CM-03. Habitat selection of Indo-Pacific bottlenose dolphins (*Truncatus aduncus*) in The Northern Red Sea, Egypt

Medcalf, Kirsty ¹; de Hass, Thalia ¹; Awberry, Tim ²; Ziltener, Angela ¹

1. Dolphin Watch Alliance, University of Zurich
2. Marine Mammal Research Team, Scottish Association for Marine Science

An understanding of cetacean distribution and habitat preferences is essential for addressing knowledge gaps concerning the spatial ecology of vital ecological processes for species conservation-management. This study used spatio-temporal Maxent models to predict which environmental variables influenced habitat suitability for approximately 420 identified Indo-Pacific bottlenose dolphins (*Truncatus aduncus*) inhabiting the coral reefs of The Northern Red Sea, Egypt. This Important Marine Mammal Area (IMMA) is a complex network of islands where the study population forages in open waters, amid a variety of microhabitats (coral reefs, shallow bays, seagrasses, and gorgonians). Our study population utilises the region for various behavioural activities such as resting, sleeping, mating, socialising, nursing, and selective self-rubbing on substrates containing bioactive metabolites for potential self-medication. Dolphin Watch Alliance collected photographic data (2013-2025) via boat-based surveys and underwater videography, alongside spatial, behavioural, and environmental data. Environmental variables and dolphin presence were incorporated into R Statistical Software 4.42 and QGIS 3.40.2 to build Maxent models. Based on the literature, we selected three climatic predictors (sea surface temperature, chlorophyll-a, and salinity) and two abiotic factors (depth and slope). Kernel density analysis was used to assess whether groups with or without calves exhibited reef preferences. A chi-square test revealed that sightings were significantly non-uniform across reefs, suggesting other factors influenced reef popularity. Season (winter: October-April, and summer: May-September) and calf presence significantly impacted group size, whereby groups containing calves were significantly larger. Further analysis will aim to statistically investigate relationships between habitat and substrate types, coupled with harassment and avoidance behaviours (as proxies of boat presence) with group size, calf-presence, and season. The areas of highest habitat suitability often overlap with anthropogenic stressors comprising of illegal fishing, maritime traffic, and high-disturbance from the dolphin-swimming industry. These results could potentially inform conservation-management policies and adaptive ecosystem-based efforts to protect this study population.



CM-04. Harbour porpoise (*Phocoena phocoena*) in the Wadden Sea World Heritage Site and requirements for trilateral monitoring

Vrooman, Jip ¹; Scheidat, Meike ¹; Teilmann, Jonas ²; Baltzer, Johannes ³; Bie Thøstesen, Charlotte ⁴; Diederichs, Britta ⁵; Geelhoed, Steve ¹; Gilles, Anita ³; IJsseldijk, Lonneke ⁶; Keijl, Guido ⁷; Nabe-Nielsen, Jacob ²; Ruser, Andreas ³; Schnitzler, Joseph ³; Sveegaard, Signe ²; Siebert, Ursula ³

1. Wageningen Marine Research, University of Wageningen, The Netherlands
2. Marine Mammal Research, Department of Ecoscience, Aarhus University, Denmark
3. Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover Foundation, Germany
4. The Fisheries and Maritime Museum, Esbjerg, Denmark
5. Schleswig-Holstein Agency for Coastal Defense, National Park and Marine Conservation, National Park Authority, Tönning, Germany
6. Division of Pathology, Department of Biomolecular Health Sciences, Faculty of Veterinary Medicine, Utrecht University, Utrecht, The Netherlands
7. Naturalis Biodiversity Center, Leiden, The Netherlands

The harbour porpoise (*Phocoena phocoena*) is considered part of the ‘Outstanding Universal Value’ characterizing the Wadden Sea World Heritage Site situated along the North Sea coastline of Denmark, Germany and the Netherlands. The Trilateral Wadden Sea Plan aims to preserve the conservation status of the Trilateral Wadden Sea Cooperation Area, encompassing the Wadden Sea World Heritage Site. The plan has specified two conservation targets for the harbour porpoise: ¹ Viable stocks and a natural reproduction capacity and ² Conservation of habitat quality for its conservation. To assess the current occurrence of the harbour porpoise in the Wadden Sea area we collated and analysed data from regional and national research projects using telemetry, aerial surveys, strandings and passive acoustic monitoring, obtained over the years 1990 – 2020. This is the first comprehensive review of harbour porpoises in the Wadden Sea. The results illustrate that porpoises occur in both offshore and intertidal waters, showing seasonal movements and changes in local occurrence over time. Some porpoises displayed limited home ranges throughout the year, suggesting a possible residency for some of the animals using the Wadden Sea area. We also showed that methods, frequency and spatial coverage of monitoring activities vary among the countries Denmark, Germany & The Netherlands. We discuss the suitability of the different methods both regarding the challenges of monitoring in the complex Wadden Sea habitat as well as their ability to target the conservation aims of the World Heritage Site. We give several recommendations to assess the status of the species to meet the identified conservation aims.



CM-05. Indicators useful for assessing the benefits of conservation measures for whale-watching: is there any changes since the implementation of the High Quality Whale-Watching® in the Italian waters?

Moulins, Aurelie ¹; Oppio, Elena ²; Passon, Alice ³; Somà, Alessandra ⁴; Speranza, Michele ²; Verga, Alessandro ⁵; Polo, Lara ¹; Tepsich, Paola ¹; Rosso, Massimiliano ¹

1. CIMA Research Foundation, Savona, Italy
2. NBFC, National Biodiversity Future Center, Palermo, Italy.
3. DISTAV, University of Genoa, Genoa, Italy
4. Consorzio Liguria Via Mare, Genova, Italy
5. Golfo Paradiso srl, Whale-watching, Camogli, Italy

The lack of public awareness of biodiversity conservation is participating to cause of biodiversity loss. The objective of this work is to give some metrics about conservation measures proposed by the Pelagos Sanctuary and ACCOBAMS (e.g. High Quality Whale-Watching® -HQWW®, Pelagos Partnership Charter -PPC, Code of Good Conduct -CGC). It also aims to assess the benefits of the educational messages given during the whale-watching tour with the HQWW®. During two years (2023-2024), we conducted a survey with questionnaire targeting tourists on board of the two main motor-vessels proposing whale-watching from Genoa's port. In total, we collected 844 answers. Only 21,4 % were locals (from a coastal municipality of the Ligurian Region) and only a small minority of them (20.4%) have knowledge of the PPC. Only citizens from Genoa knew that their municipalities signed the Charter and they were 18%. An action of the PPC is to raise public awareness and 28% locals positively engaged in events about cetaceans and 14.4% in events about Pelagos Sanctuary. Events were organized in Genoa and other 5 cities. To determine the level of interests about cetaceans, the questionnaire asks about previous experiences of whale-watching: on the 844 tourists, 37.4% have already participated to a whale-watching tour (in Liguria 22%; in Italy outside Liguria 4%; outside Italy 21%). Selecting only locals, the portion with experiences increases at 44.8%; and they participated significantly more to previous experiences in Liguria (34%) and Italy (7%) compared to all tourists. Looking at the conservation measures implemented by ACCOBAMS and Pelagos, among all tourists, 49% knew about the CGC and 17% about the HQWW®. This result is significantly higher than the one measured in 2016-2017 (Tepsich et al. 2020) before the implementation of the certification (in 2019). This study quantifies indicators useful for assessing the benefits of conservation measures.



CM-06. Experimental techniques for minimizing orca-sailboat interactions in the Iberian Peninsula: a year of field trials

González-Tapia, Ángela M. ¹; Rivas-García, Inmaculada ¹; Silgado-Calderón, David ¹; Salazar-Sierra, Juan Manuel ²; Pelayo, Jesús ¹; Neva, Juan Carlos ¹; Baringo, Francisco ¹; Crespo, Tomás ¹; Castrillo-Pérez, José Manuel ¹; García-Bailón, Sara ¹; Endo, Yumi ¹; Alves, Rui ³; Perfeito, Margarida ¹; Mamblona-Bordonaba, Javier ¹; Crespo, Antonio ⁴; de Stephanis, Renaud ¹

1. CIRCE (Conservation, Information and Research on Cetaceans), Cabeza de Manzaneda 3, Pelayo, 11390 Algeciras, Cádiz, Spain
2. IBE (Equipo de Investigación de Biología Evolutiva), Universidad de Granada, Granada, Spain
3. Orcas.pt, Portugal
4. Cetáceos y Navegación S.L., Spain

This study tested navigational techniques to reduce interactions between orcas (*Orcinus orca*) and sailboats in the Strait of Gibraltar. Using spatial modeling, high-risk areas were identified, and strategies such as maintaining constant speed or halting navigation were trialed. Over a year of implementation, these measures resulted in a 65% reduction in interactions and a 75% decrease in emergency interventions by maritime rescue services. Field experiments involved 78 successful trials during 38 orca encounters, testing maneuvers like maintaining speed, stopping engines, or reversing. Results showed significant behavioral differences in orcas' responses depending on the technique used. Spatial models predicted high-risk zones, guiding proactive avoidance strategies for vessels. This research demonstrates that integrating behavioral studies, real-time data, and targeted navigational adjustments can effectively mitigate human-orca conflicts. Upcoming trials in 2024 will expand these insights, further refining measures to balance maritime safety and orca conservation.



CM-07. Trends in harbour porpoise abundance from aerial survey monitoring in the North Sea (2011–2023)

Hansen, Rikke Guldborg ¹; Sveegaard, Signe ¹; Teilmann, Jonas ¹; Kyhn, Line ²; Gilles, Anita ³; Ramirez, Nadya ³; Nachtsheim, Dominik André ³

1. Marine Mammal Research, Department of Ecoscience, Aarhus University, Frederiksborgvej 399, 4000 Roskilde, Denmark
2. NIRAS, Kæhlersbakken 5, 4700 Næstved, Denmark
3. University of Veterinary Medicine Hannover, Foundation, Institute for Terrestrial and Aquatic Wildlife Research, Werftstrasse 6, 25761 Büsum, Germany

According to the EU Habitats Directive, all member states must designate Marine Protected Areas, called Special Areas of Conservation (or SACs), to protect harbour porpoises (*Phocoena phocoena*). The areas must be monitored and the status of harbour porpoise reported to the EU every six year. In Denmark, sixteen SACs were designated in 2010 and five of these are in the Danish part of the North Sea and Skagerrak. These areas are inhabited by the North Sea harbour porpoise population, that is assessed to be stable in abundance over the last two decades. As part of ongoing national monitoring, annual aerial surveys were conducted in the summer season in two larger areas covering the five SACs: Skagerrak (Northern North Sea) and the Southern North Sea. The surveys followed the SCANS protocol for line-transect distance sampling and were conducted in year 2017-23 in Skagerrak and 2011-23 in the Southern North Sea. We estimate conventional design-based abundance estimates and model trends across the achieved time series. Additionally, we test the statistical power of using aerial surveys to detect trends in protected areas. We found a decline in abundance of harbour porpoise in Skagerrak, while abundance in the Southern North Sea was stable but highly variable. These findings highlight the need for continued monitoring to provide evidence-based advice on the status of species in protected areas and thereby timely conservation efforts to protect harbour porpoise populations.



CM-08. Managing small mobile cetacean populations: A paradigm shift toward dynamic management strategies – the case of the South Coast England bottlenose dolphin population

Dudley, Rebecca ¹; Storm, McClements ²; Corr, Shauna ¹; Quick, Nicola ¹; Embling, Claire ¹; Ingram, Simon ¹

1. Marine Vertebrate Conservation Research Unit, University of Plymouth
2. University of Plymouth

CM-08. Managing small, mobile cetacean populations presents significant challenges, particularly given the limitations of current management which mostly relies on small, static and spatially constrained Marine Protected Areas (MPAs). Data gaps on occupancy coupled with uncertainty surrounding human impacts further hinder conservation efforts, restricting the effectiveness of management measures. A paradigm shift from area-based management to dynamic, population-focused approaches may be crucial. This study explores the development of a dynamic, integrative framework for the management of coastal populations, with a focus on a small, discrete community of bottlenose dolphins (*Tursiops truncatus*) along the South Coast of England. The South Coast population, consisting of 48 individuals (CV = 0.18, 95% HPDI = 38–66), exhibits high mobility, with an average individual range of 530 km (68–760 km). This mobility, combined with the population's size and distribution, renders current static Marine Protected Areas (MPAs) unsuitable for their conservation. Although the Western English Channel Important Marine Mammal Area (IMMA) acknowledges the importance of this coastal region to bottlenose dolphins and several other marine mammal species, its lack of legislative authority limits its conservation impact. Our proposed framework, consisting of four stages, promotes a more data-driven, adaptive management approach within the Western English Channel IMMA. Stage one focuses on best practices for maximising data utility of animal and human-use data. Stage two identifies priority areas where anthropogenic risks are greatest. Stage three addresses risk management, proposing targeted conservation measures to mitigate threats. The final stage focuses on policy review and adaptation, critically evaluating and adjusting current management strategies. This framework aims to enhance the protection of small mobile populations at significant risk to their long-term viability and resilience to environmental change. Further research and interdisciplinary collaboration and innovation will be critical in advancing conservation efforts and the continued development of effective management strategies



CM-09. Assessing the whale-watching effort in the Pelagos Sanctuary: case of study off Genoa over a 5-year period

Furgieuele, Mara ¹; Gazzola, Federica ²; Motta, Gabriella ²; Somà, Alessandra ²; Verga, Alessandro ³; Zito, Valeria ²; Tepsich, Paola ⁴; Rosso, Massimiliano ⁴; Moulins, Aurelie ⁴

1. CIMA Research Foundation, Savona, Italy DISTAV, University of Genoa, Genoa, Italy
2. Consorzio Liguria Via Mare, Genova, Italy
3. Golfo Paradiso Whale Watching, Camogli, Italy
4. CIMA Research Foundation, Savona, Italy SNBFC, National Biodiversity Future Center, Palermo, Italy

The concept of a sustainable Blue-Economy highlights the benefits of healthy marine ecosystems providing a large range of ecosystem services. A key-measure to secure healthy marine ecosystems is to identify, test and assess regularly sustainability indicators. This work focuses on commercial whale-watching in the Pelagos Sanctuary where the High Quality Whale-Watching® (HQWW®) has been implemented as conservation measures. Certified companies are asked to report their tracks and sightings. Data was collected by the staff biologists of the two main motor-vessels certified companies over the 5 year-period (2019-2023). The dataset was standardized and rasterized at 5km-resolution, on which was calculated a series of indicators related to the tracks and sightings. In total, the companies conducted 437 trips and approached 1677 individuals/groups of cetaceans. Focusing on tours from Genoa (from which both companies navigate), the total area extension visited was 2175km² over the 5 years and encompassed the two Genoa's canyons with a limited area of 225km² always used by the two companies each year. The extension of the area of each company is significantly different in 2020-2021. Indeed, one company adopted a regular strategy over the 5-years visiting the two canyons (36% Polcevera and 30% Bisagno). The other navigated more over the Polcevera's canyon than on the Bisagno in 2020-2021 (45%-10%) and then gradually weight the navigation between the two canyons. The number of trips on the same date was very limited ⁴ in 2020 but increased over time reaching 34 in 2023. As a consequence, the number of potential sightings approached by both companies at the same date (e.g. fin whale, sperm whale and goose-beaked whale) tend to increase over time (ranging 0-10). This work measures whale-watching metrics useful for cetacean conservation.



CM-10. Habitat models in support of noise impact assessment in the Mazarron Escarpment

Frassà, Veronica ¹; Mc Allister, Amalia Jurado ²; Martínez, Pablo ²; Sosa Topón, Karen Alexandra ²; Azzellino, Arianna ¹

1. *Politecnico di Milano, DICA Civil and Environmental Engineering Department, Piazza Leonardo da Vinci, 32, 20133 Milano, MI, Italy.*
2. *Centro Tecnológico Naval y del Mar, Centro Tecnológico Naval (CTN)-Marine Technology Centre, Parque Tecnológico de Fuente Alamo, Fuente Alamo, Spain*

Project NOISEA, led by the Centro Tecnológico Naval y del Mar (CTN), investigates the impact of maritime traffic-induced underwater noise on cetaceans in the Special Conservation Area of the Mazarron Escarpment (Murcia, Spain), a region known for its marine biodiversity. The study focuses on three target species, using historical whale-watching data from 2017 to 2022, which recorded 186 long-finned pilot whales, 565 striped dolphins and 266 bottlenose dolphins, to examine habitat preferences and distribution. The study aims to compare habitat suitability models with sightings from 2023 and 2024 (19 long-finned pilot whales, 29 striped dolphins and 48 bottlenose dolphins) to evaluate alignment with model predictions and assess the impact of specific stressors such as noise and marine traffic. Presence/absence predictive models were developed using Stepwise Logistic Regression Analysis, using bathymetric features like depth and slope as covariates. Significant correlations ($P < 0.05$) and a correct prediction rate above 80% confirmed physiographic factors as reliable predictors of species presence. Analyses showed that, for each species, positives (model-predicted presence confirmed by sightings) were more frequent than false positives (presence predicted by models but not confirmed by sightings). Although the accuracy of the models was very high, we observed that when limiting the analysis to the optimal habitat (suitability values >0.8), false positives outnumbered correct predictions. This occurred particularly in the portion of our study area with high levels of maritime traffic. This led us to believe that it could be an effect of the noise produced. These analyses underline the importance of combining historical and recent data to improve habitat vulnerability assessments and develop targeted strategies to mitigate underwater noise impacts. By identifying critical habitats for protection, habitat models play a key role in addressing anthropogenic pressures and preserving marine biodiversity.



CM-11. Challenges in monitoring stranded dolphins in the Croatian part of the Adriatic Sea

Kolenc, Magdalena ¹; Korpes, Kim ¹; Topličanec, Ira ²; Gomerčić, Tomislav ²; Radin, Lada ³; Đuras, Martina ¹; Gudan Kurilj, Andrea ⁴

1. *Department of Anatomy, Histology and Embryology, Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, Zagreb, Croatia*
2. *Department of Veterinary Biology, Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, Zagreb, Croatia*
3. *EU Funds Office, Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, Zagreb, Croatia*
4. *Department of Veterinary Pathology, Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, Zagreb, Croatia*

Long-term monitoring of dolphins provides an opportunity to investigate their behaviour, assess their health, and identify threats. Systematic stranding monitoring, based on post mortem examinations, offers valuable insights into dolphin populations, often difficult to obtain through other methods. The aim of our study was to identify best practices and challenges in monitoring protocols for stranded dolphins in Croatia. We analysed the implementation of the Croatian protocol, and the data collected. Croatia has a system for reporting dead or injured strictly protected animals, managed by the Institute for Environmental Protection and Nature, Ministry of Environmental Protection, and Green Transition. According to the protocol, the finder is obliged to report the discovery of an injured or dead dolphin via emergency number or a web form. In the case of a dead dolphin, the members of the protocol must organise the transport of the carcass to the Faculty of Veterinary Medicine, University of Zagreb, where post mortem examinations are performed. However, our study showed that, in some cases, the protocol was not implemented correctly, resulting in data loss. Additionally, 44.1% of carcasses were not examined due to logistical and financial problems. In 39.9% of examined carcasses, the cause of death was not determined. Moreover, 55.3% of the examined carcasses were in the advanced stage of decomposition, resulting in poor sample quality and preventing the determination of the cause of death. To improve post mortem examinations, we propose enhancing communication between stakeholders involved in the protocol and requesting additional financial support from institutions that follow the One Health concept, such as the Veterinary and Food Safety Directorate. Our study was conducted as part of the SAMESEA project, funded by INTERREG ADRION IPA (project No.: IPA-ADRION00096), which aims to identify environmental changes by monitoring of sentinel species (bottlenose dolphin, Mediterranean monk seal and loggerhead turtle).



CM-12. Positioning marine social-ecological research in marine governance and transboundary collaborations: lessons from the Arctic and Mediterranean

Zoghbi, Jade ¹

1. *Autonomous University of Barcelona (UAB) - Arctic Research Center / INTERFASE Group*

This presentation explores marine governance in two case study sites central to discussions on marine mammals, drawing on data from my doctoral research (2020–2024). The study examines evolving human-whale relationships through an analysis of the diverse values expressed by various stakeholders. The two case study sites are Skjálfandi Bay in Northeastern Iceland and the Pelagos Sanctuary for Marine Mammals. Employing a transdisciplinary approach, the research utilized qualitative methods, including over 40 interviews and empirical observations, to assess governance practices and future pathways for conserving these critical areas. The findings underscore the importance of transboundary collaboration, ethical management principles, and inclusive policy frameworks that address both human and non-human rights. The research highlights the contrasting statuses of the sites, one established as a sanctuary and the other recently designated a Hope Spot (Mission Blue), and their shared roles as hubs for whale-watching and scientific data collection. This work contributes to marine social science and conservation by advocating for integrated governance approaches that bridge the social and natural sciences, while emphasizing the potential of whale-watching as a platform for data-sharing and public engagement. The study also reflects on the need to develop a shared language and collaborative frameworks to advance inclusive and effective governance for marine mammal conservation.



CM-13. IMAP indicators for marine mammals monitoring: towards a harmonization into the Mediterranean basin

Pedrazzi, Giulia ^{1,2}; Pasquale, Arthur ^{3,4}; Babbini, Lorenza ^{3,4}; Pasanisi, Eugenia ^{5,2}; Pace, Daniela Silvia ^{1,6}

1. *Department of Environmental Biology, Sapienza University of Rome, Italy*
2. *Echoes, Capitoline Centre for Marine Research - ETS, Rome, Italy*
3. *INFO/RAC - Information and Communication Regional Activity Centre of UNEP/MAP - Rome, Italy*
4. *ISPRA- Italian Institute for Environmental Protection and Research, Rome, Italy*
5. *PhD Program in Environmental and Evolutionary Biology, Sapienza University of Rome, Italy*
6. *CNR-IAS, Capo Granitola Unit, Torretta Granitola, Trapani, Italy*

Under the Integrated Monitoring and Assessment Programme (IMAP) of the Barcelona Convention, monitoring methods and data collection at regional level must rely on the best available knowledge and the latest scientific evidence. European regulations - including the Marine Strategy Framework Directive (MSFD) and other monitoring programs - should ensure consistency with the IMAP approach. This requires a dynamic, cost-effective and flexible harmonization process across the Mediterranean, to enable all coastal countries within the basin to collect standardized and comparable data on marine species and habitats. Here, a first comparison between the information required by IMAP and MSFD monitoring protocols and methods is presented, taking into account the more recent scientific advancements related to marine mammals (cetaceans and monk seals). IMAP Common Indicators (CI) 3 (distributional range), 4 (population abundance estimates) and 5 (population demographic characteristics), were carefully analyzed by reviewing the methods proposed for each one and the Data Standards (DSs) available for data input, along with their consistency with the most updated literature and other monitoring programs. This evaluation was conducted separately for cetaceans and monk seals, although some methods overlap between these groups. Preliminary results demonstrate a good alignment of MSFD frameworks with IMAP, sharing similar indicators and principles. IMAP DSs were further enhanced to enable the collection of relevant information for monitoring distribution, abundance and demographics of the target species, and to facilitate data analysis and aggregation. These adjustments may help data continuity and comparability. The need for a common process for threshold definitions and the harmonization of temporal and spatial assessment scales and monitoring methods between IMAP and MSFD emerged as major issues, highlighting that improved coordination between MSFD frameworks and other directives with IMAP is critical for effective marine mammals' conservation strategies in the Mediterranean region.



CM-14. Towards continuous acoustic monitoring in the north of the Pelagos Sanctuary: the ABIS project in the marine protected area of Bergeggi Island

Calogero, Giulia ^{1,2}; Pignata, Eleonora ¹; Guidi, Carlo ¹; Biasissi, Elia ¹; Manghi, Michele ³; Sanguineti, Matteo ⁴; Virzi, Davide ²; Violi, Biagio ^{1,5}

1. *Menkab: il respiro del mare APS*
2. *Area Marina Protetta "Isola di Bergeggi"*
3. *Nauta rcs*
4. *Università degli Studi di Genova, Dipartimento di Fisica, Genova, Italy*
5. *INFN, Istituto Nazionale di Fisica Nucleare, Sezione di Genova*

Marine protected areas are known to be hot spots for prey and predator species. Those areas play a critical role in the achievement of good environmental status in European seas and its species richness reflects ocean health. Here, as in the open sea, the cetaceans occurrence is a bioindicator for confirming both good condition of marine ecosystems and proper effort and management on anthropic pressures. In this framework, the ABIS (Acoustic of Bergeggi Island) project aims to collect acoustic data in Marine Protected Area of the Bergeggi Island, within the Northern point of the Pelagos Sanctuary, in order to get a yearly presence and absence rate of different species. Since February 2023, an underwater recorder has been placed for collecting sounds for 365 days. To date, on 329 days, 211 (64%) days have acoustic data, with 5027 recordings and a total of 1257 hours. Preliminary analyses indicate a consistent presence of acoustic emissions from bottlenose dolphins: clicks and whistles are respectively in 78% and 22% of the analyzed files. Additionally, a higher acoustic emission was observed at night time. Among deep divers, sperm whale clicks were detected. These results confirm the precious role of this area for several cetaceans species occurrence. The detection of clicks of coastal species and deep divers confirms how important this area is for feeding purposes. The proposed method will be reproduced firstly in the same area to get an yearly trend and improve the quality and quantity of the results and secondarily in all different marine protected areas of the Pelagos Sanctuary. It is known that marine ecosystems need systematic conservation practice and monitoring programs: ABIS represents the first project for a continuous acoustic monitoring plan within a marine protected area in the Pelagos Sanctuary.



CM-15. Specific training for navigation in areas with the presence of cetaceans

Rodríguez Covián, Roberto Noel

Seafarer training is fundamental to ensuring safe navigation, and that safety is compromised if we forget the most important fact: we are navigating in the largest ecosystem on the planet, the ocean. It is within this ecosystem that we carry out our maritime activity and for this, we have reached a high level of sophistication, where education and technology are indispensable for today's navigation. Despite these efforts, we are leaving aside the knowledge of the environment that allows us to stay afloat. Understanding marine life should be an inherently compelling aspect for seafarers. However, today's seafarers trained at universities, schools, or academies do not receive any specific education in this area, this oversight results in a loss of opportunity to develop the environmental literacy necessary for their professional duties. We are addressing the problem from the bottom up, through education. The study provides a comprehensive framework for a specific training programme for navigation in areas with the presence of cetacean. Conducted using a practical research methodology, the study is driven by the author's field experience as a captain performing cetacean sightings. Fieldwork was conducted on La Gomera's southwest coast where the author gained immersive knowledge on cetacean behaviour and the critical situations threatening their conservation. The methodology included responsible whale watching, material collection, analysis of articles, scientific publications, and films, and systematic reading of selected bibliographies. The study's results emphasize the educational aspects crucial for fostering cetacean conservation among seafarers. Insights into cetacean biology and ecology, including habitat use and human influence, are explored. Specific criteria for identifying cetaceans, and recommendations from the International Maritime Organization on mitigating ship strikes are detailed. This study has potential to effect a paradigm shift in the perspective of future seafarers, laying the foundations to create a profile of seafarers committed to cetacean conservation.



CM-16. International guidelines for sustainable marine Wildlife interactions: boat-based and in-water activities

Renell, Jenny ¹; Frisch-Nwakanma, Heidrun ¹

1. CMS Secretariat

Over the past few decades, boat-based wildlife watching and recreational in-water interactions have rapidly increased in occurrence and popularity worldwide, generating a pressing need to understand and manage any detrimental effects on the behaviour, welfare and biology of the target species, and the consequent indirect effects on local environments and human communities. To address these issues, the Convention on the Conservation of Migratory Species of Wild Animals (CMS), in collaboration with its specialized daughter agreements, has developed guidelines on both forms of wildlife interactions, presenting measures to mitigate risks and enhance conservation outcomes. By aligning recommendations across species and activity types, they provide a comprehensive framework to ensure that wildlife interactions are conducted sustainably. The guidelines were compiled through a comprehensive desk study pulling together best practices from around the world, and were reviewed by experts on the taxa covered, which include cetaceans, pinnipeds, sirenians, marine turtles, seabirds, sharks and other fish. Besides general principles that apply to all species, they contain specific recommendations for each taxonomic group, covering for example when to avoid interactions, what minimum distance to maintain, limiting the number of people in the water, what behaviours of participants to avoid, vessel speed reductions, the use of caution zones and maintaining a predictable direction of the vessel. Now combined in an issue of the CMS Technical Series, CMS Parties adopted the Guidelines for Recreational In-water Interactions with Marine Wildlife in 2024 and the Guidelines for Boat-based Wildlife Watching in 2017. They provide a framework for mitigating the impacts of boat-based and in-water interactions for marine species and are specifically designed to help policymakers develop robust national measures suited to the nature of recreational activities and the species in their waters



CM-17. Marine plastic litter impact assessment on squid-eating cetaceans in the Adriatic and Ionian Seas

Costantino, Matteo ^{1,2}; Arcangeli, Antonella ³; Biondini, Luca ⁴; Crosti, Roberto ³; Donnarumma, Vincenzo ⁵; Favaro, Livio ^{1,6}; Gamba, Marco ^{1,6}; Giovannini, Andrea ²; Giacomini, Cristina ^{1,6}; Negri, Giorgia ²; Paraboschi, Miriam ⁴; Ramazio, Marta ⁴; Rosestolato, Giorgio ²; Azzolin, Marta ^{1,2,6}

1. Department of Life Sciences and Systems Biology, University of Torino, Torino, Italy
2. Gaia Research Institute, Torino, Italy
3. ISPRA, National Institute for Environmental Protection and Research, Roma, Italy
4. Accademia del Leviatano, Roma, Italy
5. CNR-ISMAR (Institute of Marine Sciences – National Research Council), Lerici, Italy
6. Centro Interuniversitario per la Ricerca sui Cetacei (CIRCE), University of Siena, Siena, Italy

Marine plastic litter is one of the main threats for cetaceans, especially for those species mainly feeding on squids, such as sperm whales (*Physeter macrocephalus*), Cuvier's beaked whale (*Ziphius cavirostris*), Risso's dolphin (*Grampus griseus*) and long-finned pilot whale (*Globicephala melas*). Indeed, plastic is increasingly found within the stomach contents of stranded cetaceans, who mistake marine litter for their preys. For this reason, presence data were used to assess spatial risk exposure, overlapping the distribution of squid-eating species in relation to marine litter spread. From December 2014 to December 2024, visual monitoring was carried out in the ADRION region for both species and threats within the research activity conducted by the FLT-Med Network and the LIFE CONCEPTU Maris project along the Ancona-Patras route using ferries as observation platforms. Overall, 13 sightings of these rare species were registered, and a total number of 9620 plastic items were sighted along the entire transect during the years, especially packaging ("soft" plastic) and polystyrene fish boxes. The studied species were usually sighted on the Southern portion of the Adriatic Sea and in the Ionian Sea, where the bathymetry tends to increase. The marine litter map, instead, shows a homogenous distribution in the entire study area, with a higher concentration of items in the Adriatic Sea. Kernel density estimation was employed to evaluate where the presence of cetaceans and threats overlap. The results show that, although rarely encountered, these species occur in the Adriatic region in the areas with the highest concentration of marine litter. At the same time, the situation appears quite the opposite in the Ionian-Greek Sea. These results allowed to identify critical risk areas for species conservation. The identification of high-risk areas, where marine fauna has an increased exposure to litter, is, however, just the first step for prioritising conservation measures to address.



CM-18. False killer whales off north-eastern New Zealand: abundance, survival and demographics

Zaeschar, Jochen ¹; Meyer, Catherine ²; Guerra, Marta ³; Dwyer, Sarah ⁴; Brough, Tom ⁵

1. *Far Out Ocean Research Collective*
2. *University of Auckland*
3. *University of Otago*
4. *Department of Conservation*
5. *National Institute of Water and Atmospheric Research*

False killer whale (*Pseudorca crassidens*) population dynamics remain poorly understood across most of the species' range. False killer whale abundance, survival and demographic aspects were assessed from 108 encounters off north-eastern Aotearoa New Zealand between 2005 and 2025. 101 distinctive individuals were photo-identified. Social network analysis using SOCPROG shows two stable, distinct but inter-connected social clusters, aligning with social structure identified in other regions. All individuals identified in the study area are linked by association to one of two social clusters, with some adult males linked to both clusters. Neonates were encountered most frequently in December and January (78.2%, n = 18), indicating calving seasonality. Seasonal inshore/offshore movements were assessed using the presence/absence of cookie cutter shark (*Isistius* sp.) bite scars, with 93.9% (n = 46) of fresh bites observed during December and January. Abundance was estimated using Cormack-Jolly-Seber open population mark-recapture models with pooled inter-period capture histories. Abundance ranged between 74 individuals in 2004-05 and 141 individuals in 2011-12. The seasonally-resident population in the study area was estimated at 127 (CI=114-141) individuals. Results show significant variability between years, which may reflect variable search effort and/or absence of encounters with one of the two identified social clusters. Survival rates vary according to age, sex and social cluster membership. Results support the likelihood of a small, disjunct population as has been described in other regions. While preliminary genetic results suggest connectivity with the wider Pacific, we propose that the two social clusters identified here be considered a Cultural Variant based on the strong site fidelity, the stable, clustered social structure and the small abundance estimate. Consequently, these individuals should receive their own threat level classification and be managed as a small, local population. We recommend ongoing monitoring of the population, together with genetic analysis to ascertain population viability.



CM-19. machine learning to classify southern resident killer whale clicks in the Salish Sea

Houweling, April ¹; Joy, Ruth ²; Tibshirani, Robert ³

1. *Simoon Fraser University/JASCO Applied Sciences*
2. *Simon Fraser University*
3. *Stanford*

Several commercial shipping routes in the Salish Sea, Canada pass through critical habitat of the Southern Resident killer whale (SRKW), an endangered population increasingly threatened by underwater noise. To mitigate the impacts and protect the SRKW in a cost-effective manner, automated algorithms must differentiate them from West Coast Transient (WCT) killer whales, which share the same waters. This study utilizes a unique multi-year dataset from the Boundary Pass Underwater Listening Station, operated by JASCO Applied Sciences, which records vocalizations of SRKW and WCT killer whales within their critical habitat and a busy shipping lane. A novel algorithm is proposed that integrates a Random Forest-based killer whale click detector with a machine learning classifier to predict SRKW presence with high accuracy using echolocation clicks. Two machine learning methods—Logistic Regression with LASSO penalization and Extreme Gradient Boosting Classification Trees (XGBoost)—were evaluated to classify vocalizations binned by Signal-to-Noise-Ratio (SNR) into a binary response: SRKW or WCT. The findings of this study enable efforts to automatically alert vessels of the presence of SRKW in Boundary Pass, contributing to real-time noise reduction strategies to protect this vulnerable population.



CM-20. Southern right whale catches in coastal whaling stations of Brazil

Vieira, Nina ¹; Morais, Igor ²; Brito, Cristina ¹; Zerbini, Alexandre ³

1. CHAM - Centre for the Humanities, NOVA FCSH, Portugal
2. Independent Researcher, Brazil
3. CICOES, University of Washington and Marine Mammal Laboratory, AFSC/NOAA, Seattle, WA, USA

Southern right whales (SRWs, *Eubalaena australis*) were heavily hunted during the pre-modern and modern whaling eras along the coast of Brazil. The species was regularly found along the country's southern and central coasts and profitable shore-based whaling operations were established in Bahia, Rio de Janeiro, São Paulo and Santa Catarina since the 1600s. The aim of this study was to estimate SRW catches from these operations up to the 20th century. This data is key to inform a global assessment of SRWs by the International Whaling Commission. An estimate was reconstructed from the number of animals killed or the quantity of whale oil produced or of baleen exported, based on literature review and historical research. Data was collected from documentary sources, mainly written (administrative reports, whaling contracts, publications) and also visual (paintings and photographs). There were important gaps in the information used to generate catch series within the period considered (1603-1973, that is 371 years). Information on catches, either based on processed animals or on oil yield, is available only for 148 years (40% of the years for which catches presumably occurred). Two catch series, corresponding to the minimum and maximum number of whales killed, were produced with existing data to capture as much of the uncertainty in the data as possible. The estimated catch numbers for the study period were 13,680 and 27,129 for the minimum and maximum series, respectively. This study provides strong evidence of catches of calves and/or juveniles. SRWs catches off Brazil were highly destructive for the population, which started to show signs of decline since the 18th century.



CM-21. Satellite telemetry reveals novel insights into sperm whale movements, behavior, and habitat use in the Greek Seas: opportunities for conservation

Panigada, Simone ¹; Alberini, Amalia ²; Johnson, Christopher ³; Panigada, Viola ⁴; Pierantonio, Nino ¹; Zanardelli, Margherita ¹

1. Tethys Research Institute, Viale G. B. Gadio, 2, 20121, Milano, Italy
2. World Wildlife Fund Greece, Charilaou Trikoupi 119-121, 11473 Athens, Greece
3. WWF Protecting Whales & Dolphins Initiative
4. Tethys Research Institute, Viale G. B. Gadio, 2, 20121, Milano, Italy Duke University Marine Lab, Beaufort, North Carolina 28516, USA

The Hellenic Trench in the Ionian Sea hosts the highest density of Endangered sperm whales (*Physeter macrocephalus*) in the Mediterranean, with solitary males, loose male aggregations and long-term resident social units being regularly observed. The area is an important feeding and breeding ground for the eastern Mediterranean sperm whale subpopulation and was designated as an Important Marine Mammal Area (IMMA) by the IUCN SSC/WCPA Marine Mammal Protected Areas Task Force in 2016. However, this population faces high levels of mortality due to vessel-strikes and disturbance arising from seismic surveys and military exercises, which jeopardise its survival. While considerable knowledge exists on the species' local ecology and conservation status, their broader movement ecology and connectivity to critical Mediterranean areas remain poorly understood. On July 27th, 2024, one solitary adult male sperm whale was equipped with a satellite transmitter (Wildlife Computers Spot-365 LIMPET) southwest of Kefalonia, in the northern portion of the Hellenic Trench IMMA. A total of 1,725 location messages were received, providing 57 days of movement data. The whale spent 15 days southwest of Kefalonia and Zakynthos islands, performing short, localised movements before heading south along the Hellenic Trench. After a few days spent along the Peloponnese, it moved into the southern Aegean Sea, crossing the Cyclades Islands waters and progressing towards the Dodecanese region, where it remained for an additional 23 days, until the end of transmissions. Adult male sperm whales are known to roam the Mediterranean, likely in pursuit of breeding opportunities. The journey of this single whale provided valuable novel insights into the species' habitat use, behaviour and movement patterns, revealing previously undocumented transit and residency areas that may be crucial for the species' conservation in the Mediterranean. These and future findings will support the development of targeted, place-based conservation strategies, as well as mitigation efforts.

CM-22. Sailing for cetaceans' conservation with "Le Vele del Panda" project: results of five years monitoring in the Tyrrhenian and Ligurian Sea

Pintore, Laura ^{1,2,3,4,5}; De Bonis, Lorenzo ^{1,6}; Sebastiani, Ludovico ^{1,7}; Aveta, Silvia ^{1,5}; Brogi, Mirko ^{1,8}; Cervelli, Ilaria ¹; Chinelli, Dario ¹; Chirico, Donatello ¹; Clemente, Nicola ¹; Congiu, Sabrina ¹; Costa, Erica ¹; Del Pizzo, Flavia ^{1,9}; El Haddad, Nicole ^{1,10,11}; Gazzola, Federica ¹; Iemma, Aaron ^{1,3}; Inglis, Federico ¹; Mancini, Gianluca ⁵; Masulli, Andrea ^{1,9}; Montesano, Joelle ^{1,2,3}; Nanni, Melissa ^{1,9}; Pratesi, Isabella ³; Scagliola, Alice ¹; Sellini, Alessandra ¹; Terranova, Francesca ^{1,4}; Velestrini, Elisa ^{1,11}

1. WWF Italy, Vele del Panda Project, Via Po 25/c. 00198, Roma, Italy
2. WWF Italy, Marine Office, Via Po 25/c. 00198, Roma, Italy
3. WWF Italy, Conservation Office, Via Po 25/c. 00198, Rome, Italy
4. Department of Life Sciences and System Biology, University of Torino, Via Accademia Albertina 13, 10123 Torino, Italy
5. WWF Travel, Via Po 25/c. 00198, Roma, Italy.
6. University College Cork, College Road, Cork, Ireland
7. Department of Environmental Biology, University of Rome Sapienza, Piazzale Aldo Moro 5, 00185 Roma.
8. Department of Experimental and Clinical Biomedical Sciences (SBSC), University of Florence, Viale Morgagni, 50 - 50134 Firenze (FI)
9. Department of Earth Sciences, University of Rome Sapienza, Piazzale Aldo Moro 5, 00185 Roma
10. Department of Ecoscience, section for Marine Mammal Research- Aarhus University
11. Department of Biology (DiBio) - University of Padova, Via Ugo Bassi, 58b, 35121, Padova, Italy

The Tyrrhenian and Ligurian Seas, two biodiversity hotspots, are home to eight resident cetacean species, all threatened by anthropogenic pressures such as acoustic disturbance, excessive maritime traffic, overfishing and bycatch, chemical and plastic pollution. Despite their critical status, gaps in data regarding their health, distribution, and behaviour persist, hampering effective conservation strategies. To address these challenges, WWF Italy launched the "Le Vele del Panda" project in 2020, in collaboration with WWF Travel and Sailsquare. Rooted in Citizen Science and aligned with the United Nations' 2030 Agenda for Sustainable Development, the project aims to enhance public engagement in cetacean conservation and generate valuable scientific data. The initiative combines education, research, and sustainable practices to support SDGs 4 (Quality Education), 14 (Life Below Water), and 17 (Partnerships for the Goals). Over five years (2020–2024), the project conducted 142 research cruises – 7 sailing boats and 18 whale watching guides - involving 933 participants collecting data on cetacean diversity, abundance, distribution, and behaviour. Species-specific methodologies included visual monitoring, photo-identification, acoustic surveys, and systematic behavioural observations analysed using BORIS software. In total, 730 cetacean sightings were recorded, including all the eight resident species of the basin, with sighting rates as follows:



Balaenoptera physalus (7.4%), *Physeter macrocephalus* (2.05%), *Ziphius cavirostris* (5.62%), *Globicephala melas* (0.14%), *Grampus griseus* (0.68%), *Tursiops truncatus* (24.11%), *Stenella coeruleoalba* (59.32%), and *Delphinus delphis* (0.68%). This work presents the comprehensive results and insights derived from the five-year project, emphasizing the value of Citizen Science in bridging knowledge gaps and advancing cetacean conservation. The findings highlight key ecological patterns and underline the significance of participatory approaches in addressing the challenges faced by marine biodiversity in the Mediterranean Sea.



CM-23. From blow to identity: drone-assisted DNA sampling matched with photo-ID of bottlenose dolphins

Ceolotto, Luca ¹; Andrés Hervías, Carmen ²; Fiore, Elia ¹; Gonzalvo, Joan ²; Dugeny, Elyne ¹; Mazzariol, Sandro ¹; Centelleghé, Cinzia ¹

1. Department of Comparative Biomedicine and Food Science, University of Padua

2. TETHYS RESEARCH INSTITUTE

Recent technological advances in unmanned aerial vehicles (UAVs) have paved the way for innovative, non-invasive methods of studying marine mammals. In this study, we combined drone-assisted blow sampling and photo-identification (photo-ID) from the critically endangered bottlenose dolphins (*Tursiops truncatus*) subpopulation of the Gulf of Ambracia (Greece) during Spring 2024. The primary objective was to link individual genotypes to known photo-identified dolphins. A total of 27 individuals (or groups of individuals) were sampled using a modified drone equipped with sterile sampling devices to capture exhaled respiratory droplets. The biological material collected on the field was processed to isolate DNA using the DNeasy Blood and Tissue kit (Qiagen) and to detect the presence of bottlenose dolphin mitochondrial DNA (mtDNA). For this purpose, a semi-nested PCR approach was designed using universal and species-specific primers targeting mitochondrial 12S rDNA segments. First-round PCR products, amplified using one primer from both sets and purified with cleanup reagents (ExoSAP-IT, Applied Biosystems), served as input DNA for the *Tursiops*-specific PCR. Overall, 11 samples were identified as positive by gel electrophoresis and consequently sequenced. The resulting sequences were submitted for BLAST alignment, confirming the presence of bottlenose dolphins mtDNA. Simultaneously, during blow sampling, high-resolution photographs were obtained for each dolphin the drone approached, to be confronted with an existing long-term (20+ years monitoring) photo-ID catalog. We could reliably attribute DNA sequences to the sampled dolphins by integrating genetic profiles with individual photo-ID histories. Ongoing research aims to develop a set of markers to establish unique genetic fingerprints for individual dolphins. This integrated approach constitutes an effective non-invasive method for monitoring dolphin populations. Drone-based sampling, although also logistically challenging may cause less stress to the animals than the more traditional biopsy sampling, offering a promising alternative for the study of marine mammal populations.



CM-24. Match the whale: monitoring fin whale (*Balaenoptera physalus*) migration between the western Mediterranean Sea and the Strait of Gibraltar

Espada, Rocío ¹; Degollada, Eduard ²; Belda, Eduardo ³; Feliu, Blanca ⁴; Martín-Moreno, Estefania ⁵; Tort, Beatriu ²; Olaya-Ponzzone, Liliana ⁶; Anfruns, Iris ⁷; Gallego, Victor ⁸; Gil, Paco ⁷; Gostischa, Julia ⁹; García-Gómez, José-Carlos ⁶

1. *Laboratorio de Biología Marina, Universidad de Sevilla.*
2. *EDMAKTUB Association, Ctra. Sant Vicenç 17, 08393 Caldes d'Estrac, Spain*
3. *IGIC-Universitat Politècnica de València, Spain.*
4. *Instituto Español de Oceanografía (IEO-CSIC).*
5. *Ecolocaliza, Spain.*
6. *Laboratorio Biología Marina. Universidad de Sevilla, Spain.*
7. *Turmares, Spain.*
8. *Grupo de Acuicultura y Biodiversidad (Instituto de Ciencia y Tecnología Animal), Universitat Politècnica de València, Spain.*
9. *Mar a la vista, Spain.*

Photo-identification is a valuable tool for studying and conserving whales, providing critical data that contribute to a better understanding of their ecology, protecting their habitats, tracing whale migration routes and identifying recurring patterns and destinations. The fin whale (*Balaenoptera physalus*) is the most frequent species of whale in the Mediterranean and migrates from the Mediterranean Sea to the Atlantic Ocean in late spring and summer. From 1 June to 30 July 2021 to 2024, land and sea-based campaigns were conducted to monitor the migration of fin whales from Denia (Cape San Antonio), using horizontal (cameras) and vertical (drones) photo-identification techniques. At the same time and until 30 August each year, fin whales were monitored in the Strait of Gibraltar, from La Linea de la Concepción (land) and Tarifa (sea) using only horizontal photo-identification methods. Dorsal fins with notches, permanent marks, scars, in cases where little time had elapsed between recaptures, the position of parasites, and, in addition, some whales were confirmed with vertical identification captures. Comparative results yielded 100 individuals for Denia and 168 for the Strait of Gibraltar, resulting in 20 recaptures between the two study areas. Of these, 3 individuals were recaptured 4 times, 2 individuals 3 times. Although adverse weather, logistical conditions and nocturnal conditions reduced the possibility of recapture, the results indicated that at least 20% of the recaptured animals coincided in both locations and of these, 35% showed fidelity to their routes, suggesting that at least part of the animals that migrate through the Strait of Gibraltar use the Denia route.



CM-25. Social structure and connectivity of bottlenose dolphin (*Tursiops truncatus*) in the Camargue Marine Protected Area (2021–2024)

Collet, Léna ¹; Tardy, Céline ²; Marobin, Delphine ¹

1. Parc Naturel Régional de Camargue, Mas du Pont de Rousty, 13200 Arles, FR
2. MIRACETI, Place des traceurs de pierres, La Couronne, 13500 Martigues, FR

Bottlenose dolphin (*Tursiops truncatus*) have been extensively studied along the Gulf of Lion coast since the 1990s. To refine our understanding of local population dynamics, a survey was conducted from 2021 to 2024 within the Camargue Marine Protected Area (MPA). This initiative is part of TURSMED, a broader project led by the MIRACETI association, aiming to promote integrated and sustainable management of bottlenose dolphin across French Mediterranean MPAs. During this period, 71 boat-based surveys were conducted, using direct visual detection and photo-identification, along with 36 opportunistic surveys aboard whale-watching vessels. Across 76 sightings, 214 individual dolphins were identified, 180 of which were retained after quality control. Of these, 36.7% were recaptured between 2 and 10 times. To ensure reliable representation, only individuals observed on at least three occasions (n=33) were selected. The half-weight index (HWI) was applied to assess social associations. Social network analysis revealed three distinct clusters (Mean HWI = 3.54 [SD=1.61]) and few potential transient's individuals. One-third of the individuals of this social unit exhibited strong social bonds, with 3 centrality indices—strength, betweenness, and eigenvector—showing above-average values, indicating their key role in maintaining network cohesion, despite not belonging to the same cluster. These results confirm a dynamic fission-fusion society with influential individuals, some of whom were recorded every year of the study. Comparing the Camargue dolphin photo-ID catalog with those from adjacent MPAs will clarify residency patterns, determining whether individuals remain within their defined geographical area, such as the Gulf of Lion population, or if transient individuals originate from the French Riviera population. These findings highlight the value of platform-of-opportunity observations as a complement to dedicated surveys and underscore the need of integrated research and management approaches in enhancing conservation efforts for bottlenose dolphin in the Mediterranean Sea.



CM-26. The Formicula case: restricted access zone (?) declared to protect key habitat for Mediterranean Monk Seals in Greece

Gonzalvo, Joan ¹; Notarbartolo di Sciara, Giuseppe ¹

1. Tethys Research Institute, Italy

Despite showing signs of recovery, the Mediterranean monk seal *Monachus monachus* continues to be one of the world's most threatened marine mammals. The uninhabited islet of Formicula in the Inner Ionian Sea Archipelago, a Special Area of Conservation (SAC) in Greece, contains key monk seal habitat, with >40 individuals identified along its shores, showing various degrees of site fidelity across the years. This tiny islet (~500 m-wide) is also part of IUCN's "Ionian Archipelago Important Marine Mammal Area". In recent years, the waters around Formicula suffered a dramatic increase in visitors mostly attracted by the possibility of close encounters with the seals. A crescendo of highly concerning behaviours was documented, with people observed searching for seals, chasing them aboard kayaks and paddle boards, getting in the water to swim with them, and even entering the caves where the seals breed. Concern about excessive tourist pressure led to the inclusion of a special protection regime in Formicula when drafting the SAC management plan, currently under consideration. Proposed actions included the delimitation of a 200 m-wide no-entry zone along the islet's coast, except for a corridor allowing access to a single ad hoc mooring, under condition of compliance with a code of conduct and time limitation. As a result of pressure and lobbying action, on December 31st 2024, a Ministerial Decision establishing a strict protection regime around Formicula, including a no-entry zone, was adopted. However, such protection does not exclude vaguely-defined fishing from the no-entry zone, a deliberate loophole opening the door to indiscriminate access and undermining the measure's effectiveness. The time has come for the organizations that were actively involved in this process, together with the relevant government agencies, local communities and stakeholders to translate this conservation on paper into real and effective conservation action.

CM-27. A vulnerability index to support adaptive conservation strategies for Mediterranean cetaceans under changing conditions

Arcangeli, Antonella ¹; Pasanisi, Eugenia ²; Azzolin, Marta ³; Campana, Ilaria ⁴; Carosso, Lara ⁵; Castelli, Alberto ⁶; Costantini, Matteo ⁷; Crosti, Roberto ⁸; David, Lea ⁹; Farina, Marianna ¹⁰; Favaro, Livio ⁷; Freija, Natalia ¹¹; Di-Meglio, Nathalie ¹²; Odey, Garcia-Garin ¹³; Gazo, Manel ¹⁴; Gregoriotti, Martina ⁸; Grossi, Francesca ¹⁵; Maffucci, Fulvio ¹⁰; Roul, Miguez ¹⁶; Monaco, Clara ¹⁷; Moulin, Aurelie ¹⁵; Pellegrino, Giuliana ¹⁸; Raga, J.A. ¹¹; Roul, Marine ⁹; Sara, Gianluca ¹⁹; Scuderi, Alessia ²⁰; Teti, Roberta ¹⁰; Tepsich, Paola ²¹; Vighi, Morgana ¹⁴

1. ISPRA National Institution for environmental research and monitoring, Roma, Italy.
2. ISPRA National Institution for environmental research and monitoring, Roma, Italy. Department of Environmental Biology, Sapienza University of Rome, 00185 Rome, Italy.
3. Department of Life and System Biology, University of Torino, Via Accademia Albertina 13, Torino, Italy. Gaia Research Institute Onlus, Corso Moncalieri 68B, 10133, Torino, Italy.
4. Accademia del Leviatano, Via Ospedaletto 53, 00054 Maccarese, Roma, Italy.
5. Capo Carbonara Marine Protected Area, Via Roma 60, Villasimius (SU), Italy
6. Department of Biology, University of Pisa, Pisa, Italy
7. Department of Life and System Biology, University of Torino, Via Accademia Albertina 13, Torino, Italy
8. ISPRA National Institution for environmental research and monitoring, Roma, Italy
9. EcoOcéan Institut, 18 rue des Hospices, 34090 Montpellier, France
10. Marine Turtle Research Group, Department of Marine Animal Conservation and Public Engagement, Stazione Zoologica Anton Dohrn, Napoli, Italy.
11. Instituto Cavanilles de Biodiversidad y Biología Evolutiva, Universitat de València, Catedrático José Beltrán 2, 46980 Paterna (Valencia), Spain
12. EcoOcéan Institut, 18 rue des Hospices, 34090 Montpellier, France.
13. Department of Evolutionary Biology, Ecology and Environmental Sciences, and Biodiversity Research Institute (IRBio), Faculty of Biology, University of Barcelona, 08028, Barcelona, Spain. Institute of Aquatic Ecology (IEA), Universitat de Girona, 17003 Girona, Spain
14. Department of Evolutionary Biology, Ecology and Environmental Sciences, and Biodiversity Research Institute (IRBio), Faculty of Biology, University of Barcelona, 08028, Barcelona, Spain
15. CIMA Research Foundation, Savona, Italy.
16. Instituto Cavanilles de Biodiversidad y Biología Evolutiva, Universitat de València, Catedrático José Beltrán 2, 46980 Paterna (Valencia), Spain.
17. Associazione Marecamp ODV, Lungomare Scardamiano 1, 95021 Aci Castello (CT), Italy.
18. Associazione Marecamp ODV, Lungomare Scardamiano 1, 95021 Aci Castello (CT), Italy
19. Department of Earth and Marine Science, University of Palermo, Palermo, Italy.
20. Association Nereide, Tarifa, Cádiz, Spain
21. CIMA Research Foundation, Savona, Italy



Human-induced climate change is accelerating oceanic transformations, profoundly impacting global biodiversity (IPCC-AR6 report). Several international initiatives aim to monitor these changes and advance marine preservation and restoration. A key target is the protection of at least 30% of marine habitats by 2030 (CBD Kunming-Montreal Global Biodiversity Framework; European Biodiversity Strategy). However, effective spatial protection for large-scale migratory species remains a major challenge, as seasonal and climate-driven changes complicate the identification of priority areas. Current efforts to identify key cetacean areas (e.g., IUCN-IMMAs, Nature2000-SIC, ACCOBAMS-CCH) rely on the best available information which, however, is often spatially and temporally fragmented. To address these challenges, a vulnerability index was applied to assess seasonal and temporal shifts in priority areas across 10 key Mediterranean areas that have been consistently monitored by the FLT Med Network and Life CONCEPTU MARIS project. The long-term dataset (2008–2023) included 12,642 cetacean records collected over 573,000 km of survey effort. The index incorporates key biological trait indicators including species richness, diversity (Shannon-H, Dominance_D), abundance (SPUE, group size), juvenile presence, and rare species occurrence, which are essential for species preservation. Results revealed seasonal and temporal changes in priority areas. The Pelagos Sanctuary confirmed persistent overall importance, particularly during summer, despite the winter minimum. More marked seasonal variation was observed in the Spanish Migration Corridor, where maximum scores occurred during spring and autumn. The Alboran-Gibraltar consistently scored high across seasons, with spring standing out due to the presence of rare species (*P. macrocephalus*, *G. griseus*) and high individual counts of *B. physalus*, *D. delphis*, and *P. macrocephalus*. Few species dominate consistently, with exceptions in spring and the Alboran-Gibraltar area. While summer findings aligned with known key cetacean areas, autumn patterns revealed emerging priorities in the NW-Mediterranean, Tyrrhenian, and Sicily-Sardinian areas. These findings underscore the necessity of implementing adaptive conservation approaches based on robust spatio-temporal datasets.



CM-28. Let's talk about sex: how skin marks can help in estimating gender for species with low sexual dimorphism

Turchi, Alice ^{1,2,3}; Pedrazzi, Giulia ^{1,3}; Mattiussi, Alex ^{1,3}; Labriola, Maria Silvia ^{3,4,5}; Rinalduzzi, Sofia ^{3,4}; Giacomini, Giancarlo ¹; Pace, Daniela Silvia ^{1,6}

1. *Department of Environmental Biology, Sapienza University of Rome, Italy*
2. *PhD Program in Environmental and Evolutionary Biology, Sapienza University of Rome, Italy*
3. *Echoes - Capitoline Centre for Marine Research - ETS, Rome, Italy*
4. *Department of Biology, University of Rome Tor Vergata, Rome, Italy*
5. *PhD Program in Evolutionary Biology and Ecology, University of Rome Tor Vergata, Italy*
6. *CNR – Institute for the Study of Anthropogenic Impacts and Sustainability in the Marine Environment – Capo Granitola Unit, Torretta Granitola, Trapani, Italy*

Sex-ratio is an important population metric in animal conservation, but its study in marine mammals with low sexual dimorphism is often challenging. We used skin mark analysis on selected common bottlenose dolphin individuals (12 males and 27 females) to 1) test its ability to capture differences in markings between male and females, and 2) build a sex classification model exclusively based on non-invasive photographic material. Skin marks were measured across the whole-body surface based on dolphin photographs acquired between 2016 and 2023 at the Tiber River estuary (Tyrrhenian Sea, Western Mediterranean). To evaluate their progression over time, the Rate of Change (RoC) of marked body surface was calculated using data from different years. Non-parametric tests were used to assess sex-specific differences in marks. A GLM with binary response was built through a stepwise procedure, using mark-based indices (Marked body area, Light speckles, Vesicular lesions, Wounds, Protruding tissue, Tooth rakes, Anthropic, RoC) as gender predictors. Relevant differences between sexes emerged in markings (Mann-Whitney U-test: $p < 0.05$), with males presenting greater marked body surfaces than females ($48 \pm 1\%$ vs $22 \pm 1\%$). Social, aggression- and fishing-related marks were more numerous and extended in males, with an evident and stronger tendency of mark accumulation over time (males: $\text{RoC} = 1.97 \pm 1.39$; females: $\text{RoC} = -0.33 \pm 0.57$). The estimated model reached high accuracy ($86 \pm 1\%$) and sensitivity (males: $79 \pm 2\%$; females: $90 \pm 1\%$) in sex classification tasks. These results highlight the feasibility and effectiveness of this methodological approach for sex-ratio investigations and for identifying the presence of differential pressures insisting on the two sexes in a certain region, with meaningful conservation implications. The exclusive use of photographic material makes this methodology potentially applicable and adaptable to multiple cetacean species and environments, aiding the efforts of conservationists worldwide.



CM-29. Marine fauna observers as research and conservation sentinels of marine mammals in the industry sector

Soley, Raquel ¹; Avila, Isabel C. ²

1. *Projecte Guaita, 08198, Barcelona, Catalunya*
2. *Institute for Terrestrial and Aquatic Wildlife Research (ITAW), University of Veterinary Medicine Hannover, Germany*

At sea mitigation of acoustic impacts by the industry is based on several regional guidelines overseen by Marine Mammal Observers (MMOs) and Passive Acoustic Monitoring operators (PAMs). These activities vary in location (offshore to coastal), type of sound source, intensity, and type of operations. Consequently, MMOs and PAMs are at the frontline in the conservation of marine mammals (MM) preventing direct injuries and, in some cases, disturbance to these species. Observers may gather valuable data on species ecology while ensuring compliance with regulations. Over 80 published papers and reports were reviewed to identify how many studies used data collected by MMOs and PAMs during industrial activities. Keywords involved mitigation, seismic or observers. A total of 32 publications resulted in studies on MM, mainly offshore (75%). Data was collected between 1990-2018 and involved 13 visual surveys, 1 acoustic survey and 18 surveys from both techniques combined. Publications focused on species occurrence and distribution (56%) followed by behaviour (28%). The data was used in the creation of marine protected areas, evaluation of new technologies, divulgation of rare species occurrence, improvement of survey methodology procedures, and the evaluation of mitigation approaches. The number of publications is low given the amount of annual industrial operations worldwide, ranging regionally from hundreds to over a thousand. This may be due to the requirements by regulators in the respective countries. Furthermore, observers are often on the high seas and in inaccessible areas for researchers, leaving out important data that could inform and contribute to the development of conservation strategies and management plans within countries' Exclusive Economic Zones and international waters. Professional, expert and high-quality observers can be an integral part towards the conservation of MM. Their multifaceted role in mitigation of impacts, monitoring, and promoting sustainable management while onboard can highly benefit the research and industrial sectors.



CM-30. Will migratory corridors change due to expected global warming

Peres dos Santos, Rui ^{1,2,3}; Violi, Biagio ⁴; Sears, Richard ²; Magno, Ramiro ³; Castilho, Rita ¹

1. *Marine Ecology Human Impacts and Diversity (MARDIV), Centre of Marine Sciences (CCMAR), University of Algarve, Campus de Gambelas, Faro, Portugal*
2. *Mingan Island Cetacean Study (MICS), Quebec, Canada*
3. *Pattern Institute, Faro, Portugal*
4. *Menkab, il Respiro del Mare Association, Savona, Italy*

Migration is a fundamental aspect of the life cycle of baleen whales, with significant implications for their ecological patterns and conservation. Despite the critical importance of migration, the precise impact of global warming on habitat suitability on migratory corridors from these species remains poorly understood. This study investigates the effects of ocean warming on the distribution of migratory baleen whales in temperate latitudes, focusing on the Azorean waters as a key migratory corridor. Leveraging species distribution models and future projections from global climate models, we assess the potential repercussions of ongoing ocean warming on baleen whales' migration patterns. From 2012 to 2018, an opportunistic platform was used to collect data on cetacean presences. In order to broaden the data collected in the Azores the Global Biodiversity Information Facility was accessed. Our results reveal a change in habitat suitability for migratory whale species in the Azores, indicating potential disruptions in migration timing. These findings underscore the urgent need for effective conservation strategies and management practices to mitigate the impacts of global warming on baleen whale populations. By examining the complex interactions between global warming, migration patterns, and habitat suitability, this study sheds light on the environmental changes impacting baleen whale habitats in a dynamic world, facilitating informed decision-making for marine conservation efforts.



CM-31. Current species protection does not serve its porpoise – knowledge gaps on the impact of pressures on the critically endangered baltic proper harbour porpoise population

Lehnert, Kristina ¹; Koschinski, Sven ²; Owen, Kylie ³; Kamińska, Katarzyna ⁴

1. *University of Veterinary Medicine Hannover, Germany*
2. *Meereszoologie, Nehnten, Germany*
3. *Applied Ocean Physics and Engineering Department, Woods Hole Oceanographic Institution, Woods Hole, MA, USA*
4. *Department of Fisheries, Ministry of Agriculture and Rural Development, Warsaw, Poland*

Successful management requires information on pressures that threaten a species and areas where conservation actions are needed. The Baltic Proper harbour porpoise population was listed as Critically Endangered by the International Union for the Conservation of Nature in 2008, with no change in conservation status despite conservation policy calling for its protection and an urgent need for management action to protect this population. We provide an overview of the status of the population, highlight knowledge gaps on the impact of pressures, and make recommendations for management of anthropogenic activities. Based on an exceeded limit for anthropogenic mortality, the high concentrations of contaminants in the Baltic Sea, combined with reductions in prey availability and increases in underwater noise, it is inferred that this population is likely still decreasing in size and conservation action becomes more urgent. As bycatch and unprotected underwater explosions result in direct mortality, they must be reduced to zero. Inputs of contaminants, waste, and existing and emerging noise sources must be minimised. Additionally, ecosystem-based sustainable management of fisheries is paramount to ensure prey availability, and maintain a healthy Baltic Sea. Stranding networks to routinely assess individuals for genetic population assignment and health should be expanded, to identify rare samples from this population. Knowledge is still scarce on the population-level impact of each threat, along with the cumulative impact of multiple pressures on the population. However, the current knowledge and management instruments are sufficient to apply effective protection for the population now. While bycatch is the main pressure impacting this population, urgent conservation action is needed across all anthropogenic activities. Extinction of the Baltic Proper harbour porpoise population is a choice: decision-makers have the fate of this marine mammal population in their hands.



CM-32. Marine mammal strandings in the Red Sea and Arabian Gulf (2018–2024): identification of key monitoring areas and call for a stranding network

Al Turki, Sultan ¹; Salazar, Juan ²; Rabaoui, Lotfi J ¹; Al Qahtani, Tareq ¹; Al Zahrani, Ahmad ¹; Ardan, Abdulsalam ¹; Arossa, Silvia ¹; Vilela, Raul ²; Qurban, Mohamed A ¹

1. NCW National Center for Wildlife, Saudi Arabia

2. KAUST Beacon Development, King Abdullah University of Science & Technology, Saudi Arabia

Between 2018 and 2024, 34 marine mammal strandings were recorded in the Red Sea and Arabian Gulf of Saudi Arabia, thanks to the efforts of the National Center for Wildlife (NCW), which is responsible for collecting and analyzing data as part of its mission to conserve the country's biodiversity. The recorded species included the bottlenose dolphin (*Tursiops truncatus*), pantropical spotted dolphin (*Stenella longirostris*), rough-toothed dolphin (*Steno bredanensis*), Risso's dolphin (*Grampus griseus*), Indian Ocean humpback dolphin (*Sousa plumbea*), dugong (*Dugong dugon*), and a humpback whale (*Megaptera novaeangliae*). Dolphins represented most cases (71%), followed by dugongs (23%) and whales (5%). The strandings were primarily concentrated in the northern and southern areas of the Saudi Red Sea coast and the eastern Gulf coast, highlighting key regions for marine mammals ecology and monitoring. However, the vast geographical extent of the Saudi coastline, spanning approximately 3,800 km along the Red Sea and Arabian Gulf, makes it challenging to adequately attending strandings, resulting in incomplete and underestimated data records. The NCW is key to the conservation of marine mammals in Saudi Arabia, and establishing a national stranding monitoring network with Stranding Response Centers is essential to strengthen scientific research and develop effective management plans for their conservation.



CM-33. Internationally agreed conservation measures for the Atlantic humpback dolphin

Minton, Gianna ¹; Collins, Tim ²; Keith Diagne, Lucy ³; Eniang, Edem A. ⁴; Kema Kema, Judicaël Régis ⁵; Takoukam Kamla, Aristide ⁶; Weir, Caroline ⁷; Frisch-Nwakanma, Heidrun ⁸

1. *Consortium for the Conservation of the Atlantic Humpback Dolphin*
2. *Wildlife Conservation Society*
3. *African Aquatic Conservation Fund*
4. *Biodiversity Preservation Center, Nigeria*
5. *National Parks Agency Gabon*
6. *African Marine Mammal Conservation Organization*
7. *Ketos Ecology*
8. *CMS Secretariat*

The Atlantic Humpback Dolphin (*Sousa teuszii*) is listed on Appendices I and II of the Convention on Migratory Species (CMS) and has been assessed as ‘Critically Endangered (CR)’ on the IUCN Red List of Threatened Species. Found only in shallow-water habitats of 19 countries on the Atlantic coast of Africa, fewer than 3,000 individuals are thought to remain, and their habitats are threatened by expansions of artisanal fisheries, coastal development, and habitat degradation. Following extensive government consultations, the 14th Meeting of the Conference of the Parties to CMS (COP14) adopted, through Resolution 14.10 the Single Species Action Plan for the Atlantic Humpback Dolphin (<https://www.cms.int/en/document/single-species-action-plan-atlantic-hum...>), developed by species experts. Its goal is “to promote the long-term sustainability of *Sousa teuszii* populations and their habitats by reducing the negative effects of human activities through research, awareness, capacity-building and action”. The Single Species Action Plan is led by the need to address the most pressing threats facing the species and includes a risk matrix which provides a framework for action. It outlines 18 objectives with corresponding actions, priorities and timeframes, grouped along these themes:

- Threat 1. Fisheries bycatch (Risk ranking: Catastrophic)
- Threat 2. Utilization of meat for bait, wild meat trade, or food (Risk ranking: major)
- Threat 3. Habitat loss and degradation (including underwater noise from shipping and construction) (Risk ranking: major)
- Threat 4. Data deficits (Risk Ranking: major)
- Threat 5. Resource and Capacity deficits (Risk ranking: major)
- Threat 6. Prey depletion (Risk ranking: moderate)
- Threat 7. Climate change (Risk ranking: Potentially major, but uncertain)

We offer an overview of the activities agreed by governments and provide a region-wide summary of internationally coordinated conservation measures and progress to date on the actions to be implemented by Range States individually and collectively.



CM-34. Twenty years of marine mammal historical records in the Red Sea and Arabian Gulf: identification of important areas and implications for conservation

Rabaoui, Lotfi J ¹; Salazar, Juan ²; Al Qahtani, Tareq ¹; Ardan, Abdulsalam ¹; Al Nasheri, Hamad ¹; Al Turki, Sultan ¹; Al Zahrani, Ahmad ¹; Arossa, Sivia ¹; Vilela, Raul ²; Pilcher, Nicholas J ³; Qurban, Mohamed A ¹

1. NCW National Center for Wildlife, Saudi Arabia
2. KAUST Beacon Development, King Abdullah University of Science & Technology, Saudi Arabia
3. MRF Marine Research Foundation, Malaysia

Between 1999 and 2024, the National Center for Wildlife (NCW), a key organization in biodiversity conservation in Saudi Arabia, gathered more than 1,000 historic records and sightings of marine mammals in the Red Sea and Arabian Gulf. The records came not only from direct observations from NCW fieldwork activities but also from published literature and reports along the past two decades. This long-term historic dataset has provided the first comprehensive insights into the distribution and diversity of marine mammals in the Saudi Red Sea, a region that had previously lacked detailed data on these taxa. The preliminary analysis of the created dataset showed that the most frequently observed species were *Tursiops aduncus* (22.25%), *Stenella longirostris* (13.48%), and *Sousa plumbea* (10.99%), along with 115 sightings of *Dugong dugon* (10.62%), both of which are classified as vulnerable by the international Union for Conservation of Nature (IUCN). A total of 18 different species were identified, including mysticetes, odontocetes and dugongs, and their spatial patterns were analyzed. Although the data reveal significant species diversity, substantial knowledge gaps remain, including estimates of population size, seasonal distribution patterns and impacts of anthropogenic threats, such as habitat degradation and boat interactions. The findings underscore the importance of the Red Sea and Arabian Gulf for marine mammals ecology, highlighting the need to enhance monitoring efforts, conduct in-depth ecological studies, and implement targeted conservation strategies to protect these species. This effort is essential for ensuring the long-term sustainability of the Red Sea and Arabian Gulf ecosystems, positioning them as key areas for global marine biodiversity conservation.



CM-35. Citizen science initiatives enhance the willingness to engage in marine conservation: perspectives from whale watching participants in Italy, Iceland & the Azores

Barbaccia, Eleonora ¹; Rodriguez, Lauren Kelly ²; Ovide, Belén García ³; Gabualdi, Mario ¹; Villa, Enrico ⁴; Jahoda, Maddalena ⁵; Rasmussen, Marianne Helene ⁶; Lanfredi, Caterina ⁵; Traugott, Michael ²; Thalinger, Bettina ²; Azzellino, Arianna ¹

1. *Politecnico di Milano DICA Civil and Environmental Engineering Department, Piazza Leonardo da Vinci, 32, 20133 Milano, MI, Italy.*
2. *Applied Animal Ecology Research Unit, Department of Zoology, University of Innsbruck, 6020 Innsbruck, Austria.*
3. *University of Iceland. Húsavík Research Center.*
4. *Cetacean Watching Lda, Cais da Madalena, 9950-305 Madalena do Pico, Azores, Portugal.*
5. *Tethys Research Institute, c/o Acquario Civico, I-20121 Milano, via G.B. Gadio, 2, Italy.*
6. *University of Iceland's Húsavík Research Center, Hafnarstétt 3, 640 Húsavík, Iceland.*

Marine ecosystems face growing threats from climate change, pollution, and human activities, highlighting the urgent need for effective conservation measures. By actively involving the public in such actions, individuals can contribute to the protection and restoration of these fragile ecosystems. Whale watching offers a unique opportunity to educate and inspire participants and encourage their involvement in marine conservation initiatives. This study, conducted as part of the Biodiversa+ project eWHALE, investigated whether integrating scientific research—specifically environmental DNA (eDNA) sampling—with whale watching activities enhances environmental awareness and motivate participants to take direct conservation action. A survey was conducted to investigate the profile of whale watching participants across three study areas: the Western Mediterranean Sea, Iceland and the Azores. The main objectives of the survey were to assess whether a citizen science experience with eDNA sampling enhanced participants' motivation to attend whale watching cruises, increased their environmental awareness, and strengthened their commitment to biodiversity conservation. A total of 224 survey responses were collected in the summer of 2024. Factor and cluster analyses revealed five participants' profiles based on their responses to levels of commitment to conservation, personal behaviors, interest in learning, and related attitudes. Logistic regression analysis identified key variables influencing participants' willingness to pay (WTP) for marine biodiversity conservation. Results showed that environmental awareness and education were significant positive predictors of WTP, while higher ticket prices negatively influenced WTP. Notably, 80% of participants expressed a WTP, being driven by the educational whale watching experience. In conclusion, this study highlights the potential of combining whale watching activities with educational programs and citizen science initiatives to increase public awareness and encourage direct engagement in marine



conservation. To achieve high levels of engagement and financial support, efforts should focus on promoting environmental awareness and education while maintaining affordable ticket prices to encourage broader participation.



CM-36. The Mediterranean monk seal's return to a heavily used area as a case study for the species' overall conservation in Greece

Panou, Alikí ¹; Bundone, Luigi ^{2,3}; Chaldas, Xenophon

1. *Archipelagos - environment and development, Lourdata, Greece*
2. *Archipelagos - ambiente e sviluppo, Italia*
3. *Ca'Foscari university of Venice*

In the central Ionian Sea, Greece, monitoring of marine caves with a beach or rocky platform in their interior for resting/reproduction of the rare Mediterranean monk seal *Monachus monachus* started in 1985. Up to 2008, the use of caves by the species and sightings in the Gulf of Argostoli, Kefalonia Island was rare, in spite of numerous caves available. However, since 2015, the return of the monk seals to a part of the coastline located only 600-700 metres (direct line) from Argostoli, the island's capital, is being registered through daily observations from the land above. Although the 4 caves at this site are not particularly suitable for monk seals (extremely small beaches of 1-2 square metres or wide entrances which render them less secluded), up to 7 seals -mostly juveniles- are recorded almost daily in all seasons in front and inside the caves despite kayakers and swimmers from the nearby beach entering the caves, tourist vessels with loud music anchoring in front while the dozens of tourists are advised to visit their interior, and numerous people walking or jogging along the coast. Remarkably, the same site was preferred by seals in the 1960's as stated by old fishermen. The seals are not particularly afraid of humans, use the caves quite often and do not flee when swimmers approach them to up to 3-5 metres distance in water. Furthermore, one birth was registered in 2021 and two pups were born in 2024, one of them during high season. As the MPAs to be established throughout Greece may not be enough to allow for the monk seal's full recovery, the seals' obvious habituation to high levels of human disturbance may result in substantially increased terrestrial habitats.



CM-37. RACA: sharing insights of a remote stranding network – the Azores archipelago

Miodonski, Joana ¹; Simião, Susana ¹; Lagoa, João ¹; Santos, Marco ¹; Carriço, Rita ¹; Carreira, Gilberto ¹

1. *Azores Regional Directorate of Maritime Policies (DRPM), Horta, Azores, Portugal*

Cetacean strandings can provide valuable information on its populations. Monitoring strandings in the Azores is essential for the management of the marine environment under European directives, particularly the Habitats and Marine Strategy Framework Directives with all the constraints associated to a stranding network in a remote archipelago. In the Azores, a systematic data record started in 1996, although records can be found since the 1990s. In 2006, a legal Regional Stranding Network (RACA) was finally established, enabling a coordinated action, involving several entities, to these events. Presently, RACA is coordinated by the Regional Directorate of Maritime Policies with three main objectives: ¹ to minimize the possible threats that marine stranded megafauna might pose to human health and safety; ² to minimize pain and suffering of stranded live animals; and ³ obtain maximum scientific and educational benefits from live or dead stranded animals. From 1990 to 2024, 551 stranded cetaceans belonging to 22 species have been recorded. Currently, RACA is being restructured benefitting from a number of European projects (Marcet, Marcet 2 and LIFE IP Azores Natura), by: a) equipment supply to the local operational teams; b) data collection improvements; c) standardizing protocols and efforts to transfer knowledge with other Macaronesia stranding networks; d) implementing sample collection protocols in order to assess the presence of contaminants and/or genetic analysis among others; e) revising and structure the strandings database; and f) capacitating the public veterinary staff of the Azores to assess the health status of stranded cetaceans and determine causes of death. In 2023, the first certificated training on cetacean necropsies took place in the Azores counting with the presence of 61 trainees, including 31 public veterinarians and 17 veterinarian students participated.



CM-38. Photo-ID catalog of long-finned pilot whales (*Globicephala melas*) in the Ligurian sea

Picozzi, Jessica ¹; Giampetraglia, Paola ²; Calascibetta, Andrea ³; Soster, Francesca ⁴

1. Via Ippodromo 61, 20151 Milano, Italy
2. Via del Molinello 88, 86039 Termoli, Italy
3. Department of Earth and Marine Science (DiSTeM), University of Palermo
4. Malta College of Arts Science & Technology (MCAST), TriqKordin, Paola, PLA 9032, Malta

The long-finned pilot whale (*Globicephala melas*) was recently classified as endangered in the Mediterranean, with limited research available on this population in the western Ligurian Sea. This study aims to assess the presence and to create a photo-ID catalog of long-finned pilot whales in the region. Data on their geographical location, group size and photo-identification was collected from June to September, from 2022 to 2024, onboard a whale-watching vessel. A total of 18 sightings were recorded as part of opportunistic data collection. 550 individuals were observed, including 419 adults, 74 juveniles, 44 calves, and 13 newborns. Group size ranged from 4 to 150 individuals, with a mean of 30.56 (SE= ± 7.37). A total of 6236 photographs of animals were taken to identify individuals based on the morphology and unique markings of the dorsal fin and body. A total of 238 individuals were photo-identified. Among these, 80 individuals were photographed on both the right and left sides of their dorsal fin. 24 Mother-calf pairs were observed, suggesting that the area may serve as a calving and nursing ground. 28 individuals were resighted, 21 within the same season and 7 across different years at different times. The results indicate a degree of site fidelity and highlight the importance of this area for the conservation of this species. This study lays the groundwork for collaborative photo-ID efforts with research institutions, enabling improved tracking of long-finned pilot whale movements and contributing to conservation strategies for this endangered species across the western Mediterranean.



CM-39. A review of the narwhal ivory trade

Dolman, Sarah ¹; Fisher, Sue ²; Hunter, Katie ³

1. *Environmental Investigation Agency, 62-63 Upper Street, London N1 0NY; College of Medical, Veterinary & Life Sciences, University of Glasgow, Bearsden Road, G61 1QH, UK*
2. *Animal Welfare Institute, 900 Pennsylvania Avenue, SE, Washington, DC 20003, USA*
3. *Whale and Dolphin Conservation, Brookfield House, 38 St Paul St, Chippenham SN15 1LJ, UK*

The narwhal is endemic to Arctic waters. The vast majority of the world's narwhals occur in Canada and Greenland, where they are hunted by indigenous hunters under quota. Whilst Canada and Greenland are the only countries harvesting narwhal under quota, they are not the only countries trading narwhal parts. In addition to their value for food (mainly mattak, which is skin and some of the adhering blubber), narwhals are hunted for their teeth and unique spiraled ivory tusk (an enlarged left tooth), which can reach up to 2.5 metres in length and grows on males, and occasionally on females. The tusk is commercially valuable and so is a driver for international trade. Narwhals were listed on CITES Appendix II in 1979 thereby requiring international trade be controlled in order to protect the species. The IUCN Red List covering Europe identified narwhals as 'Vulnerable', reflecting the continuing decline in narwhals in East Greenland. Narwhals are listed as 'Near Threatened' in West Greenland and as 'Endangered' in East Greenland, on the Greenland Red List. The unsustainability of some narwhal hunts, the extent, trend and value of the narwhal ivory trade, concerns about illegality and convergence with other crimes, such as money laundering, and illegal wildlife trade, conservation impact and data limitations will be discussed.



CM-40. Whales and storytelling: a tool for conservation

Jahoda, Maddalena ¹; Airoidi, Sabina ¹

1. *Tethys Research Institute, Viale G. B. Gadio 2, 20121, Milano, Italy*

Stories of individual animals are rarely featured in peer-reviewed literature, but they can attract significant public attention. We examined two notable cases that gained extensive media coverage: a group of killer whales previously spotted in Iceland, which entered the Mediterranean Sea in December 2019; Codamozza/Fluker, a fin whale that suffered the amputation of its flukes in 2019 and was followed by media in June 2020 while swimming off the coasts of Italy and France. We assessed public interest in these stories through two main sources: 1) print and digital general audience publications and 2) web searches via Google Trends through relevant keywords across different languages and countries. A total of 336 articles (181 about the orcas, 155 about Codamozza) were collected, with 37.63% categorized as local and 62.37% as national. The data were further analyzed by 'involved' countries - those where the animals had passed near (Italy and France for Codamozza, only Italy for the orcas) - and non-involved countries. Searches were conducted in Italian, English, German, and French. Of the total, 295 (87.80%) articles came from involved countries (151 about the orcas, 144 about Codamozza), while the rest, 41 articles (orcas: 30; Codamozza: 11), came from non-involved countries (UK, Switzerland, Germany, Iceland, France) and from international English-language outlets, with one website from as far as Indonesia. During the period of the events, compared to one month earlier, Google Trends showed peaks of interest in involved countries, as well as in almost all non-involved countries considered, albeit to a lesser extent (Switzerland, Germany, Austria). These findings suggest that narratives about charismatic species like cetaceans can trigger strong public responses and have the potential to generate substantial support for conservation efforts, even spreading at some distance. In this respect, maintaining communication channels between researchers and the media could be key.



CM-41. Diversity, habitat use, and potentially suitable areas for marine mammals in the NEOM Nature Reserve (Northern Red Sea, Saudi Arabia)

Salazar, Juan Manuel ¹; Vilela, Raul ¹; Patterson, William ¹; Alghair, Mishari ²; Cowie, Winston ²; Porej, Deni ²; Judd, Christy ³; Ramalho, Ricardo ¹

1. KAUST Beacon Development King Abdullah University of Science & Technology, Saudi Arabia
2. NEOM Nature Reserve, Saudi Arabia
3. Reef Ecology Lab King Abdullah University of Science and Technology, Saudi Arabia.

From 2018 to 2024, marine mammals sighting data have been collected by King Abdullah University for Science and Technology (KAUST) in the northern Red Sea region of Saudi Arabia, as part of a suite of studies that NEOM have conducted to investigate biodiversity and integrate sustainable practices during any potential developments. These studies employed various methods including drone transects, drone focal searches, vessel transect surveys, land-based observations, and recording opportunistic sightings. During this period, more than 500 sightings of seven different species have been recorded. Notably, the inshore obligate species, dugongs (*Dugong dugon*) and Indian Ocean humpback dolphins (*Sousa plumbea*), accounted for more than half of all sightings. Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), spinner dolphins (*Stenella longirostris*), pantropical spotted dolphins (*Stenella attenuata*) and common bottlenose dolphins (*Tursiops truncatus*) were also seen regularly with a more ubiquitous distribution across NEOM's waters. Observations of Risso's dolphins (*Grampus griseus*) are mostly limited to the Gulf of Aqaba, though their distribution may be wider than previously thought. Predictive Habitat Suitability Models were applied to identify key environmental parameters and potentially suitable areas for marine mammal occurrence in the region. These models integrated environmental variables, such as the presence of coral reefs, seagrass beds, depth, and slope to explore species' habitat preferences. In this way, areas preferred by marine mammals based on the sightings data could be confirmed, as well as identifying potentially favorable areas that may currently be under-surveyed due to limited research efforts. This study provides valuable information on the ecology of marine mammals in the northern Red Sea, emphasizing the importance of preserving potentially favorable habitats that could be affected by natural or anthropogenic changes. The results of this study will support NEOM further their conservation efforts and habitat management plans in a unique and rapidly developing marine environment.



CM-42. A sense-making approach to the understanding of laws impact on human/cetacean coexistence along the Atlantic Coast of the Iberian Peninsula IMMA

Mazzi, Alessandro ¹

1. *Wageningen University & Research*

Cetacean populations within the Important Marine Mammal Area (IMMA) of the Atlantic Coast of the Iberian Peninsula, including the Iberian Orca subpopulation, the Iberian Harbour Porpoise, and the resident Bottlenose Dolphins of the Sado Estuary, face mounting threats from human activities. Stressors such as chemical and noise pollution, bycatch, resource depletion, and habitat degradation are exacerbated or mitigated by the design and implementation of legal frameworks. These laws have the power to either enable or constrain such stressors, ultimately determining the socio-ecological conditions necessary for coexistence between humans and cetaceans. This paper introduces a framework and methodology designed to identify and prioritize the most critical policy interventions needed to address these challenges. By systematically mapping the socio-ecological impacts of legal frameworks, the study reveals how laws influence key stressors affecting cetaceans, such as weak regulation of industrial fishing leading to overexploitation of prey, insufficient measures to prevent chemical runoffs, and ineffective protection and restoration of critical habitats. The framework highlights opportunities to recalibrate legal approaches to reduce harm, focusing on the most impactful areas for intervention. Using the Atlantic Coast of the Iberian Peninsula as a case study, the paper aims to provide a methodology that can be used to prioritise policy actions to foster human/cetacean coexistence in other AIMMs in Europe and across the globe. By equipping scientists, policymakers, and conservationists with a structured methodology for prioritizing policy interventions informed by social and ecological sciences, this research contributes to broader efforts to ensure the survival of cetacean populations and the long-term resilience of marine ecosystems.



CM-43. Safety first: acoustic deterrence as a mitigation tool for seal-human conflicts in the Helgoland dune swimming zone

Heimberg, Kim Nina ¹; Gross, Stephanie ¹; van Neer, Abbo ¹; Escobar-Calderon, Juan Felipe ¹; Schaffeld, Tobias ¹; Siebert, Ursula ¹

1. *Institute for Terrestrial and Aquatic Wildlife Research (ITAW), University of Veterinary Medicine Hannover, Foundation*

Situated offshore in the North Sea, the Helgoland Dune hosts Germany's largest grey seal (*Halichoerus grypus*) colony, highlighting its unique role as both a biodiversity hotspot and a popular tourist destination. The combination of limited space and growing interaction between seals and humans, particularly in shared swimming areas, has raised safety concerns due to previous incidents of seal-human encounters. To mitigate these risks, an acoustic deterrent system based on the "Targeted Acoustic Startle Technology" (TAST) was tested. This system aims at deterring seals by emitting short (0.2s) band-limited sound signals around 1 kHz, designed to trigger specifically the seals' innate acoustic startle reflex and not of other species. The aim is to provide a sustainable, nature-friendly method to protect swimmers while preserving the local grey seal population due to the very limited effect distance. Successful implementation could make the TAST a practical management tool for the Helgoland municipality. The TAST was deployed in the designated bathing area during two independent field seasons (2023 and 2024), and seal presence was monitored using images captured every 2s from an elevated position. In total, 22,086 grey seal positions were determined and categorised into three distance classes relative to the sound source (<10 m, 10-25 m, >25 m). Seals were observed farther from the sound source during signal emission compared to control periods. Specifically, 47.79% of seals were detected at distances >25 m during signal emission, compared to 32.69% during control periods. Conversely, seals were observed within a radius of 10 m only 0.23% of the time during signal emission, compared to 3.01% during control periods, representing a 13-fold increase in proximity during control conditions. These findings demonstrate the effectiveness of the TAST in deterring grey seals, reducing the likelihood of human-seal interactions, and offering a promising solution for coexistence in shared coastal environments.



CM-44. A Rügen thriller: 44 healthy well-fed dead grey seals, a fish trap, intense media coverage, policy changes and an ongoing investigation

Denkinger, Judith ¹; Klemens, Lisa ²; Wächter, Ida ²; Neumeister, Almut ²; Heller, Volkhardt ²; Baschek, Burkhard ²

1. *German Ocean Museum, 18439 Stralsund, Germany Universidad San Francisco de Quito, Colegio de Ciencias Biologicas y Ambientales, Quito, Ecuador*
2. *German Ocean Museum, 18439 Stralsund, Germany*

The competition between grey seals and fisheries is a global conflict, often causing fatal consequences for both and threatening population stability or species survival. On October 1st in 2024, five large grey seals washed ashore at Lobbe, Rügen's eastern coast. All were healthy, well-nourished adult males. Thanks to ongoing monitoring of mammal strandings by the Ocean Museum Germany (DMM), the animals were recovered and autopsied. Over the following weeks, an unusually high number of seals stranded, exceeding previous numbers and DMM and the Biosphere Reserve Southeast Rügen (BRASOR) filed charges against unknown and issued a press release. In the same area, a fish trap without seal safety devices was legally operating. By October 30th, 44 dead grey seals were recorded, including five found near the trap. A total of 3 animals were autopsied by the DMM confirming that the animals were otherwise healthy and well nourished. Brain samples were tested by the Löffler Instituted and tested negative for influenza A, CDV/ PDV, Usuto and West Nil Virus. While fish traps located in the Greifswalder Bodden are required to use seal-safe devices, this requirement does not extend to the BRASOR area. Despite the loss of 44 for seals, which amounts to about 10% of the estimated number of grey seals at the coast of Mecklenburg Pomerania, the cooperation between Institutions, the continuous reporting in all media supported a change in conservation policy the Ministry of environment of Mecklenburg-announcing that seal-safe fish traps will be required along the entire coast of Mecklenburg-West Pomerania starting in spring 2025. This case highlights the importance of long-term stranding monitoring, information of the public, thorough autopsies for identifying and addressing anomalies to implying new conservation policies. Investigations are ongoing, with further autopsy results pending.



CM-45. Navigating waters of change – ambitious baseline data collection for marine mammals prior to large-scale offshore green energy developments in Danish Waters

Anker Kyhn, Line ¹; Nabe-Nielsen, Jacob ²; Teilmann, Jonas ²; Griffiths, Emily ²; van Beest, Floris ²; Galatius, Anders ²; Wilson, Maria ¹; Boel Jørgensen, Poul ²; Sveegaard, Signe ²; Dietz, Rune ²

1. NIRAS, Denmark

2. Section for Marine Mammal Research, Aarhus University, Denmark

Offshore projects to harvest renewable energy are increasing. For Environmental Impact Assessments, collection of high quality baseline data are required by the authorities. Here, we present a two-year baseline survey for marine mammals from the North Sea, where a large-scale offshore development was planned with multiple wind farms (3GW) and an energy island, with electricity distribution to neighbouring countries and hydrogen to be generated and stored during windy periods. The survey consisted of nineteen fixed passive acoustic harbour porpoise stations, seven wideband cetacean recorders, four annual line transect surveys for cetaceans, aerial seal haul-out counts, and satellite tracking of grey and harbour seals from the nearest haul-outs. In year two, the entire Danish North Sea was covered by aerial line transect surveys to estimate the abundance and distribution of harbour porpoises and other marine mammals. Seal movements were characterized based on residence time, and habitat suitability modelling was performed based on the static and dynamic environmental variables that best informed the model. The area had a high density of harbour porpoises in July (0.88-1.96 porpoises/km²) with a mother-calf ratio of 16%. Harbour porpoises had a diel acoustic pattern with more activity during daylight, matching distribution and behaviour of sand eels. White-beaked dolphins with calves were observed for the first time in Danish waters, and white-beaked dolphins as well as minke whales showed regular presence in the study area. The analysis of the seal movements suggests that the future offshore wind farm area 80-150 km from the shore was of low importance to the two seal species due to the remoteness from land. Grey and harbour seals spent only 0.2% and 0.1% of their time in the area, respectively. These findings leads to recommendations for future monitoring programs before during and after developing wind farms in the North Sea.



Ecology



EC-01. Round trips from the Gulf of Taranto to the Gulf of Catania as first evidence of *Grampus griseus* (Cuvier, 1812) corridors across the Ionian Sea (Mediterranean Sea)

Cipriano, Giulia ^{1,2}; Santacesaria, Francesca Cornelia ³; Pollazzon, Vittorio ³; Tumino, Carla ^{4,5}; Raffa, Alessandra ⁴; Maglietta, Rosalia ⁶; Carlucci, Roberto ¹; Monaco, Clara ⁴

1. University of Bari, Department of Biosciences, Biotechnology and Environment, Bari, Italy
2. CoNISMa, Rome, Italy
3. Ionian Dolphin Conservation ETS, Taranto, Italy
4. Marecamp Association, Catania, Italy
5. University of Catania, Department of Biological, Geological and Environmental Sciences, Catania, Italy
6. Institute of Intelligent Industrial Technologies and Systems for Advanced Manufacturing, CNR-STIIMA, Bari, Italy

In July 2024, an exceptional sighting of 50 Risso's dolphins in the Gulf of Catania allowed to compare photos from this event with the catalogue of photo-identified dolphins in the Gulf of Taranto from 2013 to 2024. While Risso's dolphins were regularly seen in the Gulf of Catania until 2018, this sighting was the first in six years. In the Gulf of Taranto, the species has shown a consistent presence since 2013, becoming one of the Mediterranean areas where it regularly occurs. This study provided the first evidence of Risso's dolphin movements across the Ionian Sea, confirming matches for six individuals: 1 adult female and 5 juveniles of undetermined sex. These six animals were observed together in the Gulf of Taranto up to 9 times. The adult female was first sighted in the Gulf of Taranto in 2021 with a dependent calf and re-sighted 24 times until 2023. This calf, now classifiable as juvenile, was not identified in Catania, but it was seen again in Taranto in June and August 2024. In July 2024, the same adult female was observed with a newborn in Catania and again in late August in Taranto with a nursing calf identifiable by shark-related marks. One of 5 matching juveniles, previously identified as undetermined sex in Taranto in 2021, was seen with a calf in Catania, suggesting it is female. Unfortunately, this individual has not been seen again in Taranto in 2024. Another juvenile observed in both Catania and Taranto in 2024 was first sighted in Taranto in 2018 with its mother, and it became independent in 2023. These findings highlight the variability in the use of habitat by Risso's dolphins and the importance of comparing photo catalogues from bordering areas in order to fill knowledge gaps about Risso's dolphin movement patterns.



EC-02. Site fidelity and connectivity of Risso's dolphin (*Grampus griseus*) in the English Channel: Insights into coastal habitat use and migration patterns

Olhasque, Oihana ^{1,2,3}; Authier, Matthieu ³; Biacchi, Juliette ¹; Adams, Jen ⁴; Jones, Duncan ⁵; Symes, Josh ⁵; Duchemin, Matthieu ¹; Spitz, Jérôme ^{2,3}

7. Association AL LARK - Cancale, France

8. UMR 7372 - CEBC - Centre d'études Biologiques de Chizé - La Rochelle Université / CNRS

9. UMS 3462 - Observatoire Pelagis - La Rochelle Université / CNRS

1. Manx Whale and Dolphin Watch, Isle of Man

2. Marine Discovery Penzance, Cornwall

Risso's dolphin (*Grampus griseus*) is an oceanic species with vulnerable conservation status in certain European regions. Despite its widespread presence, significant gaps remain in understanding its ecology, particularly the role of coastal habitats in migratory and trophic patterns. We hypothesize that seasonal fidelity to North Atlantic coastal areas plays a key role in these patterns. Using a combination of capture-recapture models and photo-identification techniques, we analyzed data from four sites in the English Channel: two to the west : Isle of Man, MWDW (IM-UK) ; Cornwall, Marine Discovery (C-UK) and two to the east : North-West French Brittany, PNMI (NWFB) ; North-East Brittany, AL LARK (NEFB) ; collected over 17 years (2007-2024). Preliminary results shows that 51% of NEFB individuals (N=45) and 14% of NWFB individuals (N=93) were recaptured at least twice between 2007 and 2024, only in summer, with some spanning 8-9 years, indicating clear seasonal fidelity to specific coastal sites likely linked to feeding and migration routes. Four recaptures were found between these two sites but no recaptures occurred so far between NEFB and IM-UK (2007-2024) or with C-UK (2021-2024). Next step will focus on matching individuals from NWFB with those from UK, where geographical proximity increases the likelihood of matches. Future work will explore how seasonal variability and environmental factors influence Risso's dolphins' distribution along the French Atlantic coast. A multi-tracer approach to trophic ecology will investigate the role of coastal habitats in their feeding behavior and the impacts of environmental change and anthropogenic pressures. By fostering a collaborative European network, this work aims to enhance cooperation across research institutions and local stakeholders to improve this species' conservation status.



EC-03. Sperm whale echolocation behaviour and movements during prey capture attempts: searching for a signature of successful prey captures

Oliveira, Cláudia ¹; Pérez-Jorge, Sergi ¹; Prieto, Rui ¹; A. Silva, Mónica ¹

1. Institute of Marine Sciences – OKEANOS and Institute of Marine Research - IMAR, University of the Azores, Horta, Portugal

Prey capture efficiency estimates are essential to quantify the bioenergetic impacts of human-induced stressors on marine megafauna. Distinguishing successful from unsuccessful prey capture attempts (PCA) is particularly difficult in marine mammal species that forage underwater. Sperm whale (*Physeter macrocephalus*) buzzes have been associated with PCA, targeting single prey on each buzz, although success prey capture rates remain unknown. We analyzed the movements and acoustic behaviour during PCAs of 25 sperm whales instrumented with DTAGs to investigate whether we could detect signatures associated with actual prey handling or consumption. We identified two types of buzzes: buzzes followed by a pause (Bzs-pause) and buzzes followed by usual clicks (Bzs-click). Compared with Bzs-click, Bzs-pause had lower mean jerks before the terminal buzz phase and after the terminal buzz phase, which could indicate a deceleration occurring at the end of the pursuit while handling captured prey. Bzs-pause had longer inter-buzz intervals than Bzs-click, possibly linked with the prey engulfment process and the restart of echolocation on a new prey item. The presence of a post-buzz pause, potentially associated with prey handling and/or engulfment, offers a promising indicator of successful PCAs in sperm whales. While challenging, this hypothesis could be tested using underwater sound and video equipment to validate the production of Bzs-pause and Bzs-click and the successful and unsuccessful prey captures.



EC-04. First insights of orca social dynamics in São Miguel, Azores

Cabayol Ferraz, Georgina ¹; Pereira, Andreia ¹; Haro Hereu, Alba ²; González García, Laura ³

1. *Futurismo Azores Adventures, Ponta Delgada, Portugal.*
2. *International Master of Science in Marine Biological Resources (IMBRSea), Ghent University, Belgium.*
3. *Institute of Marine Sciences - OKEANOS, University of the Azores, Horta, Portugal.*

Orcas (*Orcinus orca*) are apex predators widely distributed in the North Atlantic. However, their populations remain understudied, particularly in mid-Atlantic regions like the Azores, where data remains scarce. This study presents the first insights of orca social structure around São Miguel Island. Opportunistic data was collected from whale-watching vessels between April 2006 and January 2025 by Futurismo Azores Adventures and collaborating companies within the MONICET project. A total of 75 individuals were photo-identified, with 40% resighted at least once. Social structure analysis was conducted for 21 individuals sighted at least on three occasions. Preliminary results showed a general low mean association index of 0.16 ($SD \pm 0.07$). However, thirteen individuals were observed across multiple years. Three of them were sighted together over 9, 10 and 11 years apart; while other four individuals were resighted together annually since 2022. Both core groups showed $HWI > 0.82$ within them, but have been sighted with other individuals in different occasions. On the other hand, more sporadic interactions occur. For instance, one adult female has been sighted in three different years, each year accompanied by different individuals. These findings suggest mixed-age and mixed-sex social units, characterized by a combination of long-term bonds and casual associations. In the Azores, orcas form small groups, interact intermittently with other individuals, and frequently exhibit male dispersion, with males occasionally sighted alone. These results emphasize the adaptability of orcas and suggest the possibility that their dynamic social behaviour may be influenced by their foraging strategies in the Azores. Although data scarcity restricts definitive conclusions, this study highlights the value of long-term opportunistic data from whale-watching activities in advancing knowledge of mid-Atlantic orca populations.



EC-05. Health status assessment of blue whales in the Mid-North Atlantic Azores

Dionísio, Gisela ^{1,2}; Brandão, Cláudia ^{3,4}; Albuquerque, Mafalda ^{1,3}; Peres dos Santos, Rui ^{5,6,7,8}; Gomes-Pereira, José ^{1,3,9}

1. *AtlanticNaturalist, Monsenhor Silveira de Medeiros 9900-021 Horta, Portugal*
2. *Laboratório Marítimo da Guia, Faculdade de Ciências, MARE, Marine and Environmental Sciences Centre/ARNET, Aquatic Research Network, Universidade de Lisboa, Cascais, Portugal*
3. *Naturalist - Science and Tourism, MARE-Startup, Cais de Santa Cruz, Loja A1, 9900-026 Horta, Portugal*
4. *Ispa—Instituto Universitário de Ciências Psicológicas, Sociais e da Vida, 1149-041 Lisboa, Portugal*
5. *Marine Ecology, Human Impacts and Diversity (MARDIV), Centro de Ciências do Mar (CCMAR), Campus de Gambelas, Faro, Portugal*
6. *Universidade do Algarve, Campus de Gambelas, Faro, Portugal*
7. *Mingan Island Cetacean Study (MICS), Quebec, Canada*
8. *Pattern Institute, Faro, Portugal*
9. *Institute of Marine Sciences - OKEANOS, University of the Azores, Horta, Portugal*

Marine mammals are valuable indicators of environmental health due to their apex role in marine trophic systems and their function as sentinels of ecological change. Environmental shifts that decrease prey availability often result in reduced fat reserves, which are externally observable in whales. The Azores serve as a key habitat for North Atlantic blue whales (*Balaenoptera musculus*), acting as a stopover during their migrations between breeding and feeding grounds. The region provides foraging opportunities, particularly in spring, driven by seasonal upwelling that enhances prey availability. This geographic location is pivotal for studying blue whale ecology and migration patterns in the North Atlantic. Despite the recognized importance of the Azores, there are no studies focused on the body condition of blue whales in the area. This study employed non-invasive methods, analyzing photographs of blue whales (*Balaenoptera musculus*) captured in the Azores between 2017 and 2024. Body condition was assessed by scoring visible features, such as undulations along the vertebral processes and overall body shape. Skin condition, visible injuries, and scarring were documented to identify possible interactions with fishing gear, ship strikes, or predators. Using these techniques, an overall health status assessment is made. These findings aid in the development of conservation strategies by identifying health trends and potential threats, thereby supporting long-term protection and monitoring programs for blue whales in the North Atlantic.



EC-06. Acoustic detection of Fin Whales through an OBS/H network over a broad area in the Ionian Sea (Central Mediterranean)

de Vincenzi, Giovanni ¹; Filiciotto, Francesco ¹; Beranzoli, Laura ²; Sgroi, Tiziana ²; Sciacca, Virginia¹

1. Istituto di Scienze Polari, Consiglio Nazionale delle Ricerche (ISP-CNR), Messina (ME)
2. Istituto Nazionale di Geofisica e Vulcanologia (INGV), Sezione Roma 2

The population of fin whales (*Balaenoptera physalus*) that inhabits the Mediterranean Sea is protected by several international agreements and has been recently classified as “endangered” by the Red List of the IUCN. Many surveys confirmed the seasonal presence of fin whales (FW) in highly productive regions of the Mediterranean Sea. However, the limited quantity of data available in Central Mediterranean Sea limits the definition of key bio-ecological activities. This work is part of the project “KNOWhale - KNOWledge improvement for the conservation of endangered Mediterranean fin Whale in Southern Italy”, funded by Next Generation EU. The project aims to expand knowledge about the species’ acoustic behaviour, seasonal occurrence, and movements. In this work, we present updated information about FW's presence and movements in the Ionian Sea, several years after previous studies, and across a significantly broader area, between Eastern Sicily and Calabria. 8 synchronized Ocean Bottom Seismometers (OBS), equipped with a hydrophone sampling continuously at 100Hz, were deployed from May 2017 to January 2018 for the project SEISMOFAULTS in an area covering 100 x 150 km. Acoustic data from 3 of these OBSs were analysed to detect FW 20-Hz calls, using the MATLAB automatic detector SAW. Preliminary results reveal the occurrence of FW calls over five non-consecutive days between October and December 2017. 945 vocalizations were detected and, in some cases, simultaneously recorded by different OBSs. OBS3 registered 55 signals distributed over two days; OBS5 captured 106 calls in one day; OBS7, the easternmost site, registered 784 calls between October 21st and December 12th. These results highlight different periods of acoustic occurrence in the area compared to previous studies, improving knowledge on FW seasonality and movements. Furthermore, the availability of synchronous recordings from multiple widely spaced hydrophones represents the foundation for the first acoustic tracking of FW in Mediterranean Sea.



EC-07. Short-scale variation of fin whale song parameters at a Mid- Atlantic migratory habitat, the Azores Archipelago

Leitão, Rita ¹; Silva, Mónica ¹; Ferreira, Ana ²; Romagosa, Miriam ¹

1. OKEANOS - Institute of Marine Sciences
2. University College London

Fin whale (*Balaenoptera physalus*) songs consist of a stereotyped repetition of low-frequency sounds believed to act as reproductive displays. Songs include downsweep notes centered at 20 Hz (A) and, in some regions, a lower frequency note, the backbeat (B). Fin whale songs have been recorded in all ocean basins and their characteristics differ between regions, especially the time interval between consecutive notes (inter-note- interval - INIs), which has been used for population or stock differentiation. Although studies in the North Pacific and North Atlantic provided strong evidence of geographic distinctiveness of fin whale song INIs, this parameter can also vary temporally within the same region. Therefore, investigating how particular acoustic song features vary across years and within the same region is key for understanding if certain song features can be used to distinguish populations and reveal patterns, drivers and limits of song variation. Here, we measured INIs and proportions of note types (A and B) in selected songs (8 songs and 32786 notes) detected in 15 days (October of 2022) of recordings from Ocean Bottom Seismometers deployed in the Azores. Our results revealed that 37% of songs were composed by two note types while 63% only had the A note type. We found two dominant groups of INIs, centered at 12 and 15 seconds, and all but one song included both INI types. A previous study in the same area found song INIs of ~16s in 2020, meaning that fin whales have changed their INIs again in this region, and include an INI type described in 2002-2003 south of the Azores. The fact that most songs include both INI types may imply a novel transition period in the evolution of fin whale songs but more data is necessary to confirm this.



EC-08. Integrating real-time feeding events and predictive models to understand the patterns of Sei whales in the Azores

Albuquerque, Mafalda ¹; Gomes Pereira, José ^{1,2,3}; Sousa Guedes, Diana ⁴; Boavida Portugal, Joana ⁵; Dionísio, Gisela ^{2,6}

1. *Naturalist - Science and Tourism, MARE-Startup, Cais de Santa Cruz, Loja A1, 9900-026 Horta, Portugal*
2. *AtlanticNaturalist, Monsenhor Silveira de Medeiros 9900-021 Horta, Portugal.*
3. *Institute of Marine Sciences - OKEANOS, University of the Azores, Horta, Portugal.*
4. *CICGE - Centro de Investigação em Ciências Geo-Espaciais*
5. *MARE-Marine and Environmental Sciences Centre, University of Évora*
6. *Laboratório Marítimo da Guia, Faculdade de Ciências, MARE, Marine and Environmental Sciences Centre/ARNET, Aquatic Research Network, Universidade de Lisboa, Cascais, Portugal*

The Azores play a pivotal role in the ecology of the endangered sei whale (*Balaenoptera borealis*). While traditionally recognized as a migratory corridor, recent observations suggest that the archipelago may also serve as a significant feeding ground. Notably, between August and November 2022, a substantial feeding aggregation was documented, indicating the region's importance in the species' life cycle. Sei whales exhibit flexibility in their feeding grounds, often adjusting their foraging locations based on prey availability and environmental conditions. Despite this adaptability, considerable gaps remain in our understanding of their wintering habitats, summer feeding areas, and tropical breeding grounds. In this study, we employed species distribution models (SDMs) to predict how habitat suitability feeding grounds might shift under future scenarios using different environmental variables and multiple datasets to elucidate trends in the northward distribution of sei whales. Our findings suggest that the Azores may function as a transitional ecological hotspot. An increase in primary productivity around the Azores could lead to shorter migrations, with the region serving as an alternative to traditional Arctic feeding grounds. This is further supported by the behavioral analysis of the sei whale aggregation event, highlighting the area's significance as a feeding ground. This study integrates a real-time ecological event (feeding aggregation) and predictive models to assess future distribution patterns under climate change, making it highly relevant to conservation and management. Improvements are proposed to mitigate the impact of vessel traffic and whale-watching activities on the feeding behavior of *Balaenoptera borealis*.



EC-09. Comparison of CPOD and FPOD performance in monitoring harbour porpoise occurrence

Ransijn, Janneke ¹; Noort, Bart ¹; Verdaat, Hans ¹; Geelhoed, Steve ¹

1. *Wageningen Marine Research*

This study compares the performance of two acoustic monitoring devices for harbour porpoises: the Cetacean Porpoise Detector (CPOD) and its successor, the Full waveform capture POD (FPOD). The research was conducted as part of a multi-year project initiated in 2019 to assess the impact of the Borssele offshore wind farm development on harbour porpoise in Dutch coastal waters. The availability and support for CPODs are expected to decrease in the coming years as a transition is made to the newer FPODs. To enable comparisons between current and future studies using either CPODs, FPODs, or both types of PAM devices, FPODs were co-deployed with CPODs at four locations in the so-called Harbour Porpoise Network Borssele in 2022. In line with expectations, preliminary findings indicate that while both devices detect porpoise activity, FPODs show higher detection rates due to their technological advancements compared to CPODs. Temporal patterns in porpoise detections are similar between both devices, but detection rates differ significantly, particularly at finer temporal scales. A universal scale factor for comparing data from CPODs and FPODs is challenging due to varying detection probabilities influenced by environmental conditions. The study underscores the need for further research to quantify the relationship between acoustic detections and environmental conditions. This research is part of the Wozep offshore wind ecological programme Rijkswaterstaat on behalf of the Ministry of Climate Policy and Green Growth of the Netherlands.



EC-10. Cooperative feeding strategies and lateralised lunge feeding behaviour of Southern Hemisphere fin whales within large feeding aggregations at the Western Antarctic Peninsula

Rychwalski, Alexander Nicolas ¹; Herr, Helena ²; Möllmann, Christian ¹

1. Universität Hamburg

2. Universität Hamburg & Alfred Wegener Institut

Cetaceans are known to engage in a range of cooperative feeding strategies to enhance their individual foraging efficiencies through the coordinated efforts of a group of conspecifics. Although several rorqual species have been documented to form large temporary feeding aggregations (non-mutualistic) and perform synchronised feeding lunges in pairs and triplets (mutualistic), these group feeding behaviours were only classified as intentionally cooperative in the case of humpback whales (*Megaptera novaeangliae*) and Eden's whales (*Balaenoptera edeni*). Here, we investigate cooperative group behaviour of surface lunge feeding Southern Hemisphere fin whales (*Balaenoptera physalus quoyi*) by analysing aerial video imagery captured at the feeding grounds off Elephant Island, Antarctica. The aerial video footage had a total duration of 13:03h and was recorded during two research expeditions in the austral summers of 2018 (PS112) and 2023 (MSM115) using drones and on-board helicopters. We present first observational indicators of 190 separate groups of 2-7 Southern Hemisphere fin whales engaging in cooperative feeding behaviours through at times repetitive, highly coordinated, and synchronised feeding lunges. We found that the majority (55.1 %) of all recorded surface feeding lunge events ($n = 898$) exhibited coordinated and synchronised group behaviours and further indicated a high degree of right-side lateralisation during group side lunges, with predominantly right-biased roll manoeuvres (98,1 %) and clockwise lunge directions (93,7 %). In addition, we observed groups of fin whales employing intentional prey herding techniques, such as clockwise circular swimming and echelon formation feeding, to presumably concentrate prey into denser aggregations and further enhance their overall foraging efficiency. Our results provide new insights into the feeding ecology of baleen whales, representing the third recorded instance of a species of rorqual engaging in cooperative lunge feeding and to our knowledge the first documented case of cooperative foraging occurring within the large feeding aggregations.



EC-11. North Atlantic Azores as a nursery area for sperm whales

Silva, Beatriz N. ¹; Dionísio, Gisela ²; Dias, Inês C. ¹; Tolosa, Marc ¹; Gomes-Pereira, José Nuno ²

1. *Picos de Aventura - Animação e Lazer*

2. *Naturalist - Science and Tourism*

The Azores archipelago provides a key habitat in the North Atlantic for resident and seasonal sperm whales (*Physeter macrocephalus*), which are known to feed on its characteristic volcanic slopes. This study analyses 10 birth events and 26 newborn sightings recorded between 2016 and 2023, revealing new seasonality and behaviour patterns demonstrating the archipelago's importance as a nursery site. Sperm whale births occurred mainly in late spring and summer, peaking in August, with more newborn sperm whales observed from July to October. Pre-birth behaviours involved energetic social activity among juveniles and females (e.g., rolling, body contact, tail slapping, acoustic interplay). A large bloodstain marked births and, in some cases, placenta observation, followed by the appearance of a light grey-coloured head and a skin-marked newborn. They swim more irregularly, sometimes receiving assistance from adults to surface to breathe. Groups tend to remain close after birth, and newborns are often surrounded by other calves and juveniles, occasionally showing curiosity toward boats. Habitat preference and social ecology were further assessed through 4,400 sperm whale encounters between 2009 and 2022 (data from Naturalist, Science and Tourism and MONICET), evaluating the influence of environmental, spatial, and temporal variables on calf presence and distribution with Kruskal-Wallis and Generalized Additive Models. Groups with calves tend to occur in deeper areas than groups without calves, with average depths of 1,111 m and 1,044 m, respectively. This is the first study to integrate extensive multi-year datasets to highlight the critical role of the Azores as a nursing ground for sperm whales, one of the species' most sensitive life stages. By providing insights into habitat preferences and calving seasonality, this research contributes to marine mammal conservation and advances the understanding of sperm whale ecology in the North Atlantic.

EC-12. Unlocking São Miguel island's acoustic environment with a drifting buoy

Louro, Jéssica ¹; Rolim, Margarida ^{1,2}; Martins, Rafael ¹; Cruz, Nuno ³; Cascalho, José ⁴; Botelho, Andrea ^{5,6}; Mendes, Armando ⁴; García, Laura ^{1,2}

1. *Futurismo Azores Adventures, Portas do Mar, 9500-771, Ponta Delgada, São Miguel, Azores*
2. *Institute of Marine Sciences - OKEANOS, University of the Azores, Rua da Mãe de Deus, 9500-321 Ponta Delgada, Portugal*
3. *Institute for Systems and Computer Engineering, Technology and Science, Faculty of Engineering, University of Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal*
4. *University of the Azores, Faculty of Sciences and Technology, 9500-321 Ponta Delgada, Portugal IS2E and Artificial Intelligence and Computer Science Laboratory – LIACC, Portugal*
5. *University of the Azores, Faculty of Sciences and Technology, 9500-321 Ponta Delgada, Portugal*
6. *CIBIO, Research Centre in Biodiversity and Genetic Resources, InBio Associate Laboratory, BIOPOLIS Program in Genomics, Biodiversity and Land Planning; UNESCO Chair – Land Within Sea: Biodiversity & Sustainability in Atlantic Islands, University of the Azores, 9500-321 Ponta Delgada, Portugal*

Monitoring biodiversity and anthropogenic activities is essential for effectively conserving and managing marine ecosystems. Underwater acoustics provides a valuable monitoring tool, particularly in sound-rich marine environments. São Miguel Island, Azores – a hotspot for cetacean diversity influenced by tourism, cargo ships, and other anthropogenic activities – offers an ideal setting for such research. Research in this area has relied on opportunistic data from whale-watching vessels, which, while highly valuable, face limitations such as restricted coverage and inactivity periods. To address these gaps, a pilot study was conducted on October 17, 2024, using a portable, compact buoy equipped with a hydrophone Soundtrap ST600HF to assess the island's south coast acoustic environment. The buoy was deployed 5.5 nautical miles off São Miguel south coast, near Caloura, and drifted for 27 hours covering approximately 26 nautical miles eastward before recovery 7,7 nautical miles from Faial da Terra. The acoustic recordings were manually analysed, leading to the identification of cetaceans and anthropogenic sounds. Over a full diel cycle, a diverse range of toothed whale acoustic activity was detected with dolphin whistles in 89% of the deployment hours, pilot whale (*Globicephala* spp.) vocalisations in 46% and sperm whale (*Physeter macrocephalus*) foraging echolocation clicks in 39%. Anthropogenic noise, including cargo ships, whale-watching vessels, and other boats, was detected in 32% of the hours, exclusively during daylight. By complementing visual occurrence data, this multidisciplinary approach demonstrated the buoy's effectiveness in capturing both natural and human-generated sounds. Expanding the use of such buoys offers a cost-effective and practical solution for increasing long-term acoustic monitoring in periods and areas where no other sampling is conducted, providing further insights into how human activities may impact marine ecosystems.



EC-13. Preliminary data on the diving behavior of sperm whales in the Central Mediterranean Sea from bio-logging tags and drones

Capasso, Giulian ^{1,2}; Evrard, Anaëlle ²; Ferri, Sara ^{2,3}; Sciacca, Virginia ⁴; Rosso, Massimiliano ^{5,6}; Sechi, Alberto D. ^{5,6}; Borroni, Anna ^{5,6}; Moulins, Aurelie ^{5,6}; Luschi, Paolo ¹; Bocconcelli, Alessandro ⁷; Caruso, Francesco ^{2,7}

1. University of Pis, Italy
2. Stazione Zoologica Anton Dohrn, Naples, Italy
3. University of Turin, Italy
4. Istituto di Scienze Polari, CNR- ISP, Messina, Italy
5. CIMA Research Foundation, Savona, Italy
6. NBFC, National Biodiversity Future Center, Palermo, Italy
7. Woods Hole Oceanographic Institution, Woods Hole, USA

In the Mediterranean Sea, sperm whales (*Physeter macrocephalus*), classified as "Endangered", face significant threats from bycatch, vessel strikes, pollution, and prey resource depletion caused by overfishing. Despite their ecological importance, gaps remain in understanding their diving behavior, particularly due to the limitations of traditional visual boat-based surveys. As part of the PRIN 2022 DIVES project (Deep-sea Investigation with a View to Protect Elusive Cetacean Species), we aim to address this challenge by combining bio-logging tags, passive acoustic monitoring, and drone-based photogrammetry. The project specifically aims to investigate this species with a focus on locomotion activity and acoustic behavior. Here, we present preliminary results of the first DIVES campaign, conducted in the Western Ionian Sea in July 2024, a critical, poorly known area for deep-diving cetaceans. Non-invasive suction cup CATS tags have been deployed to record the diving behavior and vocal activity, while drone-based photogrammetry provided body size estimations of two sperm whales. These preliminary results include 13 hours of tag data and morphometric measurements from drone video recordings. The analysis revealed foraging dives reaching depths up to 1266 meters, the acoustic presence of the Mediterranean-specific 3+1 coda pattern, and the use of echolocation clicks both during the descent phase and the bottom phase. During this phase clicks were also linked to buzzes (creaks) and kinematic signature, indicating active foraging behavior. Efficient prey detection and capture are crucial for the survival and reproductive success of apex predators like cetaceans, which are increasingly impacted by human-induced habitat degradation, reducing prey availability and increasing energy costs. These preliminary findings provide critical ecological and behavioral insights into an endangered whale population and advance the application of non-invasive monitoring methodologies.



EC-14. Insights from long-term photo-identification in the Northwestern Mediterranean: not so faithful sperm whales in a hazardous area?

Vidal-Quinqueton, Aurélie ¹; Delrocq, Sylvie ¹; Gannier, Alexandre ¹; Gannier, Adrien ¹

1. Groupe de Recherche sur les Cétacés

The sperm whale (*Physeter macrocephalus*) is a common species in the Mediterranean Sea, where it constitutes an approximately closed population. It often bears persistent natural markings and flukes before its foraging dives, enabling it to be non-invasively studied by photo-identification. Groupe de Recherche sur les Cétacés has been photo-identifying sperm whales in the Mediterranean since the early nineties, obtaining 273 identifications between 1991 and 2024. Fluke-based identifications were graded using a 0-3 quality index, confirming stability of the identification process over time (mean IQ=2.15 during 1991-2004; 2.20 during 2005-2014; 2.19 during 2015-2024). 64 recaptures involving 36 individuals were found in the dataset. Analyses were performed on a subset of identifications obtained in the liguro-provençal area (n=188, with 52 identifications in 1991-2004, 60 in 2005-2014, and 75 in 2015-2024), yielding a total of 54 recaptures on 28 individuals, which were assumed to be adult or subadult males based on their size, morphological aspect and group structure. Picture comparisons highlighted a remarkable stability of the external aspect of individuals through time, including depigmentation details which were persistent and useful for recognition in up to 31% of individuals. The stable aspect of the animals between their first and their last identification (max span=15 years) could indicate that these time spans are short compared to their age. Signs of ship collisions were assessed, revealing an apparent decrease in wounded whale frequency over the three periods (10% to 9% to 6%): sperm whale local distribution overlaps with very busy traffic lines. The discovery curve was strikingly linear over the 34-year period ($y=-0.0002x^2+0.7366x+1.925$; $R^2=0.9991$) which, together with the short intervals found between first and last captures (median=2 summers), pointed towards limited long-term site fidelity and fluid exchanges with other male feeding grounds in the Mediterranean, a trend already evidenced in other recent studies.

EC-15. Assessing ecological function of range-shifting North Atlantic odontocetes using amino acid $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$

Plint, Tessa ¹; Dietz, Rune ²; Ferguson, Steve ³; Kiszka, Jeremy ⁴; Remili, Anaïs ⁵; Rikardsen, Audun ⁶; Rosing-Asvid, Aqqualu ⁷; Sonne, Christian ²; Watt, Cortney ³; McKinney, Melissa ¹

1. Department of Natural Resource Sciences, McGill University, Ste-Anne-de-Bellevue, Quebec, Canada
2. Department of Ecoscience, Arctic Research Centre, Aarhus University, Roskilde DK-4000, Denmark
3. Freshwater Institute, Fisheries and Oceans Canada, Winnipeg, Manitoba, Canada
4. Institute of Environment, Coastlines and Oceans Division, Florida International University, Department of Biological Sciences, Florida International University, North Miami, USA
5. Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada
6. Faculty of Biosciences, Fisheries and Economics, UiT The Arctic University of Norway, Tromsø, Norway
7. Greenland Institute of Natural Resources, GR-3900 Nuuk, Greenland

Multiple toothed whale species are undergoing large-scale distribution shifts in the North Atlantic due to climate change, which may lead to new competitive and predatory interactions. Here, we use $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ isotopes of individual skin amino acids (AA) that distinguish trophic ($\delta^{15}\text{N}$) and source/essential ($\delta^{15}\text{N}/\delta^{13}\text{C}$) isotope signals to evaluate changing odontocete ecological function across the North Atlantic. First, we applied AA ($n = 13$) $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of two groups of North Atlantic killer whale (*Orcinus orca*) (Greenland [$n = 9$], pinniped-dominant diet; Norway [$n = 10$], fish-dominant diet) to assess trophic and baseline differences in these dietary tracers. Mean essential AA $\delta^{13}\text{C}$ values were not significantly different between groups, implying similar carbon sources. Differences in mean $\delta^{15}\text{N}$ AATrophic (Norway = +22.3 ‰; Greenland = +25.6 ‰) and mean AASource (Norway = +7.8 ‰; Greenland = +12.1 ‰) suggest both trophic and baseline differences. Mean $\delta^{15}\text{N}$ of AAs Glx and Thr (Norway = +21.18 and -28.56 ‰; Greenland = +24.60 and -31.42 ‰) further support trophic separation between groups. However, published trophic-source AA $\delta^{15}\text{N}$ pairings (TPGlx-Phe Norway = 2.1, Greenland = 2.1; TPPro-Phe Norway = 4.8, Greenland = 4.7; TPTrophicAA-SourceAA Norway = 4.6, Greenland = 4.8) showed limited differences between groups and often underestimated actual TP (Norway = ~4; Greenland = ~5) determined by previous QFASA studies. Further studies are required to untangle metabolic effects on trophic and source AA $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in high level marine consumers. This work is part of a multi-species dataset within the WhaleAdapt project. As such, additional multi-species amino acid data across multiple marine habitats (e.g., coastal, pelagic, deep-water) will be presented, with a focus on toothed whale species experiencing prominent range shifts under climate change.



EC-16. Seasonal patterns in an aggregation of male sperm whales (*Physeter macrocephalus*) off Northern Norway

Morange, Zoë ¹; Similä, Tiu ²; Rikardsen, Audun H. ¹; Maldonado Rodriguez, Ambar ³; McKinney, Melissa ³; Blévin, Pierre ⁴; Pedersen, Ove Mikkal ²; Cubaynes, Sarah ⁵; Blanchet, Marie-Anne ⁶

1. UiT - The Arctic University of Norway, Tromsø, Norway
2. Whale2Sea, Andenes, Norway
3. Department of Natural Resource Sciences, McGill University, Ste-Anne-de-Bellevue, QC, Canada
4. Akvaplan-niva, Tromsø, Norway
5. CEFCE, Univ. Montpellier, CNRS, EPHE-PSL University, IRD, Montpellier, France
6. Norwegian Polar Institute, Tromsø, Norway

Adult male sperm whales (*Physeter macrocephalus*) forage at high latitudes throughout the year on the edge of continental shelves and over deep waters. In Northern Norway, the edge of the continental shelf is close to the coast allowing for long-term observations of male aggregations. Previous studies in this area have shown that some individuals are observed over several years. However, these observations only focused on summer, limiting our understanding of seasonal dynamics. We used year-round capture–mark–recapture data based on photo identification between 2009 and 2023, observation effort, abiotic (sea surface temperature and mixed layer density) and biotic variables (fishery landings) to assess which factors impacted detection and migration rates using Bayesian multistate models. In addition, biopsy samples were collected since 2020 to investigate possible seasonality in isotopic niches. We obtained 426 days of data, 111 days in winter (October–April) and 315 days in summer (May–September). Among 365 identified individuals, 29% were encountered across multiple years. A higher number of individuals could be identified in winter compared to summer despite a lower effort. The mean estimated residency time was shorter in winter (13 days) than in summer (18 days). We identified four groups with distinct seasonal preferences in occurrence and residency time. Stable isotopes showed overlap in the isotopic niches in both seasons, however, individuals sampled in summer had a wider range in $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ indicating a greater diversity in habitat use. Despite the marked seasonal patterns, the relatively short residency times imply that this area constitutes only a fraction of the broader foraging range of sperm whales in the Northeast Atlantic. This study highlights the year-round presence of sperm whales in the area, while demonstrating distinct seasonal preferences.



EC-17. The vocal behaviour off transient *Orcinus orca* in São Miguel, Azores: acoustic analysis of social and hunting contexts

Miquel Carpintero, Àlex ^{1,2}; Fergelot, Inès ³; Cabayol, Georgina ²; González García, Laura ^{2,4}

1. *Universitat Autònoma de Barcelona, Barcelona, Spain*
2. *Futurismo Azores Adventures, Ponta Delgada, Azores, Portugal.*
3. *École de Biologie Industrielle, Paris, France.*
4. *Institute of Marine Sciences – OKEANOS, University of the Azores, Horta, Azores, Portugal.*

Orcas (*Orcinus orca*, Linnaeus, 1758) are highly social apex predators whose acoustic behaviour offers valuable insights into their ecology and social dynamics. Acoustic signals play a crucial role in maintaining group cohesion, coordinating hunting strategies, and fulfilling various social and ecological functions. This study provides the first detailed description of orca vocalizations in the Azores, where they are observed only occasionally. Their presence in the Region is unpredictable, and they are not known to form resident populations. Data for this study was based on three audio recordings collected during commercial whale-watching trips off the southern coast of São Miguel Island in February 2023. The audio recordings, each lasting approximately ten minutes, were captured using a SoundTrap ST300HF hydrophone deployed near the boat while orcas were in the area. Two distinct behavioural contexts are documented: orcas resting alongside common dolphins in the morning; and orcas gathering to feed following the successful hunt of an opah fish (*Lampris guttatus*) in the afternoon. In the two recordings analysed, the most emitted vocalizations (92,96%) were whistles. Morning whistles ranged from 3737,71 to 71760,22 Hz, while in the afternoon, whistles ranged from 613,64 to 18920,46Hz. Notably, a pulsed call emitted in the afternoon ranged from 491,8 to the highest frequency recorded, 20065,57 Hz. Pulsed calls, consisting of broadband clicks with high repetition rates (250–2000 pulses per second), produce distinctive tonal qualities. Burst pulse calls, a subset of pulsed calls, vary widely in form and are extensively used for group cohesion, behaviour coordination, and individual recognition. In transient orcas, they are typically associated with post-hunt gatherings or social interactions. Despite their significance, burst pulses remain understudied, underscoring the need for further research



EC-18. A potential wintering hotspot for baleen whales around El Hierro (Canary Islands) revealed by an acoustic mooring

Miquel I Bosch, Judit ¹; Alcázar-Treviño, Jesús ^{2,3}; Buchan, Susannah ^{4,5,6}; Fraile-Nuez, Eugenio ³

1. Department of Animal Biology, Edaphology and Geology, University of La Laguna, Tenerife, Spain.
2. Department of Industrial Engineering, University of La Laguna, Tenerife, Spain
3. Centro Oceanográfico de Canarias (IEO-CSIC), Santa Cruz de Tenerife, Spain.
4. COPAS COASTAL, University of Concepción, Chile
5. UDEC, University of Concepción, Chile
6. Centro de Estudios Avanzados en Zonas Áridas (CEAZA), Chile

The Canary Islands, situated under the influence of the Gulf Stream and Saharan upwelling, are a vital marine biodiversity hotspot and a critical migratory corridor for cetaceans in the North Atlantic. Despite this ecological importance, data on temporal and spatial patterns of baleen whales (Mysticeti) in this region remain scarce. This study uses passive acoustic monitoring (PAM) to assess the acoustic presence of mysticetes off El Hierro, the most southwestern of the Canary Islands. Acoustic data were recorded continuously for 21 days (96kHz sampling rate; a total of 163 3-hour files) between December 2023 and January 2024, using a PAM system moored on the underwater volcano Tagoro (124m depth). An analysis of low-frequency sound bands (<600 Hz) revealed a total of nine cetacean species-specific vocalisations. These were attributed to four baleen whale species: fin whale (*Balaenoptera physalus*), sei whale (*B. borealis*), blue whale (*B. musculus*), and Bryde's whale (*B. edeni*). Fin whale calls were the most frequently detected, i.e.: 20 Hz pulses were present in 30% of the 3-hour recordings (n=49 files) and their double-pulse calls in 19% of the recordings (n=31 files), followed by sei whale downsweeps (10%; n=17 files), blue whale A calls (5%; n=8 files), and Bryde's whale Be3 calls (0.6%; n=1 file). An automatic detector for blue whale A calls, developed using PAMGuard software, identified 18 hours of blue whale call presence during the study period, corresponding to 490 type A vocalizations. Vocalisation patterns exhibited no consistent diel trends across species or call types. These findings highlight the need for further research to assess this region as a potential wintering habitat for baleen whales. They also provide a baseline for mysticete presence in the Canary Islands, emphasizing the utility of PAM for long-term monitoring and the potential for comparative studies across key habitats.

EC-19. Feeding ecology of the mediterranean fin whale: dietary shifts?

Trudelle, Laurène ¹; Morat, Fabien ²; Tardy, Céline ¹; Labach, Hélène ¹; Ody, Denis ³

1. Association MIRACETI, place des traceurs de pierres, La Couronne, 13500 Martigues, France
2. PSL Université Paris : EPHE-UPVD-CNRS, USR 3278 CRIOBE, Université de Perpignan, 52 Avenue Paul Alduy, 66860, Perpignan, Cedex, France.
3. WWF-France, 6, rue des Fabres, 13001 Marseille, France

The northwestern Mediterranean Sea is a key feeding ground for fin whales (*Balaenoptera physalus*) during summer. This study investigated the trophic level and dietary trends of Mediterranean fin whales from 2019 to 2024 by analyzing carbon and nitrogen stable isotope ratios ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$). A secondary objective was to assess the impact of lipid extraction on isotopic signatures, particularly on $\delta^{13}\text{C}$. The analysis was conducted on 120 biopsies collected between 2019 to 2024 in French Mediterranean waters. The samples were lyophilized, ground, and encapsulated before isotopic analysis using an isotopic ratio mass spectrometer. The results showed that lipid extraction significantly increased $\delta^{13}\text{C}$ values (before: $m = -19.45 \pm 0.62 \text{ ‰}$; after : $m = -20.81 \pm 0.51 \text{ ‰}$, in average) ($V=7260$, $p<0.001$), while $\delta^{15}\text{N}$ remained stable (before: $m = 7.38 \pm 0.53 \text{ ‰}$; after : $m = 7.38 \pm 0.57 \text{ ‰}$, in average) ($V=3333$, $p>0.05$). A positive relationship between the C:N ratio before lipid extraction and $\Delta^{13}\text{C}$ was observed ($F(1, 118) = 477.3$, $p < 0.05$, $r^2 = 0.8018$), leading to a lipid normalization equation for $\Delta^{13}\text{C} = -2.8827 + 0.9805 (\text{C:N})$. These findings suggest that lipid extraction does not affect the $\delta^{15}\text{N}$ signature of fin whale skin, and the equation can replace lipid extraction when it is costly or time-consuming. The results are consistent with a diet consisting of krill (*Meganyctiphanes norvegica*) in the Mediterranean Sea. Significant interannual and individual variability in isotopic signatures was observed, with 2024 showing higher $\delta^{13}\text{C}$ values than previous years. This may indicate variations in prey consumption (e.g., anchovy, sprat) or feeding areas. The lack of recent isotopic data for organic matter and krill in the study area underscores the need to gather more prey data from the region and to continue skin sampling of this species to validate potential long-term dietary changes, possibly driven by climate-related variations.



EC-20. The trophic ecology of the pinnipeds residing on the coasts of the British Isles (*Phoca vitulina* and *Halichoerus grypus*)

Rapuano, Silvia ¹; Hernandez Milian, Gema ²; Dzurek, Alexandra ³; Pierce, Graham John ¹

1. Instituto de Investigacións Mariñas (Institute of Marine Research-CSIC) R/Eduardo Cabello Nº 6 - CP 36208. Vigo (Pontevedra)
2. Centro Oceanographic Centre Vigo (Spanish Oceanographic Institute-CSIC) Subida Radio Faro 50, Cabo Estai, 36390 Vigo.
3. Zoology Department , University of Aberdeen Tillydrone Ave, Aberdeen AB24 2TZ, United Kingdom

Grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) play an important role in marine food webs in the British Isles. Their interactions with fisheries generate significant ecological and economic interest, and the diet of both species exhibits spatial and temporal variations, adapting to the availability of prey in their environment. This study analyzed 188 scat samples from grey seals (n=76) and harbour seals (n=112), collected between 1998 and 2014 in the Ythan Estuary (NE Scotland) and the Orkney Islands. Prey identification was conducted through the analysis of hard structures, such as otoliths, bones, and beaks, which allowed for greater accuracy in the results. Among the most important prey are several species of high ecological and/or economic value. These include sandeels (Ammodytidae), clupeids such as herring (*Clupea harengus*), *Trisopterus* spp., pollack (*Pollachius pollachius*), whiting (*Merlangius merlangus*), blue whiting (*Micromesistius poutassou*), and flatfish species like plaice (*Pleuronectes platessa*) and flounder (*Platichthys flesus*). Many of these species are of significant importance to commercial fisheries, highlighting the need for sustainable management strategies that balance seal conservation with the interests of the fishing industry. A detailed analysis of the diet of both seal species was performed using multivariate analyses, including standard dietary indexes and Generalized Additive Models (GAMs). These analytical methods allowed for a comprehensive examination of dietary patterns, taking into account both spatial and temporal factors that might influence prey selection and availability. The results obtained from this study provided valuable insights into the feeding ecology of grey and harbour seals in the British Isles. This information facilitated the discussion of potential interactions between seal populations and local fisheries, providing valuable information to guide the management of these species and marine resources in the region.



EC-21. First insights on reproductive parameters of *Grampus griseus* (Cuvier, 1812) in the Northern Ionian Sea, Central Eastern Mediterranean Sea

Santacesaria, Francesca Cornelia ¹; Merci, Marianna ¹; Carlucci, Roberto ²; Clemente, Nicola ¹; Fanizza, Carmelo ¹; Maglietta, Rosalia ³; Pollazzon, Vittorio ¹; Cipriano, Giulia ²

1. *Ionian Dolphin Conservation ETS*
2. *Department of Biosciences, Biotechnology and Environment, University of Bari Aldo Moro*
3. *Institute of Intelligent Industrial Technologies and Systems for Advanced Manufacturing - CNR*

An insight on reproductive parameters of Risso's dolphin (*Grampus griseus*) is provided in the Northern Ionian Sea, where fragmentary information on the species is available. Sighting data were collected between July 2016 and September 2024 during 199 vessel-based surveys. For each survey, date, coordinates, depth (m), time of first contact, group size (number of individuals within a 100-meter radius), and the number of nursing calves (newborns and adult-dependent calves) were recorded. Photos were collected and analysed for photo-identifying Risso's dolphins based on fin shape and natural marks. Females were identified through genital area photographs and/or close association with a calf in at least three sightings. They were classified as reproductive (RF) if they had given birth to a viable calf during the study period, or as non-reproductive (NRF). The annual calving rate was calculated by dividing the total number of newborns by the total number of RF sighted each year. The mean calving rate and its confidence interval (CI) at 95% were also calculated. The inter-birth interval (IBI) was calculated based on the time between successive births. During the study, 213 individuals were photo-identified, including 33 females, and 51 nursing calves. Among the females, 31 were classified as RF. Of these, 38.7% (n=12) were observed with one nursing calf, 58% (n=18) with 2 calves and 3.2% (n=1) with 3 calves. The annual calving rate reached its maximum value of 0.83 in 2018 and 2020, while it was null in 2016 and 2019. The mean calving rate was 0.41 (CI: 0.32-0.50), suggesting that mature female gives birth every 2.4 years on average. The mean IBI was 3.1 years (range from 1.9 to 6.0 years). These results align with those reported in other non-Mediterranean area, deepening knowledge on Risso's dolphin auto-ecology and providing potential suggestions to improve conservation management strategies.



EC-22. Mesopelagic fish consumption by dolphins in Azorean waters

Lebon, Myriam ¹; Pérez-Jorge, Sergi ¹; Spitz, Jérôme ²; A. Silva, Mónica ¹

1. Institute of Ocean Sciences - OKEANOS, University of the Azores

2. Observatoire Pelagis, Université de La Rochelle CNRS

The fishing industry is considering fish from the mesopelagic zone as a new alternative to supply the increasing demand for seafood and fisheries products of a growing worldwide population. Mesopelagic fish are essential components of the biological carbon pump and represent a key link between lower and higher trophic levels, notably by serving as prey for many top-predators. To understand the potential impact mesopelagic fishing could have on predator populations, we first identified the main consumers of mesopelagic fish in the cetacean community of the Azores by estimating their diet proportions using stable isotope mixing models (MixSIAR). The models showed that mesopelagic fish account for 49.4%, 52.5% and 47.9% of the diet of *Delphinus delphis*, *Stenella frontalis* and *Tursiops truncatus*, respectively. We added *S. coeruleoalba* because stable isotope signatures suggest this species feed also on mesopelagic fish in similar proportions. Using these diet proportions and estimates of dolphin abundance during summer months around the central group of islands (representing 3.5% of Azorean EEZ), we applied bioenergetic models to estimate the consumption of mesopelagic fish by these dolphins. We estimated the total consumption of mesopelagic fish by the four dolphin species to 1,448 tons (1,154 -1,773), of which 60.2% are consumed by *S. frontalis*, 24.4% by *T. truncatus*, 10.9% by *S. coeruleoalba* and 4.4% by *D. delphis*. Although fishing mesopelagic fish is still challenging, it could have major impacts on dolphins and ecosystems that rely on these organisms. Moreover, other mesopelagic taxa such as zooplankton or cephalopods are fundamental components of the diet of other cetaceans in this community (i.e. baleen whales, sperm whales) and may also be affected by such fisheries. It therefore urges to improve our understanding of the impact fishing in the mesopelagic zone could have on cetaceans and other components of ecosystems worldwide.



EC-23. Decadal changes in the diet and blubber thickness of harbour porpoises: a sign of the changing times?

Rogan, Emer ¹; Hernandez-Milian, Gema ²; Bass, Amanda ³; Morrissey, Ashling ⁴; Murphy, Sinéad ⁵; Kavanagh, Ailbhe ⁶

3. School of Biological, Earth and Environmental Sciences, University College, Cork. Ireland.

4. IEO, Galicia, Spain

5. School of Biological, Earth and Environmental Science, University College Cork, Ireland.

6. School of Biological, Earth and Environmental Science, University College Cork, Ireland

7. Marine and Freshwater Research Centre, Department of Natural Resources and the Environment, School of Science and Computing, Atlantic Technological University, Galway, Ireland

8. Marine Institute, Galway, Ireland

Temporally explicit information on predator-prey interactions is essential for understanding food web dynamics and assessing ecosystem health and function in marine systems. Changes in prey composition and prey availability likely have knock-on effects on top predators, their individual health, and may result in shifts in distribution. Here we examine the diet of harbour porpoise (*Phocoena phocoena*) through stomach content analysis (n=118 individuals) from stranded and bycaught animals and look at changes in blubber thickness (n=136), as a proxy for health and condition, over three decades (1990–2019). Prey species were identified from hard parts with the majority of stomachs containing prey items comprising 4,661 items from at least 46 different species, revealing a diverse diet of fish and cephalopods. Although most of these prey types occurred infrequently and in small amounts, indicating a generalist feeding strategy, important decadal changes in diet were identified. The relative importance of *Trisopterus* spp. in harbour porpoise diet has decreased significantly since the 2000s, while the importance of other groups such as sandeels (*Ammodytes* spp.) and gobies (*Gobidae*) has increased, indicating a shift in the prey base. This shift in diet from larger prey to significantly smaller prey items is simultaneously reflected in changes in blubber thickness. There has been a significant decrease in blubber thickness, measured in front of the dorsal fin in three locations (dorsal, mid and ventral) across the three decades. Statistical modelling (GLM) showed a significant decline in blubber thickness with time, irrespective of sex, maturity status, cause of death (bycaught/stranded) and season, although blubber depth was greater in winter. Both strands of evidence point towards changes in prey availability, potentially linked with environmental change, which may be the underlying reason for the recent shift in porpoise distribution and decline in abundance in the Celtic Sea region.



EC-24. Diving deep into feeding behaviour: insights from stomach temperature data in a long-finned pilot whale (*Globicephala melas*)

De Clerck, Sara ¹; Mikkelsen, Bjarni ²; Ugarte, Fernando ³; Heide-Jørgensen, Mads Peter ³

1. Faroe Marine Research Institute, Tórshavn, Faroe Islands Greenland Institute of Natural Resources, Nuuk, Greenland
2. Faroe Marine Research Institute, Tórshavn, Faroe Islands
3. Greenland Institute of Natural Resources, Nuuk, Greenland

Understanding the feeding behaviour of marine predators is essential for assessing their ecological roles and energetic needs. In 2024, we deployed a stomach temperature pill (STP) in a wild pilot whale (*Globicephala melas*) in the Faroe Islands to identify feeding events through temperature drops during prey ingestion. The STP, linked to a satellite tag on the whales' back, recorded data for 25 days before it was emitted. The satellite tag continued to transmit location data for an additional 16 days (41 days total). The first feeding event occurred approximately three hours post-tagging. Over 25 days, 50 feeding events were detected, with a feeding rate of 3.1 (SD = 1.9) events per 24 hours. Feeding depths ranged from 0.5 m to 745 m, with a mean of 316.2 m (SD = 258.2 m). When compared to dive data from seven other tagged pilot whales in the Faroe Islands (weighted average of 165.4 dives per 24 hours; SD = 232.4), the proportion of successful feeding dives was estimated at 1.89% (SD = 2.89%). This study demonstrates the utility of stomach temperature data in directly linking feeding events to dive behaviour, offering more precise insights into prey consumption of a medium-sized toothed whale, and three-dimensional habitat selection for feeding. Our findings improve our understanding of the foraging ecology and energetic demands of pilot whales, supporting ecosystem modelling and conservation efforts, particularly in the face of environmental changes impacting prey availability. This research was conducted under all necessary permits and in accordance with ethical guidelines for handling marine mammals, as outlined by Andrews et al. (2019).



EC-25. A route out of the ordinary: records of occasional cetacean species in the Aeolian Archipelago, Mediterranean Sea

Vaccaro, Alice ¹; Luongo, Angelica ¹; Gelippi, Michelle ¹; Blasi, Monica F. ¹

1. Filicudi Wildlife Conservation

The Aeolian Archipelago, a volcanic island chain located in the Tyrrhenian Sea (Southern Italy), has the potential to hosts a high cetacean biodiversity associated with extensive neritic and oceanic habitats within short distances. From 2005 to 2024, dedicated boat surveys (N=2350) were conducted to collect photo-ID data on different cetacean species inhabiting the study area. Our results indicated the presence of a resident population of bottlenose dolphins (*Tursiops truncatus*), striped dolphins (*Stenella coeruleoalba*), and different aggregations of sperm whales (*Physeter macrocephalus*). Furthermore, occasional sightings of other cetacean species were also recorded, mainly of fin whales (*Balaenoptera physalus*), Risso's dolphins (*Grampus griseus*) and, in minor part, of pilot whales (*Globicephala* spp.). Fin whale sightings occurred mostly in autumn and included a total of 10 individuals. Precisely, 6 solitary animals from 2005 to 2009, 2 individuals together around Lipari Island in June 2021, and a mother-calf pair between Salina Island and Filicudi Island in June 2022. Between 2019 and 2024 Risso's dolphins were sighted once each year, typically north of the Archipelago's islands, 3-5 miles offshore, with group sizes ranging from 1 to 6 individuals. Photo-ID analysis indicated individual re-sightings through the years. Concerning pilot whales, a stranded animal (a juvenile male) was found along the coast of Salina Island in summer 2022, and a group of 6 individuals was observed first near Alicudi Island and then Filicudi Island in June 2023. Based on these observations, it emerges as essential to increase the focus of future study efforts on the presence and use of habitat of occasional species, as well. The waters around the Aeolian Archipelago may be used as a migratory corridor by pelagic animals, thus the establishment of effective management strategies appears crucial to properly conserve cetaceans in the area.



EC-26. Maldives Dolphin Project – Koba koamas survey

Barreiros, João Bernardo ^{1,2}; Fumagalli, Sara ¹; Valsecchi, Elena ^{1,3}

1. *Department of Earth and Environmental Sciences (DISAT), University of Milano-Bicocca, Milan, Italy*
2. *Centre for Ecology, Evolution and Environmental Changes - Azorean Biodiversity Group – Island Biodiversity, Biogeography & Conservation – IBBC*
3. *MaRHE Center, Magoodhoo, Maldives.*

Cetaceans have been studied across the globe in multiple different parameters and, with the aid of new technologies and easier access to more remote areas, there are now fewer places where these animals have not yet been studied. This project started with basic questions regarding dolphins in the Maldives and, due to the limited information found and frequent external reports of sightings, more questions rose. The Maldives is a country dedicated to tourism for the last few decades, and there are multiple registers of cetaceans in the surrounding waters but, despite basic information regarding species diversity, we found a gap in the general knowledge of population dynamics, communities and their behaviours. This, followed by reports of frequent sightings, mainly in the southern Atolls, has given the opportunity to start a preliminary survey on the populations surrounding a particular area, exploited by Maldivian Resorts. In the development of this study, the main objective is to identify species surrounding the Eastern islands of Huvadhu Atoll and characterize the populations through photo Identification, with the compilation of catalogues, and photogrammetry through drone images, acoustic recordings and environmental DNA. The project is dependent on the availability and cooperation from Resorts and touristic based enterprises, but also with occasional information from locals that also cooperate with the project. Until early 2025, we have registered four species and started elaborating respective catalogues for each one, with one of them shy of 300 individuals. All of these photo-ID images were filtered and manually selected, and the process will continue under AI processors that will help on the database resolution. Thousands of photos and hundreds of videos were obtained and are currently being analysed by the team, as well as acoustic data, and environmental DNA. This will be a long-term survey on the diversity, dynamics and ecology of cetacean populations in the southern Maldives, envisioned by the University of Milano-Bicocca, Marhe centre, Mercure Kooddoo Maldives resort, with valuable contributions from all the staff and locals who are detrimental to the feasibility of this project.



EC-27. Site fidelity of Risso's dolphins (*Grampus griseus*) along an underwater canyons system

Giralt Paradell, Oriol ¹; Castillo, Clara ^{1,2}; Marco, Núria ¹; Juncà, Sílvia ¹; Marcos, Ricard ¹; Giménez, Joan ^{1,3}

1. *Associació Cetàcea, C/ Mas Duran 48 At 1, 08042, Barcelona, Spain*
2. *Facultad de Ciencias. Universidad de Navarra. C. de Irunlarrea, 1, 31008 Pamplona, Spain*
3. *Centro Oceanográfico de Málaga. Instituto Español de Oceanografía. Puerto Pesquero, s/n Aptdo. 285 29640 Fuengirola, Spain*

Knowledge on the distribution of species provides baseline information towards their conservation needs and the management of human activities affecting them. More specifically, highlighting the areas within their distribution range to which individuals regularly return can reveal patterns of site fidelity. This is of particular importance for species such as the Risso's dolphin (*Grampus griseus*), for which such information is scarce in the Mediterranean Sea. Photoidentification surveys were used to study the patterns of site fidelity along the Garraf underwater canyon system (NW Mediterranean Sea). Data was collected along 237 boat surveys between 2017 and 2023, resulting in 56 sightings and 303 different individuals identified. Site fidelity was assessed calculating eight different Site Fidelity Indices (SFIs) for each individual based on three indicators: permanence and periodicity. A Divisive Hierarchical Clustering analysis based on the eight SFIs was used to classify the different individuals according to their degree of site fidelity. In this sense, individuals seen in more than one occasion were classified into three clusters, namely seasonal residents (40 individuals), regular visitors (70 individuals) and occasional visitors (6 individuals). The 187 individuals seen in one occasion were considered transient animals. Results show that the Garraf underwater canyon system is important for some individuals of Risso's dolphin, which show a strong site fidelity for the area. The study also highlights that a large proportion of the identified animals move beyond the limits of the studied area, stressing the need to expand the photo-identification studies to further regions to better understand the distribution and movements of the species in a wider context in the western Mediterranean Sea.



EC-28. You are what you eat: prey preferences of minke whales (*Balaenoptera acutorostrata*) in North-East Scotland using stable isotope analysis

Dolan, Ciarán ¹

1. University of Exeter

The Moray Firth and wider coastal waters of north-east Scotland are highly productive and offer rich feeding opportunities to resident and migratory cetaceans alike. Minke whales migrate to these high latitude areas to capitalise on the abundance of fish during the spring and summer months. For capital breeders such as these, this time provides a valuable opportunity to replenish and build energy stores in between the lean breeding months at lower latitudes. In the following study, stable carbon and nitrogen isotope ratios of minke whale bulk skin tissue were analysed to determine the dietary proportions of assimilated prey. Bayesian stable isotope mixing models (BSIMMs) showed that sand eel (Ammodytidae sp.) constituted the majority of the diet in the study area. However, whilst adults were found to consume similar amounts of sand eels and clupeid (sprat and herring) prey, juveniles more specifically targeted sand eels and Northern krill (*Meganyctiphanes norvegica*). A posteriori grouping of these species by energy density (kJ/g-1) showed that overall, minke whales targeted prey of moderate energetic content such as sand eel. Adults targeted moderate and high energy prey evenly, whilst by contrast, juvenile whales targeted equal amounts of low and moderate energy prey. With long term spatial studies documenting the importance of the Moray Firth as a primary foraging ground for minke whales, this study fills a notable gap in our understanding of the feeding ecology of minke whales using a quantitative molecular approach.



EC-29. Occurrence and distribution of cetaceans on Madeira Island: contributions to conservation and management

Ferreira, Eliana ¹; Barcelos, Luís ²; Barreiros, João ²

1. *Master's Degree in Nature Management and Conservation, University of the Azores VMT Madeira, Marina do Funchal, Loja 9 Funchal 9000-005*
2. *Azorean Biodiversity Group & cE3c - Center for Ecology, Evolution and Environmental Changes & CHANGE - Global Change and Sustainability Institute, University of the Azores - Faculty of Agricultural and Environmental Sciences (FCAA), 9700-042 Angra do Heroísmo.*

The Madeira archipelago's geographical location and unique topographical features provide privileged conditions for studying deep-water dependent cetacean species. This study aims to analyse: a) patterns in the occurrence and distribution of cetaceans in the area between the south of Madeira Island and the Desertas Islands, using observation data from trips aboard whale-watching vessels; b) identify areas and periods of higher sensitivity to anthropogenic impacts, understanding patterns of occurrence, eventual correlations with environmental/abiotic data, and areas associated with specific behaviours. Data ranges between May 2024 and April 2025, during regular trips in the study area, with up to three daily trips in the high season (May to October) and two in the low season (November to April). A dedicated observer records detailed information, including sea conditions, species, time of encounter, coordinates, pathways when sighted, group size, behaviour, presence of calves, associated species and vessels in the area. Preliminary results highlight the Bottlenose Dolphin, Short-finned Pilot Whale and Atlantic Spotted Dolphin as the most frequently sighted species, with the highest number of calves recorded. In behavioural terms, travelling has, so far, been the most predominant behaviour. Seasonal fluctuations were already identified, with the Atlantic Spotted Dolphin showing the highest frequency of sightings in June, with a decreasing trend up to the time of the preliminary analysis, while the Short-finned Pilot Whale shows an increasing trend, reaching a high frequency of sightings during the analysis carried out in November. The Rough-toothed Dolphin, a poorly studied species in the region, was most frequently observed in July, with a sharp decline in August and only one sighting in October. The conclusions obtained could be important in supporting political decision-makers in implementing future management and conservation measures, as well as mitigating the impacts of economic activities in the species' areas of occurrence.



EC-30. Assessing maternal size and age as drivers of reproductive success in a critically endangered bottlenose dolphin subpopulation

Andrés-Hervías, Carmen ¹; Vivier, Fabien ²; Bejder, Lars ³; Gazo, Manel ⁴; Gonzalvo, Joan ⁵

1. *Tethys Research Institute, Milan, Italy. Department of Evolutionary Biology, Ecology and Environmental Sciences, Faculty of Biology, University of Barcelona, Barcelona, Spain.*
2. *Marine Mammal Research Program, Hawai'i Institute of Marine Biology, University of Hawai'i at Mānoa, HI, USA.*
3. *Marine Mammal Research Program, Hawai'i Institute of Marine Biology, University of Hawai'i at Mānoa, HI, USA. Zoophysiology, Department of Bioscience, Aarhus University, Aarhus 8000, Denmark*
4. *Department of Evolutionary Biology, Ecology and Environmental Sciences, Faculty of Biology, University of Barcelona, Barcelona, Spain.*
5. *Tethys Research Institute, Milan, Italy.*

Understanding the drivers of reproductive success (RS) is crucial for conserving threatened species, where population viability depends on female reproductive output. This study examines the influence of maternal size and age on RS in the critically endangered bottlenose dolphin (*Tursiops truncatus*) subpopulation of approximately 150 individuals in the Gulf of Ambracia, western Greece. Reproductive data were derived from a long-term (>20 years) photo-identification dataset, with RS calculated for 51 females as the number of calves surviving to the minimum weaning age (2 years) divided by the female's observed reproductive years. Nearly half of the females (47%) exhibited reproductive rates below 0.1 calves per year, highlighting a markedly low reproductive output. Photogrammetry data collected from Unoccupied Aerial Systems (UASs) between 2021 and 2023 were used to estimate maternal size. Total length (TL) was obtained from blowhole-to-dorsal-fin distance proxy. Maternal volume (Vol) was calculated by segmenting the body into truncated cones (frustums) at 5% intervals. Analyses were conducted for 36 females with complete size UASs data. Linear regression models showed no significant relationships between RS and TL ($p=0.570$), Vol ($p=0.506$), or age ($p=0.343$), with low contribution to variance ($R^2<0.01$). Generalized additive models (GAMs) revealed a significant nonlinear relationship between TL and RS ($p=0.024$), identifying a peak in RS at approx. 250 cm TL. Vol and age were not significant predictors ($p=0.533$ and $p=0.299$, respectively). The GAM explained 35% of the variation in RS, suggesting that TL may have an optimal range for reproductive success. Results suggest that maternal age has no significant impact on RS, suggesting ecological or environmental factors, such as habitat degradation and eutrophication in the Gulf of Ambracia, may play a more critical role in reproductive outcomes. Our findings emphasize the need to consider multiple drivers of reproduction when managing small, endangered populations.



EC-31. How can we use marine mammals as sentinels of ecosystem change?

Chadwick, Katharyn ¹; Huckstadt, Luis ¹; Bearhop, Stu ¹; Barnett, James ²; Deville, Robert ³; Williams, Ruth ⁴; Biermann, Lauren ⁵

1. *University of Exeter*
2. *Cornwall Marine Pathology Team*
3. *London Zoological Society*
4. *Cornwall Wildlife Trust*
5. *Plymouth University*

Marine mammals have long been suggested as sentinel species of ecosystem change. However, most efforts to gather ecosystem-level information from these species remain limited to linking variability in individual performance and demographic parameters to shifts in ecosystem conditions. This is perhaps due to the relatively limited understanding we have of their role in biogeochemical cycles, patterns of biological productivity, and nutrient fluxes. Environmental changes affect the entire ecosystem across all trophic levels: from primary producers to consumers and predators, and marine mammals can offer an integrated perspective of ecosystem-wide responses to oceanographic perturbations. In this study, we combine a bottom-up (remote sensing) and a top-down (biogeochemical markers in marine top predators) approach to develop an ecological monitoring tool for coastal marine ecosystems. Metabolically inert tissues - seal whiskers and baleen - and muscle samples were sampled from local pinnipeds (*H. grypus*) and cetaceans (*D. delphis*, *P. p. phocoena* and *B. physalus*) that stranded along the Southwest coast of the UK between 2013 – 2023. Over 200 Samples, most of which came from the year-long resident *H. grypus*, were analysed using SIA ($\delta^{13}C$, $\delta^{15}N$), looking for changes in trophic position, and isotopic niche across different individuals and species. Oceanographic data for the study area were extracted for the same period and comprised; sea surface temperature, chlorophyll-a, CDOM, and wind speed, as well as data on fronts. This was analysed to identify relationships between oceanographic changes and stable isotopes values in top predators, allowing us to investigate how perturbations at the base of the trophic web cascade up and are integrated by the marine mammal community, with the potential to inform management and policy and establish a whole-ecosystem level monitoring system for undetected ecosystem change.



EC-32. Living around a volcano: acoustic detections of toothed and baleen whales in the shallow submarine volcano Tagoro (Canary Islands)

Alcázar-Treviño, Jesús ¹; Buchan, Susannah ²; Miquel i Bosch, Judit ³; Fraile-Nuez, Eugenio ⁴

1. *Universidad de La Laguna (ULL) / Centro Oceanográfico de Canarias (IEO-CSIC)*
2. *COPAS COASTAL, Universidad de Concepción / CEAZA (Chile)*
3. *Universidad de La Laguna (ULL)*
4. *Centro Oceanográfico de Canarias (IEO-CSIC)*

The Tagoro is a shallow submarine volcano off El Hierro (Canary Islands) that erupted in 2011 and is currently in its hydrothermal phase. Although destructive at first, the physical-chemical anomalies associated with the volcano enriched the area in nutrients and nowadays it supports a recovered ecosystem surrounded by mesopelagic waters (>200m depth). Here, we deployed a Passive Acoustic Monitoring (PAM) system in the main crater of the Tagoro, at 124m depth, during a week in 2016. Our main objective was to detect the presence of cetacean sounds in the area as a pilot study previous to more lengthy deployments. In just a week of acoustic recordings, we detected sounds compatible with both toothed and baleen whales. Within the toothed whales, delphinid clicks were the most abundant sounds followed by whistles, Bray-calls, beaked whale frequency-modulated clicks from two different species, and potential pilot and sperm whale clicks. The regular presence of echolocation clicks points to the area surrounding the submarine volcano as a relevant foraging ground for toothed whales. Regarding baleen whales, low-frequency calls were attributed to Bryde's and sei whales, along with sounds potentially made by humpback whales and even gunshots similar to those made by North Atlantic Right Whales (NARW). Artificial sounds were also detected, mostly from ship engines, echosounders and fishing gear. The diversity of cetacean species detected using PAM highlights the relevance of this area to these marine mammals and promotes further deployments to better characterize cetacean biophonies and to evaluate the presence of some endangered species. A seasonal and daily temporal characterization of cetacean vocalizations in the area could lead to better conservation planning for the surrounding marine reserve, i.e.: for scheduling certain fishery activities in the area.

EC-33. From points to paths: discrete-continuous analysis of short-finned pilot whale residency and movements using satellite telemetry data

Fernandez, Marc ¹; Weyn, Mieke ¹; Ferreira, Rita ¹; Rosso, Massimiliano ²; Correia, Mafalda ³; Hartman, Karin ^{4,5}; van der Harst, Pieter ^{4,5}; Dinis, Ana ¹; Alves, Filipe ¹

1. MARE – Marine and Environmental Sciences Centre /ARNET – Aquatic Research Network, Regional Agency for the Development of Research, Technology and Innovation (ARDITI), Funchal, Madeira, Portugal Faculty of Life Sciences, University of Madeira, Funchal, Portugal
2. CIMA Research Foundation - Centro Internazionale di Ricerca in Monitoraggio Ambientale, 17100, Savona, Italy NBFC - National Biodiversity Future Center, 90133, Palermo, It
3. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Terminal de Cruzeiros do Porto de Leixões, 4450-208 Matosinhos, Portugal
4. Risso's Dolphin Research Center, Pico Island, 9930-309-Azores, Portugal
5. Nova Atlantis Foundation, 1901 KV, Castricum, The Netherlands

Understanding habitat use and residency patterns is essential for developing effective conservation strategies. Traditional methods, such as photo-identification, have provided valuable insights into cetacean movements but are often constrained by high effort requirements. Biotelemetry, however, enables precise tracking of animal movements, overcoming many of these limitations. This study used data from 16 satellite SPOT tags deployed on short-finned pilot whales (*Globicephala macrorhynchus*) around Madeira Island to characterize their movements and habitat use, focusing on residency patterns. The tags transmitted for a mean of 86 days (range: 13-178 days). A two-step analysis was conducted to investigate ¹ the spatiotemporal occurrence of distinct behavioral states and ² key residency areas around Madeira. A Hidden Markov Model with a flexible covariate dependence was applied to distinguish between migration and area-restricted search (ARS) behaviors. We found that the probability of an ARS behavior is higher from June to December, highlighting temporal influences on movement patterns. Residency patterns were further analyzed using semivariograms, continuous-time movement models and an autocorrelated kernel density estimator to obtain home ranges. Of the 16 tagged whales, 12 exhibited residency behavior around Madeira Island, with eight individuals remaining in this state for over 20 days (maximum 120 consecutive days). The mean population-level 95% home range was estimated at 1823 km², with a 50% core home range of 350 km², primarily concentrated on a relatively small region southeast of Madeira Island. These findings provide critical insights into the spatial ecology of short-finned pilot whales, offering valuable information to support targeted, dynamic conservation efforts and the designation of protected areas.



EC-34. Clicks for conservation: deep learning to enhance acoustic monitoring Risso's dolphins in Scotland's MPAs

Webber, Thomas ¹; van Geel, Nienke ¹; Risch, Denise ¹; Hastie, Gordon ²; Sinclair, Rona ³; Beck, Suzanne ⁴; Boisseau, Oliver ⁵; Dyke, Katie ⁶; Hartney-Mills, Lauren ⁷; Lacey, Claire ⁸; Quer, Susanna ⁹; Walters, Alice ⁶; Young, Kirsten ¹⁰; Berggen, Per ¹¹

1. *Scottish Association for Marine Science*
2. *Sea Mammal Research Unit, St Andrews*
3. *NatureScot*
4. *Agri-Food and Biosciences Institute*
5. *Marine Conservation Research*
6. *Whale and Dolphin Conservation*
7. *Hebridean Whale and Dolphin Trust*
8. *Marine Mammal Research Program*
9. *Marine Directorate. Scottish Government*
10. *Biosciences, University of Exeter; Greenpeace Research Laboratories.*
11. *School of Natural and Environmental Sciences, Newcastle University*

Reliable classification of vocalisations is crucial for effective acoustic monitoring, especially for long-term conservation efforts targeting a specific species. Risso's dolphins are a designated species within Scotland's Marine Protected Area (MPA) network, yet reliable data on their year-round distribution in Scottish waters is currently lacking. This complicates the development of effective monitoring and management strategies for this protected species. The COMPASS project (<https://compass-oceanscience.eu/>) collected a long-term (5+ years) passive acoustic data set using static acoustic recorders deployed at 10 sites in coastal waters off western Scotland and Northern Ireland. These data have the potential to dramatically increase our knowledge of Risso's dolphin occurrence in this region. Manual annotation of these large acoustic datasets is extremely labour intensive. Deep learning offers the possibility of decreasing processing time while still achieving accurate classification. A long short-term memory (LSTM) deep learning classifier was developed specifically to identify Risso's dolphin echolocation clicks. This classifier was trained using visually verified recordings of dolphin species in the North-Atlantic and Mediterranean, obtained from towed hydrophone surveys. Two datasets (Train and Validation) derived from manually annotated click trains, were utilized for model training, while a separate dataset collected from static recorders in different regions was employed for evaluating the model's ability to generalize to new data. Results show good performance of the classifier to the validation data at both the individual click level (F1: 0.88) and the event level (F1: 0.98). Performance on the novel test dataset is also good when tested at the event level (F:0.95). The final model will be applied to the entire COMPASS data set providing outputs which will be incorporated into distribution modelling, eventually providing regulators with robust evidence to aid management decisions. This framework can also be adapted to other species and regions and is currently being tested on multiple species.



EC-35. Eating out loud: solitary males sperm whale's vocalizations reflect feeding activities in the Aeolian Archipelago, Tyrrhenian Sea, Italy

Gelippi, Michelle ¹; Giorgi, Giulia ^{1,2}; Valsecchi, Elena Agnese ²; Blasi, Monica Francesca ¹

1. *Filicudi Wildlife Conservation, Lipari (ME), Italy*

2. *Università degli Studi di Milano, Bicocca, Dipartimento di Scienze dell'Ambiente e della Terra, (MI), Italy..*

To increase the sampling rates and detections of sperm whales in poorly studied and unprotected marine environments it is necessary to combine behavioral sampling techniques with long-range and passive methods. Here, acoustic patterns and behavioral observations were compared for solitary sperm whales (*Physeter macrocephalus*) collected in the waters around the Aeolian Archipelago (Tyrrhenian Sea, Italy) from 2019 to 2024. A total of 14 individuals were analyzed for their vocalizations, behavior, age group and, when possible, sex. Solitary individuals were chosen as targets to allow a clear investigation of their acoustic trends by avoiding possible biases related to the presence of other vocalizing animals. Usual Clicks (ICI $\geq$ 0.5s) resulted to be the most dominant vocalization codes (71,8%), followed by Silence (8%), Creaks (2%; ICI $<$ 0.2s) and Transition Clicks (0.4%; ICI 0.2-0.5s). Considering that Usual Clicks, Creaks and Transition Clicks are classified as orientation/searching/foraging click types and based on the collected behavioral data, it is possible to affirm that all the animals, most of which males, were feeding during sampling time. The analysis of the diving pattern of 7 individuals resulted in a mean diving time of $21,48 \pm 11$ m. (min 7,56 m.; max 42,02 m) and in a mean surfacing time of $15,06 \pm 4$ m. (min 9,14 m.; max 20,22 m). Diving duration showed a non-strictly linear correlation with both vocalization number and water depth. However, the 2 individuals sampled during fall months appeared to dive deeper but shorter than those from summertime and this could be related to a different feeding strategy (bottom feeding in summer vs. water column feeding in fall). This work gives insights on the importance of the Aeolian Archipelago as feeding ground for solitary males and further studies appear as mandatory to understand their habitat usage to protect and conserve their presence in the study area.



EC-36. Stable isotopes indicate less coastal feeding than previously assumed in porpoises and potential food scarcity in the German Baltic Sea

Klemens, Lisa ¹; Westphal, Linda ²; Craul, Ann-Kristin ¹; Moritz, Timo ¹; Dekinger, Judith ¹; Hauswirth, Mirko ²; Dähne, Michael ²

1. *German Ocean Museum*

2. *German Federal Agency for Nature Conservation*

Diet analysis is a major tool for conservation questions like where are feeding locations and is there concern due to food scarcity caused by fisheries takes. The ratios of ^{13}C and ^{15}N were analyzed to understand the prey spectrum and the preferred hunting location of harbour porpoises in the southern Baltic Sea on the coast of Mecklenburg-Vorpommern to answer those questions for part of the Belt Sea population in Germany. Musculature samples of 30 harbour porpoises were analyzed. The porpoise samples were grouped into the categories: adult, juvenile, female and male. Muscle samples of cod, whiting, herring, spart, small gobies, round goby, flounder, plaice, silver bream and common from the Baltic Sea were also analysed. In the resulting Iso-Space plot almost all porpoise samples are clustered around herring, cod and whiting. Indicating that this three fish species are preferred by harbour porpoises. The harbour porpoises in the Baltic Sea do not feed on flat fish or on fresh water fishes, which are also abundant in the brackish waters of the Baltic Sea. A reason for this could be, which is also shown in the results, that harbour porpoises although stranded in a coastal zone do not feed in coastal areas and tend to feed offshore. The results of stable isotope analyses indicate that herring is a more preferred prey species than cod. Not like shown in results of stomach content analyses. This can indicate a bias in stomach content analyses toward fish species which have thicker and more stable otoliths like cod in contrast to species with fragile otolith like herring. The results show that a multimethod approach must be considered in diet analyses. Food scarcity will be a major impact in the future, since cod and herring are declining drastically in the Baltic Sea.

EC-37. Short-beaked common dolphins *Delphinus delphis* from European Atlantic waters segregate in space and time according to different ecological tracers

Mille, Tiphaine ¹; Méndez-Fernandez, Paula ¹; Caurant, Florence ^{1,2}; Dabin, Willy ¹; Pillet, Marion ¹; Spitz, Jérôme ^{1,2}; Viricel, Amélia ³; Munsch, Catherine ⁴; Tixier, Paul ⁵; Marchand, Philippe ⁶; Venisseau, Anaïs ⁶; Alves, Filipe ^{7,8}; Ferreira, Rita ^{7,8}; Covelo, Pablo ⁹; Pin, Xavier ⁹; López, Alfredo ^{9,10}; Torres-Pereira, Andreia ¹⁰; Eira, Catarina ¹⁰; Gaudino, Morena ¹¹; McHugh, Brendan ¹¹; Murphy, Sinéad ¹²; Chouvelon, Tiphaine ^{1,13}

1. Observatoire Pelagis, UAR 3462 La Rochelle Université/CNRS, 17000 La Rochelle, France
2. CEBC (Centre d'Etudes Biologiques de Chizé), UMR 7372 La Rochelle Université/CNRS, 79360 Villiers-en-Bois, France
3. LEMAR, UMR 6539 UBO/CNRS/IRD/Ifremer, Institut Universitaire Européen de la Mer, 29280 Plouzané, France
4. Ifremer, CCEM Contamination Chimique des Écosystèmes Marins, F-44000 Nantes, France
5. MARBEC (Marine Biodiversity, Exploitation, and Conservation), UMR IRD/Ifremer/Université de Montpellier/CNRS, 34203 Sète cedex, France.
6. LABERCA, Oniris, INRAE, 44307 Nantes, France
7. MARE – Marine and Environmental Sciences Centre, Regional Agency for the Development of Research (ARDITI), Funchal, Portugal Faculty of Life Sciences, University of Madeira, Portugal
8. CEMMA (Coordinadora para o Estudo dos Mamíferos Mariños), PO Box 15, 36380 Gondomar (Pontevedra), Spain
9. CEMMA (Coordinadora para o Estudo dos Mamíferos Mariños), PO Box 15, 36380 Gondomar (Pontevedra), Spain Department of Biology & CESAM & ECOMARE/CPRAM, Universidade de Aveiro, 3810-193 Aveiro, Portugal
10. Department of Biology & CESAM & ECOMARE/CPRAM, Universidade de Aveiro, 3810-193 Aveiro, Portugal
11. Marine Institute, Rinnville, Oranmore, Co. Galway, Ireland
12. Marine and Freshwater Research Centre; Department of Natural Resources & the Environment, School of Science and Computing, Atlantic Technical University, ATU Galway city, Ireland
13. Observatoire Pelagis, UAR 3462 La Rochelle Université/CNRS, 17000 La Rochelle, France Ifremer, CCEM Contamination Chimique des Écosystèmes Marins, F-44000 Nantes, France

For the establishment of management units, ecological tracers can provide relevant information on population structure at shorter time-scale resolutions than the genetic markers which are traditionally used. This study aims to evaluate geographical variations in ecological tracers measured in short-beaked common dolphin (*Delphinus delphis*) samples from various regions in the North-East Atlantic to investigate the ecological structure of the population for time scales covering from a few weeks to several years. This species is subject to high rates of bycatch in fishery engines each year, especially in neritic waters of the Bay of Biscay (BoB), requiring a major effort to understand possible exchanges with adjacent waters. Between 2017 and



2024, 117 stranded individuals were collected by stranding networks in four European countries (France, Spain, Portugal and Ireland). In addition, 124 biopsies were collected on individuals from offshore waters in the BoB (beyond the continental slope) and around the Madeira archipelago, and 13 biopsies were collected on individuals over the continental shelf of the BoB. Carbon, nitrogen, and sulfur isotope ratios in skin as short-term tracers, as well as ratios of different families of organic contaminants (e.g. polychlorobiphenyls, dichlorodiphenyltrichloroethane and its metabolites) in blubber as long-term tracers, were analyzed. The results showed significant differences in isotope compositions and organic contaminant ratios between individuals from strandings or biopsied in neritic waters on the one hand and individuals biopsied in oceanic waters on the other hand, highlighting two main preferential feeding habits at both short and long-term scales. However, some movements between the two habitats cannot be excluded. Overall, this study provides useful information on the ecological segregation of the population between neritic and oceanic waters, which can have implications in the refinement of management units for the common dolphin living in European waters.



EC-38. Growth of the common bottlenose dolphin (*Tursiops truncatus*) through tooth aging from strandings in Greece and the Eastern Mediterranean Sea from 1989 – 2023

Tsalapatis, Alexandros ¹; Consoli, Francesco ²; Tsirtsis, George ³; Hernández, Manuel Antonio Arbelo ²; Alexiadou, Paraskevi ¹; Kremenioti, Olga ¹; Frantzis, Alexandros ¹

1. Pelagos Cetacean Research Institute, Athens, Greece
2. Veterinary Histology and Pathology Institute of Animal Health, and Safety (IUCA) Veterinary School University of Las Palmas de Gran Canaria, Las Palmas, Spain
3. Department of Marine Sciences, University of the Aegean, Mytilene, Greece

Common bottlenose dolphin strandings in Greece were recorded from 1989 to 2023. Strandings occurred all year round, peaking in May and June, with no considerable spatial pattern being detected. Age estimates were obtained from 37 animals through tooth samples, by reading the GLGs. The estimated ages ranged from <1 to 35 years, with the maximum recorded for a female 35 years old. Gompertz model estimated an asymptotic length of 259.7 cm being reached at the age of 11 years. In an attempt to provide a wider geographical picture for the entire eastern Mediterranean Basin, Gompertz and Laird-Gompertz growth models were also fitted in a larger dataset consisting of our results pooled with those of two published studies from the Adriatic Sea and the Israelian costs. Both sexes demonstrated distinct differences while a second growth pulse was identified for males, supporting sexual dimorphism. The asymptotic lengths were estimated at 263.8 cm for females and 281.4 cm for males, at the age of 10 and 20 years, respectively. This study provides the first information on common bottlenose growth for Greece and the eastern Mediterranean basin and can serve as baseline for future research and comparison with other sub-populations.



EC-39. Assessing the trophic transfer of microplastics in marine mammals

Presas-Ferrer, Mae ¹; Garcia-Garin, Odei ²; Cardona, Luis ¹; Gazo, Manel ¹

1. *Institute of Biodiversity Research (IRBio) and Department of Evolutionary Biology, Ecology and Environmental Sciences, Universitat de Barcelona; Barcelona (Spain)*
2. *Institute of Aquatic Ecology (IEA), Universitat de Girona; Girona (Spain)*

Marine mammals may ingest microplastics (MPs) directly from the environment or indirectly through trophic transfer of contaminated prey. While the occurrence of these pollutants at the individual level has been extensively reported, there are few studies addressing the trophic transfer of MPs along marine food webs including marine mammals. Here, we conducted a systematic literature review on this topic, following the PRISMA procedure. Out of 2755 screened studies, only 8 met the established selection criteria. A total of nine marine mammal species, including mysticetes, odontocetes, polar bears and pinnipeds, were included. Modeling and meta-analysis studies represent 62.5% of the reviewed research, while field studies cover the remaining 37.5%. In field studies, KOH was used to digest organic matter in two out of three cases, and Fourier-Transform infrared (FTIR) spectroscopy was used in all of them to polymer identification. Trophic transfer of MPs to marine mammal was rejected in three of the studied food webs and confirmed in five studies. Only one out of the five studies used the Trophic Magnification Factor (TMF) to quantify the trophic transfer of MPs. This model-based study obtained a TMF value of 6.17 for the first run of the model. We attempted to quantify trophic transfer in the remaining studies but due to the absence of standardized data, we could only calculate the Biomagnification Factor in one field study, obtaining a value of 1.5, suggesting biomagnification of MPs. The complexity of analyzing food webs, the challenges of working with marine mammals in a non-invasive way and the lack of standardized data are some of the shortcomings in this area of research. Addressing these issues through further studies is essential to better understand the trophic transfer of MPs to marine mammals.



EC-40. In vitro digestion experiments of three different fish species and plastic based on the physiology of the forestomach of harbor porpoises (*Phocoena phocoena*)

Krauße, Leonie ¹; Cierjacks, Arne ²; Klemens, Lisa ³

1. University of Applied Science Dresden German Ocean Museum
2. University of Applied Science Dresden
3. German Ocean Museum

To better understand the lives of odontocetes, biomass and diet composition estimates are vital. Usually this is based on stomach content analysis and digestions rates derived from in vitro digestion experiments. Previously in vitro experiments were mostly done based on pinnipeds with only one stomach compartment, however odontocetes have up to four. To add more data on different prey species we simulated the first stomach compartment that accounts motoric movement and a digestion solution containing hydrochloric acid, pepsin and lipase with a pH=4. Additionally, an in vitro experiment was performed only with motoric movement and distilled water to look into non enzymatic digestion. For the in vitro experiment we used sprat (*Sprattus sprattus*), medium and small great sand eel (*Hyperoplus lanceolatus*), goby (*Pomatoschistus* sp.) and different kinds of plastic. All of the fish showed highly variable digestion functions and digestion rates taking between 45 to 230 minutes to complete digestion. The experiments also suggest that different sized fish of the same species differ not only in duration of digestion but also in digestion process. The experiment without enzymes showed, when compared to stomach content of stranded porpoises, that enzymes do take part in the forestomach digestion. With no glands in the forestomach a reflux from the mainstomach is likely to happen. Plastic did not show any sign of disintegration after being in vitro digested for nearly twelve hours.



EC-41. Reproductive parameters of bottlenose dolphin in the Pelagos Sanctuary (NW Mediterranean Sea)

Gnone, Guido ¹; Negri, Martina ²; Bellingeri, Michela ³; Lucchetta, Ylenia ⁴; Nuti, Silvio ⁵

1. *Fondazione Acquario di Genova*
2. *R.S.T.A. srl*
3. *Acquario di Genova*
4. *Università degli Studi di Milano*
5. *CE.TU.S. Cetacean Research Centre*

Since 2001, Fondazione Acquario di Genova and CE.TU.S. have been carrying out a research activity on the common bottlenose dolphin (*Tursiops truncatus*) in Liguria and Tuscany (North-Western Mediterranean), within the Pelagos Sanctuary. One of the objectives of the project is to monitor the reproductive behaviour of the females, their fertility rate and the mortality rate of the calves. Field data were collected on board inflatable boats (5.10 m long) in Liguria and a sailing catamaran (12 m long) in Tuscany. GPS devices were used to record sampling tracks and sighting points of the target species. During sightings, photographic data were collected to photo-identify individuals through natural dorsal fin markings. Photographic data were also used to assess the sex of the identified individuals, through regular association with a newborn calf (for females) or a photo of the ventral area (for females and males), and to reconstruct the reproductive histories of the females. We then calculated the annual fertility rate (YFR), total fertility rate (TFR), calving interval (CI) and calf mortality rate within the first year of life (MR1). From 2006 to 2019, we sighted bottlenose dolphins 225 times and managed to photo-identify 331 individuals. Of these, 61 were identified as females and 18 as males. The TFR was 0.34, the CI was 3.27 ± 0.2 (SE) and the MR1 was 0.22. Compared to other studies, inside and outside the Mediterranean Sea, the TFR was higher, the MR1 was slightly higher, while the CI was consistent with previous results. The YFR analysis seems to suggest some synchronisation between births. We are performing the same analysis on a larger dataset to confirm these preliminary results.



EC-42. First passive acoustic study of cetaceans in the Norwegian Skagerrak

Mokoroa, Jon ¹; Korslund, Lars ¹; Gordon, Jonathan ²; Freitas, Carla ³

1. University of Agder
2. Sea Mammal Research Unit
3. Institute of Marine Research

Marine ecosystems have been under pressure for decades as a result of intensive human activity. Cetaceans have also been negatively affected by our actions, so to implement protection and conservation plans, it is crucial to know the current state of the populations. In the last decades, passive acoustic monitoring (PAM) has become an important tool to fulfil this purpose. This study, makes use of PAM to investigate the spatial and temporal occurrence of cetaceans in the Norwegian Skagerrak between March 2023 and February 2024. Two methods were used: i) Monthly transect ship surveys from Norway to Denmark using a towed hydrophone array; and ii) Moored Continuous Porpoise Detectors (CPODs, n = 6) deployed at the Norwegian coast to monitor the presence and the vocal activity of harbour porpoises (*Phocoena phocoena*). Towed hydrophone data were analysed using PAMGuard to study the cetacean occurrence along the year. The CPOD data were used to investigate spatial, seasonal and diel patterns in porpoise presence and vocal activity. Ship surveys revealed the presence of harbour porpoises, northern bottlenose whales (*Hyperoodon ampullatus*), minke whales (*Balaenoptera acutorostrata*) and bottlenose dolphins (*Tursiops truncatus*) in the area. Generalized Additive Models, fitted to the CPOD data, showed spatial, seasonal and diel variations on harbour porpoise presence and vocal activity. Significantly higher harbour porpoise presence and vocal activity were registered during spring, especially in the northernmost sites. Moreover, porpoise presence was significantly higher during the night, independently of the time of the year. Changes in prey availability, porpoise calving and mating seasons, and prey migration may be behind these observations. This study was the first of its kind performed in the Norwegian Skagerrak, and it provided novel information about specially, the harbour porpoises in the Norwegian Skagerrak. However, important knowledge gaps must still be filled to properly manage them.



EC-43. Cementochronological variation in strontium isotope ratios in bothnian ringed seals (*Pusa hispida*)

Cervin, Linnea ¹; Persson, Sara ²; Mark, Chris ³; Macieira, Mariana ¹; Lundström, Karl ⁴

1. Department of Environmental Monitoring and Research, Swedish Museum of Natural History, Box 50007, 104 05, Stockholm, Sweden
2. Centre for Reproductive Biology in Uppsala, CRU, P.O. Box 7054, 750 07 Uppsala, Sweden
3. Department of Geosciences, Swedish Museum of Natural History, Box 50007, 104 05, Stockholm, Sweden.
4. Department of Aquatic Resources, Swedish University of Agricultural Sciences, Turistgatan 5, 453 30 Lysekil, Sweden

The rapidly changing environmental conditions in the Baltic Sea may influence the behaviour of its top predators, such as ringed seals (*Pusa hispida*). Alternative methods are needed to monitor their feeding strategies, habitat use and other behaviours, for which baseline data are currently sparse. The objective of this pilot study was to assess whether strontium isotopes ($^{87}\text{Sr}/^{86}\text{Sr}$) in the cementum of adult Swedish ringed seal canines may reveal shifts in foraging behaviour in females compared to males. Canine teeth from 12 adult seals (nine females aged 8–14 and three males aged 13–14) were opportunistically collected during the hunt in the Bothnian Bay between spring 2019 and autumn 2021, as part of the Swedish health monitoring programme. The teeth were sectioned and analysed chronologically for strontium isotope ratios using laser ablation multi-collector inductively coupled plasma mass spectrometry (LA-MC-ICP-MS). Temporal isotope fluctuations showed shifts between marine and terrestrial food sources, indicated by deviations below (marine) and above (near-terrestrial) the Baltic Sea background values (0.7092–0.7097). Males seemed to rely on prey closer to land, especially later in life (0.7091–0.7107), suggesting flexibility in prey choice. In contrast, most adult females showed reliance on marine-derived prey (0.7089–0.7098), which could be linked to the high energy demands of pregnancy and lactation, as well as the need to remain near sea ice during the breeding season. The decline in quality and changes in prey abundance, such as herring and vendace, may also influence these dietary patterns. Despite limitations in yearly resolution, caused by cementum thickness and strontium concentrations, this study demonstrates the potential of isotopic analyses in pinniped teeth to study diet and potentially reproduction. Future studies with larger sample sizes and refined methods may further enhance the utility of this approach as a monitoring tool for top predators in data-deficient populations.



EC-44. Summary of whale strandings in Iceland

Halldórsson, Sverrir Daníel ¹; Sigurðsson, Guðjón Már ¹

1. Marine and Freshwater Research Institute Fornubúðir 5, 220 Hafnarfjörður, ICELAND

Since 1980, the Marine and Freshwater Research Institute (MFRI) has systematically kept records of cetacean strandings in Iceland. Long-term stranding databases have gained more attention recently as they can offer critical insights into ecosystem status, especially as global warming increasingly impacts marine environment and cetacean species. Information from strandings constitutes as one of the most important sources of biological/ecological data on many species of cetaceans in Icelandic and adjacent waters. Depending on circumstances (species, accessibility etc.) the MFRI and cooperating institutions have arranged for sampling and measurements of the carcasses. This study examines whale strandings around Iceland between 1980 and 2024, focusing on trends and species involved. A total of 480 stranding events have been registered in the period. The total number of animals was 714 consisting of 19 identified species with long-finned pilot whales accounting for the highest number (256 animals, 60 events including six mass strandings). The most frequent species was the sperm whale (*Physeter macrocephalus*) (86 events, 98 animals). The strandings database has some records of species, previously unknown for the Icelandic waters, the striped dolphin (*Stenella coeruleoalba*), Sowerby's beaked whale (*Mesoplodon bidens*) and Risso's dolphin (*Grampus griseus*). All three species have their main distribution south of Iceland's waters. Future study on shift in environmental factors like sea temperature, prey availability, and marine pollution might cast a light on relation to the recent appearance of new species around Iceland. The number of reported strandings increased over time, peaking in 2018, but the reason for this is unclear and it is possible that increase in tourism and a ratified cooperation introduced in 2007 has made the reporting of stranding more efficient. After the record year in 2018 when 42 strandings were registered the trend has turned downwards again but effect of Covid-19 pandemic might be the explanation.



EC-45. Spatial and temporal variation of Harbour porpoises' presence in four contrasted sites along the French coasts revealed by static passive acoustic monitoring

Béesau, Julie ¹; Fouin, Elise ¹; Torterotot, Maëlle ¹; Michel, Mathilde ¹; Virgili, Auriane ²; Samaran, Flore ¹

2. ENSTA campus de Brest, Institut Polytechnique de Paris, France
3. Share the Ocean, Larmor-Baden, Bretagne, France

Static Passive Acoustic Monitoring (SAM) is a cost effective means to get accurate information on the cetacean acoustic presence and habitat use, and could be included in a long-term monitoring strategy. Harbour porpoise (*Phocoena phocoena*) presence was monitored by SAM along the French coasts in four contrasting areas; two on the Atlantic coast (in the Iroise Sea and the Arcachon bay) and two in the English Channel - the Dover Strait - in front of Calais and in front of Dunkirk. C-PODs were deployed on these four areas for one to ten years depending on the study sites. These long-term recordings enable a comprehensive analysis of harbour porpoise presence, capturing both spatial and temporal variations in acoustic activity. The study aims to ¹ describe spatial and temporal variability between sites, considering factors such as seasonal patterns, and ² assess temporal variability within sites, focusing on the influence of light cycles and tidal rhythms on acoustic activity. Harbour porpoises were recorded throughout the year at all sites, but with significant spatial variation. In the Iroise Sea, harbour porpoise acoustic detections were higher in summer than in winter. In the Arcachon bay and Calais, more detections were recorded in winter, while around Dunkirk, the highest number of detections was recorded in spring. Regarding temporal variability within sites, diel patterns of acoustic activity were observed. Light cycles and tidal rhythms influenced the timing and frequency of echolocation activity, suggesting that harbour porpoises may adapt their behaviour to changing environmental conditions throughout the day. These results were in consistent with previous scarce visual surveys, and the seasonal and spatial variation observed underlines the importance of long-term continuous observations. With its excellent potential for collecting robust baseline data in poorly studied areas, SAM could meet the requirements of the European Directive and the Marine Strategy Framework Directive by being implemented in a regional monitoring strategy to investigate changes in key areas of interest at temporal and geographical scales.



EC-46. Estimating energy expenditure of sperm whales

Silva, Mariana ¹; Oliveira, Cláudia ¹; Prieto, Rui ¹; Fahlman, Andreas ²; Silva, Mónica ¹; New, Leslie³

1. *Institute of Marine Sciences - OKEANOS & Institute of Marine Research – IMAR, University of the Azores, Horta, Portugal*
2. *Fundacion Oceanografic, Valencia, Spain. Global Diving Research, Sanlucar de Barrameda, Spain. IFM, Linkoping University, Linkoping, Sweden*
3. *Ursinus College, Collegeville, Pennsylvania*

Assessing species' vulnerability to disturbances (e.g., changes in prey availability, noise) can be done with bioenergetics models, often within frameworks such as the population consequences of disturbance (PCoD). However, to successfully quantify the cumulative effects of disturbance on populations it is crucial to first understand the link between behavioral changes on an individual's metabolic costs. Measurements of energy expenditure (e.g., field metabolic rates, FMR) are difficult to obtain for large cetaceans because traditional methods are logistically and/or ethically impossible. Consequently, FMR is estimated indirectly, using proxies like respiration rates. In this study, we estimated daily FMR of sperm whales (*Physeter macrocephalus*, estimated mean body mass of 9164 kg, 95% CI: 4798-14843) from social units in the Azores by combining in situ behavioral data with respiration rates from different surface periods. We first calculated the volume of oxygen consumption (VO₂) per breath as the product of tidal volume and oxygen exchange fraction. The FMR was then calculated as the VO₂ times the estimated number of respirations per day. To account for variability and uncertainty in parameters estimates, we performed a Monte Carlo simulation to create probability density distributions around each variable, which resulted in distributions of energy expenditure. Our results estimated a mean daily FMR of 412.27 MJ (95% CI: 262.20-616). This study provides the first estimates of daily FMR for sperm whales and suggested that the FMR of this species is on average 1.59 times (range: 1-2.37) the predicted basal metabolic rate of similar-sized terrestrial mammals. These findings, when combined with data on energy acquisition contribute to improve predictions of how environmental stressors impact energy balance, health and the long-term population viability of deep-diving marine mammals.

EC-47. Zinc concentrations in the bone of marine mammals

Vighi, Morgana ¹; Garcia-Garin, Odei ¹; Borrell, Asunción ¹; Aguilar, Alex ¹; Valdivia, Meica ²; González, Enrique M. ²; Páez-Rosas, Diego ³; Drago, Massimiliano ⁴

1. Department of Evolutionary Biology, Ecology and Environmental Sciences, and Biodiversity Research Institute (IRBio). Faculty of Biology. University of Barcelona, 08028, Barcelona, Spain
2. National Museum of Natural History (MNHN), 11000, Montevideo, Uruguay
3. Universidad San Francisco de Quito, Galápagos Science Center, Islas Galápagos, Ecuador. Galapagos Conservancy, Fundación Conservando Galápagos. Islas Galápagos, Ecuador. Dirección Parque Nacional Galápagos, Unidad Técnica Operativa San Cristóbal, Islas Galápagos, Ecuador.
4. Department of Evolutionary Biology, Ecology and Environmental Sciences, and Biodiversity Research Institute (IRBio). Faculty of Biology. University of Barcelona, 08028, Barcelona, Spain

Zinc (Zn) is an essential trace element that is naturally present in oceanic waters and sediments, but its release and accumulation in the sea may be enhanced by anthropogenic activities through atmospheric and river deposition. Although Zn is required for bone development, growth, turnover and homeostasis in all vertebrates, its high concentrations can alter the equilibrium of marine ecosystems by producing detrimental impacts to phytoplankton, macroalgae and fish. Concerns for Zn toxicity in larger vertebrates such as marine mammals are low; however, Zn concentrations in the bone of these species can provide relevant information about their living environment, habitat use and physiology. Here, we assess Zn concentration in bone samples from 12 marine mammal species of different locations to determine interspecific variability and potential geographical or habitat-related differences. Samples included species from the Río de la Plata estuary (Uruguay) (*Arctocephalus australis* (n=24), *Otaria flavescens* (n=14), *Pontoporia blainvillei* (n=30), *Tursiops truncatus* (n=15), *Delphinus delphis* (n=6), *Orcinus orca* (n=5), *Phocoena spinipinnis* (n=12), *Pseudorca crassidens* (n=14), *Lagenodelphis hosei* (n=15)), the coastal waters of Mauritania (*Monachus monachus* (n=11), *Phocoena phocoena* (n=12), *Delphinus delphis* (n=11)), and the Galapagos archipelago (Ecuador) (*Zalophus wollebaeki* (n=20)). Zn analyses were performed based on the method described in Vighi et al. (2017). Generalized Linear Models (GLMs) were applied to explore the potential effect of species and their habitat (i.e., estuarine–coastal, continental shelf, oceanic) on Zn concentrations. Zn concentrations ranged 78.4 - 1680.1 mg kg⁻¹ and results showed a significant interspecific variability within the Río de la Plata and Mauritania areas and a significant effect of habitat within the Río de la Plata estuary. Interestingly, overall Zn concentrations in pinnipeds were significantly lower than those in cetaceans, highlighting that Zn is a relevant indicator of marine mammal ecology and physiology and of the different habitat/environmental conditions in which they live.



EC-48. Two years of passive acoustic monitoring in a French MPA: gaining knowledge on the annual presence of porpoises and delphinids, and testing acoustic equipment

Torterotot, Maëlle ¹; Beesau, Julie ¹; Perraud, Léa ¹; Gicquel, Cécile ²; Samaran, Flore ¹

1. *Lab-STICC UMR 6285 - ENSTA, campus de Brest, Institut Polytechnique de Paris, France*

2. *French biodiversity agency (OFB), Iroise marine park, Le Conquet, France*

The CETIROISE project (funded under the French economic recovery plan) aimed at monitoring cetacean presence in the Iroise sea (Britanny, France), using passive acoustic monitoring. Targeted species were porpoise and delphinids (particularly common and bottlenose dolphins). From May 2022 to May 2023, 7 sites were equipped with acoustic recorders in the northern sector of the Iroise Marine Natural Park (PNMI). Since May 2023, only the two most coastal sites remained instrumented. During the first year of survey, the moorings were each equipped with two recorders: the F-POD (Chelonia Limited), an echolocation-click logging device, and the Sylence LP (RTSys), a broadband recorder sampling at 128 kHz. After May 2023, the two remaining moorings were instrumented with different recorder configurations, on the one hand to test new equipment and programming parameters, and the other to continue monitoring cetaceans. Delphinid whistles were detected with PAMGuard's whistle and moan detector while delphinid and porpoise clicks were directly assessed from the FPOD detections. Manual annotation was performed on the web-based annotation platform APLOSE and used to assess clicks and whistles automated detection performances. Results from the first year of the study showed contrasting patterns of delphinid acoustic presence between coastal and offshore sites, on which whistles were almost continuously detected throughout the year, though peaking in summer. Porpoise spatial acoustic presence was more homogeneous and also peaked in summer. Extending the recording effort to a second year enabled to observe the inter-annual variability in the presence of delphinids and porpoises. It also allowed us to validate in-situ F-POD detections of delphinid and porpoise clicks by comparing results with broadband data, and to test the influence of instrument layout (e.g. F-POD vs. C-POD, head up or down, different duty cycles) on detection results.



EC-49. Environmental drivers of minke whales (*Balaenoptera acutorostrata*) habitat use in coastal Iberian Peninsula waters (Galicia, Spain)

THIBAULT, Romain ¹

1. Bottlenose Dolphin Research Institute

The escalating impact of human activities on marine ecosystems necessitates a thorough understanding of how marine predators, such as cetaceans, respond to environmental changes. Our investigation focused on minke whale (*Balaenoptera acutorostrata*) distribution in a region profoundly affected by human activities and marked by episodes of coastal upwelling in the north-west Iberian Peninsula. Data collection spanned from April 2016 to October 2022, involving dedicated daily research boat surveys along the south coast of Galicia (Spain). We used generalized additive models and 11 environmental variables to examine the determinants shaping the small-scale distribution of minke whales in these waters. Our findings indicated that minke whale distribution is driven by three non persistent environmental variables: sea surface temperature, sea surface salinity, and chlorophyll-a concentration. The presence of minke whales is likely intricately linked to dynamic interactions among these factors and prey availability, demonstrating fine-scale habitat selection by the species. This insight contributes valuable information to the limited understanding of minke whale ecology in the North-East Atlantic. The study's outcomes offer essential support for managers in devising effective management and conservation strategies, aiming to alleviate the detrimental impacts of human activities on minke whale distribution.



EC-50. Dugong foraging activity along hyper-urbanised coastal areas

Ng, Sirius ¹; Ow, Yan Xiang ²; Huang, Danwei ³; Jaafar, Zeehan ³

1. *Department of Biological Sciences, National University of Singapore.*
2. *St. John's Island National Marine Laboratory, Tropical Marine Science Institute, National University of Singapore*
3. *Department of Biological Sciences, National University of Singapore. Lee Kong Chian Natural History Museum, National University of Singapore. Tropical Marine Science Institute, National University of Singapore.*

Effective species conservation management is contingent on the availability of context-specific ecological information. Attaining this information through direct observation is especially difficult for behaviourally elusive organisms that occur in small populations such as the dugong (*Dugong dugon*). To understand spatiotemporal trends in dugong site-use and population size structure along the highly anthropogenically impacted coastal areas of Singapore, standardised transect surveys (2018-2024; n=41) were conducted to identify dugong feeding trails (DFTs; n=384) within two intertidal seagrass meadows. DFT counts, geographical coordinates, and morphometric measurements were obtained to highlight core areas and peak periods of dugong foraging activity. Seagrass material, collected directly adjacent to each DFT, were characterised in terms of species present, biomass, nutritional (carbon and nitrogen) and fibre content. This information enabled us to distinguish DFTs made by nursing calves and sub-adults/adults; and thus, elucidate site-use dynamics in relation to the population size structure of the local dugong population. Our approach of indirect dugong observation is ideal for obtaining ecological information needed to design management strategies for these elusive marine mammals, especially in areas where populations have become small and fragmented.



EC-51. Real-time acoustic monitoring of Greenland bowhead whales

Pierpoint, Chris 1; Tervo, Outi 2

1. *Seiche Ltd.*
2. *Greenland Institute of Natural Resources*

We collaborated with local stakeholders, Visit Greenland and University of Copenhagen to install an autonomous hydrophone ‘listening station’ at Qaqqaliaq Lighthouse, Qeqertarsuaq, west Greenland. The objective was to enable real-time monitoring of underwater sound via a publicly accessible web portal. The hydrophone system was anchored to the seabed and cabled across the intertidal zone and cliff face, to the unmanned lighthouse. The acoustic signals were processed and recorded at the lighthouse, where mains power was available. Underwater sound was then transmitted in mp3 format, over a 4G network to a cloud server. The audio stream was presented at a dedicated project web site. Researchers could also connect to the stream directly, from any location. The system operated during winter 2023-24 and enabled remote monitoring of bowheads and bearded seals. The system was damaged during the subsequent ice melt, but we aim to reactivate it in 2025. We present examples of bowhead and bearded seal song recorded from the remote audio stream. Long-term operation of remote listening stations in the Arctic habitats is very challenging, but can enable access to underwater sounds of wildlife, physical processes and human activities in real-time, worldwide.



EC-52. Humpback whale (*Megaptera novaeangliae*) maturity and body condition in Ireland and beyond based on drone photogrammetry data

Blázquez Hervás, Miguel ¹; Massett, Nick ²; O'Callaghan, Seán ¹; Hogan, Marcus ²; López Suárez, Pedro ³; Lopes, Katia ³; Whooley, Pádraig ²; O'Brien, Joanne ¹; Wenzel, Frederick ⁴; O'Connor, Ian ¹; Berrow, Simon ²

1. Marine and Freshwater Research Centre, Atlantic Technological University, Old Dublin Road, Galway, Ireland.
2. Irish Whale and Dolphin Group, Merchants Quay, Kilrush, Co. Clare, Ireland.
3. BIOS Cabo Verde, Santa Isabel, Sal Rei, Boa Vista, Cabo Verde.
4. North Atlantic Humpback Whale Catalog, College of the Atlantic, Bar Harbor, MA, USA.

Animal morphometrics are essential to understand a species life history, as well as the ecological relationships of the species and the environment. This study explored humpback whale (*Megaptera novaeangliae*) maturity and body condition in Ireland using Unmanned Aerial Systems (drones) photogrammetry. We used morphometric data collected in Ireland between 2022 and 2024. Some additional data were also collected opportunistically in other areas in the NE Atlantic such as Norway and Cabo Verde. Body length and condition metrics and their associated uncertainty were estimated using Bayesian modelling. Photogrammetric measurements provided insights into age structure, migratory behaviours, and habitat use. We observed a positive correlation between body length and offshore habitat preferences in Irish waters, with shorter (younger) individuals demonstrating a preference for waters closer to the shore, potentially increasing exposure to anthropogenic pressures. Moreover, the findings indicated geographical and temporal variations in body condition. Humpback whales in Cabo Verde exhibited the highest body condition metrics compared to other regions, suggesting selective migration of well-conditioned individuals. Meanwhile, Irish humpback whales showed intra-seasonal improvement in body condition both at population and individual level, corroborating the importance of Ireland as a secondary feeding ground. This study underscores the value of UAS photogrammetry in advancing the understanding of humpback whale ecology in understudied regions, providing relevant information for species conservation and management.

EC-53. Preliminary findings on passive acoustic monitoring of bottlenose dolphins presence in the Istanbul Strait

Amaha Öztürk, Ayaka ¹; Dede, Ayhan ^{1,2}; Tonay, Arda M. ^{1,2}; Öztürk, Bayram ^{1,2}

1. *Istanbul University, Faculty of Aquatic Sciences, Kalanderhane Mah. Onalti Mart Sehitleri Cad. No: 2, Fatih, Istanbul, Türkiye.*
2. *Turkish Marine Research Foundation (TUDAV), P.O. Box: 10 Istanbul, Türkiye*

The Istanbul Strait, part of the Turkish Straits System, is one of the narrowest waterways in the world, connecting the Black Sea to the Marmara Sea. It is an important migration corridor for marine creatures, including cetaceans, also known as home to resident group of bottlenose dolphins (*Tursiops truncatus*). In June-July 2023, totally 44 days, passive acoustic monitoring (PAM) was made with SoundTrap ST600HF in Filburun Cove, located at the northern end of the Istanbul Strait, under the EU Horizon Project, BRIDGE-BS. In summer months, a pound net (set net) is placed in that small cove and the vicinity is dominantly used by bottlenose dolphins according to previous studies. To determine dolphin whistles, SoundTrap (wav) records were analysed by PamGuard software used together with UK whistle and moan detector and ROCCA for output parameters (Date/Time, duration, min/max Frequency, etc). Totally 170501 whistles were detected, with the daily counts varied between 291 and 11118. Duration of the whistles varied between 0.1-2s, and frequencies 500-32000Hz. Diel pattern of whistles was observed as increasing in numbers during daytime. LFN (Low frequency narrowband) sounds like moans were observed only during night, between 0.8-7 kHz with up to 47 kHz harmonics, durations below 0.5s. The study reveals that the dolphins use this cove actively during summer and the area needs a long-term monitoring program, including the use of PAM.



Emerging Topics



ET-01. Deep learning approach for automated photo identification using vertical aerial drone imagery of fin whales (*Balaenoptera physalus*)

Huss, Kilian ¹; Rychwalksi, Alexander ²; Wabenhensch, Jakob ³; Viquerat, Sacha ⁴; Herr, Helena ⁴

1. University of Hamburg - Institute of Marine Ecosystem and Fishery Science, Alfred Wegener Institute
2. University of Hamburg - Institute of Marine Ecosystem and Fishery Science
3. University of Hamburg
4. Alfred Wegener Institute, University of Hamburg - Institute of Marine Ecosystem and Fishery Science

Photo identification (photo ID) is a vital tool for the study of cetacean populations. However, traditional manual matching techniques are time-consuming and have become increasingly inefficient with growing database sizes. Recent advances in machine learning have demonstrated accurate and efficient performances of automated individual identification based on lateral images of dorsal fin features. Following the introduction of drone-based techniques in cetacean research, aerial perspectives have become available for photo ID, enabling the analysis of morphological features and pigmentation patterns that were previously inaccessible. Leveraging this, we propose a framework for the (semi) automated identification of individual Southern Hemisphere fin whales (*Balaenoptera physalus quoyi*) (SHFW) using vertical aerial drone imagery. In a proof of concept, we semi-automatically annotated ~13h of aerial video imagery by combining deep learning techniques for human facial recognition with expert validation. Video material was captured at the feeding grounds off Elephant Island, Antarctica, recorded during two research expeditions in the austral summers of 2018 (RV Polarstern, PS112) and 2023 (Maria S. Merian, MSM115) via drones and on-board helicopters. Our method improves traditional techniques by systematically exploring distinctive dorsal pigmentation patterns and markings visible from above, such as the Central Chevron Pattern and the blaze, which have been demonstrated to be conducive information for manual photo ID tasks. We employ a YOLO model for automatic detection, tracking, and cropping of individual fin whales from drone video footage. We then use a convolutional neural network for individual feature extraction and embeddings. Our approach aims to create an expandable catalogue of SHFW individuals, using machine learning, potentially enabling long-term monitoring and cross-regional capture/recapture studies. Our workflow is evaluated on a human annotated, held out test dataset, sourced from the original video material, as well as an out-of-distribution dataset containing aerial footage of Northern Hemisphere fin whales (*B. p. physalus*).



ET-02. Enhancing photo-Identification of Indo Pacific bottlenose dolphins (*Tursiops aduncus*): a 360 approach

de Haas, Thalia ¹; Medcalf, Kirsty ²; Ziltener, Angela ³

1. Dolphin Watch Alliance (DWA) and MarineVagabond Freelancing
2. Dolphin Watch Alliance (DWA)
3. Dolphin Watch Alliance (President DWA) and University of Zurich: Department of Evolutionary Anthropology

Photo-identification is fundamental to marine mammal research, with traditional methods relying on dorsal fin photographs of *Odontoceti* (particularly *Delphinidae*) and fluke photographs of *Mysticeti*. Occasionally, features such as pectoral fins or body markings are utilised. Dorsal fin identification is effective, though it has limitations, including changes in dorsal fins due to age, health, and environmental conditions. Determining the number of individuals in closely associated groups can be challenging when dorsal fins are obscured or resemble one another. Furthermore, misidentification may arise due to photographic quality or observer bias. This study investigates whether integrating underwater photographs enhances photo-identification accuracy of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in the Northern Red Sea, Egypt. The dataset, collected by Dolphin Watch Alliance (DWA), includes surveys from 2019 and 2023 that combined boat-based and underwater photography. Long-term engagement with the local dolphin community enabled DWA to capture detailed close-range underwater photographs, providing a comprehensive 360-degree view of the individuals by including multiple body features. We compared identification results across three key metrics: the number of positively identified individuals, the accuracy of individual identifications, and group size counts. Paired t-tests and Wilcoxon signed-rank tests were used to evaluate the impact of incorporating underwater photographs compared to relying solely on boat-based photographs for these metrics and their overall accuracy. Preliminary analysis suggests that including underwater images increases identification accuracy by capturing specific body features, such as body patterns, scars, and unique markings, which are not visible in boat-based images. This new method is particularly useful for distinguishing individuals with similar dorsal fin shapes, preventing misidentification, and improving group size estimates. Additionally, more individuals can be positively identified, leading to more accurate population size estimates and demographics. This research aims to establish a new standard in photo-identification methods, improving population assessments and advancing protective strategies for dolphin populations.



ET-03. Faeces of harbour porpoises (*Phocoena phocoena*) can stimulate phytoplankton growth

Weber, Maxime ¹; Zanderink, Frank ¹; Osinga, Nynke ¹; Nooijen, Danielle ²; Van Burken, Selina ³

1. Rugvin Foundation
2. HAS Green Academy
3. Aeres Hogeschool

CO₂ emissions are rising and form the predominant driver of climate change. The ocean acts as a carbon sink. Defecation by cetaceans has been shown to enhance primary productivity in marine ecosystems, by supplying (micro)nutrients such as Fe, N, and P to phytoplankton. Studies have been focussing on greater whales and there is a knowledge gap whether smaller cetaceans provide these same services. Laboratory experiments were conducted by Rugvin Foundation to study the effects of harbour porpoise faeces as a stimulant for phytoplankton growth in Dutch marine systems. Three pilot studies were performed with the first study focussing on algal growth in North Sea water (2022), the second in water from the Eastern Scheldt (2023), and the third on creating a methodology to study primary production by measuring algal gas exchange (CO₂ /O₂)(2024). Harbour porpoise faeces were obtained from stranded individuals by the veterinary faculty of Utrecht University. Samples from seventeen, six, and seven necropsied porpoises were obtained respectively in 2022, 2023, and 2024. Different volumes of faeces were added to water obtaining one of four algal species (*Nannochloropsis oceanica*, *Phaeodactylum tricornutum*, *Phaeocystis globosa*, or *Skeletonema costatum*), and cell densities were measured for two weeks. Preliminary results demonstrated that harbour porpoise faeces increased algal growth in almost all cases. *P. Tricornutum* (Eastern Scheldt trial) and *P. globosa* (North Sea trial) showed a positive dose-dependent effect. The third study developed a method (which is currently being improved) to measure gas exchange in vitro to quantify primary production by algae. Based on our findings, we hypothesize that harbour porpoises could enhance algal growth and primary productivity in shallow coastal waters such as the North Sea and its estuaries and that they thereby ultimately contribute to the capacity of marine ecosystems to fix or sequester carbon.



ET-04. Difference on the detection process and probabilities between digital and visual aerial survey methods for monitoring cetaceans populations

Escobar Calderon, Juan Felipe ¹; Nachtsheim, Dominik ¹; Ramirez Martinez, Nadya Carolina ²; Authier, Matthieu ³; Gilles, Anita ¹

1. *University of Veterinary Medicine Hannover, Foundation, Institute for Terrestrial and Aquatic Wildlife Research, Werftstrasse 6, 25761 Büsum, Germany*
2. *1)University of Veterinary Medicine Hannover, Foundation, Institute for Terrestrial and Aquatic Wildlife Research, Werftstrasse 6, 25761 Büsum, Germany 2)Fundación Macuáticos Colombia, Calle 27 # 79-167, Medellín, Antioquia, Colombia*
3. *Observatoire PELAGIS UAR 3462, CNRS-La Rochelle University, La Rochelle, France*

The increasing availability of tools for high-quality image acquisition, combined with challenges in conducting traditional visual distance sampling surveys (DS) near offshore constructions, has driven a surge in digital sampling methods for monitoring animal populations. In the North Sea, where significant infrastructure development is anticipated, aerial surveys using aircrafts equipped with cameras are being used for environmental assessments. Unlike DS methods, which estimate a detection function to account for declining detection probability with distance, digital surveys assume no animals are missed across the strip of the transect. This assumption of uniform and perfect detection, while appealing, is usually not substantiated and can be affected by the detection protocol during image processing. This study aimed to compare detection processes in DS and digital surveys, identifying sources of variation and their implications for estimates. Furthermore, we investigated how real-world digital survey data may deviate from uniform perfect detection by analyzing digital sampling data from three North Sea surveys targeting marine megafauna between 2018 and 2021. We found that detection frequency varies across images due to positional and environmental factors. The implications of these findings are discussed both in the scope of DS theory and with the help of simulations. Additionally, the importance of parameters of digital sampling like camera overlap and repeated assessments of the same image by different operators are discussed. The results emphasize the importance of information such as object positions in digital surveys to evaluate and address the assumption of perfect uniform detection. Furthermore, as digital methods become widespread, there is a need to develop new statistical frameworks that account for the characteristics of digital surveys, in the detection as well as classification process. We highlight the potential of digital surveys while calling attention to the theoretical advancements required to align them with established DS principles.

ET-05. Preliminary results from a new approach to classify on- and off-axis sperm whale (*Physeter macrocephalus*) clicks

Favazza, Marcella ^{1,2}; Lanfredi, Caterina ³; Airoidi, Sabina ³; Pace, Daniela Silvia ²; Pedrazzi, Giulia ²; Silvestri, Margherita ⁴; Soto, Gerardo Emanuel ⁵

1. Tethys Research Institute, c/o Acquario Civico, Viale G.B. Gadio 2, Milan, 20121, Italy
2. Sapienza University of Rome, Piazzale Aldo Moro 5, Rome, 00185, Italy
3. Tethys Research Institute, c/o Acquario Civico, Viale G.B. Gadio 2, Milan, 20121, Italy
4. Instituto de Ecología y Evolución, Universidad Austral de Chile, Independencia 641, Valdivia, Chile
5. Instituto de Estadística, Universidad Austral de Chile, Independencia 641, Valdivia, Chile

Sperm whales produce usual clicks (UCs), broadband impulsive sounds with a multi-pulse structure. Measuring the Inter-Pulse-Interval (IPI), the within-click time lag between consecutive pulses, allows for estimating the animal's size. However, whales are often recorded in unknown orientations to the hydrophone, rendering IPIs indistinguishable and limiting the utility of the acoustic datasets. This study presents a method of classifying UCs into different categories, using a multi-layer Convolutional Neural Network (CNN) approach for their automatic extraction and classification. The final objective will be to test the different UCs for IPI, potentially increasing the usable dataset. Here, we developed a classification protocol based on three categories of qualities: high (on-axis UCs, with more than two detectable pulses; no overlapping with other clicks), medium (on-axis with less than two detectable pulses or off-axis with more than two detectable pulses; no overlapping with other clicks) and low (failing to meet other criteria). Following this protocol, ~24,000 clicks from 12 recordings of four individuals, collected between 2008 and 2024 by Tethys Research Institute in the Pelagos Sanctuary area (Northwestern Mediterranean Sea), were manually classified with Raven Pro 1.6. High and medium UCs represented 12% of the sample (respectively n=150 and n=2,812), while 88% (n=21,038) were low UCs. A balanced dataset of 10,000 UCs, including all the three categories, was obtained by augmenting high UCs through gaussian noise and random stretching. This dataset was used to train and validate the CNN model for classification, achieving 95.8% training accuracy and 94.3% validation accuracy. Although further optimization is needed, the successful classification into three categories represents a first step towards automatic IPI estimation. Future work will involve testing CNNs for IPI calculation and associated measurement error. This approach can potentially increase data usability while reducing processing time, facilitating studies on sperm whale body size across diverse populations.



ET-06. Improving cetacean body length estimation using aerial photogrammetry: addressing the impact of body curvature and surfacing variability

Gende, Anxo ^{1,2}; Sechi, Alberto Demetrio ^{2,3}; Borroni, Anna ^{2,3}; Moulins, Aurelie ^{2,3}; Tepsich, Paola ^{2,3}; Grossi, Francesca ^{2,3}; Correia, Mafalda ¹; Rosso, Massimiliano ^{2,3}

1. Interdisciplinary Centre of Marine and Environmental Research, University of Porto (CIIMAR/CIMAR LA), Matosinhos, Portugal
2. International Centre for Environmental Monitoring (CIMA Research Foundation), Savona, Italy
3. NBFC, National Biodiversity Future Center, Palermo, Italy

Aerial photogrammetry is an effective non-invasive method for measuring cetacean body parts. However, cetaceans often display body arching and rolling while surfacing, which can lead to inaccurate measurements, as the animal may appear shorter in the frame than it actually is due to the effects of body curvature and foreshortening. Nevertheless, many traditional photogrammetry studies use the largest single measurement from a photo for total body length estimation. While this method can work for some slow-moving species, it does not work for many others, leading to measurement errors. To address this gap, this study analyzed photogrammetry readings from different video frames during the animal's surfacing. Overall, 53 breathing events from 20 different goose-beaked whales (*Ziphius cavirostris*) were investigated, for a total of 3178 video frames analyzed. For each breathing event, we compared the largest total body length value (TBL) obtained from a single photo with the composite total body length (CTBL) calculated from measurements of different body parts across multiple frames of the same event. We intend to present a detailed workflow of the measurement process to make it easily replicable for other researchers. Results indicate that CTBL provides a more accurate total body length estimation and is statistically larger than TBL (mean=1.084; se=0.03; p-value=0.02). Reliable CTBL can be obtained by summing three different measurements: snout-blowhole (SB), blowhole-dorsal fin (BD), and dorsal fin-fluke trailing edge (DF), taken in different phases of the surfacing. Statistical tests indicate that optimal SB, BD, and DF measurements were obtained during the first third (0-0.3), the middle (0.4-0.7), and the final part (0.9-1) of the surfacing, respectively. Finally, there were no statistical differences in duration between the pre-dive breathing event and the others during the same surfacing period, suggesting that any breathing event can be randomly selected without affecting the results' accuracy.



ET-07. The use of UAV photogrammetry to study phocids body size and weight: refining methods

Poldner, Alyssa ¹; Glarou, Maria ²; M. Granquist, Sandra ³; Henneman, Judith ¹; Rubio-Garcia, Ana ⁴; H. Rasmussen, Marianne ²

1. Department of Wildlife Management, Van Hall Larenstein University of Applied Sciences, Leeuwarden, The Netherlands
2. Húsavík Research Centre, University of Iceland, Húsavík, Iceland
3. Marine and Freshwater Research Institute, Hafnarfjörður, Iceland, The Icelandic Seal Center, Hvammstangi, Iceland
4. Veterinary and Research Department, Sealcentre Pieterburen, Pieterburen, The Netherlands

Phocids serve as critical indicators of ecosystem health, with body mass reflecting adaptations to environmental changes such as temperature and resource availability. Traditional methods for studying seal morphometrics, such as physical capture and handling, are invasive and stress-inducing. In contrast, aerial photogrammetry has emerged as an ethical and effective alternative, with several studies, demonstrating the accuracy and reliability of non-invasive UAV photogrammetry to measure marine mammals. In this study we aimed to validate the precision and accuracy of this method by comparing the UAV measurements of harbour and grey seal pups with empirical measurements obtained through handling of rehabilitated seals. In April 2024, true measurements of two harbour seals (*Phoca vitulina*) and four grey seals (*Halichoerus grypus*) housed at Sealcentre Pieterburen were collected and compared with UAV-derived estimates of length, axillary girth, and weight. A DJI Inspire 2 UAV equipped with a DJI Zenmuse X5S camera, an Olympus M.Zuiko 45mm f1.8 lens, and a laser rangefinder, captured photographs at altitudes of 40–100 meters under controlled conditions, with animals lying on flat surfaces. The drone images were processed using a three-step workflow: filtering, grading, and measurement extraction. Measurement precision was assessed through repeated measurements within- and between- images of the same individuals. To model the cross-sectional body shape of harbour and grey seals, we estimated the height-width-ratio across the body of each species, which allowed for accurate calculations of body volume. Body mass was estimated using species-specific body density derived from published data, with preliminary results showing a marginal variance between true measurements and UAV-derived estimations, indicating high accuracy. These findings highlight UAV photogrammetry as a reliable, non-invasive tool for assessing seal body condition, offering a practical and ethical alternative for wildlife monitoring and conservation efforts.



ET-08. Advancing cetacean behavioral research: first implementation of a drone survey protocol for bottlenose dolphins in Montenegro

Lingenfelder, Lena ¹; Akkaya, Aylin ²

1. Ghent University (International Masters of Marine Biological Resources) Marine Mammals Research Association (DMAD) and the Montenegro Dolphin Research (MDR)
2. Marine Mammals Research Association (DMAD) and the Montenegro Dolphin Research (MDR)

Integrating drone surveys into cetacean research enhances our understanding of behavior, group cohesion, and health status. In the Adriatic Sea, bottlenose dolphins (*Tursiops truncatus*), the region's only regularly observed coastal species, have been the focus of extensive behavioral studies. This study evaluates drone technology's potential to refine behavioral observations and investigates differences between traditional visual methods and drone-based data collection. From April 9 to May 25, 2024, land-based surveys were conducted along the entire Montenegrin coastline. Behavioral data from visual observers were recorded using standardized spreadsheets, independent of the drone operator's observations. When dolphins were sighted, the drone was deployed and flown at an altitude above 30 meters to minimize disturbance. The footage was analyzed to document group composition, behavior, and individual counts, facilitating direct comparisons with land-based observations. A total of 24 land surveys were conducted, with dolphins observed in only eight instances. Behavioral data from both methods were compared across five matched survey days, yielding 42 minutes of drone footage. Despite differing sampling intervals (20 seconds for drones vs. 5 minutes for land-based), both methods showed strong agreement in detecting travel-related behaviors (66.7% drone vs. 65.4% land-based), with traveling identified as the predominant behavior (39.7% drone vs. 44.2% land-based). Drone surveys exhibited greater sensitivity in detecting social behaviors (7.1%) and fine-scale behavioral transitions. Findings indicate that while both methods effectively capture primary behavioral states, drones uniquely reveal complex behaviors such as socializing, courtship, and defecation, absent in land-based observations. This study marks the first implementation of a drone survey protocol in Montenegro, providing valuable insights into dolphin behavior. A standardized framework, detailing procedures and guidelines, has been successfully developed for long-term monitoring. The study results underscore the potential of drones in cetacean research, supporting their integration into monitoring and conservation strategies to enhance data accuracy and ecological understanding.



ET-09. A field-deployable reverse transcription insulated isothermal PCR (RT-iipcr) for the global surveillance of morbillivirus infection in cetaceans

Hsieh, Cheng Chen ¹; Lattao, Chricel ²; Hsieh, Meng Jung ¹; Yang, Wei Cheng ¹

1. *School of Veterinary Medicine, National Taiwan University, Taipei, 10617, Taiwan*

2. *Institute of Biology, University of the Philippines-Diliman, Quezon City, 1101, Philippines*

Morbillivirus infection poses a global zoonotic threat of significant concern to veterinary and public health. The aim of this study is to develop a rapid and portable detection method for cetacean morbillivirus (CeMV) to enable broader detection and address information gaps in certain regions. Current CeMV detection methods have several disadvantages, including high technical requirements, the need for specialized equipment, and the reliance on skilled personnel. These challenges are compounded by issues such as sample degradation during transportation. Reverse Transcription Insulated Isothermal PCR (RT-iiPCR) offers a solution to these obstacles. It has advantages such as being rapid, portable and can be used on RNA detection, its relatively simple procedure allows it to be conducted without highly trained technicians. Therefore, RT-iiPCR is an ideal on-site diagnostic tool. In this study, we designed a universal primer and probe set based on published P-gene sequences of CeMV, including DMV, BWMV, PWMV and PMV. Custom synthetic RNA fragments were used to test the analytical sensitivity of the RT-iiPCR, while clinical sensitivity was assessed using tissue samples spiked with RNA templates. The detection method was further validated using CeMV-positive formalin-fixed paraffin-embedded (FFPE) samples, as well as stranded cetacean samples collected around Taiwan in 2024. The performance evaluation of the RT-iiPCR showed substantial agreement with RT-qPCR. CeMV-positive FFPE samples from Brazil, Spain, and Hawaii, were detected CeMV positive in all samples by RT-iiPCR. The Ct values ranged from 23 to 32, indicating that RT-iiPCR is reliable and capable of detecting even mild infections. CeMV surveillance is crucial not only for understanding its epidemiology but also as an indicator of overall ocean health. Therefore, the CeMV RT-iiPCR detection method developed in this study is essential for early detection and mitigation of adverse impacts of CeMV infections on cetacean populations.



ET-10. Advancing cetacean classification utilising neural networks and time domain acoustic data from click trains

Duffield, Callum ¹; Tregenza, Nick ¹

1. *Chelonia Limited*

This study aimed to enhance existing classification methods by utilising time-domain features from click trains as inputs to single-layer neural networks (SLNNs). Click trains (N = 184647) were manually categorized and validated using the FPOD app into three classes: trains from Narrow Band High Frequency species (NBHF), trains from Other Cetacean species (OtherCet), and trains from Sonars. We extracted 185 time-domain features from these click trains to train the SLNNs and used both click-level and train-level raw data and derivatives. Preliminary results show that models with train level data outperform those without and that models containing selected derivatives also outperformed models containing raw data alone. The models produced achieved F1 scores of up to 0.96, with false positive rates as low as 0.9% for OtherCet and 1.0% for NBHF. These results approach the performance of the KERNO-F classifier. This work demonstrates the potential of integrating time-domain features with neural networks to achieve rapid, accurate, and scalable cetacean classifications with minimal human intervention. Future studies should explore the use of more complex convolutional and multi-layer networks to capture intricate feature dynamics.



ET-11. Interactive visualization of research projects with R-Shiny based on a by-catch study

Bittelli, Davide ¹; Rasim, Jonas ¹; Taugnitz, Tim ¹; Dähne, Michael ²; Denking, Judith ¹

1. *Deutsches Meeresmuseum*
2. *German Federal Agency for Nature Conservation (BfN)*

Presenting research results and project setups can be challenging, particularly when the project pipeline involves multiple stages, such as data preparation, exploration, modeling, or other specific analyses. However, presenting data in an understandable and easily accessible manner fosters transparency, creates new research opportunities, and is essential in times of fake news. To address this, an interactive dashboard, built using the shiny and golem packages in R, has been developed to enhance the visualization and communication of research findings of the PAL-CE project by the Deutsches Meeresmuseum. The project investigates the impact of Porpoise ALerts (PAL) on harbour porpoises in the Baltic Sea. PAL was designed to mitigate bycatch by emitting artificial, porpoise-like sounds to increase the animals' echolocation activity. The dashboard provides a user-friendly platform to navigate the project's description, experimental setups, enables data exploration, and explores modeling results. It transforms several multilayered research datasets into accessible formats for stakeholders, authorities and researchers. Data from four field campaigns over three years in Denmark and Germany, was collected using up to 17 FPODs and 4 Soundtraps for up to three months per campaign. These devices monitored porpoises under three scenarios: no treatment, gillnet, and gillnet with PAL. Given the complexity and volume of data from these devices, presenting the results in a static format would have been extremely challenging, reinforcing the need for an intuitive and interactive visualization tool. The acoustic and environmental datasets were analyzed with generalized additive models to evaluate the impact of different variables. Current results suggest that PAL significantly increases porpoise click rates near fishing nets, effectively alerting the animals without displacing them from the area. This R-based dashboard not only showcases the effectiveness of the PAL but also demonstrates how interactive tools can streamline the presentation of complex ecological studies by enabling easily accessible insights.



ET-12. Connecting the dots: citizen science for conservation

Wyss, Virginie ¹; Conne, Arnaud ²; Bouveret, Laurent ³; Wenzel, Frederick ⁴; López Suarez, Pedro ⁵; Betancourt, Liliana ⁶; Bedall, Kim ⁶; Frediani, Jodi ⁶; Lubansky, Tanja ⁴; Jones, Lindsey S. ⁴; Chosson, Valerie ⁷

1. *Marine Observer, La Réunion.*
2. *ATLAS EXPEDITIONS Suisse.*
3. *Observatoire des Mammifères Marins de l'Archipel Guadeloupéen - OMMAG*
4. *Allied Whale, College of the Atlantic, Bar Harbor, ME USA 04609)*
5. *Bios CV, Sal-Rei, Boa Vista, Republic of Cape Verde*
6. 6.
7. *Marine and Freshwater Research Institute, Hafnarfjörður, Iceland*

For more than 52 years, the North Atlantic Humpback Whale Catalog (NAHWC) has identified more than 12,000 humpback whale (*Megaptera novaeangliae*) individuals based on their fluke ventral side image. Over the span of half a century, five feeding grounds located in the Arctic and sub-Arctic waters (namely Norway and Iceland in the Eastern North Atlantic, and West Greenland, Canada and the Gulf of Maine in the western North Atlantic) and 3 breeding grounds located in the tropical waters of the North Atlantic ocean (namely the Cabo Verde Islands (CVI) for the East, and the Lesser Antilles and the Greater Antilles for the West) have been identified. Based on historical data, their interconnectivity follows a clear pattern. The Western feeding grounds have connection with only the Western breeding grounds, while the Eastern feeding grounds have connection with all known breeding grounds on both sides of the North Atlantic Ocean. In recent years, Atlas Expeditions (non-governmental organization, NGO) coordinated two expeditions off the western coast of Greenland. A total of 48 humpback whale individuals were identified: 25 during the Glacialis expedition (2021) and 23 during the Sila expedition (2023). All data collected during these expeditions were shared with a team of international scientists. We report here, 9 connections between the West Greenland feeding ground and all the known breeding grounds of the North Atlantic (Recapture rate of 18%), Samana Bay and the Silver Bank for the Greater Antilles, Guadeloupe for the Lesser Antilles and the endangered breeding population of CVI. This case emphasizes the value of citizen science and NGO support in data collection in a rapidly changing environment. Our knowledge of West Greenland humpback whale migratory dynamics has been challenged by these expeditions, as is our understanding of the humpback whale migration patterns in the North Atlantic Ocean.



ET-13. Low-impact cetacean monitoring: advancing land-based drone methods for cetacean research in Iceland

Dodds, Flordespina ¹; Stoller, Alyssa M. ¹; Robinson, Abigail ¹; Ward, Jessica ¹; Slavík, Petr ¹; Røsand, Synnøve ¹; Laute, Amelie ¹; Grove, Tom ¹

1. Whale Wise, Swansea, SA3 1LB, UK

In areas with coastal cetacean occurrence, deploying Unoccupied Aerial Vehicles (UAVs, drones) from land platforms offers distinct advantages over vessel-based deployment. Since 2021, Whale Wise has conducted almost exclusively land-based drone operations in northern Iceland, collecting aerial images for body condition and scar assessment, and blow samples to monitor humpback whales (*Megaptera novaeangliae*). This operation requires at least three researchers on-site, we have used three DJI drone models (Phantom 4 Advanced, Phantom 4 Pro V2.0 and Mavic 3) to complete over 670 hours of drone operation and have captured aerial images of over 275 individual whales. Land-based drone flights enabled us to survey whales up to four kilometres from shore, capturing both body condition and high-quality fluke identification (ID) images. Results demonstrate that this method is highly effective for obtaining paired aerial and ID images of coastal whales, making it a practical alternative to boat-based operations. Advantages of this method include reduced disturbance to whales by eliminating boat noise and proximity, lower carbon emissions from decreased fuel use, and significantly reduced operational costs. However, land-based operations are subject to varying local UAV regulations (including requirements for special authorisation) and demand extensive training and effective multi-crew coordination to guide the drone operator, track target animals, and monitor potential disturbance. Despite these challenges, this approach offers a promising, feasible, and sustainable option for long-term cetacean research in coastal environments.



ET-14. Applying natural capital thinking to marine mammals

Parker, Samantha ¹; Milner, Emma ¹

1. *Natural England*

Natural Capital describes the parts of our environment that have value to people, these can be direct or indirect and can include ecosystems, species, oceans, as well as natural processes and functions. The natural capital assessment approach focuses on defining and quantifying ecosystem service benefits. As Natural Capital assets, marine mammals are defined through assessment of quantity (abundance), quality (health and condition) and location (distribution). In addition, they generate direct economic benefits through the ecosystem services they provide. These fall into three categories: Provisioning, Regulation and Maintenance, and Cultural services. We reviewed existing evidence for English inshore marine mammals in order to understand what evidence was available for Natural Capital Assessments, and to inform future evidence collection. This consisted of a rapid review of literature relating to ecosystem services, and a review of monitoring projects within English waters to obtain data relating to marine mammals as ecosystem assets. The review found significant evidence gaps across both ecosystem assets and services, and therefore their natural capital value, resulting in a risk to marine mammals from a lack of informed policy and management decision-making. Enhancing our understanding will provide evidence that will be central to our ability to make management decisions through applying natural capital approaches. Recommendations were given to close these knowledge gaps for assets and services, which have since been consolidated into an integrated evidence collection project using a Natural Capital and Ecosystem Assessment approach, through a Defra funded programme of work. The new evidence will allow the application of natural capital and ecosystems approaches for marine mammals, and in turn support their active conservation through informed decision-making.



ET-15. Estimating body volume evolution of fin whales in the Catalan coast (NW Mediterranean) feeding ground

Mészáros, Dorottya ¹; Tort, Beatriu ¹; Degollada, Eduard ¹

1. EDMAKTUB Cetacean Research Assosiation

The body volume (BV) is an indicator of the nutritional status of fin whales (*Balaenoptera physalus*). Due to the annual migration and the seasonal feeding pattern the body volume fluctuates over time. During the feeding season the whales must accumulate sufficient energy storage for the migration and reproduction. This temporal variation reduces or increases the relative body mass in a relatively short amount of time and therefore affects the fitness and survival rate. The objective of the study was to analyse the body volume evolution of fin whales over three consecutive foraging seasons between 2021 and 2023, both on individual and population level in the Catalan coast feeding ground, located in the Northwestern Mediterranean Sea. Drone based aerial photogrammetry is an accessible and non-invasive method for precise morphological data collection of free-ranging cetaceans, and was employed in this study to monitor volumetric changes over time. The morphometric and volumetric estimates were calculated with the MoprhoMetriX and CollatriX softwares. In total, 1099 still images were analysed during the project, depicting 82 individuals. The results from the BV measures revealed differences of the relative foraging success and energy replenishment of the incoming whales during the three examined seasons. Where the year 2021 and 2022 obtained a 2.5 magnitude higher mean BV than 2023. The individual resighted animals within the same season showed relative increase of their BV, with a BV gain rate of 0.05 m³ per day. Consequently, inter-annual and intra-annual volumetric comparison provides a comprehensive understanding of the seasonal trends of energy storage and bioenergetics of the fin whales that congregate at the Catalan feeding ground. Additional research is necessary to obtain a more holistic understanding of the population health and dynamics of fin whales in the Northwestern Mediterranean Sea.



ET-16. The digital laboratory: an impact collaborator for the artist/scientist

Putnam, Barbara P ¹; Bundone, Luigi ^{1,2}; Pajana, Giulio ²; Hollingsworth, Janet ³; Fredin, Zachary ⁴; Nepovinnykh, Ekatarina ⁵; Kunnasranta, Mervi ⁶; Niemi, Marja ⁶; Baimukanova, Assel ⁷; Goodman, Simon ⁸

1. *Archipelagos-ambiente e sviluppo, Italia, USA*
2. *Ca'Foscari University of Venice, IT*
3. *Fabrication Center at The Metro, Kingston, NY, USA*
4. *The Possible Zone, Boston, MA USA*
5. *Lappeenranta-Lahti University of Technology, FI*
6. *University of Eastern Finland, FI*
7. *Al-Farabi Kazakh National University, KZ*
8. *University of Leeds, UK*

Art/science collaboration balancing beauty with scientific data can result in innovative approaches to communication. An ongoing project involved makerspaces to convey habitat and identification data of the threatened Saimaa ringed seal (*Pusa hispida saimensis*), Caspian seal (*Pusa caspica*) and Mediterranean Monk seal (*Monachus monachus*) in artistic quilts. “Makerspaces” are physical spaces housing cutting edge design software and computer-driven fabrication machinery. Such labs encourage exploration across disciplines with materials and processes. Extensive technical support frees the user to think broadly and learn from others using the space. We explored processes to generate materials for use in constructing quilted art, incorporating elements derived from photographs including habitat and photo ID images of the three seal species. Converted high contrast camera-trap images of the identified Saimaa seal Phs050, were sent to a Zund G3XL Flatbed Cutter. The positive and negative wood cuts resulting in the exact fur patterns of the seal at near life-size is a task nearly impossible to accomplish free hand. The woodcuts were then used for traditional ink printmaking onto fabric. High contrast images were also sent to a vinyl cutter, affixed on plexiglass and exposed to the sun with cyanotype chemistry on cotton. Additionally, a Brother GTXpro Garment Printer used in the clothing industry, printed images of all three pinniped species, including camera traps, aerial photographs of seals, and seal habitats, experimenting with differing cellulose fibers. Then the printed fabrics were sent to the Zund Cutter to obtain precise squares which can afterward be sewn into quilts. This evolving project exemplifies the capability of makerspaces to provide access to advanced technological tools, fostering richer artistic expression to eventually reach greater public connection at the art and science interface.



ET-17. Marine Mammal research outputs from mNCEA programme

Milner, Emma ¹; Parker, Samantha ¹

1. Natural England

A Natural Capital Assessment looks at natural assets (i.e. habitats and species) to define and quantify the ecosystem services and benefits they provide. In 2022, we reviewed what evidence existed for English marine mammals that could be used in Natural Capital Assessments. This review found significant evidence gaps in the knowledge of inshore marine mammals. To address this an integrated evidence collection programme was undertaken. This three-year marine Natural Capital Ecosystem Assessment (mNCEA) programme funded by Defra, focused specifically on marine natural capital assets. The aim of the programme was to provide a robust evidence base gathering ecological, economic, and societal information to increase understanding of our English marine environment. The monitoring and data collection undertaken throughout the programme has included both emerging and existing technologies to provide the following marine mammal research outputs; 1). Principal considerations when designing environmental DNA (eDNA) studies for marine mammals and when interpreting their results for species monitoring or management. 2). Acoustic monitoring data which has improved understanding of cetacean presence and foraging behaviour along the Northeast coast of England. 3). A study on how Artificial Intelligence can be an effective tool to analyse aerial and drone imagery of seal colonies. 4). An understanding of the contribution of abundant UK marine mammals in nutrient cycling and how this might contribute to the wider ecosystem. 5). An economic study of the cultural values of two marine mammal species common in English waters. 6). A Photo ID study to determine a baseline estimate of abundance for bottlenose dolphin along the Northeast coast of England. This new evidence collected across the three years of the programme will contribute to the application of natural capital and ecosystems approaches for marine mammals, and in turn support their active conservation through better informed management and policy decisions.



ET-18. Assessing the effectiveness of acoustic indices in measuring bottlenose dolphin depredation on fishing nets

La Manna, Gabriella ¹; Perretti, Francesco ²; Ronchetti, Fabio ²; Montanari, Anna ²; Ceccherelli, Giulia ¹

1. *University of Sassari - National Biodiversity Future Center*

2. *MareTerra - Environmental Research and Conservation*

Marine mammal depredation on fishing gear poses significant challenges, including economic losses and the potential for accidental bycatch. Understanding the mechanisms underlying depredation is critical for developing effective mitigation strategies. Passive acoustic monitoring (PAM) systems have proven to be highly effective tools for detecting the presence of dolphins near fishing nets, utilizing the acoustic signals they emit, such as echolocation clicks and communication whistles. While effective, the manual analysis of long-term acoustic recordings is resource-intensive, requiring substantial time, human effort, and financial investment. Automated acoustic analyses present a promising alternative, enabling faster processing while maintaining high detection accuracy. In this study, we evaluate the utility of acoustic indices—specifically the Bioacoustic Index, Entropy, Acoustic Diversity Index, Acoustic Evenness Index, and Acoustic Complexity Index—as tools for quantifying dolphin depredation on fishing gear. The analysis was conducted on 124 acoustic files recorded in Sardinia (Western Mediterranean Sea). By comparing the values of these indices in the presence of echolocation clicks and whistles to those from control recordings without dolphin acoustic presence, we assessed the effectiveness of these acoustic indices in distinguishing depredation events. This approach highlights the potential of acoustic monitoring and automated analysis using acoustic indices to improve fisheries management practices and enhance marine conservation efforts.



ET-19. Narwhals document atlantification of East Greenland

Sun, Qingchuan ^{1,2}; Chambault, Philippine ^{3,4}; Sørensen, Helle ¹; Andresen, Camilla ⁵; Ditlevsen, Susanne ¹; Heide-Jørgensen, Mads Peter ⁶

1. *Data Science Lab, Department of Mathematical Sciences, University of Copenhagen, Copenhagen, Denmark*
2. *Data Science Group, Faculty of Business Administration and Economics, Bielefeld 12 University, Bielefeld, Germany*
3. *Greenland Institute of Natural Resources, Strandgade 91,2, DK-1401 Copenhagen K, Denmark*
4. *Department of Ecology and Evolutionary Biology, The University of California, 1156 High 7 Street, 95064 Santa Cruz, CA, United States*
5. *GEUS, Copenhagen, Denmark*
6. *Greenland Institute of Natural Resources, Strandgade 91,2, DK-1401 Copenhagen K, Denmark*

An innovative strategy for surpassing traditional ship-based oceanographic surveys involves the utilization of animal-borne recorders to gather data from hard-to-access ocean regions, such as the Arctic. In this study, satellite-linked instruments were temporarily attached to the dorsal ridge of 6 narwhals (*Monodon monoceros*) between 2017 and 2019 [1]. These instrumented narwhals collected over 2000 high-resolution temperature and salinity profiles, including measurements from depths exceeding 1500 m. Combined with standard oceanographic data from the World Ocean Database, these profiles provide insight into the influx of Atlantic Intermediate Water (AIW) along East Greenland. In the Blosseville Basin, starting from depths of 150 m and below, AIW begins to extend toward the East Greenland coast and below 250 meters, AIW becomes the dominant water mass, with minimal influence from Polar Water at these depths with a temperature increase of 0.04°C per year above 500 m between 1960 and 2021. Notably, temperatures and salinities near glaciers in Scoresby Sound and Kangerlussuaq were significantly higher than those near the shallower Blosseville Coast. Summer iceberg discharge correlated strongly with elevated sea temperatures and salinities below 200 m, highlighting an overall increase in influence by AIW in the Blosseville Basin and in East Greenland's coastal areas. [1] East Greenland narwhals were selected for this study because they are ice-associated species and, as such, meet the dual condition of being primarily affected by changes in ice cover and being good indicators of such changes. Since 2020, tagging has ceased due to the critical conservation status of this population.



ET-20. High-resolution UAV video recordings show that dolphins change group cohesion in response to experimental swim-with-dolphin activities São Miguel, the Azores, Portugal

Al Abbar, Fadia ^{1,2,3}; Fiori, Lorenzo ^{3,4}; Eikelboom, Jasper A J ^{1,5}; Visser, Fleur ^{6,7,8}; Grundlehner, Anne¹; Lodder, Anne¹; O'Callaghan, Sean ^{3,9}; Gonzalez Garcia, Laura ^{3,10}; Aarts, Geert ^{1,11}; van Langevelde, Frank ¹

1. *Wildlife Ecology and Conservation Group. Wageningen University and Research, Wageningen, the Netherlands*
2. *Behavioural Ecology group. Wageningen University and Research, Wageningen, the Netherlands*
3. *Azores delphis project, São Miguel, Azores, Portugal*
4. *Department of Life Science, Texas A&M University-Corpus Christi, Texas, United States of America*
5. *of Geo-information Science and Remote Sensing. Wageningen University and Research, Wageningen, the Netherlands*
6. *Kelp Marine Research, den Hoorn, the Netherlands*
7. *Department of Freshwater and Marine Ecology, University of Amsterdam, the Netherlands*
8. *Department of Coastal Systems, NIOZ (Royal Netherlands Institute for Sea Research), t'Horntje, the Netherlands*
9. *Marine & Freshwater Research Centre, Department of Natural Sciences, Atlantic Technologic University, Galway, Ireland*
10. *The Institute of Marine Sciences – OKEANOS, Faial, Azores, Portugal*
11. *Wageningen Marine Research, Den Helder, the Netherlands*

Social group cohesion can identify anti-predator tactics, since it is a protection measure in group living animals. Changes in group cohesion have been documented in dolphins exposed to vessel-induced disturbance which indicates a potential fear response. Dolphin group cohesion has previously been analyzed qualitatively since obtaining fine-scale spatial data for highly mobile dolphin species is inherently challenging. Unoccupied aerial systems (UAS) provide a platform from which inter-individual distances (IID) (cm) can be accurately quantified. Georeferenced images enable the estimation of the geo-location of each dolphin within the frame. However, current state-of-the-art methods involve annotating each individual per frame manually which is extremely time consuming, especially for large dolphin aggregations in videos with high frame rates. In this study we flew a UAS at 60m altitude to investigate wild common dolphin (*Delphinus delphis*) group cohesion in response to experimental exposures to swim-with-dolphin vessel approaches in between 2021-2023 in São Miguel, Azores. Dolphins were manually labeled in ~hundred frames to train a machine learning model (yolov5) for the automatic detection of each dolphin in 177 videos at 1 fps (total



104,820 frames) with a 0.86 average precision. The mean IID was used as a proxy for dolphin group cohesion. The effect of parallel-vessel approach, dropping swimmers parallel to the dolphins' swimming path (parallel-approach) and repeated J-vessel approaches dropping swimmers in front of the dolphins' swimming path (J-approach) on the mean IID was tested. Results show that dolphin groups decreased their mean IID during the J-approach. The mean IID also decreased during the parallel-approach after a J-approach was conducted, but not if the parallel-approach was conducted first. This indicates that a J-approach has a stronger effect on group cohesion. Identifying when dolphins respond to different boat approaches is essential information for informed management decisions aiming to limit the effects of tourism on delphinids.



Genetics and Evolution



GE-01. Integrating environmental DNA (eDNA) in a population structure study advances our knowledge on bottlenose dolphins (*Tursiops truncatus*) in Irish waters

Griffin, Bogna ¹; De Bonis, Lorenzo ²; O'Callaghan, Sean ³; Daly, Mags ⁴; Berrow, Simon ⁴; Mirimin, Luca ³

1. Marine Institute, Rinnville, Oranmore, H91 R673 Co. Galway, Ireland
2. School of Biological Earth and Environmental Sciences, Department of Zoology and Ecology, University College Cork, Distillery Field North Mall, Cork, Ireland
3. Marine & Freshwater Research Centre, Atlantic Technologic University, Dublin Road, H91 T8NW, Galway, Ireland
4. Irish Whales and Dolphin Group, Merchants Quay, Kilrush, Co. Clare, Ireland

Multiple population genetic studies on bottlenose dolphins have been carried out in Ireland and adjacent NE Atlantic waters. However, while these studies have advanced significantly our understanding of population structure, the numbers and location of sampled individuals are often limited to stranding events or biopsy samples, that are invasive to acquire and difficult to gain a licence for. In this study, eDNA sampling was implemented to expand the number and range of samples available, in particular from areas that were underrepresented in previous studies. Between the 18th and 24th of July 2021 a total of 25 eDNA water samples and 9 blow samples were collected from the RV Celtic Mist during a Bottlenose dolphin survey within the Brandon and Tralee Bays, Co. Kerry and the mouth of the Shannon Estuary. Samples of 5L of water were filtered directly from the sea, in proximity of bottlenose dolphins, using tubing weighted with a steel weight suspended from the moving vessel. Blow samples were collected by placing a glass fibre filter inside a petri dish mounted onto a telescopic pole positioned above the dolphin's blowhole while the animals were bow-riding. Presence of both mitochondrial and nuclear DNA was detected in 6 out of the 25 eDNA samples and in one of the blow samples. Population structure analysis, using mtDNA haplotypes (Dloop) and microsatellite data, assigned all the eDNA sampled individuals to the population resident in the Shannon Estuary Special Area of Conservation (SAC). This population is characterized by high level of demographic and genetic isolation and thus insights on their movements outside of their home range, can be key for its conservation and management. To the best of our knowledge, this is the first study that has successfully integrated eDNA samples into a microsatellite-based population structure analysis in the marine environment.

GE-02. The missing link: what about Central Eastern Atlantic *Kogia* spp?

Pupillo, Graziella ¹; Martín Martel, Vidal ²; Fusar Poli, Francesca ²; Rota, Alessia ^{3,4}; Maggioni, Davide ^{5,6}; Ramazzotti, Fausto ⁵; Dumortier, Charlotte ⁷; Méndez-Fernandez, Paula ⁷; Torres-Pereira, Andreia ⁸; Sá, Sara ⁸; Brownlow, Andrew ⁹; ten Doeschate, Mariel ⁹; Galimberti, Andrea ⁵; Valsecchi, Elena ^{3,6}

1. University of Milano-Bicocca, Piazza della Scienza 1, 20126 Milan, Italy
2. Society for Study of the Cetaceans in the Canary Archipelago (SECAC), Arrecife, Lanzarote, Canary Islands, Spain
3. Department of Environmental and Earth Sciences, University of Milano-Bicocca, Piazza della Scienza 1, 20126 Milan, Italy
4. National Biodiversity Future Center (NBFC), 90133, Palermo, Italy
5. Department of Biotechnology and Biosciences, University of Milano-Bicocca, Piazza Della Scienza 2, 20126 Milan, Italy
6. MaRHE Center, Magoodhoo Island, Faafu Atoll, Republic of Maldives
7. Observatoire Pelagis, UAR 3462 La Rochelle Université/CNRS, 17000 La Rochelle, France
8. Department of Biology & CESAM & ECOMARE/CPRAM, Universidade de Aveiro, 3810-193 Aveiro, Portugal Portuguese Wildlife Society (SPVS) & Marine Animal Tissue Bank (MATB), Estação de Campo de Quiaios, 3081-101 Figueira da Foz, Portugal
9. Scottish Marine Animal Stranding Scheme (SMASS), Institute of Biodiversity, Animal Health & Comparative Medicine, Glasgow, G12 8QQ

The Kogiidae family remained almost completely unknown until the early 2000s, when new molecular approaches made it possible to investigate elusive and cryptic species. The two cosmopolitan species composing the family, the Pygmy Sperm Whale (*Kogia breviceps*) and the Dwarf Sperm Whale (*Kogia sima*), tend to be very elusive animals and rarely display active behaviour when breathing at the surface. Moreover, the two species share many morphological features. Thus, an effective way to study and differentiate the two congeneric species is by molecular screening. Two regions of the mitochondrial DNA have proved to be particularly informative and have been used in previous studies: part of the control region and part of the cytochrome B region. This study aims to fill the knowledge gap on the population structure of *Kogia*'s in the Central Eastern Atlantic and the Mediterranean Sea, marine regions that have been poorly studied to date. We had access to a relatively large sample set (n=39 *Kogia breviceps*; n=4 *Kogia sima*) collected from specimens stranded in the Canary Islands, Italy, Portugal, France and the UK. All samples were sequenced using slightly modified primers targeting the same two DNA fragments used in the scientific literature. The resulting sequences were aligned with those already available in the worldwide molecular database. Three cases (6,97%) of misidentification, i.e. carcasses attributed to one species, but molecularly assigned to the other congeneric species, were found. We performed a comprehensive global phylogenetic analysis, focusing on both intra- and inter-specific genetic diversity between these two species. The results obtained



for *Kogia breviceps* confirm an ongoing genetic flow between the oceans, while the small sample for *Kogia sima*'s supports previous findings showing isolation between Atlantic and Indo-Pacific populations.



GE-03. Species-specific assay for detecting and monitoring endangered sperm whales (*Physeter macrocephalus*) in the Mediterranean Sea

Pool, Rachel Vanessa ^{1,2}; Fernandez, Chloé ¹; García-Gallego, Alicia ¹; Brotons, José María ³; Raga, Juan Antonio ¹; Fraija-Fernández, Natalia ¹; Arcangeli, Antonella ⁴

1. Marine Zoology Unit, Cavanilles Institute of Biodiversity and Evolutionary Biology, Science Park, University of Valencia, Valencia, Spain
2. Island Biodiversity and Conservation (IBC) centre, University of Seychelles, Anse Royale, Mahé, Seychelles
3. Asociación Tursiops, Palma de Mallorca, Balearic Islands, Spain
4. ISPRA, National Institute for Environmental Protection and Research, Italy

The sperm whale, *Physeter macrocephalus*, is a deep diving species of odontocete that occurs in tropical, temperate, and polar waters around the globe. While present in most marine environments, it exhibits a preference for the deeper waters of the continental slope. In the Mediterranean Sea, current data provides evidence for the existence of a single subpopulation of sperm whales, genetically distinct from that of the Atlantic. Due to the Endangered status of the Mediterranean subpopulation, it is crucial to develop monitoring tools that can address the knowledge gaps resulting from the elusive nature of this species and that can be employed in areas where abundance data is limited. Here we detail the design and preliminary testing of a species-specific primer set to detect the presence of sperm whales in environmental DNA (eDNA) seawater samples. First, we designed the primer set using the control region (D-loop) of the reference sperm whale mitochondrial genome available from GenBank. After in silico testing using the GenBank database, the primers were then tested in vitro for specificity using ¹ sperm whale and fin whale (*Balaenoptera physalus*) tissue samples and ² in mock communities of marine vertebrates from the Mediterranean Sea at both normalized and unequal DNA concentrations. To start validating the applicability of this technique to eDNA samples, the primers were also used to amplify DNA from 12 faecal samples collected during sperm whale sightings. Future experiments involve testing these primers with seawater samples collected during sightings and in areas known to host a high abundance of this species. If successful, this technique presents a valuable survey method that could be used to rapidly assess sperm whale presence across the Mediterranean. Supported by Generalitat Valenciana through project CETABIOENA (CISEJI/2022/5). Project code: LIFE CONCEPTU MARIS (LIFE20 NAT/IT/001371)



GE-04. On the trail of bottlenose dolphins: active and passive eDNA monitoring give insights into metacommunity ecology in Southwest Ireland

Mariani, Giulia ^{1,2}; Griffin, Bogna ³; Daly, Mag ⁴; Mincarelli, Luana Fiorella ¹; Secondini, Barbara ¹; Di Domenico, Marco ¹; Bucciachio, Andrea ¹; Mangone, Iolanda ¹; Castelli, Pierluigi ¹; Di Renzo, Ludovica ¹; Cammà, Cesare ¹

1. Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale"(IZS Teramo), 64100 Teramo, Italy
2. Faculty of Bioscience and Agro-Food and Environmental Technology, University of Teramo, 64100 Teramo, Italy
3. Marine Institute, Rinville, Oranmore, H91 R673 Co. Galway, Ireland
4. Irish Whale and Dolphin Group, Merchants Quay, Kilrush, Co. Clare, Ireland

Environmental DNA (eDNA) is a cutting-edge and cost-effective tool for biodiversity monitoring. This study integrated eDNA analysis with photo-ID surveys of bottlenose dolphins (*Tursiops truncatus*) off the southwest of Ireland (Kilrush to Dingle) to evaluate protocols and explore marine mammals and fish co-occurrence. Seawater samples were collected aboard RV Celtic Mist in May 2024 during the Shannon Dolphin Project monitoring program (SDP). Upon sighting dolphins or other species of interest, 5L of surface water was filtered (0.45 µm) in triplicate, and a passive sampler ("metaprobe", Maiello et al., 2023) was deployed. The DNA extracted from filters and metaprobes with DNeasy Blood&Tissue and Powerwater kits (Qiagen) were pooled, and the DNA library was prepared by amplifying with primers targeting the 12s rRNA gene for fish (tele02, MiFish) and marine mammals (MarVer1) (Taberlet et al., 2018; Miya et al., 2015; Valsecchi et al., 2019). Sequencing was conducted on Illumina Next2000 (600 cycles), and data were analyzed with Vsearch. *T. truncatus* was detected with tele02 primer confirming the 12 sightings (10/12 filters, and all metaprobes). Unexpectedly, during the sighting of four common dolphins (*Delphinus delphis*), only *T. truncatus* was detected (filter RRA 10.29%, metaprobe RRA 3.84%), suggesting a potential species assignment mismatch. In the case of three basking sharks (*Cetorhinus maximus*), DNA was detected only via metaprobe (RRA 0.16%), highlighting its potential as an alternative to traditional filtering. Surprisingly, the tele02 outperformed MiFish and MarVer1 in detecting fish (*Sardina pilchardus* and *Scomber scombrus* in 50% of the sightings) and marine mammals. This study confirms the reliability of our eDNA protocols in natural conditions. The data could also provide insights into local metacommunity ecology and interspecific interactions, which remain poorly explored in the area.



GE-05. Correlation between whistles variability and phylogenetic distance in Mediterranean delphinids (Delphinidae)

Quaranta, Miriana ¹; Labriola, Maria Silvia ²; Stefani, Matteo ³; Pascarella, Stefano ¹; Pace, Daniela Silvia ⁴

1. Department of Biochemical Sciences “A. Rossi Fanelli”, Sapienza University of Rome, Italy
2. Department of Biology, University of Rome Tor Vergata, Rome, Italy Echoes - Capitoline Centre for Marine Research - ETS, Rome, Italy PhD program in Evolutionary Biology and Ecology, University of Rome Tor Vergata, Italy
3. Department of Biology, University of Rome Tor Vergata, Rome, Italy PhD program in Evolutionary Biology and Ecology, University of Rome Tor Vergata, Italy
4. Department of Environmental Biology, Sapienza University of Rome, Italy CNR - Institute for the Study of Anthropogenic Impacts and Sustainability in the Marine Environment - Capo Granitola Unit, Torretta Granitola, Trapani, Italy

Whistles are found in the vocal repertoire of most delphinids (Cetacea: Delphinidae) and may encode species and population identity, with acoustic similarities potentially reflecting phylogenetic relationships. This study is the first to correlate species-specific whistles characteristics and genetic distance in the five dolphin species regularly observed in the Mediterranean Sea (Dd: *Delphinus delphis*, Gg: *Grampus griseus*, Gm: *Globicephala melas*, Sc: *Stenella coeruleoalba*, Tt: *Tursiops truncatus*), to determine whether vocalizations follow a similar evolutionary trajectory. Mitochondrial gene sequences 12S, 16S, and cytochrome c oxidase subunit I (cox1) were retrieved from online databases (e.g. GenBank). Six acoustic parameters (e.g., max and min frequency, duration) of whistles were gathered from the available literature. We performed pairwise comparison between sound divergence and genetic diversity. Specifically, genetic distance matrix was obtained using the Kimura two-parameter (K2P) method (bootstrap variance estimation, 1000 replications) based on the concatenated dataset for all used molecular markers. Acoustic distance matrix was built from the species' means of acoustic parameters using hierarchical clustering based on Manhattan distances. In the reconstructed phylogenetic tree, Dd, Sc and Tt formed a distinct clade, separate from Gg and Gm, highlighting an evolutionary divergence between the Delphininae and Globicephalinae subfamilies. Most species pairs (e.g., Gm - Tt and Dd - Sc) exhibited relatively consistent patterns in both genetic and acoustic divergences. However, Gg showed large differences in acoustic distances compared to genetic distances with all other dolphin species, being phylogenetically close to Gm, while emitting whistles acoustically similar to Tt. While a correlation exists between genetic and acoustic distances, whistles diversity does not always mirror genetic divergence, suggesting that acoustic signals of delphinids may be shaped by factors beyond genetics, such as environmental, ecological, or social conditions.



GE-06. Genetic investigation of Cuvier's beaked whale, *Ziphius cavirostris* on the northern coast of Cyprus based on mtDNA sequences

Tonay, Arda M. ¹; Taşkaya, İlayda ²; Aygün Karaçay, Hatice ³; Danyer, Erdem ⁴; Dede, Ayhan ¹; Çanakcı, Tayfun ²; Amaha Öztürk, Ayaka ¹; Bilgin, Raşit ³

1. Istanbul University, Faculty of Aquatic Sciences / Turkish Marine Research Foundation (TUDAV)
2. Cyprus Wildlife Research Institute
3. Boğaziçi University, Institute of Environment Sciences
4. Turkish Marine Research Foundation (TUDAV)

The beaked whales are one of the least known cetacean groups in the world, primarily recognized through stranding records in the world's oceans. Cuvier's beaked whale (*Ziphius cavirostris*) is the only beaked whale species commonly found in the Mediterranean Sea, but its distribution is cosmopolitan in the northern hemisphere. These whales are known to be sensitive to noise pollution, as evidenced by stranding cases linked to seismic surveys or naval operations using mid-frequency sonar. Their genetic structure has been little studied due to a lack of samples. In this study, tissue samples from four individuals involved in mass strandings of Cuvier's beaked whales along the northern coast of Cyprus in February 2023 were analyzed. Mitochondrial DNA control region analysis (286 bp) revealed two haplotypes: three of the four individuals shared a single haplotype (T3), while one had haplotype T4. These haplotypes were identical to those previously identified in the Ionian (Greece), Adriatic (Croatia), Aegean, and eastern Mediterranean (Türkiye and Cyprus) Seas. The isolated eastern Mediterranean subpopulation was seen to be highly differentiated, as it contained two unique haplotypes not found outside the Mediterranean. Further sampling from the Mediterranean Sea is needed, and sequencing with the same mtDNA markers would provide a clearer understanding of the genetic population structure of this species. This information could help develop more effective conservation strategies for beaked whales.



GE-07. Gaining insights into the population connectivity of the vulnerable subspecies of Lahille's bottlenose dolphins

Leal, Thaís ¹; Castilho Volker, Pedro ²; Simões-Lopes, Paulo C. ¹; Costa, Ana P. B. ³

1. Laboratory of Aquatic Mammals (LAMAQ), Department of Ecology and Zoology, Universidade Federal de Santa Catarina, Florianópolis, SC, Brazil
2. Zoology Laboratory (LABZOO), Universidade Federal do Estado de Santa Catarina, Laguna, SC, Brazil
3. Rosenstiel School of Marine, Atmospheric, and Earth Science, University of Miami, Miami, FL, United States

Genetic connectivity is crucial for the conservation of populations and species, as it promotes genetic diversity and reduces inbreeding. The endemic subspecies of Lahille's bottlenose dolphin (*Tursiops truncatus gephyreus*) inhabits coastal waters between southern Brazil and Argentina, and is listed as vulnerable on the IUCN Red List. One study with this subspecies recognized two distinct management units (MUs) in the coastal waters of Santa Catarina, Brazil: Laguna (LGN) and Florianópolis (FLN). Despite their proximity (~110 km), moderate genetic differentiation ($F_{ST} = 0.13$) was observed. However, this was based on small sample sizes ($N < 10$ each), excluding dolphins between the areas. To further investigate the genetic connectivity between these two MUs, 48 samples (biopsy and stranding), collected between the two areas from 2011 to 2022, were genotyped for 15 microsatellite loci. The findings revealed at least two genetic clusters, as previously predicted, but with higher genetic connectivity ($F_{ST} = 0.075$). One cluster included LGN individuals ($N = 33$), which exhibit high levels of year-round philopatry, and those inhabiting coastal waters adjacent to the Laguna estuary or found in coastal waters between the two sites ($N = 9$). The other cluster comprised individuals found in coastal waters of the FLN ($N = 4$). However, despite their connectivity, both groups exhibited low genetic diversity (allelic richness: LGN = 1.269, FLN = 1.366). Philopatry appears to be a key factor in population structuring, but it does not act as an impermeable barrier, preventing high genetic divergence or the formation of exclusive groups of residents versus non-residents. Our results do not invalidate previous findings of two MUs for the area, but highlight a higher level of connectivity between them. This connectivity contributes to their conservation, since migration can introduce genetic variability and contribute to the resilience of these units that suffer constant anthropogenic threats.



GE-08. eDNA analysis revealed the presence of Cuvier's beaked whale (*Ziphius cavirostris*) in shallow waters in Greece, Eastern Mediterranean Sea

Akritopoulou, Elena ¹; Exadactylos, Athanasios ¹; Komnenou, Anastasia ²; Sarantopoulou, Ioanna ¹; Kofidou, Evangelia ²; Drougas, Aimilia ³; Gkafas, Georgios A. ⁴

1. Marine Mammal Monitoring Unit, Department of Ichthyology & Aquatic Environment, School of Agricultural Sciences, University of Thessaly, Fytokou str., 38446, Volos, Greece
2. ARION-Cetacean Rescue and Rehabilitation Research Centre, Nea Moudania Port, 63200, Chalkidiki, Greece School of Veterinary Medicine, Faculty of Health Sciences, Aristotle University of Thessaloniki, St. Voutyra 11, 54627 Thessaloniki, Greece
3. ARION-Cetacean Rescue and Rehabilitation Research Centre, Nea Moudania Port, 63200, Chalkidiki, Greece Ministry of Environment and Energy, General Directorate of Environmental Policy, Directorate of Natural Environment and Biodiversity Management, Patission 147, 11251 Athens, Greece
4. Marine Mammal Monitoring Unit, Department of Ichthyology & Aquatic Environment, School of Agricultural

Worldwide the effect of climate change has been argued to shape species population dynamics. Environmental and anthropogenic pressures impact distribution and structure of marine mammal dynamics, resulting in a continuous challenge of species monitoring. Alongside with visual and acoustic methods, environmental DNA (eDNA) is a fairly new methodology for marine mammals monitoring, where data could contribute to the conservation of species and their habitats. In this study water samples were analysed, in three semi-enclosed gulfs in Greece, Eastern Mediterranean Sea, over three consecutive years (2022, 2023 and 2024), using the 16S-rRNA molecular marker for species identification. Briefly, water was filtered in 0.45µm pore size filters and then soaked in a lysis buffer following phenol-chloroform DNA extraction protocol. Illumina barcode-tagged primers were inserted in the PCR products and loaded in an Ion-Torren sequencer. Fastq reads were filtered based on quality score, chimeras and truncated at 210bp. Using local blastn+ against all nucleotide databases in NCBI, hits with an e-value less than 5x10⁻⁵ and identity over 98% were kept for further analysis. Results showed, among other marine species, novel presence of Cuvier's beaked whale (*Ziphius cavirostris*) in the entrance of the studied gulfs in such shallow waters (>100m) throughout the three years, and in close proximity to highly urbanised areas, despite the documented habitat and behaviour of the species. Although other scenarios could explain this (like currents' shifts, ballast waters, etc), the presence of high-filtered reads on an annual basis provide robust information regarding species site-fidelity. Hence, in the era of climate crisis, eDNA can provide crucial information on marine mammals' ecological status, identify new areas that marine mammal species have never been reported, predict behavioral and feeding changes especially regarding deep-diving species, such as Cuvier's beaked whale in specific relatively small and geographically separate marine areas, as seen in this study.



GE-09. Genomic insights into Risso's dolphin (*Grampus griseus*): a pilot study using GBS technique to uncover informative SNPs

Latini, Lucrezia ¹; Fioravanti, Tatiana ¹; Righi, Tommaso ^{1,2}; Splendiani, Andrea ¹; Tonay, Arda M. ^{3,4}; Dede, Ayhan ^{3,4}; Öztürk, Ayaka Amaha ^{3,4}; Sá, Sara ^{5,6}; Fernandez, Paula Méndez ⁷; Trez, Davide ⁸; Barucchi, Vincenzo Caputo ¹

1. Dipartimento di Scienze della Vita e dell'Ambiente, Università Politecnica delle Marche, Via Brecce Bianche, 60131, Ancona, Italy
2. Conservation Genomics Research Unit, Research and Innovation Centre—Fondazione Edmund Mach, 38098 San Michele all'Adige, TN, Italy
3. Faculty of Aquatic Science, Istanbul University, 34134 Fatih, Istanbul, Türkiye
4. Turkish Marine Research Foundation (TUDAV), 34820 Beykoz, Istanbul, Türkiye
5. Department of Biology & CESAM & ECOMARE/CPRAM, Universidade de Aveiro, 3810-193 Aveiro, Portugal
6. Portuguese Wildlife Society (SPVS) & Marine Animal Tissue Bank (MATB), Estação de Campo de Quiaios, 3081-101 Figueira da Foz, Portugal
7. Observatoire PELAGIS UAR 3462 CNRS/La Rochelle Université, 17000 La Rochelle, France
8. Department of Comparative Biomedicine and Food Science, University of Padova, Legnaro (Padova), Italy

Nowadays, NGS techniques are essential for exploring new genetic and evolutionary features of non-model organisms, the study of which involves several difficulties including limited samples availability and lack of baseline information. Risso's dolphin (*Grampus griseus* Cuvier, 1812) is a non-model, highly vagile organism of which little is known about population genetic structure in Mediterranean Sea and Atlantic Ocean; hence the need for a pilot study to find the best Genotype By Sequencing (GBS) protocol for searching and analysing informative SNPs. A double digest RAD (ddRAD) protocol was applied to eight samples that represent the diversity of the populations in the study area (Mediterranean Sea and East-Atlantic Ocean). Muscle or skin samples from stranded individuals were used for DNA extraction with a modified phenol-chloroform protocol for a higher quality and quantity yield. Single-end sequencing was performed on an Illumina NextSeq2000 producing 8M SE reads (150 bp) per sample. After alignment to the Risso's dolphin genome and filters, 15,519 loci were recovered. Significant differentiation between Mediterranean and Atlantic samples were detected by the population structure analysis for the most probable structure ($K=2$). Two samples, from the western part of the Mediterranean Sea and the French coast of the Atlantic Ocean, resulted as admixed individuals suggesting the possibility of gene flow between the two basins. However, cross contamination could be affect this two samples, given the strong negative individual fixation index (F) estimated, and lower percentage of reads aligned to the reference genome. Many no-hits reads were ascribable to bacterial contamination affecting the tissue samples, consistently with necropsy sampling strategy. Results of this pilot study demonstrate that the tested ddRAD protocol is useful for isolating



informative SNPs and can thus be applied for genotyping Risso's dolphin on a large scale, providing valuable information on its genomic structure and diversity.

GE-10. A first attempt to describe the genetic diversity of false killer whale (*Pseudorca crassidens* Owen, 1846) from the Eastern Atlantic Ocean and Mediterranean Sea

Fioravanti, Tatiana ¹; Latini, Lucrezia ¹; Manetti, Giovanni ¹; Splendiani, Andrea ¹; Maio, Nicola ²; Podestà, Michela ³; Freitas, Luís ⁴; Tonay, Arda M. ⁵; Dede, Ayhan ⁵; Öztürk, Ayaka Amaha ⁵; Caputo Barucchi, Vincenzo ¹

1. Dipartimento di Scienze della Vita e dell'Ambiente, Università Politecnica delle Marche, Via Brecce Bianche, 60131, Ancona, Italy
2. Dipartimento di Biologia, Università degli Studi di Napoli Federico II, Via Cinthia 26, 80126, Napoli, Italy
3. Museo di Storia Naturale di Milano, Corso Venezia 55, 20121, Milano, Italy
4. Museu da Baleia da Madeira, Rua Garcia Moniz 1, 9200-031, Caniçal, Madeira
5. Faculty of Aquatic Science, Istanbul University, 34134 Fatih, Istanbul, Türkiye Turkish Marine Research Foundation (TUDAV), 34820 Beykoz, Istanbul, Türkiye

The false killer whale (*Pseudorca crassidens* Owen, 1846) is one of the largest species of the family Delphinidae. It is currently classified as “Near Threatened” by the IUCN at a global level, but regional assessments are lacking due to the difficulty in collecting information on its abundance and distribution from several geographical areas. In fact, false killer whales are distributed in all tropical and warm temperate regions but are rarely observed in the wild since usually live in deep offshore waters. Population structure and genetic diversity have already been investigated, using both nuclear and mitochondrial markers, revealing genetic differentiation between and within basins. However, information previously collected derives mainly from the Pacific Ocean where false killer whales are more abundant and resident coastal populations have been identified. This study provides a first evaluation of genetic diversity of the species in the Eastern Atlantic Ocean and Mediterranean Sea by analysing both historical and modern specimens. Biological materials were provided by museums and scientific institutions, and DNA was extracted using specific protocols. The mitochondrial DNA Control Region (mtDNA CR) was amplified, Sanger sequenced, and sequences obtained were compared with haplotypes globally described so far for the species. Genetic analyses revealed some cases of taxonomic misidentification of museum samples and, among those identified as false killer whales, both new and already described mtDNA CR haplotypes were found. Eastern Atlantic samples showed some haplotypes genetically related to those from the North-West Atlantic Ocean and others with a probable Indo-Pacific origin. A temporal change in haplotype composition was highlighted among Mediterranean samples, supporting the hypothesis of a recent recolonization of this basin. These results contribute to increasing knowledge about false killer whale in the Eastern Atlantic Ocean and Mediterranean Sea, areas in which it is rare and poorly studied.



GE-11. Faecal metabarcoding as a tool to detect cetacean helminths and investigate pathways for expelling lungworms

García-Gallego, Alicia ¹; Pool, Rachel ¹; Lugli, Elena ²; Hall, Andie ²; Papaïakovou, Marina²; Hernández-Orts, Jesús ²; Littlewood, Tim ²; Brotons, Jose María ³; Raga, Juan Antonio ¹; Aznar, Francisco Javier ¹; Fraija, Natalia ^{1,2}

1. *Marine Zoology Unit, Cavanilles Institute of Biodiversity and Evolutionary Biology, Science Park, University of Valencia, Valencia, Spain*
2. *Natural History Museum, Cromwell Road, London, UK*
3. *Asociación Tursiops, Palma de Mallorca, Balearic Islands, Spain*

The study of helminth infections in cetaceans typically relies on post-mortem examination of stranded animals, with histological and coprological techniques being used as a complementary tool to detect eggs/larvae in tissues and faeces, respectively. However, the latter methods are time-consuming, require taxonomic expertise and are prone to false negatives. Faecal metabarcoding is a promising non-invasive technique that has been widely used in dietary studies of cetaceans and could also be used to detect helminths with great sensitivity. Here, we illustrate this through 1 the identification of nematode infections of the sperm whale, *Physeter macrocephalus*, in the western Mediterranean, and 2 the investigation of pathways for expelling lungworms from the host's body in delphinids. For aim 1 we obtained faecal samples from 19 sperm whales collected during field surveys in the western Mediterranean; for aim 2, we surveyed rectal faeces from five stranded striped dolphins, *Stenella coeruleoalba*, and one stranded long-finned pilot whale, *Globicephala melas*. We used ITS primers for nematode DNA amplification, and analysed the resulting sequences for taxonomic identification. *Anisakis* spp. were detected in two of the sperm whale samples (Prevalence: 10.5%), one of these being identified as *A. physeteris*. The lungworms *Halocercus delphini* and *Stenurus globicephalae* were detected in three striped dolphins and in the pilot whale, respectively, thus suggesting that faeces may represent a pathway for lungworm release to the environment. Further research is needed to explore other release pathways, such as blowhole exhalation. Our results highlight the potential of faecal metabarcoding for studying parasites in cetaceans. *Supported by projects AICO2021/022, GVA, CETABIOENA, GVA & VARACOMVAL, Biodiversity Foundation, under the NextGenerationEU PRTR.



GE-12. genetic sex determination of free-ranging short-finned pilot whales from blow samples

Miralles, Laura ¹; Arranz, Patricia ²; Coya, Ruth ¹; Turac, Elena ¹

1. *Universidad de Oviedo*

2. *Universidad de La Laguna*

Whale blow, the vapor exhaled during respiration of cetaceans, provides valuable genetic information to monitor health status and population dynamics. However, obtaining samples of sufficient quality and quantity remains a challenge, particularly for small odontocetes. Here, we developed both field and laboratory protocols optimized for the genetic analysis of blow samples of short-finned pilot whales (*Globicephala macrorhynchus*). Blow collection was performed from a small research vessel at a slow speed using a hand-held carbon fiber pole equipped with a sterile Petri dish. Determination of the sex was conducted using up to five PCRs of multiplexed markers from a classical methodology (SRY + ZFX/ZFY genes) and a novel protocol (SRY + FCB17) optimized for highly degraded, fragmented and/or scarce DNA. A total of 47 blow samples of free-ranging pilot whales off the Canary Islands were collected. The presence of DNA was confirmed in 98% of the blow samples, which were further processed resulting in 32 of them with positive genetic sex determination applying the novel methodology (70%), compared to only 8 (19%) with the classical method. Results confirmed the success of sampling, DNA extraction and sex determination using multiplexed markers in blow samples of odontocetes. This protocol represents an important management tool to conduct future non-invasive health assessments of small cetaceans in the wild.



GE-13. Environmental DNA to monitor vulnerable cetacean populations – the case study of the Iberian harbour porpoise

Afonso, Luís ¹; Valente, Raul ²; Barbieri, Beatriz ³; Suarez-Bregua, Paula ⁴; Savedra, Camilo ⁴; Pierce, Graham ⁵; Magalhães, Catarina ⁶; Correia, Ana Mafalda ²

1. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Terminal de Cruzeiros do Porto de Leixões, 4450-208, Matosinhos, Portugal ICBAS – School of Medicine and Biomedical Sciences, University of Porto, 4050-313, Porto, Portugal
2. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Terminal de Cruzeiros do Porto de Leixões, 4450-208, Matosinhos, Portugal
3. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Terminal de Cruzeiros do Porto de Leixões, 4450-208, Matosinhos, Portugal FCT-UAAlg - Faculty of Sciences and Technology, University of Algarve, 8005-139, Faro, Portugal
4. IEO-CSIC – Spanish Institute of Oceanography of the Spanish National Research Council, 36390, Vigo, Pontevedra, Spain
5. IIM-CSIC – Institute of Marine Research of the Spanish National Research Council, 36208, Vigo, Pontevedra, Spain
6. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Terminal de Cruzeiros do Porto de Leixões, 4450-208, Matosinhos, Portugal FCUP – Faculty of Sciences, University of Porto, 4169-007, Porto, Portugal

Cetaceans play a crucial role as ecosystem engineers by influencing marine environments through nutrient cycling, predation, and biodiversity enhancement. However, increasing anthropogenic pressures, including industrialized fisheries and subsequent increase of bycatch risk for marine megafauna, threaten their survival and contribute to their growing vulnerability. This is particularly true for the Iberian harbour porpoise (*Phocoena phocoena meridionalis*), a genetically distinct putative subspecies found along the Iberian Atlantic coast and northwest Africa. In the Iberian Peninsula, the harbour porpoise population is thought to be declining, potentially due to bycatch, although data from monitoring surveys remains limited. This has contributed to its concerning national status (critically endangered in Portugal and endangered in Spain) with the risk of extinction. Given their elusive nature, the anthropogenic pressures they face, and their low numbers, it is difficult to obtain robust data on abundance and distribution, making it necessary to develop non-invasive methods to monitor these porpoise populations, complementing traditional approaches. In this study, we developed a molecular approach-based methodology to detect the DNA of the Iberian harbour porpoise using environmental DNA (eDNA). Primers targeting the cytochrome b region of the mitochondrial genome - published by Parsons et al (2018) - were adapted, by replacing a single nucleotide in the forward sequence, through in silico analyses to ensure selectivity for the target subspecies. Conventional PCR amplification was first tested on genomic DNA extracted from tissue samples. The optimal conditions were then successfully validated on eDNA samples collected in Northern Portugal, where the



target DNA had been previously confirmed through metabarcoding studies (n=3, out of 96 samples). This approach offers an effective molecular monitoring method for the Iberian harbour porpoise, enhancing techniques for studying vulnerable species and contributing to broader efforts to understand cetacean populations impacted by human activities, providing valuable insights for conservation and management strategies.



GE-14. High volume approach for eDNA sampling of cetaceans and their prey; is it worth the effort?

De Bonis, Lorenzo ¹; Dillane, Eileen ¹; Reed, Thomas ¹; Rogan, Emer ¹

1. University College Cork

High volume approaches have been steadily becoming more and more popular in the world of environmental DNA (eDNA) sampling. New technologies, such as high-capacity filters, allow the filtering of tens or even hundreds of litres per sample, but they do not come without disadvantages. The aim of this study is to compare three commonly used eDNA filters: one with low filtration capacity, Sterivex; one medium, Smith-Rooth; and finally a high-capacity filter, Waterra. Sampling was carried out in summer 2024 from a whale watching vessel operating from Baltimore, in the south-west Irish coastline. A total of 24 events of minke whales (*Balaenoptera acutorostrata*) and common dolphins (*Delphinus delphis*) feeding on European sprat (*Sprattus sprattus*) were recorded. For each event, 56L of water were collected in a barrel and simultaneously filtered on board through Waterra (45L), Smith-Rooth (10L), and Sterivex (1L) filters, for a total of $24 \times 3 = 72$ filters collected at sea. In addition, a mock community was built by adding known volumes of minke whale DNA, common dolphin lysed skin and European sprat scales to ten barrels containing 56L of tap water. For each barrel, the same filtering was conducted ($3 \times 10 = 30$ filters). The 102 filters are being tested with three novel species-specific qPCR assays to quantify target DNA presence. The three filter types are compared based on target species detections, target DNA quantity (both overall and per litre filtered), filtering time, chance of clogging, simplicity of sampling and extraction, and inhibitors carry-over. This study aims at determining the best filter (among the ones tested) to sample cetaceans and their prey from a medium to small sampling vessel. Is it worth going with a high-volume approach, or are smaller filters just as viable and potentially easier to use?



GE-16. The multifaceted story feces can tell: insights from the analysis of monk seal scat samples

Valsecchi, Elena ¹; Rota, Alessia ¹; Coppola, Emanuele ²

1. University of Milano-Bicocca, Piazza della Scienza 1, 20126 Milano, Italy

2. Gruppo Foca Monaca, Via Carlo Emery 47, 00188 Rome, Italy

Rare and elusive animals are difficult to investigate, especially if their natural environment is different from ours. New molecular methodologies are proving efficacious to acquire clues about the biology and distribution of difficult-to-observe species. The Mediterranean monk seal is a typical example. Evidence of its presence in the central-western part of the basin has been corroborated by the use of specific molecular probes capable of intercepting traces of environmental DNA released by the animal in the surrounding water. In this study we use a different approach, still based on the molecular study of biological traces, but one that can provide more detailed information at the individual (rather than the species) level, being based on the study of feces. We present data obtained from 8 fecal samples, historical (2011-2013) and recent (2024), collected in marine caves, preserved according to different procedures. Metabarcoding analysis allowed the identification of prey items, consisting in the vast majority of cases of bony fish, as expected, with the following Families being those predominantly represented: Sparidae (mostly *Diplodus vulgaris* and *Sparus aurata*), Labridae (mainly *Symphodus tinca*) and Murenidae (*Murena helena*). However, in some specimens, traces of bivalves and cephalopods were also found, the latter matching sequences of the genus *Callistoctopus*, an octopus with nocturnal habits. Within one scat specimen, traces of red and brown algae were also found, probably ingested by-catch while prey chasing. Interestingly, 4 (50%) of the samples showed signs of a parasitosis from tapeworms, matching the *Diphyllbothrium* cf. *hians* sequence, while in another sample traces of the bacterial strain of *Enterococcus* were found, indicative of a possible intestinal infection. Although coprology is not an innovative approach in itself, the rapid development of high throughput DNA sequencing technology has maximized the resolution power of molecular fecal analysis.



GE-18. Social structure, genetic diversity and effective population size of the endangered killer whale population of the Crozet archipelago

Delaire, Tomé ¹; Viricel, Amélia ²; Guinet, Christophe ¹; Mourier, Johann ³; Auguin, Erwan ³; Gasco, Nicolas ⁴; Tixier, Paul ³

1. *Centre d'Études Biologiques de Chizé (CEBC), UMR 7372, La Rochelle Université - CNRS, Villiers-en-Bois, France*
2. *Laboratoire des Sciences de l'Environnement Marin (LEMAR), UMR 6539, Université de Bretagne Occidentale - CNRS/IRD/IFREMER, Institut Universitaire Européen de la Mer, Plouzané, France*
3. *UMR MARBEC, Université de Montpellier - CNRS/IFREMER/IRD, Sète, France*
4. *Muséum d'Histoire Naturelle de Paris, France*

Human activities can lead to conflicts with animal species through competition for resources or habitats. Around the Crozet archipelago (French subantarctic islands), killer whales feeding on fish catches - a behaviour termed “depredation” – are subjects to severe conflicts with industrial fisheries. The killer whales of the Crozet archipelago, which have been monitored by photo-identification for over fifty years, have been negatively impacted by this conflict through lethal practices used by fishers operating illegally in the region. Specifically, these practices have resulted in a 60% decline of the aforesaid population, now reduced to only 80-90 individuals and critically endangered. Using both photo-identification data and tissue samples collected on 31 individuals between 2005 and 2022, this study examined kinship, genetic diversity and effective population size of the Crozet killer whales in relation to their social organization, as metrics for the persistence of the population. The results showed that while the 21 social units of the population were stable over time, genetic analyses using 18 microsatellite markers suggested a low correlation between the relatedness and the strength of association among individuals, with close kin relationships observed both within and between units. Genotype data indicated high levels of genetic diversity compared to other killer whale populations and an effective population size of 53 individuals with no evidence of inbreeding. Together, these findings suggest that the social organization of the Crozet killer whales may have been disrupted by a period of additive mortality and that some level of gene flow may occur with killer whales from adjacent populations. However, the low effective population size highlights a low potential for recovery if the population is still exposed to additive mortality, urging the need for conservation actions to be implemented.



GE-19. Using environmental DNA metabarcoding to assess marine mammal biodiversity in the Western Mediterranean

Fernandez, Chloé ¹; March, David ¹; Barros-García, Carlos ²; Arangeli, Antonella ³; Raga, Juan Antonio ¹; Fraija-Fernández, Natalia ¹

1. Marine Zoology Unit, Cavanilles Institute of Biodiversity and Evolutionary Biology, University of Valencia, Valencia, Spain
2. Biology Department, Avanqua-Oceanogràfic S.L., Valencia, Spain
3. ISPRA National Institution for Environmental Research and Monitoring, Rome, Italy

Environmental DNA analysis has emerged as an effective biomonitoring technique in marine environments, demonstrating significant potential for assessing entire biological communities. This study presents data on marine mammal distribution in the Western Mediterranean gathered from more than two years of research. A total of 104 water samples, each ranging from 2 to 3 liters, were collected from various platforms, including commercial ferries, oceanographic vessels and tour boats between May 2021 and October 2023. Seventeen of these samples were taken from the Oceanogràfic aquarium, a controlled environment used for methodological validation, while the remaining samples were collected along the Cetacean Migratory Corridor, a Marine Protected Area (MPA) in the Western Mediterranean. Water was filtered using encapsulated Sterivex filters, and DNA was extracted and amplified using the previously designed marine vertebrate MarVer3 primers, targeting ~245 bp of the 16S rRNA gene. In the MPA, eDNA analysis identified resident cetacean species, including *Tursiops truncatus*, *Delphinus delphis*, *Balaenoptera physalus*, *Grampus griseus*, and unassigned *Delphinidae* variants. Using a phylogenetic framework, these last ones were taxonomically assigned to *Stenella coeruleoalba*, commonly occurring in the area, thus highlighting the challenges of differentiating closely related cetacean species. Additional sequencing data from other marine vertebrates facilitated the study of cetacean prey distribution through a trophic network exploration. In the aquarium, eDNA analysis successfully identified almost 60% of the known marine vertebrate diversity, and all marine mammal species: *Delphinapterus leucas* and *Tursiops truncatus* at species level and *Phoca vitulina* and *Zalophus californianus* at genus level. Interestingly, *Stenella attenuata* and *Orcinus orca* were also detected as false positives. These results are interpreted in light of the genetic similarity between closely delphinid species and the limitations in the completeness and accuracy of the reference database used. Study supported by Generalitat Valenciana through projects CETABIOENA (CISEJI/2022/5), IOS4DOM (CIDEAGENT/2021/058), LIFE CONCEPTU MARIS (LIFE20 NAT/IT/001371).



GE-20. Nature's perfect fast food! How lactating seals move large amounts of energy in the form of high fat milk

Sidwell, Jeni ¹; Goodman, Simon ¹; Bennett, Kimberley ²; Carr, Ian ¹; O'Connell, Mary ³; Robinson, Kelly ⁴

1. *University of Leeds*
2. *University of Aberdeen*
3. *University of Nottingham*
4. *University of St Andrews*

Pinnipeds (seals, sea lions, fur seals and walruses) have evolved diverse breeding and lactation strategies with unique adaptations for fasting, energy storage and rapid energy transfer to offspring in the form of high-fat, low-sugar milks. Although the milk properties and metabolic physiology of fasting and lactation has been described for some species, little is known about the genomic basis of these traits. We used RNAseq analysis to characterize patterns of gene expression in grey seal milk and blubber during early and late lactation to reveal insights into the mechanisms of energy storage and transfer. We collected milk, blood, and blubber samples from 10 mother-pup pairs on the Isle of May, UK, during early (day 6) and late lactation (day 16), November-December 2023. Using the DESeq2 pipeline, we analyzed how gene expression in these tissues changed as lactation progresses, finding patterns consistent with known changes in metabolite profiles in milk and blubber across lactation for lipids, carbohydrates, vitamins, and micronutrients. Seal milk fat transcripts for proteins expressed in milk fat globule membranes were found at high abundance compared to other mammals, suggesting a possible mechanism contributing to the high fat content of pinniped milks. The gene LALBA, which mediates lactose secretion in mammal milk, has previously been found to be absent in Otariid milk, but LALBA transcripts were expressed in grey seal milk at levels comparable to other mammals. This suggests that the reduced sugar content of pinniped milks is controlled by different mechanisms in otariids and phocids. By comparing seal transcriptome data to that from other mammals, we identified metabolic pathways and genes that are consistently involved in milk production and lipid metabolism across species. Our findings provide a deeper understanding of how pinnipeds have evolved specialized lactation strategies and insights into the diversity of lactation traits across mammals.

GE-21. Harbour porpoises in Turkish waters: genetic evidence for the Marmara subpopulation

Uzun, Begüm ^{1,2}; Tonay, Mehmet Arda ³; Dede, Ayhan ²; Danyer, Erdem ⁴; Aytemiz Danyer, Işıl ^{1,2}; Amaha Öztürk, Ayaka ³; Öztürk, Bayram ⁴; Bilgin, İbrahim Raşit ⁵

1. Institute of Graduate Studies in Sciences, Istanbul University, Istanbul, Türkiye - Turkish Marine Research Foundation (TUDAV), P.O. Box: 10, Beykoz, Istanbul, Türkiye
2. MARE – Marine and Environmental Sciences Centre, ARDITI – Regional Agency for the Development of Research, Technology and Innovation, Funchal, Madeira Island, Portugal
3. Turkish Marine Research Foundation (TUDAV), P.O. Box: 10, Beykoz, Istanbul, Türkiye - Faculty of Aquatic Sciences, Istanbul University, 34134 Fatih, Istanbul, Türkiye
4. Turkish Marine Research Foundation (TUDAV), P.O. Box: 10, Beykoz, Istanbul, Türkiye - Veterinary Control Central Research Institute, Ankara, Türkiye
5. Institute of Environmental Sciences, Boğaziçi University, Hisar Campus, Bebek, Istanbul, Türkiye

Understanding the population structure of cetacean species is critical for their conservation and management, particularly for endangered species like the Black Sea Harbour Porpoise (*Phocoena phocoena relicta*). This study aimed to investigate the genetic diversity and population structure of harbour porpoises inhabiting the Black Sea and Marmara Sea. In the present study, a ddRAD-seq data set of 64 harbour porpoise samples (34 western, 7 eastern), the Turkish Straits System: TSS ²⁰, and the Aegean Sea ³ was generated. This study comprises the first use of the ddRAD-seq for a cetacean species living in the TSS and Aegean Sea. The highest genetic diversity rate was observed in the TSS (varying SNP rate: 8.063%), followed by the Marmara Sea harbour porpoise population and Western Black Sea population with the rates; 7.975%, and 7.920%, respectively, indicating the presence of ancestral populations in these regions. The FST analysis revealed notable genetic differentiation between the harbour porpoise population in the Marmara Sea and other harbour porpoise populations, highlighting Marmara Sea subpopulation's distinct genetic identity. According to the phylogenetic tree analysis, five of the individuals which is sampled in the TSS with the mtDNA haplotype XVIII (a unique haplotype in the Marmara Sea) (in total, n=8) were grouped together. In addition, Structure analysis showed that individuals with the unique mtDNA haplotype XVIII were clustered together and separated from other harbour porpoise populations. All individuals having the unique mtDNA haplotype XVIII was sampled in the Marmara Sea, and this observation confirms the presence of a genetically isolated harbour porpoise subpopulation in the Marmara Sea. We suggest that the harbour porpoise subpopulation in the Marmara Sea be designated as an Evolutionarily Significant Unit (ESU), emphasizing the need for a rigorous conservation strategy to preserve its genetic diversity and evolutionary potential.



GE-22. Evolutionary history and seascape genomics of harbour porpoises (*Phocoena phocoena*): genetic basis of adaptation to salinity in the Baltic region

Celemín Amaro, Enrique ¹; Tiedemann, Ralph ¹

1. University of Potsdam

The Harbour porpoise (*Phocoena phocoena*) is a highly mobile cetacean species primarily occurring in coastal and shelf waters across the Northern hemisphere. It inhabits heterogeneous seascapes broadly varying in salinity and temperature. Populations with dissimilar demographic histories distributed across heterogeneous landscapes are useful systems for studying local adaptation and understanding the role of selection and genetic drift in their diversification. Here we produced 84 whole genomes from individuals sampled at eight different regions across the North Atlantic to study Harbour porpoise's evolutionary history and investigate the role of local adaptation in the diversification into subspecies and populations. We further developed a reduced SNP panel that clearly separates the three populations in the Baltic and use it in a larger sample set to study the geographical distribution of a relevant intragenic SNP. Our results suggest a genetic differentiation between three subspecies (*P. phocoena relicta*, *P. phocoena phocoena* and the recently proposed *P. phocoena meridionalis*), and three distinct populations within the subspecies *P. phocoena phocoena*: Atlantic, Belt Sea and Proper Baltic Sea. Effective population size and Tajima's D levels suggest a population contraction in Black Sea and Iberian porpoises, but a population expansion in the *P. phocoena phocoena* populations. Genotype-environment association analysis identified salinity as a major driver in genomic variation and identified two highly divergent genomic regions between the North and Belt Sea populations containing candidate genes associated with osmoregulation. The candidate genes include an important gene, SCNN1D, that encodes part of the epithelial Na⁺ channels (ENaC), a highly specialized sodium permeable non-voltage-sensitive ion channel that plays a key role in salt and water homeostasis. Our findings provide new insight into the genetic basis of adaptation associated with different osmotic stress between ocean and brackish waters. The results have great conservation implications as we found inbreeding and low genetic diversity in the endangered Black Sea subspecies, identified the critically endangered Proper Baltic Sea porpoises as a separate population and offers a SNP panel with enough power to properly assign individuals to any of the three populations occurring in the Baltic Sea region.



GE-23. Untargeted metabolomics of wild lung-diseased harbour porpoises imply elevated antioxidative defense in the lung and higher metabolic mobilisation in the muscle

Dönmez, Eda ^{1,2}; Drotleff, Bernhard ³; Fabrizius, Andrej ¹; Siebert, Ursula ²

1. *Institute of Animal Cell and Systems Biology, University of Hamburg*
2. *Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, Foundation*
3. *Metabolomics Core Facility, European Molecular Biology Laboratory Heidelberg*

Anthropogenic activities in the North and Baltic Seas expose harbour porpoises to a multitude of stressors that impact their health and survival. In harbour porpoises the respiratory tract shows the highest amount of health relevant pathological lesions. However, it is not understood if this may affect their oxygen uptake and supply to dependent end-organs such as muscle and consequently, their diving abilities and foraging success. Since metabolites and lipids hold an essential role in physiology and pathology, we applied untargeted metabolomics of the lung and the muscle of 12 harbour porpoises (stranded or bycaught) with varying pulmonary health status to determine dysregulated metabolites and infer underlying biological pathways. Harbour porpoises with poor respiratory health had an increased abundance of metabolites associated with oxidative stress and hypoxia in the lung and muscle. Especially highly abundant cardiolipins could be indicative of lung disease progression as they were found to reduce surfactant function and alter alveolar structure. Still, considerably upregulated antioxidative as well as anti-inflammatory metabolites hint towards active mitigating processes in both tissues, specifically the muscle. Elevated muscle metabolites mostly displayed protective properties and were associated with improving muscular function and metabolism. While circulating leucine has the capacity to directly promote muscle protein synthesis, it may also support fat metabolism for fast energy supply. Since metabolites are regulated by a plethora of processes, a combination of upregulated metabolites, that serve as markers for hypoxia, oxidative stress and associated metabolic shifts in humans, may be suitable to monitor marine mammal health. Whereas these results suggest a defined molecular mechanism from the lung downstream to the muscle, more work is required to elucidate the interaction between stressors, health and regulated processes in cetaceans to understand underlying adaptations and establish potential health screening markers to strengthen conservation efforts.



Human Interactions and Climate Change Effects



HC-01. Temporal changes in unintentionally produced PCBs in harbour porpoises (*Phocoena phocoena*) stranded along the English and Welsh coast

Schiffnederova, Katerina ¹; Williams, Rosie S. ²; McKew, Boyd ¹; Boreham, Rebekah ¹; Deaville, Rob ²; Barber, Jonathan ³; Sturrock, Anna M. ¹

1. University of Essex, Wivenhoe Park, Colchester CO4 3SQ, UK

2. Zoological Society of London, Institute of Zoology, Regent's Park, London NW1 4RY, UK

3. Centre for Environment, Fisheries and Aquaculture Science (Cefas), Lowestoft, Suffolk, NR33 0HT, UK

Polychlorinated biphenyls (PCBs) are synthetic chemicals that were commonly used in industrial products such as coolants and plasticizers over the last century. After their ban in the 1980s, environmental concentrations of these persistent organic pollutants (POPs) decreased. However, PCBs are extremely resistant to degradation, and thus remain in marine ecosystems and biomagnify up the food chain, causing immunotoxicity in marine mammals. Despite the ban, ambient PCB levels are not decreasing as rapidly as predicted, with recent studies revealing large inputs of unintentionally produced PCBs into the marine environment (created as byproducts from other processes), potentially representing around half of PCBs found in marine mammal tissues. Chemical pollution ranks as the second largest threat to all marine mammals, surpassed only by bycatch. It is therefore critical to monitor the levels of unintentionally produced PCBs in marine mammals and to mitigate their impact on wild populations. Harbour porpoises (*Phocoena phocoena*) are long-lived top predators with a high abundance and wide-ranging distribution across the Northern Hemisphere. They tend to concentrate around nearshore habitats most impacted by run off and human activities, making them key bioindicators of contamination in our seas. We used the Cetacean Strandings Investigation Programme (CSIP) dataset to investigate spatiotemporal patterns in PCB concentrations in the blubber of harbour porpoises stranded along the coast of Great Britain between 1991 and 2021. We apply Generalized Linear and Additive Models to explore spatiotemporal patterns in intentionally vs. unintentionally produced PCBs. Overall, we show declines in PCB concentrations for many congeners and regions but demonstrate important variation among congeners and areas. The results show that – despite the ban – PCBs continue to be an important pollutant and that future control efforts need to better understand the other mechanisms by which PCBs are being created and released into the environment.



HC-02. Measuring the scale of collisions with marinelife across the sailing sector (1818-2024)

Foxall, Damian ¹

1. *Marine Mammal Advisory Group (MMAG)*

The objective is to update the global dataset of collisions between marinelife and sailing vessels, providing a better understanding of the issue. Ritter (2012) provided an initial insight using the data compiled between the dates 1966 – 2008 which referenced collisions (81) and near misses (42). Peel, D. et al. (2018) referenced collisions (53). Winkler et al (2020) referenced collisions (402) between cetaceans and all types of marine traffic, and collisions (49) with sailing vessels. In 2023, IWC provided the author with a dataset of (35) collisions with sailing vessels. Convinced the scale of the problem is underreported, the author compiled an updated global dataset - the Marine Strike Log (MSL). The MSL data (1819-2024) represents a significant increase of collision data between sailing vessels and marinelife. The methods used to compile data include: existing datasets/research; multilingual search of marine journalism, and internet sources; 1:1 interviews with sailors (53); implementation of an onboard reporting system that has generated reports (100) which include time & geospatial data. The MSL(Dec2024) holds reports of collisions(535) and near misses(70) with identified, and unidentified objects and marine life. We propose that this new data supported by ongoing live reporting is a valuable source of information to help mitigate collisions with marinelife for all marine traffic.



HC-03. Is climate change influencing mercury accumulation in southern elephant seals (*Mirounga leonina*)? The case of a colony from ASPA 132, Isla 25 de Mayo/King George Island, Antarctic Peninsula

Barragán-Barrera, Dalia C. ¹; Riet-Sapirza, Federico ²; Mojica-Moncada, Diego ³; Negrete, Javier ^{4,5}; Curtosi, Antonio ⁶; Bustamante, Paco ⁷; Caballero, Susana ⁸; Luna-Acosta, Andrea ⁹

1. R&E Ocean Community Conservation
2. Vida Silvestre Uruguay, Montevideo, Uruguay
3. Association of Polar Early Career Scientists of Colombia (APECS Colombia), Bogotá, Colombia
4. Departamento de Biología de Predadores Tope, Instituto Antártico Argentino, Buenos Aires, Argentina
5. Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Godoy Cruz 2290, C1425FQB, CABA, Buenos Aires, Argentina
6. Dirección Nacional del Antártico, Instituto Antártico Argentino, Buenos Aires, Argentina
7. Littoral ENVironnement et Sociétés (LIENSs), La Rochelle Université, La Rochelle, France
8. Halmos College of Arts and Sciences, Nova Southeastern University, Davie, FL, USA
9. Independent Consultant, France

Temperature in Antarctica has shown higher levels in the western Antarctic Peninsula (wAP), where increased ice melting rates have been reported. The southern elephant seal (SES) (*Mirounga leonina*), which undertakes long trips between breeding or molting and foraging areas in both Antarctic and Subantarctic waters, has several breeding and molting colonies along the South Shetland Islands. This includes individuals from the colony on Isla 25 de Mayo/King George Island (wAP), which are distributed within Antarctic Specially Protected Area 132. These individuals conduct long feeding migrations, showing differences between sexes. Therefore, females and males could be exposed to different levels of pollutants, which may be reflected in their tissues across their large distribution range. To assess this hypothesis, total mercury (THg) concentrations were measured in dermal samples from free-ranging SES (n=50) on Isla 25 de Mayo/King George Island, collected using a remote biopsy dart sampling method (PAXARMS system). The results indicated that THg concentrations ranged from 145 to 1,915 ng/g dw (mean=730, SD=388). Significant differences were detected between sexes, with females having higher concentrations (range=306-1,915, mean=859, SD=427 ng/g dw) than males (range=145-1,645, mean=629, SD=329 ng/g dw). The THg differences found here may be explained mainly by the feeding niche partitioning between sexes. Females prefer mesopelagic prey or prey associated with sea ice in the wAP, which are enriched in methylmercury. Conversely, males prefer to feed on cephalopods, which have shown decreasing THg levels in recent years. Additionally, females tend to travel to the wAP, where higher melting ice rates have been reported, which may imply higher mercury exposure through melted ice. In brief, our results not only provide insights into mercury contamination in SES but also highlight the need to continue monitoring the potential effects of climate change on mercury contamination in Antarctic marine mammals.



HC-04. Clicking for ... squid fishing jigs? Targets of (potentially?) enhanced detectability to dolphins engaged on depredative tasks

Barreto, Miguel ¹; Azevedo, José M. N. ²; Lobo, Victor Sousa ³

1. CINAV, Centro de Investigação Naval
2. Institute of Marine Sciences - OKEANOS, University of the Azores
3. CINAV, Centro de Investigação Naval Nova IMS, NOVA Information Management School

Risso's dolphins taking squid from fishing lines is a problem in the Azores. The fishery for veined squids (*Loligo forbesi*) is done manually, with each fisher working a single handline with 2 weighted jigs at 100-300 m depths. Previous strategies employed, like the use of pingers for acoustic deterrence, failed in reducing dolphin predation. An alternative strategy for lowering the depredating success would be to reduce the acoustic detectability of the gear. As a first step in assessing the feasibility of this strategy, we tested the acoustic detectability of 6 jigs, covering various typologies in use. Underwater acoustic responses were studied in an anechoic tank, with a bistatic (60° triangled geometry) configured sonar, using sinusoidal signals between 40-160 KHz at 10 KHz steps, thus comprising a significant portion within the spectral range of whistling dolphins clicks. Waveform analysis and Target-StrengthEnergy (TSE) were computed with specially written MATLAB routines that also enabled plotting frequency response curves. An averaged TSE value was then estimated for each jig and subsequently applied to an inverse form of the active sonar equations previously derived by Whitlow Au and colleagues for 50% correct Detection Thresholds (DT50%), of dolphins searching targets on low noise level environmental contexts, later applied also by Madsen to model dolphin-squid detection thresholds. TSE values for the jigs studied span from -50 dB to -35 dB, therefore enabling estimations of DT50%'s to distances between 78m and 140m. This compares with the detectability ranges of aprox. 115m of a 15cm DML *Loligo* squid in transversal orientation. However, these TSE's shall be higher to a dolphin's broadband, monoestatic (forward-looking) sonar search, so extending detection ranges and potentially serve as enhanced targets to depredating individuals. These results encourage the development and testing of "stealth", acoustically transparent, hand-jigs as a way to reduce dolphin depredation of squids.



HC-05. Spatiotemporal overlap of minke and humpback whales with krill fishing vessels in the Western Antarctic Peninsula

Mestre, Julie ¹; Trathan, Philip N. ¹; Durban, John W. ²; Friedlaender, Ari S. ³; Hutchinson, Amber ¹; Joyce, Trevor W. ⁴; Rogers, Alex ¹; Reisinger, Ryan R. ¹

1. *School of Ocean and Earth Science, University of Southampton, National Oceanography Centre Southampton, European Way, Southampton, United Kingdom*
2. *Anderson Cabot Center for Ocean Life, New England Aquarium, United States*
3. *Ocean Sciences & Institute for Marine Sciences, University of California, Santa Cruz, Santa Cruz, CA, United States*
4. *Marine Mammal Institute, Oregon State University, Newport, OR, United States*

Populations of many krill consumers are increasing in the Western Antarctic Peninsula, as they recover from overexploitation. Simultaneously, krill fisheries expand and operate in increasingly spatially concentrated hotspots, raising concerns about local krill depletion. Krill fishery is currently managed by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), at the Food and Agriculture Organization Subareas scale (658,738.58 km² for the most heavily fished Subarea 48.1). CCAMLR has recognised the necessity to rely on a smaller-scale management approach. Small Scale Management Units (SSMU; 16,000 km² - 440,000 km²) have been designated but precautionary krill catch limits have not been set accordingly. We aim to assess the extent to which competition occurs between foraging whales and fishing vessels within the Western Antarctic Peninsula. Using tracking data from 47 humpback whales and 19 minke whales which foraged in Area 48.1, we quantify their spatiotemporal overlap with krill fishing vessels from 2012-2018. First Passage Time analyses revealed similar krill search scales for minke whales and fishing vessels (~19 km), while the mean search scale for humpback whales was 1.4 times larger (~27 km). We compared spatiotemporal overlap between the two whale species and fishing vessels, throughout the fishing season, between years and for all SSMUs. Humpback whales had a larger spatiotemporal overlap with fishing vessels, suggesting they may be more vulnerable to competition. We further compared environmental parameters at whale foraging grounds and vessel fishing areas to better characterize the extent to which they compete for krill. Our results highlight the scale of krill-predators and fisheries interactions in Subarea 48.1. They confirm the need to include baleen whales in krill fisheries management to reach an ecosystem-based management. We provide invaluable information that will help CCAMLR to spatially and temporally sub-divide the precautionary catch limit between SSMUs.



HC-06. By-catch mortality in mediterranean dolphins: important insights from a 14-year study in Andalusia

Fernández-Maldonado, Carolina ¹; Cerezo, Alejandra ¹; Arbelo, Manuel ²; Sierra, Eva ²; Román, Marta ¹; Vivas, María Soledad ³; Márquez, Teresa ¹; Grondona, Manuel ⁴; Iglesias, Claudia ²; Fernández, Antonio ²

1. SEASHORE ENVIRONMENT AND FAUNA. Calle Sevilla nº4, 11380. Tarifa seashore.ef@gmail.com
2. Veterinary Histology and Pathology, Institute of Animal Health and Food Safety (IUSA), Atlantic Center for Cetacean Research, Marine Mammals Health WOAHCOL Centre, University of Las Palmas de Gran Canaria, Veterinary School, Las Palmas, Spain.
3. Environmental and Water Agency. Junta de Andalucía.
4. Territorial Delegation of Sustainability and Environment in Málaga. Junta de Andalucía.

By-catch (incidental catch of non-target species) is the primary direct threat to cetacean populations worldwide. Despite some mitigation efforts, it remains of great concern and quantifying levels and causes of by-catch is a conservation priority. The Alboran Sea is an area of intensive fishing activity with frequent, severe interactions with marine wildlife. Assessing the cause of death with confidence in stranded dolphins requires thorough expert necropsies, as external evidence of entanglement is not always apparent. Between 2011 and 2024, 2,184 cetaceans (17 species) were recorded by the Andalusian Regional Government as part of the work conducted by the Andalusian Stranding Network for Marine Mammals and Turtles. Of these, 63% (1382 individuals) belonged to the most frequently stranded species: the striped (*Stenella coeruleoalba*; 56%), common (*Delphinus delphis*; 32%), and bottlenose dolphins (*Tursiops truncatus*; 12%). Complete anatomopathological examinations using a standardised procedure were conducted on 177 striped, 113 common dolphins, and 22 bottlenose dolphins to determine cause of death. Gross findings and histological analyses revealed traces of fishing gear or marks, fractures, amputations, good health status, recently ingested gastric contents, chyle in lymphatic ducts, edema, hyperinflated and hemorrhagic lungs, hemorrhages, hepatic congestion, and disseminated gas bubbles. These lesions are indicative of interaction with fishing activities, which was identified as the cause of death in 90 common dolphins (80% of examined individuals). For striped and bottlenose dolphins, interactions were identified in approximately 18% of cases (n=32 and 4, respectively). The number of bycaught animals found stranded represents an underestimate of the total number by-caught. The findings presented here provide a solid basis for assisting with estimating population by-catch levels and highlight the importance of continuing and expanding such studies. They also underscore the significant threat of by-catch, particularly to common dolphins, which are classified as "Vulnerable" by the Spanish Royal Decree 439/1990.

HC-07. Artisanal fisheries and Local Ecological Knowledge: potential contribution to the assessment of cetacean conservation status in Gabon

Kema Kema, Judicaël Régis ¹; Maloba Makanga, Jean Damien ²; Akendengue Aken, Igor ³; Minton, Gianna ⁴; Collins, Tim ⁵; Mve Beh, Jean Hervé ⁶; Koumba Mabert, Brice Didier ⁷; Ntougou Ndoutoume, Omer ⁸; Ntie, Stephan ⁹

5. -Centre d'Etudes Biologiques de Chizé (CEBEC), UMR 7372 CNRS/La Rochelle Université, 17031 La Rochelle, France -Observatoire Pelagis, UAR 3462 CNRS, La Rochelle Université, La Rochelle, France -Laboratoire d'Analyse Spatiale et des Environnements Tropicaux (LANASPET), Libreville, Université Omar Bongo, Gabon - Agence Nationale des Parcs Nationaux (ANPN), BP : 20379 Libreville, Gabon
1. Laboratoire d'Analyse Spatiale et des Environnements Tropicaux (LANASPET), Libreville, Université Omar Bongo, Gabon
2. -Laboratoire de Géomatique, de Recherche Appliquée et Conseil (LAGRAC), Université Omar Bongo, Gabon - Aquatic Species ONG, 107 rue Pierre Nguema, Lalala Dakar. BP :1306 Libreville, Gabon
3. Consortium for the Conservation of the Atlantic Humpback Dolphin (CCHAD), 2242 PT Wassenaar, The Netherlands
4. -Wildlife Conservation Society (WCS), New York, NY 10460, USA
5. -Laboratoire d'Hydrologie et d'Ichtyologie (LHI), Institut de Recherches Agronomiques et Forestières, CENAREST, BP : 2246, Libreville, Gabon. -Direction Générale des Ecosystèmes Aquatiques (DGEA), Ministère des Eaux et Forêts, Libreville, Gabon.
6. -Centre Nationale des Données et de l'Information Océanographique (CNDIO), CENAREST, Libreville, Gabon - Direction Générale des Pêches et de l'Aquaculture (DGPA), Ministère de la Pêche et de la Mer, Libreville, Gabon.
7. -Agence Nationale des Parcs Nationaux (ANPN), BP : 20379 Libreville, Gabon
8. -Agence Nationale des Parcs Nationaux (ANPN), BP : 20379 Libreville, Gabon -Département of Biologie, Université des Sciences et Techniques de Masuku, Franceville, Gabon

In the absence of conventional scientific knowledge, Local Ecological Knowledge (LEK) can be a useful alternative, but requires a good understanding of the communities surveyed. The aim of this study was to characterize the artisanal fishing communities likely to provide LEK relative to cetaceans in Gabonese waters. A semi-structured questionnaire combined with a 10x10km grid map was used to gather information on socio-demographics and fishing practices as well as cultural beliefs and practices related to cetaceans. From 2022 to 2024, a total of 189 fishermen were interviewed from five locations spread out along the entire coast of Gabon. Eighty five percent of respondents stated that they had some knowledge about cetaceans in Gabon. Respondents reported a total of 327 cetacean observations or encounters from their own experience, including *Tursiops truncatus* (43%), *Megaptera novaengliae* (35%), *Sousa teuszii* (9%) and *Delphinus delphis* (6%). More than half of the survey sample (51%) was middle aged (between 30 and 60 years old). Respondents were mainly from Benin (34%), Gabon (24%) and Nigeria (20%). In terms of fishing



practices, 81% of the respondents used gillnets. Their fishing areas were mostly located within 20 km of the coast (90%). Furthermore, 60% of respondents indicated an absence of cultural ties with cetaceans ($n=96$), and only 9% ($n=14$) stated that cetacean meat was consumed occasionally. A significant difference was observed between the fishermen with some reported knowledge of cetaceans and without LEK based on age (Chi-square; $p=0.014$), educational levels (Chi square; $p=0.00036$) and location (Chi-square; $p=1.55e-06$). This work identified key characteristics of artisanal fishermen in Gabon and highlighted their potential for providing LEK on cetaceans. Incorporating LEK in the assessment of cetacean conservation status would improve these assessments and make any resulting conservation measures more accepted by local communities.



HC-08. Exposure and responses of harbour porpoises (*Phocoena phocoena*) to shipping noise in the Fehmarnbelt, Western Baltic Sea

Ham, Gin Swen ¹; Hermon, Erwan ²; Mortensen, Lars ³; Bardram Nielsen, Sophia Elisabeth ³; Ferreira, Sofia ³; Kosarev, Vladislav ¹; Folegot, Thomas ²; Nehls, Georg ¹

1. BioConsult SH GmbH & Co. KG, Schobueller Strasse 36, 25813 Husum, Germany
2. Quiet Oceans, Plouzane, France
3. DHI A/S, Agern Allé 5, DK-2970 Hørsholm, Denmark

Studies of the impact of anthropogenic underwater noise on harbour porpoises have mainly focused on the effects of short-term impulsive noise, but little is known about how continuous vessel-related noise affects the animals. The Fehmarnbelt is a significant maritime traffic route between Germany and Denmark. Using porpoise occurrence data from monthly digital aerial surveys (HiDef) and continuous Passive Acoustic Monitoring (PAM), coupled with high resolution noise data, this study investigates the responses of harbour porpoises to long-term exposure to shipping noise in the Fehmarnbelt. Porpoise acoustic detections were extracted from 22 C-POD stations deployed across the study area and time-stamped at 1 minute with sound pressure levels at the stations predicted by “Quonops” underwater noise prediction platform, at a 15-minute interval. Visual analysis showed that harbour porpoises were more frequently detected during quieter periods. This finding was supported by a Kolmogorov-Smirnov test, which revealed a significant difference in noise levels between positive detections and non-detections. To assess the influence of noise levels on harbour porpoise occurrence, we used either aerial survey observations (“HiDef model”) or acoustic detections (“PAM model”) as response variables in a Generalized Additive Model (GAM). The “PAM model” utilised a high temporal resolution of 15-minutes, whereas the “HiDef model” operated at a coarser resolution, averaging data on a daily basis. Noise was only significant in the “PAM model”, where the probability of porpoise occurrence decreased as sound pressure levels increased >115dB ref. 1μPa. While distance to shipping lanes was a significant factor in the “HiDef model”, the effect was weak, with porpoise abundance decreasing only slightly with increasing distance from shipping lanes. High temporal resolution data revealed the noise levels that harbour porpoises are exposed to instantaneously and showed that the animals are affected when noise become increasingly loud, but they tend to tolerate lower noise levels.



HC-09. Habitat overlap and resource competition between fisheries and *Delphinus delphis* in the central Aegean Sea, Greece

Tintoré, Beatriz ^{1,2}; Gardijan, Marija ²; Miliou, Anastasia ²; Troisi, Gera ³

1. Department of Mechanical & Aerospace Engineering, Brunel University London, Kingston Lane, Uxbridge, UB8 3PH, UK
2. Archipelagos Institute of Marine Conservation, Agios Konstantinos, Samos, 83100, Greece
3. Department of Mechanical & Aerospace Engineering, Brunel University London, Kingston Lane, Uxbridge, UB8 3PH, UK.

The overlap of cetacean habitats and fishing grounds leads to inevitable interactions, potentially impacting dolphin populations. *Delphinus delphis*, classified as “endangered” in the Mediterranean, is among the species affected. This study investigates the resource overlap between various fisheries (trawlers, purse seiners and others) and the *D. delphis* population in the central Aegean Sea, Greece. It aims to evaluate coexistence and assess policy effectiveness. Dolphin abundance was estimated from sightings recorded between 2015 and 2023 in the central Aegean Sea, and their diet preferences were established through a systematic review. Data on annual fishery landings was sourced from the Hellenic Statistical Authority. The Pianka Index was used to measure the overlap between the species caught with various fishing gear types and those preyed upon by *D. delphis*. The values ranged from 0 (no overlap) to 1 (complete overlap). The encounter rate was 1.158 *D. delphis* /100km, with each dolphin predicted to consume 1.78 tons of fish annually. Considering the estimated population size, 404.11 tons of targeted species are preyed upon annually by the *D. delphis* population in the central Aegean Sea. With data from all fisheries, it was estimated that a total of 4,840.17 tons of prey species for *D. delphis* was landed annually. The Pianka Index revealed an overlap of 0.389 with trawlers, 0.132 with purse seines, and 0.171 with other gear types. This highlights the vulnerability of specific landing groups and the robust overlap between fisheries and dolphins targeting the same species. Moreover, despite Greece's membership in the General Fisheries Commission for the Mediterranean, the Aegean Sea ranks second in Illegal, Unreported and Unregulated (IUU) fishing due to trawling violations. This signifies the need for policy reinforcement and sustainable solutions, involving fishers and policymakers to integrate an efficient, ecosystem-based management approach.



HC-10. Friends or Foes? The evolving relationship between fisheries and dolphins in northern Catalonia (NW Mediterranean)

Amigó, Natalia ¹; Álvarez de Quevedo, Irene ²; San Roman, Daniel ¹; A. Chicote, Carla ¹

1. SUBMON - Conservation, study and awareness of the marine environment, Barcelona, Spain.
2. BETA Tech Center, University of Vic-Central University of Catalonia (UVic-UCC), Vic, Spain.

Bottlenose dolphins (*Tursiops truncatus*) are frequently observed in the coastal waters of Girona in northern Catalonia (NW Mediterranean), interacting with bottom trawlers. To assess the impact of these interactions, face-to-face interviews were conducted with 35% of the 190 regional trawler fleet in autumn 2024, complementing data collected in 2018 (55%) and 2021 (66%). Given the increasing conflicts between dolphins and trammel net fisheries in southern Catalonia, interviews were also conducted with 30% of Girona's artisanal fleet (12 vessels) to assess potential issues in the northern region. All trawler fishermen reported interactions with dolphins, with 90% stating that dolphins actively follow their nets to feed, reflecting an increase in this perception compared to previous surveys. Most fishermen (90%) viewed these interactions as neutral or positive, while 10% expressed concerns about potential stock depletion. No gear damage was reported by trawler fishermen, while 30% of artisanal fishermen who reported interactions (fewer than 75%) noted gear damage and catch loss. These concerns were only expressed by fishermen from a guild south of Girona. The estimated annual economic loss per affected boat was approximately €3,300. Despite frequent interactions, bycatch events remain rare, and no incidents were reported by trammel net fishermen. All surveyed trawler fishermen reported at least one historical dolphin capture, contrasting with the 80% in 2018 to 95% in 2021. Of these, 45% involved decomposed bodies, while 55% involved live or recently deceased individuals. On average, trawler fishermen in northern Catalonia bycatch two dolphins (SD = 2.7) over their careers (average of 32 years). In summary, dolphin-trawler interactions remain stable, with low bycatch rates and mostly neutral or positive perceptions. Similarly, trammel net negative interactions are rare, unlike in southern Catalonia. The next steps include expanding interviews across Catalonia to better understand the interactions, develop mitigation measures, and help minimise economic losses.



HC-11. Spot the difference: comparing the prediction power of AIS and VMS to model the co-occurrence of fishing activities and cetaceans along the Iberian Atlantic coast

Champsaur, Juliette ¹; Gutiérrez-Muñoz, Paula ²; Punzón, Antonio ³; Authier, Matthieu ⁴; Pierce, Graham J. ¹

1. *Instituto de Investigaciones Marinas, Consejo Superior de Investigaciones Científicas, IIM-CSIC, 36208 Vigo, Spain*
2. *Centro Nacional Instituto Español de Oceanografía-CSIC, Centro Oceanográfico de Vigo, Subida a Radio Faro 50-52, 36390 Vigo, Spain*
3. *Centro Oceanográfico de Santander, Instituto Español de Oceanografía, Santander, Spain*
4. *Observatoire PELAGIS, UAR 3462, CNRS-La Rochelle Université, La Rochelle, France*

Bycatch represents a significant and escalating threat to small cetacean populations in Europe, especially the common dolphin, which faces unprecedented levels exceeding its Potential Biological Removal (PBR) limits. This unsustainable impact is especially pronounced in the Bay of Biscay, necessitating the urgent implementation of conservation measures. A crucial first step in addressing this issue is bycatch risk assessment which identifies spatial overlaps between cetacean densities and fishing activities, commonly using effort data collected by Vessel Monitoring Systems (VMS). This study aims to compare VMS with the Automatic Identification System (AIS) to predict co-occurrence along the Iberian Atlantic Coast from 2012-2019. AIS is widely used for fleet tracking and offers more accessible data, but it can be deliberately switched off and signal reception issues occur in offshore areas. It is used by small vessels, whereas VMS is restricted to boats over 12 meters. We statistically compared the spatial distribution and intensity of set gillnet fishing effort estimated from either AIS or VMS data, while accounting for spatial autocorrelation. These data were then overlaid with density data of three cetacean species: common dolphins, bottlenose dolphins, and long-finned pilot whales. Results indicated that AIS fishing activity, unlike VMS, can be underestimated. This limitation was evident in the co-occurrence analysis, where VMS more accurately identified bottlenose dolphins as most likely to overlap with set gillnet fisheries, followed by common dolphins and long-finned pilot whales. This study concludes that AIS is better for detecting general fishing patterns, while VMS provides more accurate effort estimates and identifies priority zones more efficiently. Both systems have complementary limitations in terms of data transmission frequency, fleet coverage, and detection and additional data such as logbooks, landing records, and on-board bycatch monitoring can be useful to improve the identification of high-risk bycatch zones effectively.



HC-12. Impacts of ship noise on harbour porpoise movements and population dynamics

Nabe-Nielsen, Jacob ¹; Tougaard, Jakob ¹; von Benda-Beckmann, Sander ²; de Jong, Christ ²; Frankish, Caitlin K. ³

1. *Department of Ecoscience, Aarhus University*
2. *Netherlands Organization for Applied Scientific Research (TNO)*
3. *Norwegian Polar Institute*

Noise from commercial ships can affect cetaceans by scaring them away from their foraging grounds, which may ultimately affect populations negatively. As the number of ships increases globally, we urgently need new methods for assessing such impacts to guide management and conservation. Here we used data from GPS tracked harbour porpoises in Danish waters to assess to what extent they are deterred by vessel noise. The received noise levels were calculated based on the sound levels emitted by the ships, combined with knowledge of how sound propagates under different environmental conditions. Subsequently we incorporated the observed behavioural responses to individual ships in an agent-based model (ABM) where the individual animals' movements were simulated to closely resemble those of real porpoises. The ABM also incorporated ships that moved along the same shipping routes as they use in the real world, while they emitted realistic amounts of noise. The modelled animals' foraging efficiency was influenced by the extent to which they were scared away from their foraging grounds by ships, and their survival and reproduction depended on whether they were able to maintain a positive energy balance. Our results indicate that GPS tracked porpoises were deterred by ships 5–9% of the time even at distances >2 km. Model simulations for a re-routing of ship traffic which occurred in eastern Kattegat (between Denmark and Sweden) reproduced realistic temporal changes in soundscapes and porpoise presence. The results suggest that re-routing had no impact on abundance of porpoises in the region, but that further intensification of ship traffic could affect the porpoise population negatively. This illustrates how ABMs based on realistic animal movements and energetics can be valuable for guiding management and reducing negative impacts of disturbances.



HC-13. Small-scale fishery and bottlenose dolphin presence in Asinara Island MPA (Italy): results and considerations for a sustainable management

Zappata, Michela ¹; Gazale, Vittorio ²; Giacomina, Cristina ³; Papale, Elena ^{3,4}; Pireddu, Laura ¹; Sanna, Valeria ¹; Vargiu, Giovanni ²; Zanello, Aldo ²

1. *Associazione CRAMA*
2. *Parco Nazionale "Isola dell'Asinara"*
3. *Department of Life Sciences and System Biology, University of Torino*
4. *Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment (IAS)*

Monitoring fishing activity is one of the key tools used by MPAs to promote the sustainable management of natural resources. Data collection enables the assessment of conservation measures' effectiveness and the evaluation of the interaction between marine life and human impact. In the MPA of Asinara National Park, which surrounds Asinara Island (northwest Sardinia, Italy) with an extension of about 108 km², fishing activity is allowed to a limited number of licensed fishermen; all fishing data are collected by external operators. The objective of this work is to implement the MPA's management tools for sustainable fishing by analyzing the possible relationship between fishing activities and dolphins, to outline a framework for a future specific evaluation. Data obtained from two independent monitoring activities, fishery monitoring and bottlenose dolphin monitoring, over a five-year period (2019-2023), were compared. 868 fishing operations of 5 target species, 145 monitoring days, corresponding to 7865 km travelled, and 74 dolphin sightings were examined and digitized in a geographic information system (Qgis). The analysis of dolphin Encounter Rates (number of sightings/km) in relation to fishing effort (number of nets and traps) and yield (CPUE) showed spatial overlap in areas with abundant prey resources. The results of this preliminary study aim at defining the guidelines for studying the direct interaction between bottlenose dolphins and fishing activities within MPA. The guidelines include advanced monitoring of the relationship between fisheries and dolphins with on-board operators, timely data collection in overlap areas, assessment of economic impacts and involvement of fishermen. This case-study provides an assessment of human impact on the MPA and lays the groundwork for future research on the direct interaction between bottlenose dolphins and fishing activities aiming to maintain a balance between biodiversity protection and human pressure, a key role of the MPA



HC-14. Reports of depredation behavior of Risso's dolphins (*Grampus griseus*) from pelagic longline fisheries near the Pelagie Islands (Mediterranean Sea)

Evrard, Anaëlle ¹; Turco, Gabriele ^{2,3}; Cattano, Carlo ^{1,3}; Grancagnolo, Desiree ^{2,3}; Milazzo, Marco ^{2,3}; Caruso, Francesco ^{1,3}

1. *Stazione Zoologica Anton Dohrn, Naples, Italy*
2. *Department of Earth and Marine Sciences, University of Palermo, Italy*
3. *National Biodiversity Future Center (NBFC), Palermo, Italy*

Characterizing interactions between cetaceans and fishing gears is challenging due to the difficulty of observing their underwater behavior. Current methods, such as boat-based visual assessments, provide limited insights into the impacts on cetacean populations and fisheries revenue. This study investigated the depredation behavior, consisting in the partial or total removal of the bait, of Risso's dolphins (*Grampus griseus*) on pelagic drifting longline fisheries around the Pelagie Islands (Italy) during summer campaigns in 2023 and 2024. Video cameras were deployed to monitor interactions, with baits, and acoustic data were analyzed using spectrograms and audio listening to examine the dolphins' behavior. Preliminary results revealed that Risso's dolphins depredated baited longlines, with individuals identified across both years. In nearly 90% of approaches, the dolphins produced an acoustic pattern consisting of a train of clicks, followed by a pulsed sound and another click train. The absence of whistle emissions suggests the use of foraging-specific signals in solitary or loosely associated interactions, even when multiple individuals were present. Additionally, depredation rates varied depending on the bait type used, highlighting potential bait-specific preferences. These findings provide novel insights into the opportunistic foraging and acoustic behavior of Risso's dolphins, offering valuable information for developing mitigation strategies to reduce interactions with fisheries. This study contributes to the understanding of poorly documented behaviors in this species and underscores the importance of promoting management/conservation efforts for the Mediterranean subpopulation, recently classified as "Endangered".



HC-15. Post-disentanglement monitoring of a bottlenose dolphin

Quiñones-Lebrón, Shakira G. ¹; Lokar, Krista ¹; Genov, Tilen ²

1. *Morigenos – Slovenian Marine Mammal Society, Piran, Slovenia*
2. *Faculty of Mathematics, Natural Sciences and Information Technologies, University of Primorska, Koper, Slovenia*

The overlap between fisheries activities and habitat use by bottlenose dolphins (*Tursiops truncatus*) in the Gulf of Trieste (northern Adriatic Sea) poses a significant threat of bycatch and entanglement in fishing gear, with approximately 39% of mortality in this area attributed to fishing gear. There have been no reported cases of disentanglement and release in this area, as all entanglement cases have been found post-mortem or involved free-swimming animals with gear attached. Even after an apparently successful human intervention, the likelihood of survival may be reduced due to the injuries sustained during entanglement. The long-term survival of marine mammals following rescue depends on various factors, including the severity of the injuries sustained and the promptness of the rescue response. One year post-rescue has been proposed as a benchmark for long-term survival, with around 80% of individuals surviving after five years in another population of bottlenose dolphins. Here, we present the first case of monitoring a disentangled dolphin in the Gulf of Trieste. In May 2023, an adult male bottlenose dolphin was found with a bottom-set gillnet wrapped around its tail near the Bay of Piran in the Gulf of Trieste. The dolphin was disentangled by a fisherman and immediately monitored by our research team, where photo-identification and a general health assessment were conducted. Over the following 16 months, the dolphin was observed on 12 separate occasions, consistently accompanied by other members of its resident social group and exhibiting normal behaviour. It showed no signs of boat aversion and occasionally approached and inspected our research vessel. This case underscores the critical importance of rapid intervention in dolphin entanglement incidents, but also of subsequent monitoring in assessing long-term survival and therefore the intervention's success.



HC-16. Tropical cetaceans are advancing their occurrence in response to warming temperatures in the Azores

Dias, Inês C. ¹; Ramon-Martorell, Magí ¹; Tolosa, Marc ¹

1. *Picos de Aventura - Animação e Lazer, Marina Pêro De Teive, Avenida João Bosco Mota Amaral, 9500-771 Ponta Delgada, Açores*

All around the globe, marine species are adjusting their distributions in response to ocean warming, seeking suitable ecological conditions. In the Azores, sea surface temperatures (SST) have been on the rise over recent decades, reaching an unprecedented record in the summer of 2024. This study investigates the effects of rising SST on the occurrence of tropical cetaceans' species off São Miguel Island, using 16 years (2009–2024) of whale-watching data. The Atlantic spotted dolphin (*Stenella frontalis*), an abundant seasonal visitor, and the Bryde's whale (*Balaenoptera edeni*), an occasional summer migrant, were selected as target species. To investigate interannual trends in their presence, Generalized Additive Models were applied to binomial daily presence data, while Generalized Linear Models were used to analyze annual daily presence ratios (DPR) and seasonality-related occurrence parameters against SST predictors. Results revealed a significant increase in Bryde's whale presence during the study period, with highest DPR in 2017, 2023, and 2024, corresponding to warmer SST. However, limited records of the species restricted further ecological inference. For spotted dolphins, modelling showed increasing presence since 2016, which was best explained by higher spring SSTs, though with moderate model performance. Both species exhibited clear advancing seasonal patterns driven by increasing spring and early summer temperatures. These findings suggest that local SST fluctuations influence the occurrence of tropical cetaceans in São Miguel, with more pronounced effects on seasonal advancements for spotted dolphins and on overall seasonal presence for Bryde's whales. Future research should include additional dynamic environmental parameters to better understand distribution shifts. In a context of ocean warming, it is essential to continue to monitor the occurrence of these keystone species to assess the potential effects of these fluctuations on the local marine ecosystem.



HC-17. Assessing potential habitat modifications of cetaceans and their prey in association with present and future offshore wind farm developments in the North Sea

Crouch, Sophie ¹; Waggitt, James ¹; Neill, Simon ¹

1. *Bangor University*

Shelf sea ecosystems are facing rapid environmental change, with widespread human activities and large-scale expansion of offshore wind farm (OWF) infrastructure reshaping marine mammal habitats in these regions. As the size and number of OWF structures increase, hydrological conditions in both near-field and far-field habitats are expected to change, with the potential to alter the drivers of prey distribution and behaviour. These changes may, in turn, affect the suitability of habitats and foraging sites for marine mammals. Understanding links between oceanographic processes, prey availability, and marine top predators is key to understanding and predicting potential changes to their distributions. This study integrates long-term marine mammal datasets (POSEIDON; 1980–present) and prey surveys (ICES DATRAS) with high-resolution hydrodynamic model outputs (Delft3D-FM DCSM) to examine these relationships in the North Sea. In this study, a mechanistic modelling approach is employed to understand the impact of physics on prey availability, and subsequently the impact of prey availability on marine mammals. Simulations of future OWF scenarios reveal potential changes in mixing, stratification, and primary productivity, with effects varying by region, scale, and existing species distribution. Among prey species, those predominantly in the central and southern North Sea are identified as the most affected, with both positive and negative changes identified. Marine mammals relying on prey in these regions may therefore be most affected by habitat modifications. However, the wide-ranging nature of marine mammals could mitigate the overall impact due to their ability to exploit different regions at the scales of predicted changes. By incorporating both hydrodynamics and prey availability, this study provides deeper insights into the processes driving marine mammal distributions, improving predictive capabilities for changing ecosystems and supporting more effective marine spatial planning and management in the region.



HC-18. Assessing the marine traffic exposure on offshore bottlenose dolphins off the Galician coast, Spain

Soares, Logan ¹; Methion, Séverine ²; Dunel Roig, Nathalie ²; Reisinger, Ryan R. ³; Díaz López, Bruno ²

1. Bottlenose Dolphin Research Institute (BDRI), Av. Beiramar 192, O Grove CP. 36980, Spain; School of Ocean and Earth Science, University of Southampton, European Way, Southampton SO14 3ZH, UK
2. Bottlenose Dolphin Research Institute (BDRI), Av. Beiramar 192, O Grove CP. 36980, Spain
3. School of Ocean and Earth Science, University of Southampton, European Way, Southampton SO14 3ZH, UK

Marine traffic is a major anthropogenic threat to marine wildlife, particularly cetaceans. Previous literature has focused on the impacts of marine traffic on inshore bottlenose dolphins, however, there is limited information on the risk of vessel exposure to the offshore bottlenose dolphin ecotype. The present study aims to assess the exposure of offshore bottlenose dolphins (*Tursiops truncatus*) to marine traffic off the Iberian Peninsula coast. A total of 3713 instantaneous samples were recorded, with offshore bottlenose dolphins being present for 201 of the samples (5.4%). With the use of Automatic Information System (AIS) and the multi-year observational data set (2017-2022), the relationship between offshore bottlenose dolphin presence and marine traffic density, as well as other environmental predictors, was modelled using Generalised Additive Models. Pleasure vessels and sailing vessels had a low overlap with offshore bottlenose dolphins due to species habitat selection. Offshore bottlenose dolphin presence had strong relationships with oceanographic variables, particularly depth, associated with the continental shelf, slope, and the regional upwelling system. There was potential overlap with fishing and cargo vessels, which frequently occur over the continental shelf however these vessels did not influence the presence of offshore bottlenose dolphins. The predicted presence of offshore bottlenose dolphins in a wider area around the Galician and northern Portugal coasts significantly decreased under maximum vessel density, particularly over the continental shelf, compared to minimum and average vessel densities. This indicated potential displacement or avoidance of marine traffic, highlighting the need for implementing management strategies to minimise the impacts of marine traffic off the Iberian Peninsula.



HC-19. A changing minimum of the underwater sound speed depth and potential consequences for cetacean vocalizations

Affatati, Alice ¹; Scaini, Chiara ²; Dat Nguyen, Tuan ³; Fiore, Sandro ³; Salon, Stefano ²

1. *National Institute of Oceanography and Applied Geophysics - OGS, Trieste, 34010, Italy & Department of Mathematics, Informatics and Geosciences, University of Trieste, Trieste, 34128, Italy*
2. *National Institute of Oceanography and Applied Geophysics - OGS, Trieste, 34010, Italy*
3. *Department of Information Engineering and Computer Science, University of Trento Trento, 38122, Italy*

Climate change is a relevant global threat that impacts marine ecosystems. Despite the importance of sound for cetaceans, there is still little knowledge of ocean acoustic parameters that could modify vocalization propagation. We used temperature and salinity from the Global Ocean Physics Reanalysis dataset of the EU Copernicus Marine Service to compute a 3D ocean sound speed dataset that covers the global ocean at 1/12° horizontal resolution and 50 vertical levels. We computed the average depth of the global minimum ocean sound velocity from 1995 to 2020 by developing a Python-based parallel software solution running on the HPC facility at the University of Trento. Since the SOFAR channel serves as a guide for sound propagation, the change in time of the sound speed minimum value could indicate the potential variation in the propagation of cetacean communication calls. Our results show that the depth of minimum sound velocity shows a sharp increase from approximately 570 to 590 m depth in 2005 and has been increasing from 2005 to 2020 due to climate change. Additionally, the introduction of Argo buoys to the Copernicus dataset produced a sharp increase around 2005 due to high-resolution data. Our study relies on the Italian National Center on High-Performance Computing, Big Data, and Quantum Computing Consortium, and the long-term storage ISCRA project. We also build on our previous work, which identifies acoustic hotspots presenting substantial climate-change-induced sound speed variations toward the end of the century, potentially affecting the communication of cetacean species in the areas. Human stressors may affect numerous cetacean species, and heterogeneous data collection has led to significant knowledge gaps in species distributions. Overlapping hotspots with changing sound speed minimum with important areas for cetacean diversity is critical to building conservation management tools and providing a starting point for policies-oriented research.



HC-20. Limitations to noise mitigation systems in reducing harbour porpoise disturbance during offshore pile driving

Brandt, Miriam ¹; Vilela, Raul ¹; Dragon, Anne-Cecile ¹; Diederichs, Ansgar ¹; Gündert, Siegfried ²; Rose, Armin ¹; Nehls, Georg ¹

1. BioConsult SH GmbH&Co.KG, 25813 Husum, Germany

2. Institute of Technical and Applied Physics (itap) GmbH, 26129 Oldenburg, Germany

To reduce harbour porpoise (*Phocoena phocoena*) disturbance and risk of injury during pile driving, it is mandatory at offshore wind farm construction sites in Germany to apply sound mitigation techniques. While, based on sound measurements, this should in theory clearly reduce porpoise avoidance reactions, empirical evidence has still largely been pending. Here we study the spatial extent of porpoise disturbance effects during piling at the construction of seven offshore wind farms over a four-year period (2010-2013) in the German North Sea in relation to the broadband sound exposure levels measured at 750 m distance from piling (SEL05@750m). Most foundations were constructed using different noise mitigation systems with varying efficiency due to still being under development at that time. Porpoise occurrence was studied using C-PODs at various distances from construction. GAM modelling of porpoise detections during piling revealed that the interaction of SEL05@750m with distance from piling significantly affected porpoise detections. While disturbance reached up to 20 km at 180 dB SEL05@750m, it was reduced to about 6 km at 165 dB SEL05@750m. Further decreases in noise levels to 155 dB SEL05@750m, however, had only marginal effects on disturbance ranges. This may be related to the use of deterrence devices before piling (especially seal scarers) and/or to disturbance created by other construction-related activities (e.g. an increase in shipping traffic) and/or be due to the relevant frequencies no longer playing a role as high frequency noise may already be filtered out by noise mitigation systems. Results show that, within limits, noise mitigation systems have the potential to reduce disturbance effects on porpoises. However, more research is needed to identify the exact reasons for the described limitations, which is crucial for the development of efficient noise mitigation regulations.

HC-22. Spatial variations in the contamination of short-beaked common dolphins *Delphinus delphis* from European Atlantic waters by historical chemicals

Chouvelon, Tiphaine ^{1,2}; Méndez-Fernandez, Paula ¹; Caurant, Florence ³; Dabin, Willy ²; Mauchamp, Audrey ¹; Pillet, Marion ^{1,3}; Viricel, Amélia ⁴; Munsch, Catherine ²; Richard, Gaëtan ⁵; Churlaud, Carine ⁶; Brault-Favrou, Maud ⁶; Marchand, Philippe ⁷; Venisseau, Anaïs ⁷; Alves, Filipe ⁸; Ferreira, Rita ⁸; Covelo, Pablo ⁹; Pin, Xabier ⁹; López, Alfredo ^{9,10}; Torres-Pereira, Andreia ¹⁰; Eira, Catarina ¹⁰; Gaudino, Morena ¹¹; McHugh, Brendan ¹¹; Murphy, Sinéad ¹²; Mille, Tiphaine ¹

1. Observatoire Pelagis, UAR 3462 La Rochelle Université/CNRS, 17000 La Rochelle, France
2. Ifremer, CCEM Contamination Chimique des Écosystèmes Marins, F-44000 Nantes, France
3. CEBC (Centre d'Études Biologiques de Chizé), UMR 7372 La Rochelle Université/CNRS, 79360 Villiers-en-Bois, France
4. LEMAR, UMR 6539 UBO/CNRS/IRD/Ifremer, Institut Universitaire Européen de la Mer, 29280 Plouzané, France
5. Société d'Observation Multi-Modale de l'Environnement (SOMME), 56400 Plougoumelen, France
6. LIENSs (LIttoral ENvironnement et Sociétés), UMR 7266 La Rochelle Université/CNRS, 17000 La Rochelle, France
7. LABERCA, Oniris, INRAE, 44307 Nantes, France
8. MARE – Marine and Environmental Sciences Centre, Regional Agency for the Development of Research (ARDITI), Funchal, Portugal Faculty of Life Sciences, University of Madeira, Portugal
9. CEMMA (Coordinadora para o Estudo dos Mamíferos Mariños), PO Box 15, 36380 Gondomar (Pontevedra), Spain
10. Department of Biology & CESAM & ECOMARE/CPRAM, Universidade de Aveiro, 3810-193 Aveiro, Portugal
11. Marine Institute, Rinville, Oranmore, Co. Galway, Ireland
12. Marine and Freshwater Research Centre; Department of Natural Resources & the Environment, School of Science and Computing, Atlantic Technical University, ATU Galway city, Ireland

As long-lived species generally feeding at high trophic levels, cetaceans accumulate chemical contaminants in their tissues, especially lipophilic and/or contaminants that biomagnify in food webs. This contamination pressure may intensify other anthropogenic threats such as bycatch, increasing the vulnerability of populations, particularly in the case of the common dolphin *Delphinus delphis* in the Northeast Atlantic. The concentrations in historical chemical contaminants were measured in approximately 140 stranded or bycaught common dolphins collected by networks of four European countries (Ireland, France, Spain, Portugal), as well as in 77 living individuals biopsied in offshore waters of the Bay of Biscay (beyond the continental slope) and around the Madeira archipelago, between 2017 and 2023. Specifically, four non-essential and potentially toxic trace metals (silver, Ag; cadmium, Cd; mercury, Hg; lead, Pb) were analyzed in the liver and kidneys of stranded/bycaught animals. In addition, several congeners from different families of persistent organics pollutants (POPs, including polychlorobiphenyls (PCBs), Polybrominated diphenyl



ethers, dichlorodiphenyltrichloroethane and metabolites) were analyzed in the blubber of both stranded and biopsied individuals. For individuals of similar size or age range, higher Ag and Pb hepatic and renal concentrations were found in dolphins from the French coasts of English Channel (EC), whereas some Irish individuals exhibited high Cd concentrations, either due to feeding preferences or reflecting historical contamination of the different areas. POP concentrations were the lowest in females, and in individuals biopsied in remote offshore waters from the Bay of Biscay and Madeira archipelago, while PCB concentrations were higher in males from EC. Selected ratios of POPs also evidenced probable sources of contamination (agricultural vs. industrial) in the different regions studied. Despite the presumed high mobility of the species in the NE Atlantic, these spatial variations in dolphins' contamination may suggest a non-negligible spatial segregation of the population in European waters.



HC-23. Habitat suitability predictions of the Southern right whale in contrasting climate change scenarios using historical catch data

Ouled-Cheikh, Jazel ¹; Aguilar, Alex ¹; Borrell, Asunción ¹; Bas, Maria ²; Fuster-Alonso, Alba ²; Vighi, Morgana ¹; Ruiz-Sagalés, Marc ¹

13. *Institut de Recerca de la Biodiversitat (IRBio) and Departament de Biologia Evolutiva, Ecologia i Ciències Ambientals (BEECA), Facultat de Biologia, Universitat de Barcelona, Barcelona, Spain*

1. *iMARES group, Departament de Recursos Marins Renovables, Institut de Ciències del Mar (ICM-CSIC), Barcelona, Spain*

Historical open-boat whaling (18th to 20th centuries) is perhaps the most well-documented natural resource exploitation in history. Vessel positions, as well as sighted/hunted whales, were often recorded in logbooks daily. During this period, Southern right whales (SRW; *Eubalaena australis*) were heavily targeted by whalers and, in some cases, were later brought to the brink of extinction. Now, some populations are showing signs of recovery. However, knowledge of their habitat preferences and movement patterns is still needed to assess the potential effects of anthropogenic activities and climate change on the species. In this study, we developed habitat suitability models by combining historical offshore whaling data with 13 environmental variables from Earth System Models (ESM) of the Coupled Model Intercomparison Project 6 (CMIP6; MIROC-ES2L, MRI-ESM2-0). Our objectives were to (i) assess SRW environmental preferences in the past by using the “past1000” experiment of the mentioned ESM and (ii) predict monthly habitat suitability under different climate change scenarios (Shared Socioeconomic Pathways [SSPs]; SSP1-2.6 and SSP5-8.5). By employing an ensemble modelling approach (Gradient Boosting Machine, Random Forest and Support Vector Machine), we found that winter and summer suitable habitats differ and that in the worst-case future scenario of climate change (SSP5-8.5), SRWs will lose a great portion of their suitable habitat compared to the present and the past. This highlights the need for new conservation measures that account for anthropogenic activities and climate change on this species. Funded by PID2020-119712GB-I00 and PRE2021-098656 from MICIU/AEI/10.13039/501100011033 and FSE+.



HC-24. OCEAN APP: advancing maritime safety and mitigating ship-strikes with innovative technology

Heapes, Trea ¹; Berrow, Simon ¹; Whooley, Pádraig ¹

1. *The Irish Whale and Dolphin Group*

Ship strike on whales is recognised as one of the greatest threats to large whales worldwide. Numerous projects are underway to try and mitigate this through various techniques. OCEAN is a multidisciplinary EU Horizon Europe funded innovation and development initiative focused on enhancing navigational safety and reducing ship strike risks to marine mammals. Coordinated by the Western Norway University of Applied Sciences the consortium brings together 13 partners across seven European countries, combining expertise in navigation, ecology, sensor technology and risk management. As part of the OCEAN ecosystem, the IWDG developed a clear and easy to use mobile reporting app for viewing and reporting marine hazards which include cetaceans, with the emphasis on large whales, which are of highest risk. The app follows human-centered design, targeting watch-keepers on smaller ships and yachts. The app is device- independent due to the Progressive Web Application technology (PWA) and is available on desktop, mobile phones and tablets. The app has undergone real-life field testing at sea on survey vessels and ferries. Devices require inbuilt GPS for sufficient location accuracy. Although the app runs within a browser, it behaves as an app on the device once installed. The app integrates with a new European Integrated Hazard Infrastructure (ENHI) which in a fully evolved installation receives four key data streams, including predicted whale presence from habitat modelling, passive acoustic detections and whale observations from space from other consortium members. The ENHI transmits these observations in real time, to data receivers such as the OCEAN reporting app and the OCEAN 4D Situation Awareness Display, which is primarily intended for large ocean vessels. Using this information, the mariner can make informed decisions in order to reduce the likelihood of ship strike incidents, improving both the welfare of individual whales and the conservation status at population level.



HC-25. The DELFISHPAM Project: first acoustic characterization of bottlenose dolphins' interactions with aquaculture and FADs in Maltese waters

Cossio, Viola ¹; Patti, Patrizia ²; Pedrazzi, Giulia ¹; Papale, Elena ³; Aquilina, Michela ²; Laspina Parisi, Matthew ⁴; Schembri, Jean Paul ⁴; Pace, Daniela Silvia ¹

1. *Sapienza University of Rome, Piazzale Aldo Moro 5, Rome, 00185, Italy*
2. *EcomarineMalta Ltd, Triq Nicolo Isouard 18 Oakfields 4 Mosta, Malta*
3. *CNR-IAS, Institute for the Study of Anthropic Impacts and Sustainability in the Marine Environment, National Research Council, unit of Capo Granitola, Via del Mare 3, 91021 Torretta Granitola, Italy*
4. *Department of Fisheries and Aquaculture*

The DELFISHPAM project applied Passive Acoustic Monitoring techniques for the first time in Malta, to investigate the interaction of bottlenose dolphins (BDs) with aquaculture activities and Fishing Aggregating Devices (FADs), in important conservation areas and along the island's eastern coast. Data were collected between February and October 2024 through autonomous recorders deployed in four different locations near aquaculture cages and FADs. A total of 7364 recordings were analyzed covering 386 hours during 80 days of sampling. BD sounds' presence was investigated by analyzing spectrograms with Raven Pro 1.6 to detect Click Trains, Whistles, Buzzes (considered as proxy of feeding activity), Burst pulsed sounds, and Bray-Call sequences. Results showed the acoustic presence of BD at all sites, almost every sampled day. Different patterns of acoustic detections emerged throughout the day across the sites: peaks during early morning were documented near aquaculture cages (06:00–08:00, 23.6% of the detections), while during late-night hours near FADs (23:00–00:00, 11.3% of the detections). All vocalizations were recorded at all sites, with click trains and whistles being the most detected sounds. Feeding sounds followed a pattern similar to the overall acoustic presence, suggesting that foraging activity likely occurred during all interactions. These findings confirmed that dolphins can opportunistically exploit fish farms and FADs as a regular source of food, as suggested by the extensive detection of feeding sounds. The evidence of BDs interaction with fish farms and FADs for the first time in Maltese waters is an essential baseline information to be integrated in future marine spatial planning for a more sustainable management of fishery activities. The results highlight the importance of integrating ecological data into decision-making processes to ensure that economic activities are carried out alongside appropriate conservation strategies that take into account marine mammal presence.



HC-26. Integrating biologging and AIS data to unravel whale-vessel collision dynamics: a case study of fin whales in the North-Western Mediterranean

Pierantonio, Nino ¹; Cioffi, William R. ²; Folegot, Thomas ³; Ody, Denis ⁴; Panigada, Viola ^{1,5}; Panigada, Simone ¹

1. *Tethys Research Institute, Viale G. B. Gadio 2, Milano, Italy*
2. *Southall Environmental Associates, Inc., Aptos, California, USA*
3. *Quiet Oceans, Bâtiment Cap Ocean, Technopôle Brest-Iroise, Plouzané, France*
4. *WWF France - Mission Océans et Côtes 6, Rue des Fabres, 13001 Marseille, France*
5. *Duke University Marine Lab, Beaufort, North Carolina 28516, USA*

The impacts of vessel collisions on individual whales and the effect on their populations are a global priority and concern. The Mediterranean sub-population of fin whales (*Balaenoptera physalus*) is particularly threatened, with frequent reports of lethal collisions alongside significant knowledge gaps on the welfare implications of non-lethal encounters. To investigate fin whale behavioural responses to maritime traffic and establish baseline knowledge on vessel-strike dynamics, we analysed satellite-derived and AIS data within a Close Point of Approach framework. Between 2021 and 2024, fifteen fin whales were equipped with satellite transmitters in the north-western Mediterranean Sea during May and June, within the framework of the Life SeaDetect project. Tracking data revealed localised movements and mid-distance displacements, with deployments lasting between 8 and 48 days and whales moving across areas of high volumes of maritime traffic and high levels of underwater noise. AIS-integrated analyses of whales' trajectories, obtained by interpolating raw Argos locations via continuous-time state-space models, highlighted numerous close encounters and near-miss events with cargo ships, passenger vessels, and tankers, with whale-vessel interactions estimated at distances as little as 9 meters. Critically, evidence for lateral avoidance behaviour was limited, as fin whales exhibited minimal horizontal displacement in response to approaching vessels, with whales performing shallow dives rather than diverting from nearby traffic. The observed constrained repertoire of avoidant behaviours underscores the high susceptibility of fin whales to vessel strikes, calling for robust mitigation measures to reduce collision risk. These findings are a first step towards clarifying the dynamics of fin whale-vessel collisions and can support the identification of Associated Protective Measures, such as dynamic routing schemes or vessel speed reductions within the recent North-Western Mediterranean Particularly Sensitive Sea Area. They also provide a scientific basis for the identification of spatially explicit conservation tools and effective management strategies to protect this Endangered sub-population.



HC-27. Closing the net on bycatch

Taylor, Nicola L ¹

1. Joint Nature Conservation Committee (JNCC)

Bycatch is a global issue, but one which generally requires a very regional and dynamic approach. The complexities are standing in the way of making real progress towards elimination in many cases, as are available resources. Work is ongoing across a huge number of countries, fisheries and species; and there is opportunity to learn from the global community in support of speeding up progress to tackle this issue. Here, novel case studies of progress and challenges are outlined as examples in support of knowledge share and ultimately, progress towards more effective monitoring and mitigation of this pressure; such as cost-effective and self-managed implementation of Remote Electronic Monitoring; systems to enable fishing in amongst restrictions; the challenges with self-reporting; and incentivisation for participation in monitoring and mitigation. These case studies were gathered as part of a funded project through The Churchill Fellowship.



HC-28. Disentangling the interaction between fisheries and delphinids in the Valencia region (Western Mediterranean)

Izquierdo-Serrano, Mar ¹; Gozalbes, Patricia ¹; Aznar, Francisco Javier ¹; Raga, Juan Antonio ¹; Tomás, Jesús ¹

1. Marine Zoology Unit, Cavanilles Institute of Biodiversity and Evolutionary Biology, University of Valencia, Spain

The assessment of cetacean by-catch across different fishing gears is fundamental to ensure their conservation in the Western Mediterranean; here, we highlight the importance of combining two sources of data, i.e. fisher's reports and information from cetacean strandings to accomplish this. Between 1994 and 2024, 2 common bottlenose dolphins (*Tursiops truncatus*), 8 striped dolphins (*Stenella coeruleoalba*) and 1 Risso's dolphin (*Grampus griseus*) were accidentally caught off the Valencian coast and delivered by fishers to the regional stranding network. Nevertheless, fishing interactions are known to be higher than these reports, according to by-catch estimates gathered from interviews held in 2022 to bottom trawling and artisanal fleet of the region (23 common bottlenose dolphins/year and 7 striped dolphins/year). To determine evidence of by-catch in stranded animals, we examined 2 common bottlenose dolphins and 5 striped dolphins accidentally caught by bottom trawlers that were reported recently dead to the regional network. During necropsies, we made a list of external injuries: bleeding on the edge of rostrum, and superficial skin lesions, such as those caused by contact with the cod-end and with other caught species during fishing hauls. We also examined a common bottlenose dolphin that was stranded trapped in a gillnet. The evidence included netmarks as a result of entanglement: encircling marks around the head and the rostrum, and incisions on the fins. More data are needed to compile a list of injuries associated with each type of fishery. However, our results contribute to differentiate the types of fishing gear involved in stranded cetaceans suspected of fishery interactions, which will aid in the assessment of cetacean bycatch in the study area. This work was supported by the VARACOMVAL project from the Biodiversity Foundation (MITECO) of Spain under the NextGenerationEU (PRTR).



HC-29. Rethinking bycatch risk: Integrating gear characteristics in the spatiotemporal co-occurrence of dolphins and passive fishing in the Bay of Biscay

Deslias, Camille ¹; Barry, Flore ¹; Authier, Matthieu ¹; Bidenbach, Emeric ²; Genu, Mathieu ¹; Dubroca, Laurent ³; Ridoux, Vincent ¹; Peltier, H       ¹

1. *Observatoire Pelagis, UAR 3462 CNRS, La Rochelle Universit  , La Rochelle, France*
2. *Centre d'  tudes et d'Expertise sur les Risques, l'Environnement, la Mobilit   et l'Am  nagement (CEREMA), Plouzan   29280, France*
3. *Institut Fran  ais de Recherche pour l'exploitation de la Mer, IFREMER, Laboratoire Ressources Halieutiques de Port-en-Bessin Huppain, Normandie, France*

Bycatch in gillnets and trammel nets is a major challenge for dolphin conservation. Studying co-occurrence between passive gear fishing effort and dolphin distribution can shed light on the current high bycatch level of common dolphins (*Delphinus delphis*) in the Bay of Biscay (France). Current methods for assessing fishing effort do not take into account the characteristics of static fishing gear (soaking time, net length and height) despite these features' importance in explaining bycatch risk. High-resolution geolocation data were used to determine net immersion duration and its length. The height of the net was obtained from onboard observers' data. The distribution of small delphinids was estimated from observation data from the SCANS-III (summer 2016) and SAMM-II (winter 2021) aerial surveys. A co-occurrence index was computed as fishing effort multiplied by dolphin density, expressed in dolphins.fishing hours and representing the total number of dolphins exposed during the fishing activity. During winter, the co-occurrence between dolphins and gillnet and trammel net fishing effort encompasses the entire continental shelf. Offshore vessels mostly targeting hake have the highest co-occurrence index in both winter and summer (4830 dolphins.fishing hours and 886 dolphins.fishing hours, respectively). Offshore vessels targeting soles have the second highest co-occurrence index (1239 dolphins.fishing hours) in winter, while mixed vessels targeting soles have the second highest co-occurrence index (407 dolphins.fishing hours) in summer. Fishing effort that includes all the characteristics of passive gear allows us to obtain more realistic bycatch risk maps than the currently used vessel speed threshold. This method also provides a replicable framework for other regions and possibly at a finer temporal resolution. This could provide a more detailed understanding of spatial and temporal changes in the bycatch risk of common dolphins at the population scale, and thus enable conservation measures to be fine-tuned.



HC-30. Bottlenose dolphins and fisheries: variability of acoustic repertoire during opportunistic feeding interactions in the Tyrrhenian Sea

Rinalduzzi, Sofia ¹; Labriola, Maria Silvia ²; Turchi, Alice ³; Mattiussi, Alex ⁴; Pedrazzi, Giulia ⁴; Giacomini, Giancarlo ⁵; Russo, Tommaso ⁶; Pace, Daniela Silvia ⁷

1. *Department of Biology, University of Rome Tor Vergata, Rome, Italy Echoes - Capitoline Centre for Marine Research - ETS, Rome, Italy*
2. *Department of Biology, University of Rome Tor Vergata, Rome, Italy Echoes - Capitoline Centre for Marine Research - ETS, Rome, Italy PhD Program in Evolutionary Biology and Ecology, University of Rome Tor Vergata, Italy*
3. *Echoes - Capitoline Centre for Marine Research - ETS, Rome, Italy PhD Program in Environmental and Evolutionary Biology, Sapienza University of Rome, Italy*
4. *Echoes - Capitoline Centre for Marine Research - ETS, Rome, Italy Department of Environmental Biology, Sapienza University of Rome, Italy*
5. *Department of Environmental Biology, Sapienza University of Rome, Italy*
6. *Department of Biology, University of Rome Tor Vergata, Rome, Italy National Inter-University Consortium for Marine Sciences (CoNISMa), Rome, Italy*
7. *CNR – Institute for the Study of Anthropogenic Impacts and Sustainability in the Marine Environment – Capo Granitola Unit, Torretta Granitola, Trapani, Italy*

The bottlenose dolphin (BD) has been documented to opportunistically interact with different types of fishing gear for easy access to prey, often generating conflicts (due to depredation) with relevant socioeconomic/ecological implications. Passive acoustics may be a powerful tool to better understand the associations between BDs and fishing activities, as the analysis of distinctive sounds with different functions could help a finer characterization of the interactions. This study uses BD acoustic recordings collected at the Tiber River estuary (central Tyrrhenian Sea, Western Mediterranean) between 2019-2022 including interactions with trawling and gillnets. Feeding in the absence of fishing gears (natural feeding) was used as a control to compare the acoustic behaviour during opportunistic/non-opportunistic foraging. Recordings were analyzed with Raven Pro 1.6. Three main BDs sounds were selected to characterize the acoustic repertoire and measure the acoustic parameters [Whistles (W), Click-Trains (CT), and Burst-Pulses (BP)]. The Emission Rates (ER) of the vocalizations emitted during natural/opportunistic feeding were compared through the Kruskal-Wallis test. The effect of natural/opportunistic feeding on acoustic parameters extracted from each vocalization was tested using MANOVA and linear models (LMs) for each sound type. Results showed ¹ significantly higher CT and BP ERs during feeding on gillnets (KW-test: $p < 0.05$), possibly linked to the CT role in targeting the prey trapped in the net and the BP role in foraging events/intraspecific



communication; ² significant influence of different feeding behaviours for every sound (MANOVA: $p < 0.05$); and ³ significant increment of W inflection points during trawler-associated feeding (LM: $p < 0.05$; $\beta = 0.86$), possibly related to the augmented information exchange needed to coordinate groups in such dynamic context. This study has shown that opportunistic foraging activities are mediated by differential usage of sounds, improving basic knowledge on BD interactions with fishery and providing additional elements for developing effective management strategies to mitigate conflicts in highly anthropized areas.



HC-31. Spatio-temporal association and overlap of fin whale distribution and krill fisheries at the Western Antarctic Peninsula

Daume, Hannah Viola ¹; Viquerat, Sacha ^{1,2}; Herr, Helena ^{1,2}

1. *Institute of Marine Ecosystem and Fishery Science, Universität Hamburg*

2. *Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research.*

The Western Antarctic Peninsula provides essential feeding grounds for Southern Hemisphere fin whales, that subsist primarily on Antarctic krill – a species also targeted by the largest commercial fishery in the Southern Ocean. The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) oversees the management of the krill fishery using an ecosystem-based approach; yet baleen whales are not explicitly considered. Consequently, interaction and potential for competition between the currently recovering fin whale population and expanding krill fishery are major conservation and management concerns. In this study we analyzed the spatio-temporal overlap of krill fishery and fin whale abundance at the Western Antarctic Peninsula during austral summer 2023. Fin whale sighting surveys were carried out during research expedition MSM115 of the German Research vessel Maria S. Merian in the area surrounding the northern tip of the Antarctic Peninsula from March 1–10, 2023, following standard line transect distance sampling methodology. A habitat suitability model was employed to predict fin whale distribution across a spatial grid, which was also used to aggregate fine-scale catch and effort data from the krill fishery during austral summer 2023, provided by the CCAMLR Secretariat. To analyze the spatial overlap of predicted fin whale abundance and krill fishing effort, the spatially explicit distributions were compared using a structural similarity index measure (SSIM). A fin whale hotspot was identified near Elephant Island, while fishing effort was spatially concentrated at the South Orkney Islands. No overlap was observed at the fin whale hotspot, whereas significant fine-scale overlap was detected at the South Orkney Islands. These findings highlight the need to include predator-fishery overlap into fishery management strategies to mitigate potential competition for the shared resource and ensure sustainable ecosystem management.



HC-32. Exploring the ecological drivers of plastic ingestion by marine megafauna

Hunter, Emma ¹; Barnett, James ²; Deaville, Rob ³; Duncan, Emily ¹; Godley, Brendan ¹; Lindeque, Penelope ⁴; Nelms, Sarah ¹

1. *University of Exeter*
2. *Cornwall Marine Pathology Team Cetacean Strandings Investigation Programme, Institute of Zoology/ Zoological Society of London*
3. *Cetacean Strandings Investigation Programme, Institute of Zoology/ Zoological Society of London*
4. *Plymouth Marine Laboratory University of Exeter*

Plastic ingestion by marine megafauna has been documented in peer-reviewed literature as early as 1985, with microplastics ($\leq 5\text{mm}$ in size) emerging as a research focus since 2015. With 50 years of research available, this study aimed to consolidate the information into a dataset suitable for exploring the factors that may be driving plastic ingestion events in marine megafauna, including cetaceans and pinnipeds. This study provides an analytical summary of the state of research, shifting the focus from “what” species are ingesting plastic to the underlying “why.” A systematic review using the PRISMA approach was conducted, resulting in 293 peer-reviewed publications deemed suitable for inclusion following a rigorous screening process. Each publication was subsequently searched for information relating to macro- and microplastic presence/ absence, number of plastic items per individual, and plastic characteristics alongside potential determinants influencing plastic ingestion (e.g. species, health status, geography, individual characteristics, ecological factors such as prey type, feeding strategy, and habitat). The resultant database synthesises information on over 64,000 samples across 100 species investigated for macroplastic presence, including 3736 samples from cetaceans and 1517 from pinnipeds. For microplastic presence, data were collated from over 10,000 samples representing 96 species. Most of these samples originated from pinnipeds. Preliminary insights show that macroplastic presence has been reported for 31 cetacean species, including 14 with deep diving abilities, eight of which are Ziphiidae. This dataset provides a platform to explore factors, such as habitat, that may affect the susceptibility of certain species and populations to plastic ingestion. With scope to identify any relevant spatial patterns and temporal trends, the insights gained can guide effective conservation and mitigation measures.



HC-33. Analysis of stress-related hormones and behaviour in feeding killer (*Orcinus orca*) and humpback (*Megaptera novaeangliae*) whales exposed to intense tourist operations

Dellepiane, Federica ¹; Waugh, Courtney ²; Arranz, Patricia ³; Tryland, Morten ¹; Sonne, Christian ⁴; Munari, Marco ⁵; Eriksen, Laurits ⁶

1. Universitet i Innlandet
2. Nord Universitet
3. University of La Laguna
4. Aarhus University
5. University of Padova
6. Eriksen Production

Anthropogenic impacts on cetaceans occur from multiple stressors (e.g., vessel noise, entanglement, pollution). Here we used a multidisciplinary approach to understand the potential effect of noise-related disturbance on the behaviour and physiology of two sympatric whale species, killer whales (*Orcinus orca*) and humpback whales (*Megaptera novaeangliae*), in a fjord ecosystem of Northern Norway. Data collection took place from the 8th to the 14th of January 2025 off Skjervøy (70.0340° N, 20.9737° E), using a hydrophone (Soundtrap ST300, 144 kHz sampling rate, 4 m depth) to record whale vocalizations, and ambient and vessel noise. Hormone levels (cortisol) were measured from individual blow samples collected in sterile petri dishes attached to autonomous unmanned vehicles AUVs (DJI Mavic 3 cine) flying at 2-4 m altitude. Behavioural parameters of sampled individuals (respiration rate, behavioural state) were collected with UAVs and analyzed using Boris (Friard & Gamba, 2016). Information on vessel type and activity was gathered through AIS (Automatic Identification System) on Marine Traffic. Sixteen blow samples were collected and stored in RNALater (n = 8 Humpback whales and n= 8 Killer whales). A total of 161 min of acoustic data from high and low number of vessels present, were collected. Behavioural analysis was completed on 207 min of drone footage, including observations of 15 Humpback whales and 5 Killer whale pods (n= 52 individuals). Results of vocalizations and behavioural events are interpreted in the light of environmental variables tested (noise levels, number of vessels present) and related to cortisol levels on the whales, in this and other sampled populations elsewhere. These data will help inform conservation strategies and develop guidelines for marine tourism and vessel traffic, needed to improve the sustainability of whale-watching industry operating in the region and for the management of wild cetacean populations.



HC-34. The WhaleAdapt project: an international, interdisciplinary effort to support vulnerable North Atlantic communities in adapting to climate change-driven redistribution of harvested odontocetes

McKinney, Melissa ¹; Dietz, Rune ²; Kiszka, Jeremy ³; Sonne, Christian ²; Chandelier, Guillaume ³; Fielding, Russell ⁴; Ferguson, Steven ⁵; Garroway, Colin ⁶; Matthews, Cory ⁵; Søndergaard, Jens ²; Watt, Cortney ⁵

1. McGill University, Department of Natural Resource Sciences, Ste-Anne-de-Bellevue, QC, Canada
2. Aarhus University, Department of Ecoscience, Arctic Research Centre, Roskilde, Denmark
3. Florida International University, Department of Biological Sciences, North Miami, FL, USA
4. Coastal Carolina University, HTC Honors College, Conway, SC, USA
5. Fisheries and Oceans Canada, Arctic Aquatic Research Division, Winnipeg, MB, Canada
6. University of Manitoba, Department of Biological Sciences, Winnipeg, MB, Canada

Countries of the Global South and Indigenous communities within the Global North are disproportionately affected by climate change, in part due to use of local wild-caught foods. As common wild harvest species worldwide, toothed whales are caught in the North Atlantic from the eastern Caribbean to Inuit communities in the Arctic. Within these understudied and remote regions, there is limited knowledge of many of harvested odontocete populations. The WhaleAdapt project is an international collaboration of researchers and local organizations aiming to address how vulnerable North Atlantic communities that consume odontocetes can successfully adapt to changes in these marine resources due to climate change. To do so, we are evaluating 1) changing odontocete distribution, 2) shifting trophic roles, 3) human health concerns regarding contaminants and nutrients in these foods, 4) harvest sustainability using genomics, and 5) changing socioeconomic values of harvests. Initial results of the project include predictions on the habitat suitability of North Atlantic odontocetes using ensemble models, and how shifts will affect community dynamics, including people. Changes in habitat suitability vary among species, with significant northward range expansion of tropical and temperate species (e.g., *S. coeruleoalba*, *D. delphis*, *Globicephala* spp.) and range contraction of Arctic to sub-Arctic/north temperate species (Monodontidae, *Lagenorhynchus* spp.). Among range-expanding odontocetes ($n > 300$ samples from 2020-2024), some show strong spatial patterns of foraging specialization and genetic differentiation (e.g., *Orcinus orca*), while others exhibit limited variation in foraging across regions and no genetic population structure (e.g., *Physeter macrocephalus*). Results of this uniquely pan-North Atlantic project will contribute to climate change adaptation, reducing IPCC-identified risks to ocean ecosystems, food security, human health, and living standards, thereby supporting the sustainability of odontocete harvests and the communities that harvest whales.



HC-35. Passive acoustic alert system (PAL) and the effect on harbour porpoise (*Phocoena phocoena*)

Rasim, Jonas ¹; Bittelli, Davide ¹; Taugnitz, Tim ¹; Bär, Tom ¹; Cosentino, Mel ²; Craul, Ann-Kristin ¹; Dähne, Michael ³; Dinkel, Thaya Mirinda ⁴; von Dorrien, Christian ⁴; Gallus, Anja ¹; Jørgensen, Poul Boel ²; Kyhn, Line Anker ⁵; Meyer-Klaeden, Ole ¹; Rostock, Leon ¹; Steinbach, Emma ¹; Tougaard, Jakob ²; Warmuth, Marco ¹; Denking, Judith ¹

1. *Deutsches Meeresmuseum Stralsund*
2. *Aarhus University*
3. *Bundesamt für Naturschutz*
4. *Thünen Institut Rostock*
5. *ISAAFFIK*

Bycatch is a significant threat for harbour porpoises. While acoustic pingers prevent bycatch, they also induce displacement, particularly problematic when used in protected areas. To counter that issue the Porpoise ALert (PAL) was developed. The intended function of the PAL is that emitted porpoise-like sounds alert the porpoises rather than deterring them, thereby inducing an increase in echolocation and awareness to nets. To assess the effect of PAL on acoustic behaviour of porpoises, four field campaigns were conducted: two at Fyns Hoved, Denmark (2022, 2023) and two in Eckernförde, Germany (2023, 2024). For each campaign a setup of 15 FPODs and four 4-channel soundtrap arrays were deployed around a modified gillnet. Porpoise echolocation sounds were recorded in three different scenarios: gillnet alone, gillnet with PAL and control without gillnet or PAL. PALs have been used in gillnet fisheries in Eckernförde since 2017, but never at Fyns Hoved. Thus, the porpoises at Fyns Hoved were considered naïve to PAL, allowing to investigate potential differences in the reactions to the signal in relation to previous experience to PALs. Detections of PAL signals were removed from the FPOD data and the remaining clicks were analysed with generalized additive models to test for effects of the treatments, with additional environmental co-factors. The current results suggest a significant increase in the click activity of porpoises, caused by the PAL. The effect increased with decreasing distance to the net. Based on DP10M, the PAL does not seem to have a significant impact, regarding the occurrence of porpoises. The higher click activity found with the PAL increases the probability of porpoises to detect reflections of the net while not excluding them from the area. Future research should be directed at testing efficiency of PAL to mitigate bycatch in real fisheries and the long-term efficiency of the mitigation.



HC-36. Freeze or flee? Narwhals react differently to two sound disturbance types

Tervo, Outi ¹; Samson, Adeline ²; Ditlevsen, Susanne ³; Jensen, Frederik Hindborg ³; Blackwell, Susanna ⁴; Williams, Terrie ⁵; Heide-Jørgensen, Mads Peter ¹

1. Department of Mammals and Birds, Greenland Institute of Natural Resources, Greenland
2. Laboratoire Jean Kuntzmann, University Grenoble-Alpes, Grenoble, France
3. Data Science Laboratory, Department of Mathematical Sciences, University of Copenhagen, Copenhagen, Denmark
4. Greeneridge Sciences Inc., Santa Barbara, USA
5. Department of Ecology and Evolutionary Biology, University of California, Santa Cruz, Santa Cruz, CA, United States

Understanding animal responses to anthropogenic disturbances is crucial for conservation efforts. This study investigates the behavioural and energetic responses of narwhals (*Monodon monoceros*) to sound exposure, focusing on ship noise and associated airgun pulses, in East Greenland. Using a semi-controlled experimental setup, narwhals (n=6) were exposed to both ship noise and experimental airgun pulses during trials, and to ship noise alone during intertrials. Behavioural data, including locomotion mode and energetic costs, were analyzed in relation to sound exposure levels and distance from the sound source. Results indicate distinct responses by narwhals to both sound exposure types. In addition, at close distances to the sound source (<5 km), results suggest differing reactions to the two sound exposure types. During trials, narwhals exhibited a 'flee' response, characterized by increased stroking frequency and energetic costs. In contrast, during intertrials, narwhals displayed a 'freeze' response, slowing down their locomotion without significant increases in energetic costs. The observed fleeing response resulted in doubling of energetic costs compared with normal behaviour, and can therefore impact the energy budget of individual narwhals, especially if the disturbance is prolonged or repeated. These findings emphasize the importance of considering both behavioural and energetic responses of marine mammals to anthropogenic disturbances.



HC-37. Anthropogenic impact on Baltic and Skagerrak seals

Macieira, Mariana ¹; Cervin, Linnea ¹; Thorsson, Elina ²

1. Department of Environmental Monitoring and Research, Swedish Museum of Natural History, Stockholm, Sweden
2. Department of Pathology and Wildlife Diseases, Swedish Veterinary Agency, Uppsala, Sweden

The impact of anthropogenic activities on marine animals is well documented and has severe consequences on marine ecosystems. Pinnipeds are particularly vulnerable to marine debris due to their amphibious lifestyle, meaning they are doubly exposed, both at sea and on the coast. This study aimed to evaluate the prevalence and characteristics of debris-induced lesions in seals from the Baltic Sea and Skagerrak. Between 2007 and 2024, 2313 grey (*Halichoerus grypus*), 1026 harbour (*Phoca vitulina*), and 505 ringed seals (*Pusa hispida botnica*) from Swedish waters underwent postmortem examinations at the Swedish Museum of Natural History and the Swedish Veterinary Agency. The majority of these animals were hunted (71.4%), while the remaining were bycaught (20.3%) or stranded (8.3%). The presence of plastic debris or fishing gear in the digestive tract and signs of entanglement were recorded. In total, 19 cases of marine debris were documented, of which three were fatal. Prevalence rates were 0.48% in grey seals, 0.39% in harbour seals, and 0.79% in ringed seals. The frequency of debris detection has increased in recent years. Males and juveniles were the most affected demographic groups. Ingestion of debris was more frequent than entanglement (76.9% vs 30.8%). Most affected animals had stranded. These findings align with previous studies on phocids in other areas despite the Baltic having around half as much macro debris as the world average. The results are assumed to be underestimated since many affected animals are likely lost at sea. Mild skin lesions from fishing gear may also go unnoticed due to fur coverage. Nevertheless, some cases were extremely severe, resulting in diminished welfare, pain, infection, and death. This study demonstrates the importance of long-term monitoring for the timely detection of environmental threats so that measures, such as improved waste management and promotion of eco-friendly fishing gear, can be implemented.



HC-38. Estimates of ship collisions and fatalities of fin, blue, sei and sperm whales off the Azores

Romagosa, Miriam ¹; Pérez-Jorge, Sergi ¹; Oliveira, Cláudia ¹; Fonseca, Catarina T. ¹; Prieto, Rui ¹; Cañadas, Ana ²; Silva, Mónica A. ¹

1. *Institute of Marine Sciences – OKEANOS & Institute of Marine Research – IMAR, University of the Azores, Horta, Portugal*
2. *Marine Geospatial Ecology Lab, Duke University, Durham, NC, United States*

The global increase in marine traffic has intensified ship collisions with large whales, causing sublethal or fatal injuries in numbers that may threaten some populations. Thus, predicting potential collisions and their lethality has become an indispensable tool for the conservation and management of vulnerable species, especially in areas where high densities of whales and ships co-occur. The Azores archipelago is an important migratory and feeding habitat for fin (*Balaenoptera physalus*), blue (*B. musculus*) and sei whales (*B. borealis*) and a breeding and foraging habitat for sperm whales (*Physeter macrocephalus*) that lay at the confluence of several transatlantic shipping routes. In this study, we estimated the number of ship collisions and fatalities caused by cargo vessels on these four whale species from May to October in the Azores. Using estimates of whale and shipping densities, and time spent by whales within reach of vessel draughts (from time at depth statistics based on biologging data), we estimated the number of potential collisions between ships and whales and the probability of lethal collisions, based on vessel speed. For the entire study period (6 months) and area (most of the Azorean Economic Exclusive Zone), sperm whales were the species with the highest number of predicted collisions and fatalities (1364 and 325, respectively), followed by fin (1063 and 253), sei (299 and 70) and blue whales (194 and 46). While sperm and sei whale collision and mortality risk varied little between months, fin and blue whales showed highest values in May, decreasing substantially in the following months, with risk progressing from south to north following the latitudinal migration of these species in the region. This study contributes much needed quantitative information on ship-strike frequency and fatalities, which is urgent to support decision-making by managers and maritime authorities in the actual scenario of global shipping expansion.



HC-39. Collision risk in the Mediterranean Sea: risk perception assessment and feasibility assessment of mandatory conservation measures

Tepsich, Paola ¹; Quitiens, Tuur ²; Grossi, Francesca ¹; Crosti, Roberto ³; Santini, Elena ⁴; Pasanisi, Eugenia ⁴; Azzolin, Marta ⁵; Costantino, Matteo ⁶; Favaro, Livio ⁷; David, Lea ⁸; Fraija-Fernández, Natalia ⁹; Miguez, Raul ⁹; Raga, Juan Antonio ⁹; Farina, Marianna ¹⁰; Teti, Roberta ¹⁰; Arcangeli, Antonella ¹¹

1. CIMA Research Foundation
2. Odisee University ; CIMA Research Foundation
3. ISPRA -Italian National Institute for Environmental Protection and Research, Italy
4. ISPRA National Institution for environmental research and monitoring, Roma, Italy.
5. Department of Life and System Biology, University of Torino, Torino, Italy; Gaia Research Institute Onlus, Torino, Italy; Centro Interuniversitario per la Ricerca sui Cetacei (CIRCE)
6. Department of Life and System Biology, University of Torino, Torino, Italy; Gaia Research Institute Onlus, Torino, Italy.
7. Department of Life and System Biology, University of Torino, Torino, Italy; Centro Interuniversitario per la Ricerca sui Cetacei (CIRCE)
8. EcoOcéan Institut, France
9. Instituto Cavanilles de Biodiversidad y Biología Evolutiva, Universitat de València, Spain
10. Marine Turtle Research Group, Department of Marine Animal Conservation and Public Engagement, Stazione Zoologica Anton Dohrn, Italy
11. ISPRA National Institution for environmental research and monitoring, Roma, Italy

Ship strikes are known to be the first cause of human induced mortality for large cetaceans in the Mediterranean basin. Research effort has been dedicated to the identification of risk hot-spots, evaluation of impact of marine traffic on cetacean populations and on theoretical assessment of mitigation measures. The recent institution of the NW Mediterranean PSSA has furthermore underlined the need for identification of effective and feasible conservation measures. Within the LIFE CONCEPTU MARIS project, a training course dedicated to personnel of shipping/navigation companies, dealing with importance of biodiversity conservation in the Mediterranean Sea, with a specific focus on the risk of collision with large cetaceans and sea turtles has been realized. Furthermore, a questionnaire to analyze the perception of risk of collision with cetaceans and sea turtles and effectiveness and feasibility of proposed instruments has been created and delivered in 2023-2024. Five shipping companies were involved, a total of 133 crew members successfully completed the course. Course assessment from participants confirmed the need for training, as 94% were attending a course on such topics for the first time and 67% declared it to be useful for their working activity. Interestingly, almost 30% of crew members declared to have witnessed a collision event also with medium/small cetacean. Over 100 responses to the questionnaire were collected, mainly from people



working out at sea (52%). Encounters with cetaceans are mainly indicated as frequent or very frequent and the need for specific training is revealed (63%). The most effective mitigation measures coming out from the answers are presence of dedicated MMOs onboard, reactive slow down and altered shipping routes. The results from this activity provide essential information for the identification of mandatory measures to be proposed in PSSA and eventually over other ship strike risk areas.



HC-40. New bycatch insights unveiled through strandings analyses

Hernandez-Gonzalez, Alberto ¹; Ivaylova, Silvina ¹; Puig-Lozano, Raquel ²; Covelo, Pablo ³; López, Alfredo ^{3,4}; Pin, Xabier ³; González, Mónica ^{4,5}; Vázquez, Uxía ³; Pierce, Graham ^{1,6}

1. Instituto de Investigaciones Marinas (IIM-CSIC)
2. Instituto Universitario de Sanidad Animal y Seguridad Alimentaria (IUSA)
3. Coordinadora para o Estudio dos Mamíferos Mariños (CEMMA)
4. Centro de Estudos do Ambiente e do Mar (CESAM);
5. Universidade de Vigo (UVigo)
6. Oceanlab, University of Aberdeen

Stranded cetaceans represent an indirect source of information on bycatch as it is possible to obtain the biological profile of individuals most likely to be caught by fisheries in a particular area through necropsies. In Galicia, NW Spain, the stranding network CEMMA necropsied 3,928 common dolphins (*Delphinus delphis*), 560 bottlenose dolphins (*Tursiops truncatus*) and 345 harbour porpoises (*Phocoena phocoena*) between 1990 and 2023. Of all individuals examined, 18.5% of common dolphins (n = 725), 6.3% of bottlenose dolphins (n = 35) and 12.5% of harbour porpoises (n = 43) had external injuries consistent with bycatch (e.g., skin cuts and/or impressions caused by contact with nets, amputations, broken mandible and/or teeth). Results showed that both common dolphins and bottlenose dolphins with evidence of bycatch stranded most frequently in the north-western part of the study area (> 60%), while harbour porpoises with evidence of bycatch stranded principally in the southwest. The highest bycatch incidence for the three cetacean species was detected in winter (> 30% of the total annual). It was also observed that bycatch incidence is higher in juvenile common dolphin individuals (160 - 190 cm in length), juvenile female bottlenose dolphins (< 250 cm in length), and adult harbour porpoise individuals (150 - 200 cm in length). Finally, after analysing the diet of these three cetacean species, more pelagic prey were identified in the stomachs of bottlenose dolphins with evidence of bycatch; and demersal prey in the stomachs of harbour porpoises with evidence of bycatch. Since part of the bottlenose dolphin population have an oceanic distribution, and harbour porpoises have a more coastal distribution, these findings could indicate that these two cetacean species can be affected by different métiers in the study area (e.g., trawling vs gillnetting) and, therefore, this information could be used to support future ecosystem-based fisheries management.



HC-41. Advances in the photoidentification catalogue of common dolphins (*Delphinus delphis*) in the Bay of Algeciras, southern Spain

Olaya-Ponzzone, Liliana ¹; Espada Ruíz, Rocío ¹; Martín Moreno, Estefanía ²; García-Gómez, José Carlos ¹

1. Marine Biology Laboratory, University of Seville

2. Ecolocaliza

In Algeciras-Gibraltar Bay, southern Spain, a photo-identification catalogue of adult *Delphinus delphis* individuals recognisable by dorsal edge markings (DEMs) is being developed. In 593 sampling days (March 2017 - March 2020) 1662 sightings were made. In the study area, a highly anthropised area with high boat traffic, the animals are subject to significant threats, mainly from fishing gear and propellers. Identification is reinforced by the shape, size and intensity of the white spot on the dorsal fin (when present) characteristic of this species and by the shape of the fin itself. Individuals are ordered in the catalogue according to the locations of the DEMs. A schedule of capture and recapture (where available) of each individual is shown and the quality of the photographs in the catalogue and their distinctiveness are detailed. Of the 1429 individuals identified so far, 43.1% were photographed on the right side (90° angle), 31.9% on the left side (270° angle) and 25.0% on both sides. Left- and right-side photographs - for the same individual - were associated by overlapping characteristics. By examining the DEMs, it is possible to obtain data on the frequency and severity of negative interactions with vessels. The main objective of this work is to identify as many individuals as possible in order to estimate population size, distinguish family groups and define resident populations in the area. This information may be crucial to evaluate the need to implement protection measures in order to reduce human impact and favour dolphin conservation. The study area is a crucial feeding and breeding area for the common dolphin, listed as 'Endangered' since 2003 according to the IUCN Red List. The proposal to establish a micro-sanctuary in the area is reinforced by these results, which identify new lacerated animals and individuals with new lacerations throughout the study period.



HC-42. Close encounters – investigating Near-Miss Events of whale-vessel collisions in the Northeast Atlantic

Santos, Rita ¹; Oliveira-Rodrigues, Cláudia ²; M. Silva, Iolanda ³; Valente, Raul ³; Afonso, Luís ⁴; Gil, Ágatha ⁵; Vinagre, Catarina ⁶; Correia, Ana Mafalda ³

1. FCT-UAAlg – Faculty of Sciences and Technology, University of Algarve, 8005-139, Faro, Portugal. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal.
2. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal. Department of Biology, FCUP – Faculty of Sciences of the University of Porto, 4169-007, Porto, Portugal.
3. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal.
4. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal. ICBAS – School of Medicine and Biomedical Sciences of the University of Porto, 4050-313, Porto, Portugal.
5. CIIMAR/CIMAR LA, Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal. CITAB - Centre for the Research and Technology of Agro-Environmental and Biological Sciences, University of Trás-os-Montes and Alto Douro, Vila Real, 5001-801, Portugal. IIM-CSIC - Instituto de Investigacións Mariñas, 36208, Vigo, Pontevedra, Spain.
6. Centre of Marine Sciences (CCMAR/CIMAR LA), Campus de Gambelas, Universidade do Algarve, 8005-139 Faro, Portugal.

Whales are considered ecosystem engineers, playing a vital role in sustaining healthy and balanced ecosystems. Effective conservation strategies are then critical to protect these species from the increasing number of threats they face, including vessel-whale collisions, which occur globally and are particularly prevalent in the North Atlantic. Among these, Near-Miss Events (NME) – incidents where no actual collision occurs but the potential and high probability for one exists – are significant. This study analysed 10 years of cetacean occurrence data (2012-2024) collected across four long-transect maritime routes in the Macaronesia, between mainland Portugal and the Archipelagos of the Azores, Madeira and Cape Verde. Data was collected through visual monitoring conducted onboard cargo ships used as Research Platforms. Descriptive statistics and spatial analysis under Geographic Information Systems were applied to characterize the spatial distribution of NMEs. Collision risk was assessed by relating NMEs to relevant factors, including whale's location in relation to the vessel, the vessel's speed, the whale's species, group size, and behaviour. In total, 741 sightings of large whales (baleen and sperm whales) were recorded, of which 22 (2.97%) represented a NME (following criteria adapted from literature). Thirteen sightings occurred near the bow of the vessel, where the probability of collision is higher. A high percentage of animals involved in the NMEs (40%) showed an indifferent behaviour towards the vessel, suggesting a lack of awareness of the ship's



passage, substantially increasing the possibility of collision. *Balaenoptera acutorostrata* was the species most frequently involved in these events, accounting for 36.36% of NMEs. These findings contribute to a better understanding of whale-vessel interactions in the Northeast Atlantic and provide valuable insights for developing management and conservation strategies designed to reduce collision risk while promoting sustainable maritime practices.



HC-43. Trawling fishery drives the distribution of bottlenose dolphins: a case study with vessel preferences at the Tiber River estuary (Italy)

Labriola, Maria Silvia ^{1,2,3}; Pedrazzi, Giulia ^{2,4}; Rinalduzzi, Sofia ^{2,5}; Parisi, Antonio ⁶; Giacomini, Giancarlo ^{2,4}; Pace, Daniela Silvia ^{4,7}; Russo, Tommaso ^{5,8}

1. Department of Biology, University of Rome Tor Vergata, Rome, Italy
2. Echoes - Capitoline Centre for Marine Research - ETS, Rome, Italy
3. PhD program in Evolutionary Biology and Ecology, University of Rome Tor Vergata, Italy
4. Department of Environmental Biology, Sapienza University of Rome, Italy
5. Department of Biology, University of Rome Tor Vergata, Rome, Italy
6. 4 Department of Economics and Finance, University of Rome Tor Vergata, Rome, Italy
7. Department of Environmental Biology, Sapienza University of Rome, Italy
8. CNR - Institute for the Study of Anthropogenic Impacts and Sustainability in the Marine Environment - Capo Granitola Unit, Torretta Granitola, Trapani, Italy
9. National Inter-University Consortium for Marine Sciences (CoNISMa), Rome, Italy

The common bottlenose dolphin (*Tursiops truncatus*, BD) is known for its opportunistic foraging behaviour, including exploiting fisheries activities. According to several years of research programs, BD frequently interacts with trawlers at the Tiber River estuary (Tyrrhenian Sea, Western Mediterranean), off the coast of Rome. This work aimed to study further the dynamics of BD-fishery interactions in the area by 1) assessing the potential degree of influence exerted by trawling fishery on BD spatial distribution and 2) testing the hypothesis that BD exhibits preferences for interacting with specific fishing vessels. Using five years of data (2019-2023), we analysed the spatial and temporal correlations between BD presence (recorded during boat-based surveys; N=177 days with sightings) and fishing effort (tracked using Vessel Monitoring System, VMS). About half (47%) of sighting days involved BD-trawlers interactions. We tested for differences in BD distribution (depth, distance from coast, distance from river mouths) between trawling and non-trawling days using PERMANOVA. Spatial overlap between BD and fishing activity was quantified using a Range Overlap (RO) metric, and a Co-occurrence Rate (CoR) was derived for each fishing vessel. A GAM was used to model BD presence in the area, with environmental factors and the activity of individual trawlers as predictors. Results showed that BD presence was highly correlated with fishing hotspots (RO=0.46) and confirmed a shift in BD distribution further from the coast on trawling days (PERMANOVA: $p=0.001$). Spatial overlap varied greatly among vessels (CoR: 0.22 ± 0.24 ; highest 0.74), indicating BD preferences for certain trawlers. The GAM (deviance-based $R^2=0.57$) identified several trawlers as significant predictors ($p<0.05$) of BD presence, highlighting complexity in BD behavioural patterns and possible foraging choices. These findings enhance our understanding of dolphin-fishery interactions. They may inform conservation management strategies, offering insights into how fishing practices influence BD spatial ecology and long-term viability in coastal areas.



HC-44. Assessing an automated detection system to reduce whale-vessel collision risk in the Pelagos Sanctuary

Rumes, Bob ¹; Van Nieuwenhove, Annelore ¹; Pierantonio, Nino ²; Rouhan, Angelique ³; Panigada, Simone ²

1. *Institute of Natural Sciences*
2. *Tethys Research Institute*
3. *Bureau Veritas Marine & Offshore*

Collisions between large whales and vessels are a critical threat to large whales globally, significantly contributing to their mortality and affecting their persistence. The Mediterranean Sea is a global hotspot for whale-vessel collisions, with one of the highest rates involving large cetaceans, especially the endangered fin (*Balaenoptera physalus*) and sperm whales (*Physeter macrocephalus*). An Onboard Cetacean Detection System (OCDS) was developed by the SEADETECT consortium as part of an EU-LIFE project with the aim of reducing whale-vessel collisions in the Pelagos Sanctuary. The OCDS is composed of three sensor subsystems: the optronic sensor component consisting of three cameras (thermal IR; visible near IR, and colour band; pan/tilt/zoom gimbal), the 360° radar component, and the COTS 3D LiDAR which has a more limited field of view, but which provides locally higher resolution than the radar data. Preliminary data collection and testing was conducted in summer 2024 on the whale viewing vessel La Découverte du Vivant North of Calví, Corsica Island for the individual sensor components. From January 2025 onwards the integrated OCDS is deployed on two ferries of La Méridionale running between the Côte d’Azur and Corsica. Here we present the results from the initial data collection and assess system performance under different meteorological conditions. This work is part of an ongoing effort to develop a mitigation measure tailored for the issue of whale-vessel collisions in the north-western Mediterranean Sea with potential transferability for application in other high-risk areas for ship strikes worldwide.



HC-45. Cetacean bycatch mortality from strandings: the life table method

Pierce, Graham John ¹; Read, Fiona . ²; Hernandez-Gonzalez, Alberto ¹; Brownlow, Andrew ³; Covelo, Pablo ⁴; López, Alfredo ⁴; Pin, Xabi ⁴; Saavedra, Camilo ⁵

1. *Instituto de Investigaciones Marinas (IIM-CSIC), Rúa Eduardo Cabello, 6, 36208, Vigo (Pontevedra), Spain.*
2. *Life History Studies (UK).*
3. *University of Glasgow, UK*
4. *Coordinadora para o Estudio dos Mamíferos Mariños (CEMMA), Rúa Ceán, 2, 36350, Nigrán (Pontevedra), Spain.*
5. *Instituto Español de Oceanografía, Spain*

Drift models allow stranding data to be used to estimate bycatch mortality in cetaceans. An alternative is the use of life tables, an ecological tool also used by the life insurance industry. We estimated overall annual mortality rate and annual mortality rate due to bycatch, using age data (1990-2010) for harbour porpoise (*Phocoena phocoena*) stranded in Scotland (N=360), and common dolphin (*Delphinus delphis*) (N=580), bottlenose dolphin (N=90) and harbour porpoise (N=150) in Galicia (NW Spain), plus cause-of-death data from porpoises in Scotland over the same period (N=550) and from strandings in Galicia during 1990-2023 (N = 3930, 560 and 340 respectively). Estimated average annual mortality rates were 18% (0.9% for annual bycatch mortality), 18% (2.3%), 14% (0.9%) and 12% (2.2%) respectively. In Galicia, the proportion of bycatch mortalities in stranded animals was markedly higher in 2021-2023 than the long-term average. In harbour porpoise, the figure rose almost threefold, equivalent to an annual bycatch mortality rate of 6.4%. Using the most recent population estimate (SCANS IV), this suggests that over 250 porpoises may die from bycatch every year along the Atlantic coast of the Iberian Peninsula, a number far higher than could be sustainable. We used simulations to generate confidence limits, and the ability of this method (or the use of raw age data) to detect changes in mortality rate over time, also its robustness to data limitations and biases (e.g. non-stationary age distribution, underrepresentation of young animals and deaths occurring far offshore), and suggest ways to improve the estimates. There was an increase in mortality rate in Scottish porpoises during 1990 to 2010, mainly driven by changes in juvenile mortality. Correcting for apparent underrepresentation of the youngest age classes, mortality rate increased but the year-to-year pattern was retained. A systematic approach to selecting animals for age determination is essential.



HC-46. A review of out of habitat Arctic pinniped records in south west England

Jarvis, Daniel ¹; Barnett, James ²; Cooper, Tamara ³; Sayer, Susan ⁴

1. *British Divers Marine Life Rescue*
2. *Cornwall Marine Pathology Team*
3. *Cornish Seal Sanctuary*
4. *Seal Research Trust*

Records of vagrant Arctic pinnipeds in Europe are reported to be increasing due to climate change, in addition to natural exploration behaviour. In the UK, these sightings are more likely in northern regions closer to their known range, such as Scotland. This review aims to assess the apparent recent increase of reports in south west England, which is noteworthy given its distance much further south and as there are comparatively very few records from the intervening western UK and Irish coastlines. Since 1900 there have been 12 records of four species in this region, comprising four hooded seals (*Cystophora cristata*), four harp seals (*Pagophilus groenlandicus*), two ringed seals (*Pusa hispida*) and two walrus (*Odobenus rosmarinus*). 10 (83%) of these records occurred since 2004, evidencing the noted increase within the last 20 years. Furthermore, four (40%) sightings occurred within the small geographic area known as St Ives Bay. Outcomes varied with some requiring rescue and rehabilitation, whilst others were monitored without intervention. The only exception was the walrus in summer 2021 that famously required considerable management due to its unusual circumstances. Conservation and welfare organisations working alongside statutory bodies should aim to increase awareness of recognising, recording and responding to these species due to the predicted increase in occurrence. More resources may need to be allocated to them along with prepared response strategies for those that require management, including public expectations and behaviour, or rehabilitation and release. Climate change mitigation is urgently needed globally as the impacts will be most severe for Arctic species through loss of critical habitat, displacing them elsewhere. Provision of new and potentially artificial habitat in their home range are options that require careful consideration and implementation to attempt to assist these species to survive, whilst pioneer populations also attempt to adapt and establish in new habitats.

HC-47. Phthalates contamination in two odontocete species across the Macaronesian region (Eastern North Atlantic)

Sambolino, Annalisa ¹; De la Fuente, Jesus ²; Almunia, Javier ³; Alves, Filipe ¹; Cabral, José ⁴; Carreira, Gilberto ⁵; Cordeiro, Nereida ⁶; Correia, Sandra ⁴; Dinis, Ana ¹; Esteban, Ruth ⁷; Freitas, Luís ⁷; López-Suárez, Pedro ⁸; Martín, Vidal ⁹; Miodonski, Joana ⁵; Miralles, Laura ¹⁰; Pérez-Gil, Mónica ¹¹; Prieto, Rui ¹²; Renom, Berta ¹³; Servidio, Antonella ¹¹; Silva, Monica ¹²; Simião, Susana ⁵; Varo-Cruz, Nuria ¹¹; Verborgh, Philippe ⁷; Arbelo, Manuel ²; Fernandez, Antonio ²

1. MARE - Marine and Environmental Sciences Centre, ARNET - Aquatic Research Network, Regional Agency for the Development of Research, Technology and Innovation (ARDITI), Funchal, Madeira, Portugal
2. Veterinary Histology and Pathology, Atlantic Center for Cetacean Research (CAIC). University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas of Gran Canaria (ULPGC), Canary Islands, Spain
3. Loro Parque Foundation, Puerto de la Cruz, Tenerife, Canary Islands, Spain
4. Instituto do Mar (IMar), Mindelo, São Vicente, Cape Verde
5. Azores Regional Directorate of Maritime Policies (DRPM), Horta, Azores, Portugal
6. LB3, Faculty of Exact Science and Engineering, University of Madeira, Funchal, Madeira, Portugal
7. Madeira Whale Museum, Caniçal, Madeira, Portugal
8. Bios Cabo Verde, Sal-Rei, Boa Vista, Cape Verde
9. Canary Islands Cetaceans Research Centre, Society for the Study of Cetaceans in the Canary Archipelago (SECAC), Lanzarote, Canary Islands, Spain
10. Department of Functional Biology, Genetics Area, University of Oviedo, Oviedo, Spain
11. Cetaceans and Marine Research Institute of the Canary Islands (CEAMAR), Las Palmas, Canary Islands, Spain
12. Institute of Marine Sciences – OKEANOS, University of the Azores, & Institute of Marine Research – IMAR, Horta, Azores, Portugal
13. Project Biodiversity, Santa Maria, Sal, Cape Verde

Phthalates (Phthalic Acid Esters – PAEs) are ubiquitous and environmentally pervasive plastic additives classified as emerging contaminants, endocrine disruptors and, in some cases, toxic for reproduction. This study evaluated PAE contamination levels in two odontocete species from the Macaronesian region, analysing the influence of factors such as sex, species, and sample type, as well as regional differences in contamination patterns. A total of 158 blubber samples were analysed, including 111 from short-finned pilot whales (*Globicephala macrorhynchus*) and 47 from bottlenose dolphins (*Tursiops truncatus*), collected between 2001 and 2022 in the Azores, Canary Islands, and Cape Verde. Samples included necropsy specimens (n=34) and biopsies from free-ranging animals (n=124). Seven common phthalates were quantified using QuEChERS extraction and gas chromatography-mass spectrometry. For both species, necropsy samples showed significant differences in Σ 7PAEs levels compared to biopsies in the Canary Islands (Wilcoxon rank sum test, $p < 0.05$), suggesting necropsy samples may not reflect the true populations'



contaminant levels. Therefore, only biopsy data were used for further analysis. No sex-related differences in PAE levels were detected. Pilot whales from Canary Island (average $\Sigma 7$ PAEs: 1324.99 ng/g w.w.), a region with greater population density and industrial activity, showed significantly higher PAE concentrations ($p=0.00018$) compared to Cape Verde (54.91 ng/g). In bottlenose dolphins, significantly higher concentrations ($p=0.00078$) were found in the Azores (174.39 ng/g) relative to the Canary Islands (46.27 ng/g). Within the Canary Islands, where both species were sampled, PAE levels in pilot whales were significantly higher than in bottlenose dolphins ($p < 0.0001$), likely due to dietary and habitat differences. Despite limitations, such as small sample size in certain regions, these findings highlight the need for long-term monitoring to evaluate the potential impacts of PAEs on marine species and the effectiveness of EU regulations, such as PAEs usage restrictions, in reducing contamination in marine ecosystems.



HC-48. Humpback whale entanglement – need for local response: conservation perspectives from MBREMP

Orio, Davis ¹; Ng'ombo, Mustapha ¹; Kalashnikova, Ekaterina ²; Akkaya, Aylin ³

1. *Mnazi Bay Ruvuma Estuary Marine Park, Mtwara, Tanzania*
2. *Tanzania Cetaceans Program, Zanzibar, Tanzania and Bazaruto Centre for Scientific Studies (BCSS), Bengueria, Mozambique*
3. *DMAD-Marine Mammals Research Association, Istanbul, Turkiye*

Mnazi Bay Ruvuma Estuary Marine Park (MBREMP), located on Tanzania's southern coast, spans 650 km² of critical habitats and ecosystems, supporting diverse flora and fauna. Established in 2000, the Park encompasses 23 villages and over 50,000 inhabitants relying on marine resources for their livelihoods. Humpback whales (*Megaptera novaeangliae*) migrate to and through these waters annually between July and November, offering invaluable eco services warranting thriving ecosystems, and income generation opportunities to local communities and the government of Tanzania via responsible tourism activities. However, these migrations also pose significant challenges for the animals and communities. Whale entanglements in fishing gear is a growing issue globally, and is an emerging problem in Tanzania, as every year several individuals are being accidentally entangled in nets in and around MBREMP seascape. These incidents threaten both marine mammals and artisanal fisheries' livelihoods, resulting in fishing net damage, income loss, and personal risks to fishers. Tension between communities and conservation authorities lead to conflicts which include compensation demands and growing mistrust. Striving to address these issues, MBREMP and marine mammal researchers have implemented disentanglement workshops, community education, and awareness initiatives. Capacity-building efforts for MPA staff have led to successful rescue of four entangled whales in 2024, however lack of capacity made operations challenging. These initiatives underscore the importance of further skills development, tools, and collaborative engagement to mitigate entanglement risks and foster coexistence. Urgent action is needed to expand whale entanglement response workshops and strengthen capacities within both park authorities and fishing communities. Enhancing legal and policy frameworks, alongside practical conservation tools, will reduce human-wildlife conflict, protect livelihoods, and ensure the long-term survival of humpback whales in Tanzania's waters. Achieving these goals is vital for ecological sustainability and the harmonious interaction of local communities with this iconic species.



HC-49. Fishing exclusion in offshore wind farms and its effects on the marine environment

Plön, Stephanie ¹; Diederichs, Ansgar ¹; Voß, Julika ¹

1. BioConsult SH GmbH & Co. KG, Schobüller Str. 36, 25813 Husum, Germany

The so-called "reserve effect" describes the effect of protecting an area, in which the extraction of marine resources is prohibited, such as the exclusion of fishing within and active fishing around a German offshore wind farm. This fishing exclusion results in a rehabilitation of benthic habitats, no removal of individuals/overfishing of the target species, as well as a change in food availability and no bycatch of the non-target species. Thus, it can have a positive effect on the protected assets relevant to the German exclusive economic zone (i.e. benthic habitats, fish, marine mammals, and seabirds and resting birds). However, different factors influence the intensity of the effect: importance of the area, size of the area, intensity of fishing effort before fishing exclusion, shift of fishing effort to other areas, biology of the species, and abiotic factors. Depending on these factors, offshore wind farms can contribute to protecting the oceans. To achieve the Kunming-Montreal Global Biodiversity Framework objective, there is a debate about classifying offshore wind farms as so-called "other effective area-based conservation measures" (OECMs), i.e. areas that contribute to the long-term conservation of biodiversity even outside of protected areas. German offshore wind farms meet the criteria for OECM classification with regard to administration/management, while at the same time meeting the criteria with regard to biodiversity. Offshore wind farms that are located in a degraded area and where the underwater structures could help to restore the damaged ecosystem and increase biodiversity appear to have the greatest potential for recognition as OECM. However, a 'case-by-case assessment' involving targeted monitoring at several locations and over longer periods of time to increase the reliability of the predicted/determined trends is required before offshore wind farms can be recognized as OECMs.



HC-50. Harbour porpoises and operational wind farms: a large-scale study in the German Bight

Wahl, Veronika ¹; Moick, Melissa ¹; Schultz, Marika ¹; Mercker, Moritz ²; Rose, Armin ³; Michalik, Andreas ¹; Schubert, Alexander ³; Diederichs, Ansgar ³; Voß, Julika ³; Freund, Anika ¹; Braasch, Alexander ¹

1. IBL Umweltplanung
2. Bionum
3. BioConsult SH

General patterns of harbour porpoise distribution around operational offshore wind farms (OWFs) can only be identified by large-scale studies which had not been carried out to date. For our study, we analysed a suitably large dataset of PAM data from Cetacean and Porpoise Detectors (CPODs), spanning a period from 2010 to 2021. We combined data from 62 CPOD positions from across OWFs in the German Bight, in order to evaluate the difference in detection rates of harbour porpoises within OWFs and in their vicinity (2.5 km around OWF borders). Two GAMM model approaches were designed: a factor model using the spatial OWF reference as a binary factor; and a continuous model using the distance to OWF, allowing to describe nonlinear dependencies of harbour porpoise abundance. We excluded all days when piling events took place within a radius of 20 km around respective CPODs. As a response variable, DP10M/5d (detection-positive ten minutes per five days) was chosen. Our results show significantly higher detection rates within OWFs compared to CPOD data from OWF vicinity, with an overall increase of 10.6 % in the factor model. No significant increase was detected by the continuous model within OWFs with respect to the average, however in the vicinity of OWFs detections decreased. It appears that OWFs in operation may attract rather than deter harbour porpoises, though the size of the effect differs among OWFs. The reef and refugium effects created by offshore wind farms (OWFs), further supported by fishing prohibitions within German OWFs, may account for our findings. The consistently higher detection rates of harbour porpoises within OWFs compared to surrounding areas, observed throughout the dataset, suggest a general pattern of slight attraction to OWFs in the German Bight.

HC-51. Fishery interaction with cetaceans: insight from 38 years of stranding monitoring (1986-2023) along the Italian coastline

Pietroluongo, Guido ¹; Grattarola, Carla ²; Belluscio, Donatella ³; Berio, Erica ⁴; Centelleghes, Cinzia ⁵; Ceolotto, Luca ⁶; Crotti, Silvia ⁷; Denurra, Daniele ⁸; Cocumelli, Cristiano ⁹; Di Donato, Alessandra ¹⁰; Di Francesco, Gabriella ¹¹; Di Guardo, Giovanni ¹²; Di Nocera, Fabio ¹³; Di Renzo, Ludovica ¹¹; Gavaudan, Stefano ⁷; Giorda, Federica ²; Lucifora, Giuseppe ¹³; Marino, Leonardo ³; Marsili, Letizia ¹⁴; Migliore, Sergio ¹⁵; Pascucci, Ilaria ⁷; Petrella, Antonio ³; Pintore, Antonio ⁸; Puleio, Roberto ¹⁵; Rubini, Silva ¹⁰; Terracciano, Giuliana ¹⁶; Toffan, Anna ¹⁷; Cozzi, Bruno ⁶; Podestà, Michela ¹⁸; Pavan, Gianni ¹⁹; Casalone, Cristina ²; Mazzariol, Sandro ⁵

1. Department of Comparative Biomedicine and Food Science, University of Padova, 35020 Legnaro (PD), Italy
2. CoNISMa, National Interuniversity Consortium for Marine Sciences, Piazzale Flaminio 9, 00196 Rome, Italy
3. Istituto Zooprofilattico Sperimentale del Piemonte, Liguria e Valle d'Aosta, 10154 Torino, Italy
4. National Reference Center for Diagnostic Investigations in Stranded Marine Mammals (C.Re.Di.Ma.), 10154 Torino, Italy
5. Istituto Zooprofilattico Sperimentale della Puglia e della Basilicata, 71121 Foggia, Italy
6. Department of Prevention, Local Veterinary Services, ASL1 Sistema Sanitario Regione Liguria, 18038 Sanremo (IM), Italy
7. Department of Comparative Biomedicine and Food Science, University of Padova, 35020 Legnaro (PD), Italy
8. Interuniversity Center for Cetacean Research (CIRCE), 16132 Genova, Italy
9. Department of Comparative Biomedicine and Food Science, University of Padova, 35020 Legnaro (PD), Italy
10. Istituto Zooprofilattico Sperimentale dell'Umbria e delle Marche "Togo Rosati", 06121 Perugia, Italy
11. Istituto Zooprofilattico Sperimentale della Sardegna, 07100 Sassari, Italy
12. Istituto Zooprofilattico Sperimentale del Lazio e della Toscana, 00178 Roma, Italy
13. Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna "Bruno Ubertini", 44124 Ferrara, Italy
14. Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale", 64100 Teramo, Italy
15. Veterinary Medical Faculty, University of Teramo, 64100 Teramo, Italy
16. Istituto Zooprofilattico Sperimentale del Mezzogiorno, 80055 Portici, Italy
17. Department of Physical Sciences Earth and Environment, University of Siena, 53100 Siena, Italy
18. Istituto Zooprofilattico Sperimentale della Sicilia, 90129 Palermo, Italy
19. Istituto Zooprofilattico Sperimentale del Lazio e della Toscana, 56123 Pisa, Italy
20. Istituto Zooprofilattico Sperimentale delle Venezie, 35020 Legnaro (PD), Italy
21. Museo Civico di Storia Naturale di Milano, Sezione di Zoologia dei Vertebrati, 20121 Milano, Italy
22. Department of Earth and Environment Sciences, University of Pavia, 27100 Pavia, Italy

The Italian Stranding Network aims to monitor fishery interaction on stranded cetaceans to identify risk patterns and support targeted conservation policies through improved forensic methods and collaboration.



Historical and new data spanning 38 years on fishery-related findings and mortalities were analyzed in 5355 cetaceans stranded in Italy, focusing on the most represented species. Literature review and evidence of interaction on stranded carcasses supported the findings' categorization, from animal history to pathological findings. Evidence assessment and post-mortem investigation methods evolved over three macro-periods, from non-standardized reporting (1986–2014, Tier 1) to an integrated national stranding network (2015–2019, Tier 2), and finally to the creation of a new standardized, evidence-based diagnostic framework under the EU-funded LIFE DELFI project (2020–2023, Tier 3). Evidence of fishery interactions was reported in 12.9% of carcasses (691/5355), with significant differences observed between species, sexes, and geographic areas. Geographic analysis identified distinct risk hotspots, such as geographical sub-areas (GSA) 17 for bottlenose and GSA 10 for striped dolphins. The most represented categories of interaction were the “presence of fishing gears” and the “larynx entanglement”, particularly affecting bottlenose dolphins. Temporal trends revealed a decline in fishery interaction rates, potentially reflecting the adoption of evidence-based approaches, improved fishing practices, conservation measures, or environmental changes. The adoption of the new diagnostic framework attributed fishery-related causes of death to 12.07% of necropsied carcasses during Tier 3 (21/174), with adult male bottlenose dolphins more represented. For the first time in Italy, these results supported recommendations for species- and region-specific mitigation strategies, including gear modifications, seasonal bans, and marine protected areas. Engaging fishing communities in conservation efforts and standardizing forensic investigations across the Mediterranean are crucial for advancing cetacean conservation. This research represents a new model and highlights the value of stranding networks in monitoring anthropogenic threats and shaping effective conservation policies.



HC-52. Evaluating mitigation effectiveness for sperm whales in seismic operations: Brazil Pelotas basin case study

Costa, Mayara ¹; Penin, Felipe ^{2,3}

1. NAV Ocean Ltd.
2. 1 - Seiche Ltd.
3. Sango Acoustics Ltd.

Seismic surveys are a significant source of anthropogenic sound in the oceans. Conventional sound sources produce low-frequency sound waves, which overlap with frequencies critical to marine mammals for communication, navigation, and foraging. Sperm whales (*Physeter macrocephalus*). This acoustic overlap can disrupt their behavior, including prey detection, social communication, and habitat use, potentially causing displacement and physiological stress. National laws or guidelines or industry best practices are commonly implemented, which include operational monitoring and mitigation measures. Although some specific aspects of such measures differ across countries. For example exclusion & monitoring zone distances or actions taken if a marine mammal is identified within these zones. In Brazil, there is a conservative regulation that applies as a mitigation measure the exclusion zone distance of 1000 meters from the source array centers, with the seismic source being shutdown if any marine mammal is detected within this area. This study was conducted during a seismic survey conducted in the Pelotas basin in southern Brazil, between May and August 2024, aiming to assess the effectiveness of mitigation measures on the local sperm whale population. Passive acoustic monitoring (PAM) using a towed hydrophone array, was carried out over 80 days. PAM equipment consists in a Seiche system with sampling rate up to 500kHz and four super-wideband hydrophone elements with frequency responses from 75Hz to 200kHz. Detections were classified into scenarios with the seismic source being active and inactive. A total of 229 detections were recorded, with 157 attributed to *Physeter macrocephalus*. 72 detections were recorded when the seismic source was active, including 15 groups within the exclusion zone. In comparison, 81 detections were recorded during periods of no seismic source activity, with 23 groups within the exclusion zone. These preliminary results suggest a possible tendency of animals not to approach to vessel with an active seismic source array.



HC-53. The dead do tell tales: improving monitoring of previously undetected bycatch in Scotland using the bycatch evidence evaluation protocol

Lennon, Rachel ¹; Davison, Nicholas ¹; Hawtrey-Collier, Anthea ²; Williams, Ruth ²; Clear, Nichola ³; ten Doeschate, Mariel ¹; Allen, Rebecca ²; Williams, Rosie ⁴; Babayan, Simon ⁵; Allen, Kathryn ⁵; Brownlow, Andrew ¹

1. *Scottish Marine Animal Stranding Scheme, School of Biodiversity, One Health and Veterinary Medicine, University of Glasgow, Glasgow G12 8QQ, UK*
2. *Cornwall Wildlife Trust, Truro, Cornwall, UK*
3. *Joint Nature Conservation Committee, Aberdeen, Scotland, UK*
4. *Zoological Society of London, Institute of Zoology, Regent's Park, London NW1 4RY, UK*
5. *School of Biodiversity, One Health and Veterinary Medicine, University of Glasgow, Glasgow G12 8QQ, UK*

Bycatch is a major threat to cetaceans, particularly small odontocetes whose prey often overlaps with those targeted by commercial fisheries. While bycatch is the leading cause of mortality for short-beaked common dolphins (*Delphinus delphis*) across the ASCOBANS region, it is seldom reported in Scotland. However, spatiotemporal analyses of strandings revealed an unexplained winter peak in common dolphin strandings on Scotland's west coast. These strandings coincide with increased fishing activity and mirror similar peaks in bycatch seen in other areas of the UK and the Northeast Atlantic, suggesting bycatch as a potential driver of the observed trend. This indicates bycatch may be underreported in these remote areas due to limited post-mortem examinations (PME). To address this, the Scottish Marine Animal Stranding Scheme (SMASS) trialled the Bycatch Evidence Evaluation Protocol (BEEP), originally developed by the Cornwall Wildlife Trust (CWT), to assess stranded cetacean carcasses for bycatch when they cannot undergo PME. Utilising SMASS's volunteer network, the trial involved collecting specific and detailed images of the carcass, which were then assessed by experts for 13 external features of bycatch. These features had previously been identified by CWT, through a panel of experienced cetacean pathologists, as important for identifying bycatch. During the 2024–2025 winter peak, 66 animals were examined, and 6 probable bycatch cases were identified that had previously gone undetected. These findings suggest bycatch may be underestimated in Scottish waters and highlights the need for enhanced monitoring. This study demonstrates BEEP's global applicability as a complementary tool for stranding schemes to improve bycatch assessments. Accurate estimations of bycatch rates are key for refining conservation strategies and mitigating the threat of bycatch to important cetacean populations.



HC-54. Exploring climate-induced changes on whales' migratory behavior in the Arctic

Papale, Elena ¹; Adamo, Antonino ¹; Calizza, Edoardo ²; Careddu, Giulio ²; Ceraulo, Maria ¹; Cucco, Andrea ¹; De Vita, Clarissa ¹; Giannini, Davide ³; Modica, Maria Vittoria ⁴; Pace, Daniela Silvia ³; Placenti, Francesco ¹; Satta, Andrea ¹; Ribotti, Alberto ¹; Roncalli, Vittoria ⁴; Saggiomo, Maria ⁴; Sorgente, Roberto ¹; Stefanni, Sergio ⁴; Zitelli, Roberta ³; BUscaino, Giuseppa ¹

1. *National Research Council of Italy - Institute for the study of Anthropic Impacts and Sustainability in the Marine Environment*
2. *University of Roma La Sapienza -Italy*
3. *University of Roma La Sapienza -Italy*
4. *Stazione Zoologica Anton Dohrn - Italy*

Climate-induced changes dramatically affect the Arctic marine environment with notable variations in habitat conditions. The west coast of the Svalbard archipelago (Norway) is experiencing a strong increase in water temperatures and sea ice losses due to the Atlantification process. These environmental changes are influencing both endemic and boreal migrant species showing a northward shift in the distribution and prolonged stay at high latitudes. In the framework of the Sedna Project, this work investigates the acoustic occurrence of fin whales (*Balaenoptera physalus*) from 2021 to 2024, and the oceanographic and trophic conditions at the onset of migration phases. Acoustic data were collected in Kongsfjorden with an underwater autonomous recorder deployed at about 75 m depth. During the last year, the mooring was equipped with a CTD profiler to evaluate oceanographic conditions, and 11 sampling points within and outside the fjord were chosen to characterize the variability of water masses, and the trophic conditions. About 4800 hours of recordings were analyzed. Acoustic data were pre-processed with an automatic detector to select three kinds of notes: 20, 40, and 130 Hz pulses. Preliminary outcomes revealed that whales occurred almost all year round, with calls arranged in songs from mid-September to mid-January. Favorable environmental and trophic conditions for the species' persistence at high latitudes were identified. However, it remains unclear how lower trophic levels are influencing the year-round occurrence of whales. Similarly, it is crucial to determine the ultimate marine or terrestrial origin of the nutrients supporting whale prey in the study area. Overall, this study emphasizes the need for a comprehensive ecosystem view to anticipate how top predator species will respond to future climate scenarios, and develop management plans that enhance conservation measures and protect whales in a changing Arctic.



HC-55. Harbour porpoises in busy waters: a UAV-based approach to investigate how recreational vessels affect swimming speed and surfacing rate

Till, Johannes ¹; Palmqvist, Valdemar ¹; Wilk, Emely Noa ¹; Carlsson, Per ¹; Stedt, Johanna ¹

1. Lund University

Like other cetaceans, harbour porpoises (*Phocoena phocoena*) are impacted by anthropogenic activities in most areas where they occur. Shipping vessels and associated noise are known to affect porpoises negatively, but little is known about the impact of recreational boats without Automatic Identification Systems (AIS) as their position and speed are more difficult to monitor. By simultaneous use of two Unmanned Aerial Vehicles (UAVs) in a high density area for the species in Sweden, this study investigates the effects of speed and proximity of recreational boats on porpoise speed and surfacing intervals. This was done by flying one UAV on predefined routes to scan the water for porpoises, initiating focal follows as soon as porpoises were observed. During focal follows, a second UAV pilot monitored recreational boat presence in the surrounding area. All monitoring data was collected as UAV video output and used to determine the time between porpoise surfacing events, measure speed of boats and porpoises, and calculate the closest distance between porpoises and boats for each focal follow. A total of 91 synchronous flights were performed in Aug 2024, resulting in 32 focal follows. Generalised linear models were used to examine recreational boat impact on porpoise speed ($n = 17$) and surfacing intervals ($n = 11$). Results reveal that the mean speed of porpoises decreased with increased boat speed, and that this effect was stronger the closer the boat was to the porpoise. Also, time between porpoise surfacing events decreased with decreasing distance to boats. No effect of maximum boat speed on porpoise behaviour could be detected. This study highlights that recreational boats can affect porpoise behaviour, with possible implications for individuals and populations. Further, it adds to a growing number of studies that illustrate the potential of UAVs for marine mammal data collection and studies of anthropogenic impacts.



HC-56. Using passive acoustic to better understand dolphins' behaviour around fishing nets in bycatch context

Dupont, Mathieu ¹; Michel, Mathilde ¹; Guichard, Benjamin ²; Samaran, Flore ¹

1. ENSTA – IPP – Lab-STICC UMR 6285 – 29200 Brest, France
2. PatriNat (OFB-MNHN-CNRS-IRD) - Centre d'expertise et de données sur le patrimoine naturel 29229 Brest, France

Bycatch due to fishery interactions is a primary threat to common dolphins (*Delphinus delphis*) in European waters. Various solutions, including the use of pingers, are under investigation to mitigate incidental captures. However, the nature of these interactions, particularly the circumstances surrounding captures, remains poorly understood. Passive Acoustic Monitoring offers a cost-effective and reliable method to study the acoustic behaviour of this species near fishing nets. The APOCADO project aims to explore these interactions and provide insights into delphinid acoustic presence around fishing nets in the Iroise Sea (Brittany, France). Acoustic data were collected using Ocean Instruments SoundTraps ST400 HF deployed directly on fishing nets during short time periods. From May 2022 to December 2023, recording campaigns with different fishing vessels accumulated over 5,500 hours of data. Automated detectors (PAMGuard and a custom click detector) for whistles, clicks and buzzes revealed the acoustic activity of dolphins and are used as a proxy of their presence within the proximity of the instrument. The acoustic presence was quantified using the Hourly Detection Rate (HDR), which calculates the proportion of minutes with positive detection per hour. The HDR was compared across different variables in a multivariate analysis to explore factors that could influence the acoustic presence of dolphins near the nets like: net type, fishery location, day/night periods, and seasonal trends. Results indicate that on average 30% of a deployment's duration revealed acoustic presence of dolphins near the nets. Seasonal analysis revealed the highest acoustic activity during summer and winter, matching with the periods with highest bycatch rates in the region. Additionally, the results showed that certain fishing practices, such as the fishery location, the target species, or the type of net used, influenced the acoustic presence of delphinids around the nets. These findings underline the temporal and behavioural patterns of delphinid interactions around fishing nets, providing insights for developing targeted bycatch mitigation measures. Future work will focus on assessing the effectiveness of mitigation tools like pingers. Understanding the dynamics of these interactions is critical for minimizing bycatch and ensuring the sustainable coexistence of fisheries and small cetaceans.



HC-57. Offshore wind farm use of harbour seals from the Wadden Sea

Maurer, Nina ¹; Nachtsheim, Dominik A. ¹; Schaffeld, Tobias ¹; Siebert, Ursula ¹; Schnitzler, Joseph G. ¹

1. *Institute for Terrestrial and Aquatic Wildlife Research (ITAW)*

Offshore wind farms (OWFs) are increasing rapidly in response to the need for renewable energy in the EU. One of the most abundant top predators in the North Sea, harbour seals (*Phoca vitulina*); inhabit coastal environments, ranging from rocky UK coastlines to the Wadden Sea tidal mudflats. They regularly initiate offshore foraging trips from their haulout sites. A key question is whether seals use OWFs as foraging habitats due to reef-building potential or avoid them due to anthropogenic disturbances, including vessel activity and turbine noise. Despite the rapid expansion of OWFs, their ecological effects on marine predators remain poorly understood. To address this, we tracked 27 harbour seals from the German Wadden Sea using SMRU GPS Phone Tags deployed between 2015 and 2024. These devices recorded Fastloc GPS, dive and haulout data, inferring behavioural states using a Hidden Markov Model (HMM). Four behavioural states were determined: haulout, low-activity surface, foraging and transit. The latter two states were derived from step length and turning angles of the regularised GPS track, while haulout and low-activity surface were pre-defined using the tag's dive and haulout data. Preliminary results show that most seals entered OWFs at least once during the deployment period. In total, seals visited at least ten OWFs, however, only spent less than 5% of their total deployment time in them. Changes in behavioural states upon entering OWFs may suggest potential behavioural changes in response to, e.g. prey abundance within the OWF, especially at the turbine foundations, or the local OWF soundscape. The low OWF usage by harbour seals questions their ecological role as important foraging habitats for marine predators. Further analyses aim to quantify these behavioural changes and their underlying ecological implications, emphasizing the importance of integrating behavioural ecology and conservation strategies to understand OWF impact on marine predators.



HC-58. Out of habitat marine mammals as pioneers in a changing climate

Nunny, Laetitia ¹; Pili, Anna ; Jarvis, Dan ²; Simmonds, Mark ³

1. *OceanCare*
2. *British Divers Marine Life Rescue*
3. *University of Bristol*

An out of habitat marine mammal is an individual that is found outside of their natural range and/or in habitat that may be suboptimal for their welfare and survival because of a lack of suitable conditions and/or because there is potential conflict with humans. Here we review recent cases of out of habitat marine mammals including walrus recorded in Europe and belugas in numerous locations, and consider the potential drivers for them being out of habitat. Climate change is one factor which may be contributing to an increase in out of habitat marine mammals and it may be appropriate, in some cases, to consider these individuals as pioneers seeking new habitat. To protect their welfare and potentially allow them to gather essential knowledge, they should be explicitly included in conservation legislation and management planning. The possibility that more individuals may appear in a particular location in the future and for a population to establish itself, should be taken into consideration. We have been in consultation with scientists, rescue centres and other relevant stakeholders around the world to develop a better understanding of the incidence of out of habitat marine mammals and to determine how they are being responded to. From this we provide a new synthesis of information and management advice. Immediate management recommendations when an out of habitat marine mammal is identified will vary on a case-by-case basis but may include simply monitoring the situation or perhaps providing a safe area for the animal, encouraging it to move, capturing and translocating it, or, in cases where the animal's welfare is hopelessly compromised, euthanasia. Managing the expectations and activities of the public around these animals is almost always important and we encourage relevant authorities to be better prepared for such visitors with response strategies ready.



HC-59. Close encounters: insights into harbour porpoise behaviour around fishing nets

Dinkel, Thaya Mirinda ¹; Larsen, Julie Sofie ²; Denkinger, Judith ³; Cosentino, Mel ²; Dahlke, Flemming ⁴; Stepputtis, Daniel ¹; Adler, Sven ⁵; Tougaard, Jakob ²; Dähne, Michael ³

1. *Thünen Institute of Baltic Sea Fisheries*
2. *Aarhus University*
3. *Deutsches Meeresmuseum*
4. *University of Hamburg*
5. *Swedish University of Agricultural Sciences*

Incidental by-catch in set fishing gear is a main cause of mortality for small cetaceans worldwide. However, it is still largely unknown what causes entanglement. This study tested the response of wild harbour porpoises to a net and a net with an acoustic alerting device (PAL). PALs emit synthetic porpoise-like sounds, suggested to increase echolocation activity in nearby porpoises, and have shown to reduce bycatch in gill nets in the Belt Sea. Studies were conducted in a coastal habitat (Fyns Hoved, Denmark) during summer in 2022 and 2023. A modified net was designed to resemble a real net, but with minimized risk of entanglement. Three treatments were tested: control (no net), net, net+PAL. 88 encounters of wild porpoises were filmed with a drone in the experimental area with acoustic detectors (F-PODs) placed around the net. Behaviour of porpoises were classified in four categories based on drone footage analysis: crossing the net, swimming along the net, swimming around the edge of the net, and turning around. The swimming speed changed very little as the animals approached the net, suggesting that neither the net, nor the PAL induced strong responses in the animals. However, slightly faster swim speeds were observed when the net was present (with or without PAL (statistically significant only with PAL)). Respiration rates were significantly higher when only the net was present, compared to net with PAL. The echolocation behaviour of the porpoises was not affected by the presence of net or PAL. Visible reactions of porpoises towards the net and net with PAL were detected at distances below or within lower ranges of previous acoustic net detection studies. Despite this, and under the conditions presented during the study, the porpoises were able to detect and avoid collision with the net irrespective of the presence of the PAL.



HC-60. What's on the menu? Trophic overlap between bottlenose dolphins, striped dolphins and hake fisheries in the western Mediterranean

López Gil, Laia ¹; Míguez-Lozano, Raúl ¹; Raga, Juan Antonio ¹; Gozalbes, Patricia ¹; Aznar, Francisco Javier ¹

1. Universidad de Valencia, Av. de Blasco Ibáñez, 13, El Pla del Real, 46010 València, Valencia, España

In the Mediterranean Sea, the common bottlenose dolphin, *Tursiops truncatus*, is classified as 'Vulnerable' due to the impact of several factors on their populations, especially the interaction with fisheries. Diet studies are essential to understand the nature of these interactions. We analyzed the stomach contents of 49 bottlenose dolphins stranded along the Valencian Community (eastern Spain) in the period 1983-2024, focusing on the trophic overlap with the European hake, one of the main target species of fisheries, and with the other abundant dolphin in the area, the striped dolphin, *Stenella coeruleoalba*. A total of 83 prey taxa, mostly neritic, were identified: 61 teleosts, 19 cephalopods, and 3 crustaceans. European hake, *Merluccius merluccius* (%F=72.1%, %N=43.2%) was the key prey; other taxa occurred with %F<40% and %N<10%, even after grouping them at family level. Pianka's index of trophic overlap between bottlenose dolphins and striped dolphins significantly increased from the period 1983-99 (0.153) to the period 2000-10 (0.348) and 2011-24 (0.420). This trend can be accounted for by the observed dietary shift of striped dolphins towards neritic prey, especially juvenile hake, over the last two decades. However, the size of hake differed between dolphin species, with bottlenose dolphins consuming larger fish (range of estimated length based on otolith length: 25-35 cm total length) than striped dolphin (10-25 cm). Considering that the minimum legal size for captured hake in Spanish Mediterranean fisheries is 20 cm, only bottlenose dolphins seem to be directly competing for the same target fish. However, hake is a key prey for the two dolphin species, and is also heavily captured by fisheries, thus a key question is how this prey will meet the trophic needs of them all in the long term.



HC-61. Delphinid whistle detection and noise analysis in madeira through passive acoustic monitoring (PAM)

Gámez-Rodríguez, Ana ¹; Gauffier, Pauline ²; Verborgh, Philippe ²; Esteban, Ruth ²; Berenguer, Mónica ²; Domingues, Raquel ²; Tierno de Figueroa, José Manuel ³; Freitas, Luis ²

1. *Madeira Whale Museum, University of Granada*
2. *Madeira Whale Museum*
3. *University of Granada*

Delphinids play a critical role in shaping community structure and ecosystem functioning through top-down control mechanisms, and changes in their occurrence can indicate environmental shifts and anthropogenic threats. Among chronic stressors, underwater radiated noise from ships can affect the communication, orientation, and foraging in marine mammals, particularly coastal dolphins. This work assessed temporal patterns in delphinid whistle detections and underwater noise levels in southern Madeira island through PAM. Data was collected between October 2021 and December 2023 by deploying autonomous acoustic recorders (SoundTrap 300HF) off Funchal with a 3/12 min duty cycle. A total of 2,072 hours of recordings covering 394 days were processed in PAMGuard to detect dolphin whistles and quantify noise levels. Binary variable Hourly Presence (HP) was computed from whistle detections as a proxy for delphinid occurrence. To assess ambient noise, 63 Hz and 125 Hz 1/3-octave bands were measured as Sound Pressure Levels (SPLs, dB re 1 μ Pa rms). Binomial Generalized Linear Models were applied to explore the effects of diel phases, sea surface temperature (SST), and the 1/3-octave bands on HP. After manual validation, 4.86% of the data contained true detections. Results showed: ¹ HP was significantly related to diel phases and SST ($p < 0.05$), with increasing detections in the evening and at lower temperatures, and ² 63 Hz and 125 Hz 1/3-octave bands had overall low noise levels (exceeded 100 dB in 2% and 1.84% of the total hours, respectively), with no significant effects on HP. However, more extensive research in time and space is needed to confirm these observations. The study helped to understand the local underwater soundscape, frequented by touristic operators daily. Considering that this industry is growing in the region, current information reinforces the importance of considering the ecological activity of wild dolphin populations when implementing management policies.



HC-62. Microplastics and related additives in marine mammals of Arctic waters

Piette, Mathilde ¹; Unger, Bianca ¹; Bains, Matteo ²; Fossi, Maria Cristina ²; Fossi, Cristina ²; Siebert, Ursula ¹

1. *Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover Foundation, Germany Present address: Lower nature conservation authority, Dithmarschen district, Stettiner Straße 30, 25746 Heide, Germany*
2. *Department of Physical, Earth and Environmental Sciences, University of Siena, Italy*

Despite being a remote area, even the Arctic is affected by microplastics (MPs) pollution. Contamination occurs through various pathways, including water inputs, transfer by animals and melting sea-ice. The exposition to MPs and their potentially toxic additives poses a risk especially to marine mammals, as they are high in the Arctic trophic web. This additionally affects indigenous people using these species as main food resource. This study aims to fill ongoing research gaps by assessing the current state of MPs pollution and the presence of MPs-associated contaminants in Arctic marine mammals. For this purpose, intestinal contents and faeces of ringed seals (*Pusa hispida*) and polar bears (*Ursus maritimus*) were collected. The samples were then analysed via Fourier Transform Infrared (FT-IR) spectroscopy to obtain information about the polymer structure of extracted particles. In additions, blubber and muscle samples of the same species as well as of harbour porpoises (*Phocoena phocoena*) and humpback whales (*Megaptera novaeangliae*) were analysed by gas chromatography-mass spectrometry (GC-MS) to determine the concentration of 11 phthalates as they are known additives added to polymers to improve their characteristics. The analysis revealed the presence of MPs in faeces of ringed seals and polar bears. Nine out of 11 phthalates were detected in all individuals while dipropyl phthalate (DPrP) was detected in one humpback whale individual (152.85 ng/g dw). For both tissues, cetacean species showed the highest concentration values. The values between the four different species were variable. As the examined species feed on different spectrums of prey, these results indicate an impact of the diet in the level of MPs contamination and associated contaminants. The insight into the differing burden of MPs in marine mammals is crucial for both the conservation of these species but also for risk assessment regarding food security for indigenous people.



HC-63. Exploring magneto- and/or electroreception in the harbour porpoise (*Phocoena phocoena*): a pilot study

Hessing, Sanne ^{1,2}; Mészáros, Dorottya ¹; Schilt, Britte ³; Hermans, Annemiek ^{3,4}; Heesterbeek, Hans ⁵; Gröne, Andrea ²; van den Berg, Annemarie ¹; IJsseldijk, Lonneke L. ²

1. SOS Dolfijn, Van Ewijckskade 1, 1761 JA Anna Paulowna, The Netherlands
2. Division of Pathology, Department of Biomolecular Health Sciences, Faculty of Veterinary Medicine, Utrecht University, Utrecht, the Netherlands
3. Witteveen+Bos Engineering and consultancy, Daalsesingel 51c, 3511 SW Utrecht, the Netherlands
4. Marine Animal Ecology Group, Wageningen University, P.O. Box 338, 6700 AH, Wageningen, the Netherlands
5. Department of Population Health Sciences, Faculty of Veterinary Medicine, Utrecht University, Utrecht, Netherlands

Harbour porpoises (*Phocoena phocoena*) are subject to different anthropogenic stressors, including those related to the rapid expansion of offshore wind farm developments in the Dutch coastal zone. The energy generated offshore is currently transported to land by alternating current (AC) subsea power cables (50 Hz), which are known to generate electromagnetic fields (EMFs). Several marine species have shown behavioural responses to EMFs, which raises concerns that EMFs could also impact harbour porpoises. To adequately monitor and mitigate any possible effects of induced EMFs around subsea power cables, it is important to investigate whether harbour porpoises possess magneto- and/or electroreception and use natural EMFs for navigation or foraging. Here we present the results of a behavioural pilot experiment exposing a harbour porpoise to an AC EMF (7-8 μ T RMS at 25 cm from the pool window) under controlled conditions at the SOS Dolfijn rehabilitation centre. The harbour porpoise was recorded with a top-view camera, in which behavioural differences and presence near the coil were studied using automated video tracking and motion analysis software, EthoVision XT 17.5. No significant deviations regarding the breathing rate, first latency to approach, total duration and frequency of occurrence within the test zone, could be detected compared to the controls. We warrant caution in interpreting the results as only a single individual was tested with a small EMF intensity. The next steps are to increase sample size by testing the responses of more animals to (more intense) AC exposure, and direct current exposure, alongside morphological and anatomical investigations of magneto- and electro-sensory features using necropsied animals.



HC-64. North Atlantic blue whale (*Balaenoptera musculus*) calling behaviour during suspected seismic airgun activity recorded off Northeast Iceland

Basran, Charla J. ¹; Rasmussen, Marianne H. ¹

1. Húsavík Research Centre, University of Iceland

Given the blue whale's (*Balaenoptera musculus*) endangered status, it is of great importance to study the impacts anthropogenic activity may have on them. During Spring of 2022, both blue whale calls and currently unidentified low-pressure seismic blasts, suspected to be from an airgun, were incidentally recorded on a Soundtrap ST500 hydrophone located north of Skjálfandi Bay, Northeast Iceland. To investigate if the suspected airgun activity affected blue whale downsweep calling behavior, six 44-minute long files have been analyzed from every day from May 1st through June 20th 2022 (n = 306 files, 13464 mins). Each day was categorized as blue whale (Bm) and airgun (AG) present (Bm+AG, n = 35 days) or Bm control (0-2 weak AG signals, n = 5 days). Within Bm+AG days, each file was categorized as AG strong (n = 102), weak (n = 63), or absent (n = 39). Days with no Bm calls or files with high background noise were removed (73 files). Blue whales produced downsweep calls significantly more on Bm control (n = 30 files, $\bar{x}$ = 4.53) than on Bm+AG present (n = 204 files, $\bar{x}$ = 1.86) days (p = 1.41E-08). Within Bm+AG present days, blue whales produced significantly more downsweep calls in AG absent ($\bar{x}$ = 2.51) than in AG strong ($\bar{x}$ = 1.64) files (p = 0.03). Downsweep call duration was significantly shorter on Bm control (n = 157 calls, $\bar{x}$ = 1.84 s) than on Bm+AG present (n = 286 calls, $\bar{x}$ = 2.01 s) days (p = 0.003). These results demonstrate that seismic blasts, such as those produced by air gun activity, may disrupt and alter blue whale calling behaviour during their crucial feeding season. Though the implications of these impacts are not known, they should be considered when assessing protective measures for this endangered species.



HC-65. Mitigating cetacean collisions in a critical area

Rodríguez-Juncá, Alicia¹; Badosa, Elisabet ¹; Andrés-Alonso, M⁵; Aguilar de Soto, Natacha²; Lambert, Charlotte³; Marín, Olivia¹; Redondo, A⁵; Betancor del Rosario, A⁵; Pérez-Gil, Mónica⁶; Fabiani, M Peña ⁴

1. *Dpto. Biología Animal, Edafología y Geología, Universidad de la Laguna, Canary Islands, Spain.*
2. *Instituto Español de Oceanografía, Canary Islands, Spain.*
3. *LIENs UMR 7266, CNRS-La Rochelle Université, La Rochelle, France.*
4. *Escuela Superior de Ingeniería y Tecnología, Universidad de la Laguna, Canary Islands, Spain.*
5. *Arquimea, Spain.*
6. *CEAMAR, Canary Islands, Spain.*

This study contributes to reduce collision risk between fast-ferries and cetaceans in the Canary Islands by understanding cetacean distribution along the ferry routes and developing an early-detection system based on thermal images and intelligence software (ARQUIMEA). Between 2023-2024, 212 ferry trips were conducted on routes connecting the islands of Tenerife, Gran Canaria and Fuerteventura, with trained Marine Mammal Observers (MMOs) on board to record cetacean sightings and collect thermal images to train the software. Observations were analysed to assess species diversity, seasonality and distribution patterns. A preliminary testing of the software was performed during September and October (2024), although the software will be further utilized within the Interreg Atlantic Whale Deal project to assess its effectiveness in cetacean detection. A total of 456 visual sightings were recorded, encompassing nine species. Short-finned pilot whales (*Globicephala macrorhynchus*) were the most frequently observed species (43%), while 2.4% of sightings involved sperm whales (*Physeter macrocephalus*). Notably, 27% of sightings occurred within 500 meters of the vessel. The data was used to perform a Species Distribution Model combining with other data. This project is the first test of the application of thermal detection for collision avoidance from fast-ships in the Canary Islands. Collisions with fast-ferries have been identified as a major threat to cetaceans in the Canary Islands, a region identified by the International Whaling Commission and the International Maritime Organisation as a hotspot for ship strikes with cetaceans and particularly relevant to sperm whales. There is therefore an urgent need to advance the development of collision risk mitigation measures specifically tailored to fast-ferries, with early-detection technologies being a key option. This should be part of a broader strategy to recover the declining abundance of sperm whales in the Canary Islands, an important area for the species in the NE Atlantic.



HC-66. Spatial distribution of bycatch cases observed from stranded common dolphins (*Delphinus delphis*) in Cornwall, southwest England (2018–2023)

Chadwick, Helen ¹; Deaville, Rob ²; Beaumont, Nicola ³; Clark, James ³; Godley, Brendan ¹; Nelms, Sarah ¹; Roberts-Waite, Darcey ¹; Wessels, Mark ⁴; Williams, Ruth ⁵; Woolf, David ⁶; Barnett, James⁷

1. *University of Exeter*
2. *Zoological Society London*
3. *Plymouth Marine Laboratory*
4. *Finn Pathologists*
5. *The Wildlife Trusts*
6. *Heriot-Watt University*
7. *Cornwall Marine Pathology Team*

Bycatch, the accidental entanglement of non-target species in fishing gear, is widely recognised as one of the greatest threats to small cetaceans globally. The waters off the southwest coast of the UK are a hotspot for bycatch, particularly for one of the most abundant cetacean species in the northeast Atlantic, the short-beaked common dolphin. Between January 1991 and December 2023, the Defra-funded Cetacean Strandings Investigation Programme conducted 881 necropsies on common dolphins stranded around England and Wales. Of these, 385 were diagnosed as bycatch, 352 of which were examined in southwest England (91% of diagnosed bycatch cases). This study examines the spatial distribution of bycatch in stranded common dolphins in Cornwall, southwest England, between January 2018 and December 2023. In total, 154 individuals from 693 reported strandings in Cornwall underwent full post mortem examination during this period. Bycatch was the most common cause of death, accounting for 40% (n=61) of all necropsies. Most stranded individuals (n=52) were recorded on the south coast and 9 were recorded on the north coast of Cornwall. Among the 66 cases where bycatch was the primary cause of death, fisheries-related marks and wounds were observed and compared to different types of fishing gear. In a small number of cases, lesions were likely caused by gill nets or trawl nets; however, most cases could not be conclusively linked to a specific fishery. Minimal decomposition in many cases suggests the majority likely died near the shore. The Western English Channel, off the southwest coast of the UK, has the highest level of netting activity in the region. This suggests a potential link between the spatial distribution of bycatch-related strandings and areas of inshore fishing activity. These findings can inform strategies to mitigate bycatch and its impact on common dolphins in the region.



HC-67. Reducing marine mammal bycatch: initial trials of commercially available pingers in Icelandic bottom set gillnet fishery

Jusufovski, Dunja ¹; Sigurðsson, Guðjón Már ¹

1. Marine and Freshwater Research Institute, Fornubúðir 5, 220 Hafnarfjörður, Iceland

Acoustic deterrent devices or ADDs are becoming increasingly available to commercial fisheries as a means to reduce marine mammal bycatch and minimize potential damage to fishing gear. In April 2024, first trials of three commercially available pingers were conducted in commercial setting of Icelandic bottom set gillnet fishery targeting cod which exhibits high bycatch of small cetaceans, particularly harbour porpoises (*Phocoena phocoena*). For this purpose, we tested (i) the Fishtek Banana pingers in 3 trial sites (North, West, and Southeast coastal areas for 7 days per site), (ii) Porpoise ALert device (PAL) in 2 sites (North and Southeast for 7 days per site), and (iii) wideband PAL with a modified pinger signal, which was tested in the North trial site only with a duration of 14 days. The ADDs were tested with 3 commercially used mesh sizes (3 net panels for each mesh size) and gillnets of a total of 12 net panels. Trial results show a bycatch of predominately small cetacean species, the harbour porpoise and the white-beaked dolphin (*Lagenorhynchus albirostris*), with the highest number of bycaught individuals observed in nets equipped with PALs. The most effective ADD was the wideband PAL with no bycatch recorded. There was no difference among bycaught individuals in terms of sex ratio, apart from the PAL equipped nets where males were the dominant sex bycaught (11 out of 12 in total). While there was no significant effect of PALs and wideband PALs on the quantity or composition of the fish catch, Banana pinger equipped nets reduced the quantity of fish catch, particularly cod catch. Conclusively, the current trials indicate no effectiveness of Banana pingers and PALs on reduction of cetacean bycatch in gillnets, representing a stark contrast to the trials of these ADDs performed elsewhere.



HC-68. Preliminary analysis of dolphins' whistles variations carried out in noisy contexts in the Ionian Sea

Tumino, Carla ^{1,2}; Mulder, Christian ¹; Bonanno, Danilo²Diego-Tortosa, Dídac ²; Riccobene, Giorgio ²; Sanfilippo, Simone²; Viola, Salvatore ²

1. *Department of Biological, Geological and Environmental Sciences, University of Catania, Italy*

2. *Istituto Nazionale di Fisica Nucleare - Laboratori Nazionali del Sud (INFN-LNS), Catania, Italy.*

Shipping noise is a significant threat to acoustically active marine species, often overlapping with the vocalizations of marine cetaceans and posing a challenge to their conservation. Dolphins, for example, use whistles to communicate, with sounds ranging from 1 to 24 kHz and between 0.1 and 4 seconds duration. Detecting these whistles in acoustic recordings provides evidence of dolphin presence and can offer insights into population identity, activity, and individual recognition. Passive Acoustic Monitoring tools are ideal for such studies, providing continuous 24-hour data without the need for direct sightings. Two deep-sea acoustic observatories in the Western Ionian Sea, operated by INFN-LNS under the ITINERIS and IPANEMA projects, are equipped with high-sensitivity hydrophones that continuously transmit acoustic data to shore. The first station, located 90 km off Capo Passero at a depth of 3500 m, currently contains three synchronized hydrophones spaced approximately 300 m apart, while the second station, 25 km east of Catania at a depth of 2050 m, consists of four synchronised hydrophones arranged in a 1-meter tetrahedron. We will present analysis of hydrophones whistle. RAVEN software tool was used to tag the dolphin whistles; vessel noise was determined from acoustic data were calculating the Sound Pressure Levels (SPLs) in 1/3 octave bands at 63 Hz, 125 Hz (in agreement with the EU Marine Strategy Frame Directory), and 1 kHz. A preliminary test using 48 hours of continuous recordings of one Hydrophone in Capo Passero (June 2024) was carried out. A total of 2205 whistles were detected, and their occurrence was compared with SPLs in five-minute intervals, revealing a negative correlation between background noise and whistle presence. The analysis on other recordings is ongoing. Integration of Automatic Identification System data recorded by INFN-LNS will be used to further assess the impact of ship noise on dolphin vocalizations.



HC-69. Modelling the impact of climate change on cetacean distributions in New Zealand's waters

Laforet, Benjamin ¹; Saltre, Frederik ²; Doser, Jeffrew ³; Stockin, Karen ⁴; Peters, Katharina ¹

1. *MAVE Lab, University of Wollongong*
2. *University of Technology of Sydney*
3. *Statistical Ecology and Forest Science Lab, North Carolina State University*
4. *CERG, Massey University*

Climate change challenges ecosystems worldwide. While most cetacean species' distributions are expected to shift toward the poles, at least seasonally, the scarcity of data available limits our understanding of the underlying processes driving species' responses to climate conditions. Here, we overcome these limitations via an occupancy modelling approach to project range shifts of 11 cetacean species in New Zealand to the year 2100 relative to the present day under climate change scenarios of different severity (IPCC's RCP 4.5 and 8.5 scenarios). Our model presents a superior accuracy over traditional species distribution models and reveal distinct patterns of habitat suitability changes. Blue whale, southern right whale, killer whale, and bottlenose dolphin, are expected to gain habitat, while common, dusky and Hector's dolphins face habitat losses. We identified depth, chlorophyll a, and sea surface temperature, as critical environmental predictors, emphasizing the importance of shallow coastal areas for feeding and breeding.



HC-70. Naval sonar induces an anaerobic swimming gait in beaked whales

Martín López, Lucía Martina ¹; Isojunno, Saana ¹; Cade, Dave ²; Colson, Kate ³; Paradinas Aranjuelo, Iosu Martín ⁴; Fahlman, Andreas ⁵; Hickmott, Leigh ⁶; Visser, Fleur ⁷

1. *SMRU, Scottish Oceans Institute, University of St Andrews, St Andrews, Fife KY16 8LB, UK.*
2. *Hopkins Marine Station, Stanford University, 93950 California, USA.*
3. *Kelp Marine Research, 1624 CJ Hoorn, the Netherlands.*
4. *AZTI, Txatxarramendi Ugarte a z/g, Sukarrieta, Bizkaia 48395, Spain.*
5. *Fundación Oceanogràfic, Valencia, Spain*
6. *SMRU, Scottish Oceans Institute, University of St Andrews, St Andrews, Fife KY16 8LB, UK*
7. *Kelp Marine Research, 1624 CJ Hoorn, the Netherlands*

Naval sonar can disrupt beaked whale diving behaviour, in some cases resulting in lethal strandings. Their sensitivity likely includes a physiological response, which remains poorly understood. Beaked whales may regularly exceed their aerobic dive limit during long-duration deep-foraging dives and later in those dives during the ascent phase begin use of a unique fast and strong gait (B-strokes), hypothesized to recruit anaerobic fast-twitch fibres. Here, we hypothesised that beaked whales alter their use of B-strokes during sonar exposure, inducing a physiological response which could make them sensitive to stranding. We compared the use of B-strokes during exposed and unexposed dives in 4 species of beaked whales, using data from high-resolution movement and acoustic biologgers. Instead of the highly context-specific use during the deep-dive ascents in baseline conditions, under exposure, B-strokes were employed during any stage of either deep or shallow dives. B-stroke onset occurred during all exposure levels above 100 dB re 1µPa lasting more than 3 min. The dramatically earlier use of this gait indicates that animals are making use of an oxygen saving strategy much earlier in exposed than during unexposed dives (16 ± 13 vs. 33 ± 14 min). Moreover, B-stroke gait rates increased with increasing sound pressure level. This change in swimming gait when exposed to an external threat likely evolved to enable flexible escape responses from predators. However, prolonged responses to sonar could lead to the build-up of CO₂ and lactic acid, potentially contributing to bubble formation and growth that could lead to animals stranding.



HC-71. Unveiling dolphin interactions in bottom-set net fisheries: balancing net size and depredation risks

Marçalo, Ana ¹; Samel, Vighnesh ¹; Carvalho, Flávia ¹; Frade, Magda ¹; Erzini, Karim ¹; MS Gonçalves, Jorge ¹

1. Centre of Marine Sciences (CCMAR), University of the Algarve, Campus de Gambelas, FCT Ed. 7, 8005-139 Faro, Portugal

This study, covering 2018-2022, evaluated cetacean interactions and a bottom set-net fishery along Portugal's Southern coast (Algarve), estimating bycatch, depredation, gear damage and net length influence on Landing per Unit Effort (LPUE). The fishery employed various métiers (gillnets - mesh sizes: < 60, 60-75, 80 and 220 mm; trammel nets - 120 inner and 640 mm outer panels). Observations from 655 hauls revealed depredation by bottlenose dolphins, *Tursiops truncatus*, in 17.7% of hauls, while bycatch (isolated events of 4 bottlenose dolphins and one common dolphin, *Delphinus delphis*) occurred in < 1%. Depredation typically results in heavy damage to the net and occurs throughout the year, with elevated rates observed during the spring and winter months. Depredation rates varied among métiers, being higher in gears targeting red mullet and hake. The impact of depredation on LPUE varied based on net length and the targeted fish species. However, when comparing LPUE in hauls without depredation, there was no significant influence on the total and hake LPUE for nets shorter or longer than 6 km ($p > 0.05$). Interestingly, in hauls without depredation targeting red mullets, the LPUE was notably higher ($p < 0.01$) in nets less than 6 km in length compared to those equal to or longer than 6 km, suggesting increased fishing effort due to prolonged soaking times may lead to a heightened likelihood of depredation. These findings highlight the potential for mitigating depredation impacts by encouraging fishers to reconsider the use of excessively long nets, promoting a shift towards more sustainable practices that balance fishing efficiency with reduced interactions with small cetaceans.



HC-72. Dolphin vocal changes in response to vessel noise

Scheinin, Aviad P. ¹; Testolin, Alberto ²; Shachar, Ilan ³; Galili, Ori ⁴; Diamant, Roei ⁵

1. *Morris Kahn Marine Research Station, Cherney School of Marine Science, University of Haifa. Delphis NGO, Ort 2, Ashdod, Israel*
2. *Department of Mathematics and the Department of General Psychology, University of Padova, 35131 Padova, Italy.*
3. *Department of Marine Technologies, University of Haifa, Haifa 3498838, Israel*
4. *Morris Kahn Marine Research Station, Leon H. Charney School of Marine Sciences, University of Haifa, Haifa, Israel.*
5. *Department of Marine Technologies, University of Haifa, Haifa 3498838, Israel. Faculty of Electrical and Computing Engineering, University of Zagreb, Zagreb, Croatia.*

This study investigates the impact of vessel presence on the vocal behavior of bottlenose dolphins (*Tursiops truncatus*) in Eilat, Israel. Bottlenose dolphins, found in nearly all tropical and temperate regions, serve as apex predators and bio-indicators. Their wide distribution and habitat plasticity make them ideal subjects for studying the effects of underwater radiated noise (URN) from vessels. URN can impact marine mammals through audibility, behavioral responses, masking of sound, physiological auditory threshold shifts, and physical damage to the auditory system. As a result, standards were set to limit the transmitted acoustic power per exposure time. To quantify the impact of vessel noise, a measure of the URN affecting the dolphins is required. Utilizing two long-term acoustic recorders placed near a shipping lane and a dolphin habitat over one year, we recorded over 50,000 dolphin whistles. Deep learning methods were employed to classify these whistles based on the presence or absence of nearby vessels. Our results revealed significant non-linear changes in dolphin vocalizations in response to vessel noise, with classification accuracy exceeding 90%. This provides statistical evidence that vessel noise adversely affects dolphin communication, foraging, and overall well-being. Our findings underscore the necessity of mitigating underwater noise pollution to protect marine life, particularly species reliant on acoustic communication.



Health and Welfare



HW-01. Some preliminary data on macroparasites prevalence in delphinids stranded along the coasts of French Riviera (Pelagos Sanctuary, Northwestern Mediterranean Sea)

Gannier, Adrien C. ¹

1. *Groupe de Recherche sur les Cétacés / Réseau National Échouages*

Parasitic infestations are among the factors that may affect cetacean health, although the significance of their impact is still unclear. Their prevalence remains poorly known in some areas, which can hinder the understanding of their effects on hosts, and also prevents a better knowledge of their biology and ecology. Cetaceans stranded in France are taken care of by volunteers within the framework of the Réseau National Échouages, with the level of post-mortem examinations varying depending on logistical and personal factors. Here we report some preliminary observational data on the prevalence of macroparasites in 42 delphinids (38 striped dolphins, 3 bottlenose dolphins, 1 common dolphin) that underwent a macroscopic necropsic examination after their stranding along French Riviera coasts between 2021 and 2025. Parasites were counted (external) or semi-quantitatively assessed (internal). Three external parasite species were identified (Cyamidae (12 dolphins), *Pennella* ⁹, and *Xenobalanus* ¹). *Clistobothrium grimaldii* and *delphini* merocercoids were the most frequent internal macroparasites, being present respectively in 27 and 25 individuals. The smallest *Stenella* to be infested with merocercoids was a 110cm female, while these parasites were found in all *Stenella* larger than 114cm. The only internal macroparasite family found to infest striped dolphins smaller than 100cm was Pseudaliidae (78cm and 89cm individuals). Liver and/or pancreas of non-neonate dolphins were found infested by Campulidae or Plerocercoids in 43% and 27% of the cases, respectively. Gastroenteric nematodes, cestodes and trematodes were also encountered, as well as subcutaneous *Crassicauda* sp. Our observations underline the relevance of molecular or microscopical techniques that could improve the accuracy of taxonomic determinations. Comparisons with published data in the Northwestern Mediterranean seem to indicate that our infestation levels are roughly similar (Spain) or slightly higher (Italy) to the ones observed in neighbouring waters, although some variations might arise from differences in the performed protocols.



HW-02. Pathological assessment of by-caught cetaceans in the Bay of Biscay: necropsy and histopathological findings

Molpeceres, Ignacio ¹; Arbelo, Manuel ¹; Sierra, Eva ¹; Alonso, Paula ¹; Suárez, Cristian ¹; Consoli, Francesco ¹; Suárez, Zuleima ¹; Iglesias, Claudia ¹; García, Natalia ²; Balseiro, Ana ²; Claver, Cristina ³; Fernández, Antonio ¹

1. Division of Histology and Veterinary Pathology, Atlantic Center for Cetacean Research, University. Institute for Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC), Canary Islands, Spain
2. Division of Histology and Veterinary Pathology, Animal Health Department, Veterinary School, University of León, Spain.
3. Marine Research Division, Basque Research and Technology Alliance (BRTA), AZTI Foundation Sukarrieta, Sukarrieta, Vizcaya, 48395, Spain

By-catch represents one of the most significant threats to cetacean populations worldwide. In the Bay of Biscay, a region characterized by fishing activity and high cetacean diversity, this issue poses a critical risk to local cetacean populations, particularly small odontocetes. This study principally aims to investigate gross pathological findings (necropsy) and histological lesions associated with a recognized stressful deadly bycatch in each dolphin. Additionally, detecting concomitant non-bycatch related pathologies will be also an objective in each animal. Under the framework of the collaboration project between the general direction of sustainable fisheries of the Spanish government and the universities of León and Las Palmas de Gran Canaria, systematic standardized necropsies and further histopathological analyses were conducted in 10 common dolphins (*Delphinus delphis*), 4 harbor porpoises (*Phocoena phocoena*), and 1 long-finned pilot whale (*Globicephala melas*) bycaught in the Bay of Biscay. These animals were recovered from fishing nets by fishers in the Bay of Biscay. All individuals displayed gross lesions consistent with bycatch and cytohistological lesions associated with moderate to severe acute stress. Furthermore, all animals exhibited varying degrees of multiorgan parasitosis (ranging from mild to moderate-severe). No other significant pathologies contributing to their mortality were identified, except for the pilot whale case, which showed moderate-to-severe focally extensive lymphohistiocytic meningoencephalitis and moderate otitis, possibly associated with parasitic infestation of the pterygoid sacs. The pathological findings of this study offer valuable insights into the systemic, organic and cytohistological lesional characterization of bycaught dolphins. Additionally, this research underscores the importance of fostering collaborations to enhance the health and welfare of cetacean species by connecting the fishery industry with scientific efforts, setting the basis for future joint actions aimed at the conservation of cetacean populations.



HW-03. First documented case of a bottlenose dolphin shooting in Slovenia

Lokar, Krista ¹; Paller, Tomislav ²; Genov, Tilen ¹

1. *Morigenos – Slovenian Marine Mammal Society*

National Veterinary Institute, Veterinary Faculty, University of Ljubljana Slovenia

The common bottlenose dolphin (*Tursiops truncatus*), a protected species in Europe, still faces ongoing threats from human activities. Over 23 years of research in the Gulf of Trieste, northern Adriatic Sea, fisheries-related activities and infectious disease have been identified as one of the primary causes of death in bottlenose dolphins in the area. However, in June 2024 we documented a dead dolphin that had been shot. The animal, identified as an adult male bottlenose dolphin, displayed external wounds during the initial field inspection. A post-mortem examination revealed that the cause of death was a gunshot wound. The projectile entered the left side of the chest, punctured both lungs, and exited through the right side, likely resulting in immediate respiratory distress. Projectile fragments were collected for ballistic analysis, though the firearm used remains unidentified. This marks the first documented case of a shot dolphin in Slovenia in modern history, contrasting with several similar cases reported in neighbouring countries. The state of decomposition suggested that the dolphin had been dead for several days, making it unclear where the shooting occurred. Given the small extent of Slovenian waters and the fact that the Gulf of Trieste is shared by Slovenia, Italy, and Croatia, the incident may have taken place outside Slovenian waters. The advanced decomposition of the carcass also made it impossible to determine whether the dolphin was part of the photo-identified population regularly monitored in the area. The Gulf of Trieste and the northern Adriatic Sea in general is under considerable pressure from several anthropogenic threats that act synergistically. This case underscores that intentional killing of dolphins still occasionally occurs and may contribute to the overall mortality of bottlenose dolphins in the region.



HW-04. Dynamics of the current avian influenza (HPAIV H5N1 2.3.4.4b) panzootic in wild mammals of the Americas (2022-2025)

Sacristán, Carlos ¹; Gudmundsdóttir, Ása ¹; Ibáñez-Porras, Pablo ¹; Ewbank, Ana Carolina ¹; Sacristán, Irene ¹; de la Torre, Ana ¹; Iglesias, Irene ¹

1. *Animal Health Research Center, INIA/CSIC*

The current high pathogenicity avian influenza (HPAI) virus panzootic, caused by the (A)H5N1 clade 2.3.4.4b subclade, represents a significant threat to wildlife worldwide. The recent involvement of wild mammals in the transmission dynamics of HPAIV H5N1 has significantly impacted wildlife, particularly in Europe and the Americas. Herein, we investigated the involvement of wild mammals - including marine mammals - in the transmission dynamics of HPAIV H5N1 2.3.4.4b. We analyzed HPAIV H5N1 2.3.4.4b characteristics and transmission patterns in wildlife entry in the Americas, where most of the cases in wild mammals have been reported since 2022. Utilizing geospatial analyses (Getis Ord Gi*, Kernel density, and space-time clustering) conducted in ArcGIS Pro 3.5, we examined 2,679 wild outbreaks reported by the World Organization of Animal Health (WOAH), from 2022 to January 2025, in North and South America, to identify outbreak characteristics. Of these, 2,328 outbreaks were in birds and 351 were in mammals - a total of 28 species of wild mammals, including 6 of marine mammals. HPAIV H5N1 2.3.4.4b was reported in 13 wild mammal families, including marine mammals (i.e., Delphinidae, Phocidae, Otariidae and Mustelidae). In North America, 91.38% of the affected mammals were terrestrial (mainly scavenger carnivores, like red foxes *Vulpes vulpes*). Conversely, in South America, most outbreaks occurred in marine mammals (mainly pinnipeds of the family Otariidae, 97.39.0%, 112/115). Hotspot analysis revealed areas of significant clustering of outbreaks, with distinct geographical patterns. Kernel density analysis identified regions with high-density outbreak occurrences. Proximity analysis found potential transmission routes between avian and mammal populations. There are strong connections between avian and mammal outbreaks, particularly in coastal and wetland environments. This study provides novel information regarding the current HPAIV H5N1 2.3.4.4b epizootic's dynamics and will greatly contribute to public health initiatives, species conservation and the strategic management of avian influenza outbreaks worldwide.



HW-05. Assessing the effects of satellite tagging on the health and conservation of long-finned Pilot Whales and Orca

Company, Mara ¹; González-Tapia, Angela ¹; Grande-Cid, Rocío ¹; López-Velasco, Marta ¹; Bizarro-Maia, Ana Beatriz ¹; Mamblona-Borbonada, Javier ¹; Pelayo, Jesus ¹; Ruiz-Ojeda, Laura ¹; Rivas-Garcia, Inmaculada ¹; Santilario-Berthilier, Tomás ¹; Silgado-Calderón, David ¹; Salazar-Sierra, Juan Manuel ¹; Viladés-Santos, Paula ¹; de Stephanis, Renaud ¹

1. CIRCE (Conservation, Information and Research on Cetaceans), Cabeza de Manzaneda 3, Pelayo, 11390 Algeciras, Cádiz, Spain

This study evaluates the impact of satellite tagging on wound healing, survival, and long-term effects in eight killer whales (*Orcinus orca*) and 12 long-finned pilot whales (*Globicephala melas*) in the ecologically significant and anthropogenically impacted Strait of Gibraltar. The objective is to determine whether satellite tagging affects wound healing, survival rates, and physical condition over time. Data were collected between 2011 and 2023 during 400 sea expeditions, combining satellite tracking with photographic identification to monitor tagging site recovery and track individual cetaceans. A catalog was used to support identification, focusing on high-quality images and features such as dorsal fins and distinct markings. The results indicate that satellite tagging is well tolerated by both species, with wound healing progressing as expected and full recovery observed within 1 to 2 years. This demonstrates that satellite tagging, when performed under appropriate conditions, is a minimally invasive technique that provides valuable data on cetacean behavior and movements. By integrating long-term monitoring and photographic identification, this research highlights the importance of developing refined tagging protocols that minimize physical impacts on marine mammals. The findings contribute to advancing ethical tagging practices and ensuring these methods remain effective tools for conservation. In ecosystems like the Strait of Gibraltar, subject to significant human activity, such approaches are essential for understanding cetacean populations and informing conservation strategies. By documenting the recovery process and improving methodologies for individual identification, this study provides critical insights that enhance the balance between research needs and animal welfare, supporting the long-term protection of vulnerable species in sensitive marine habitats.



HW-06. A survey on enteric protists *Cryptosporidium* spp., *Giardia duodenalis* and *Blastocystis* in cetaceans along Italian coastlines

Marchiori, Erica ¹; Mattiucci, Simonetta ²; Palomba, Marialetizia ³; Tessarin, Cinzia ¹; Marcer, Federica ¹

1. Dipartimento Medicina Animale Produzioni e Salute, Università di Padova, Italy
2. Dipartimento Sanità Pubblica e Malattie Infettive, Università La Sapienza, Italy
3. Dipartimento di Scienze Ecologiche e Biologiche, Università della Tuscia, Italy

The water-spread protozoans *Cryptosporidium* and *Giardia* are parasites of more than 150 species of vertebrates, ranging across fish, amphibians, reptiles, birds and mammals. *Blastocystis* is the most widespread protist in terrestrial animal hosts, including humans, characterized by the existence of several subtypes (STs) with different host ranges. Molecular characterization of isolates from marine mammals is essential to trace parasite origin, distinguishing between new, host-adapted genotypes and terrestrial isolates, which may mirror the contamination of marine environment by runoffs. In this study, a survey on the presence of *Cryptosporidium* spp., *Giardia duodenalis* and *Blastocystis* in cetacean species was carried out through the analysis of 31 fecal samples belonging to the species *Tursiops truncatus* ¹⁷, *Stenella coeruleoalba* ⁵, *Balenoptera physalus* ³, *Physeter macrocephalus* ³, *Grampus griseus* ² and *Ziphius cavirostris* ¹ sampled along Italian coasts during the period 2008-2024. Three TaqMan realtime PCR assays were used for the detection of *Giardia duodenalis*, *Cryptosporidium hominis*/*Cryptosporidium parvum*, and *Blastocystis*. Next generation sequencing was used to characterize *Blastocystis* STs. Only one isolate of *Cryptosporidium* sp. was detected in one specimen of *T. truncatus* from the Adriatic Sea, and one sample from fin whale tested positive to *Blastocystis*. *Cryptosporidium parvum* was already isolated from *T. truncatus* in European Atlantic coast with higher prevalence (21%), confirming the higher probability for this top predator, belonging to a neritic species, to host terrestrial-derived isolates of these zoonotic parasites, which may accumulate through the trophic web. The genetic characterization of *Blastocystis* isolate support the presence of a host-adapted ST, newly described, composing a distinct phylogenetic clade, offering new insights into the genetic diversity of this genus. Low prevalence along the Northern and central Adriatic coasts in bottlenose dolphins seem to support low level of coastal contamination despite the high river inflow in the area.

HW-07. Lungworm infections in odontocetes: a focus on the Adriatic Sea

Marcer, Federica ¹; Tessarin, Cinzia ¹; Di Renzo, Ludovica ²; Di Francesco, Gabriella ³; Pascucci, Ilaria ⁴; Rubini, Silva ⁵; Centelleghé, Cinzia ⁶; Pietrolungo, Guido ⁶; Lawton, Scott ⁷; Marchiori, Erica ¹

1. Dipartimento di Medicina Animale, Produzioni e Salute, Università degli Studi di Padova, Italy
2. Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale", Italy; Centro Studi Cetacei, Pescara, Italy
3. Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale", Italy
4. Istituto Zooprofilattico Sperimentale dell'Umbria e delle Marche "Togo Rosati", Italy
5. Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna "Bruno Ubertini", Italy
6. Dipartimento di Biomedicina Comparata e Alimentazione, Università degli Studi di Padova, Italy
7. School of Veterinary Medicine & Biosciences, Scotland's Rural College, UK

Pseudaliidae nematodes usually infect the lungs, air sinuses and middle ears of cetaceans worldwide. Lesions due to lungworms are described as causing mortality in odontocetes, through occlusion of bronchi and bronchioles, verminous pneumonia and secondary bacterial infections. In the period 2006-2024, 125 odontocetes (109 *Tursiops truncatus*, and 16 *Stenella coeruleoalba*), stranded along Italian Adriatic coasts were evaluated for pseudaliid infections. During necropsy, metastrongylid nematodes were collected from the lungs and identified by traditional and molecular methods, targeting ITS-2 and mtDNA COI gene. Infection severity was graded (mild, moderate or severe), combining gross lesions and histopathology together with a semiquantitative evaluation of intensity. A chi-square test was used to compare prevalence and severity between sex, age categories and host species. Overall, 79/125 dolphins (65 *T. truncatus*, 59.6% [95%CI 50.4-68.8] and 14/16 *S. coeruleoalba*, 87.5% [95%CI 71.3-100]) were infected with lungworms. Two species of *Pseudaliidae*, i.e. *Stenurus ovatus* and *Halocercus delphini*, were morphologically identified in 30 and 58 animals respectively, with 9 animals showing mixed infections. The two parasitic taxa were distributed in both host species. The infection was graded as mild in 19 animals, moderate in 29 and severe, with airways obstructions, in 16 animals. The infection was significantly more frequent in striped dolphin and more severe in juveniles. Sequence data indicated the occurrence of *S. ovatus* and *Halocercus* spp. confirming species identification for most isolates. Lungworm is clearly highly prevalent in the dolphins of the Adriatic and have variable pathological effects on the host. The ecological peculiarity of this basin and the sedentary habit of bottlenose dolphin population may have a role in determining higher prevalence of *Halocercus* spp. compared to data from Western-Mediterranean Sea. Similarly, it is clear that the lungworms exist as a diverse community of species making it challenging to identify individual nematode species as the leading cause of pathology.



HW-08. Strandings of harbour porpoise (*Phocoena phocoena*) in the Lisbon and Tagus valley region: trends, causes, and conservation implications

Molarinho, João ¹; Reiner, Francisco ¹; Sequeira, Marina ²; Pardal, Sofia ¹; Robalo, Joana ^{1,3,4}; Grilo, Miguel ^{1,3,4,5}

1. RALVT – Lisbon and Tagus Valley Stranding Network, ISPA - Institute of Applied Psychology, Rua Jardim do Tabaco 34, 1149-041 Lisboa, Portugal
2. ICNF – Nature Conservation Institute and Forestry, Av. Dr. Alfredo Magalhães Ramalho 1, 1495-165 Algés, Portugal
3. MARE – Marine and Environmental Sciences Centre/ARNET – Aquatic Research Network
4. ISPA - Institute of Applied Psychology, Rua Jardim do Tabaco 34, 1149-041 Lisboa, Portugal
5. Egas Moniz Center for Interdisciplinary Research (CiiEM), Egas Moniz School of Health & Science, 2829-511 Caparica, Almada, Portugal

The presence of the critically endangered harbour porpoise (*Phocoena phocoena*) population in the Iberian Peninsula is well documented along the entire Portuguese coast, overlapping with commercial fishing activities. In the Lisbon and Tagus Valley region, 25 strandings were recorded between 1979 and 2021, representing 2.3 % of the total strandings documented in the region during that period. In 2024, following the implementation of a stranding monitoring network in October 2021, 7 strandings were recorded, accounting for 8.9% of 2024 strandings. Necropsies were conducted to investigate potential causes of death, following standardised protocols and considering decomposition state. Of the individuals recorded in 2024, 71.4% were male, with age distribution balanced between juveniles and adults. Most were in good nutritional condition. Strandings were observed across the region, but prior to the network's implementation, 48% occurred in Almada. Strandings in 2024 were more frequent in summer, a contrast to previous seasonal trends. Common necropsy findings included pulmonary oedema (71.4%), evidence of trauma (fractures and/or bruising) (57.1%), and parasitism (57.1%). Traumatic causes were identified in three cases, accidental fishing interactions in two cases, while two cases remained undetermined. The increase in strandings in this region may be linked to the foraging feeding behaviour of harbour porpoises, which exploit areas with high prey availability. While local conditions, such as prey abundance and high productivity, attract these animals, they also increase their exposure to interspecies competition and human-related risks. Thus, the recorded stranding increase likely reflects a combination of favourable feeding conditions and competition and anthropogenic pressures. Systematic data collection by stranding networks is crucial to understanding the threats to the Iberian harbour porpoise population and guiding effective conservation strategies to protect this critically endangered population.



HW-09. Epidemiological and pathological analysis of cranial Crassicaudasis in stranded cetaceans in the Canary Islands

Suárez González, Zuleima ¹; Sierra, Eva ¹; Arbelo, Manuel ¹; González, Jorge ²; Castro-Alonso, Ayoze ¹; Suárez-Santana, Cristian ¹; Rivero, Miguel ¹; Mopeceres-Diego, Ignacio ¹; Fernández, Antonio ¹

1. Division of Histology and Veterinary Pathology, Atlantic Center for Cetacean Research, University Institute for Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC), Transmontaña, Arucas 35413 Canary Island, Spain
2. University Institute for Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC), Transmontaña, Arucas 35413 Canary Island, Spain

Nematodes of the genus *Crassicauda* are known to parasitize cranial sinuses in delphinids, causing lytic bone lesions and, occasionally, migrating to the central nervous system (CNS), potentially serving as vectors for pathogens such as *Brucella* spp. This study aims to investigate the prevalence and pathological impact of *Crassicauda* spp. infestation in stranded cetaceans in the Canary Islands, with a specific focus on cranial crassicaudasis. The presence of *Crassicauda* sp. in pterygoid sacs, parasite burdens and histopathological findings of pterygoid sacs and CNS lesions were evaluated. For this purpose, reports of 54 stranded cetaceans (6.3% of 852 strandings from 1999–2023) with evidence of parasitic sacculitis were analyzed. Normal histological features from two non-parasitized cetaceans were compared to samples from parasitized individuals. Nematodes of the genus *Crassicauda* were found in 78% of cases, with the highest prevalence in *Stenella frontalis* (24%) and *Grampus griseus* (19%). Juveniles/subadults showed higher parasitization rates (59%), with no sex-related differences. Histopathology revealed mild inflammatory reactions, hyperkeratosis, and epithelial desquamation in parasitized sacs. CNS lesions were observed in 45/54 (83%) of affected cetaceans, with *Brucella* spp. being the most frequently associated pathogen (3/45, 6%). The findings of this study emphasize the importance of cranial crassicaudasis as a significant pathological condition in stranded cetaceans from the Canary Islands, highlighting its potential role in morbidity and mortality. The systematic examination of pterygoid sacs during necropsies is crucial for improving our understanding of host-parasite interactions and their implications for cetacean health. Routine testing for parasitic infestations and associated pathogens, such as *Brucella* spp., should become a standard practice to identify and monitor potential zoonotic risks and the health status of cetacean populations. Our results provide a valuable foundation for future studies and underscore the need for continuous monitoring of parasitic infections in marine mammals.



HW-10. Study of persistent organic pollutants (POPs) in bycaught cetaceans in the Bay of Biscay, Spain

García Álvarez, Natalia ¹; Molpeceres, Ignacio ²; Muñoz Arnanz, Juan ³; Jiménez, Begoña ³; García Marín, Juan Francisco ¹; Balseiro, Ana ¹; Fernández, Antonio ²

1. Division of Histology and Veterinary Pathology, Animal Health Department, Veterinary School, University of León, Spain
2. Division of Histology and Veterinary Pathology, Atlantic Center for Cetacean Research, University Institute for Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC), Canary Islands, Spain
3. Department of Instrumental Analysis and Environmental Chemistry, Institute of Organic Chemistry (IQOG-CSIC), Madrid, Spain

Anthropogenic pollution worldwide can affect the survival of cetaceans, which are particularly susceptible to potential chronic toxicity. This study represents the first report of POPs in cetaceans collected through incidental capture (bycatch) in the Bay of Biscay. We analyzed 74 compounds in blubber and liver samples of 15 cetaceans (10 *Delphinus delphis*, 4 *Phocoena phocoena*, and 1 *Globicephala melas*) collected between 2022 and 2024. Among the chemicals studied, such as organochlorine pesticides, industrial-use compounds and polychlorinated dibenzo-p-dioxins/furans (PCDD/Fs), PCBs were the most abundant with a median concentration of 7290 ng.g⁻¹ lipid weight (lw) in blubber. Common dolphins and the pilot whale showed similar levels of all chemical groups. Harbor porpoises, however, displayed higher xenobiotic concentrations, more than five times the value for PCBs. PBDE levels were much lower than those of PCBs, and no significant differences were observed between species. Yet, blubber exhibited greater concentrations than liver samples, with a median of 209 ng.g⁻¹ lw and 66,0 ng.g⁻¹ lw, respectively. Regarding PCDD/Fs, furans accounted for over 95% in the blubber, whereas dioxins were more prevalent in the hepatic tissue. The median value for organochlorine pesticides was 4480 ng.g⁻¹ lw in blubber and the p,p'-DDE/tDDTs ratio of 0.43, reaching a 0.81 ratio in the liver, which is indicative of aged DDT. In general, the residues analyzed in this study were quite similar to concentrations reported in dolphins from northern European regions, but lower than those found along the US Atlantic and Pacific coasts, and the Mediterranean Sea where current levels stay considerably higher. Nevertheless, a marked variability was observed between individuals, and some exceeded the toxic thresholds considered in the literature. Therefore, further pollutant monitoring in free-ranging dolphins is required to contribute to the conservation of marine ecosystems, and, in that context, the study of bycaught cetaceans represents a valuable insight.



HW-11. Brighton Rock- increase in bottlenose dolphin attacks on harbour porpoises in Sussex, England during 2024

Deaville, Robert ¹; Spiro, Simon ²; Perkins, Matthew ¹; Williams, Rosie ¹

1. Institute of Zoology, Regents Park, London, NW1 4RY, UK.

2. Zoological Society of London, Regents Park, London, NW1 4RY, UK.

The Cetacean Strandings Investigation Programme (CSIP) coordinates the investigation of vulnerable Protected, Endangered and Threatened (PET) marine species found stranded around England and Wales, under contract to UK Government. During 2024, ten harbour porpoises (*Phocoena phocoena*) were recovered from the coastline of West Sussex and Brighton and Hove on the south English coast, for necropsy under the CSIP remit. Nine of these harbour porpoises were diagnosed as cases of attack by bottlenose dolphins (*Tursiops truncatus*). Observed pathology included multiple, curvilinear parallel rakemarks across the externa, consistent with bottlenose dolphin teeth spacing, cavitating haemorrhagic blubber tears and splits, unilateral or bilateral rib fractures, haemothorax and/or pneumothorax and other evidence of antemortem focal, blunt force trauma. Since its inception in 1990, 1700 harbour porpoises reported stranded in England and Wales have been examined at necropsy by the CSIP, of which 215 have been diagnosed as bottlenose dolphin attack (data 1990-2024). These have primarily been recorded around the Cardigan Bay region of Wales (n=145) and the coastline of southwest England (n=47), reflecting areas of sympatric distribution between the two species. Prior to this year, only three previous cases of bottlenose dolphin attack in harbour porpoises have been diagnosed in Sussex and the wider Eastern Channel region- one each in 2019, 2020 and 2021. In recent years, sightings and strandings of bottlenose dolphins have increased along the Sussex coast, suggesting that this species may now be semi-resident in the area. These changes potentially represent movement of the South Coast Community of bottlenose dolphins along the southern English coastline and is further evidence of the changing nature of the eastern Channel region. Our findings highlight the need to better understand the drivers of distribution change that may have led to this marked change in diagnosed mortality of harbour porpoises in Sussex during 2024.



HW-12. Back into the wild: documented orca long term post-captivity survival

Tsidulko, Grigory ¹

1. Nonprofit organization “Scientific-Ecological Dolphin Rescue Center “Delfa”

Orca post-captivity releases are rare and information about their survival scarce. In mid-2018, 11 mammal-eating orca were live captured in the Sea of Okhotsk to be sold to foreign entertainment facilities. All orca were held for ~1 year in the Primorsky region, Russia - in the infamous "Whale Jail". During captivity the orca were fed fish and kept divided in small groups in 3 sea pens. Researchers were permitted to enter the facility to assess the orca for potential release. The photo-identification of individuals was part of the assessment. Inspected animals had poor health status: orca were inactive, mainly hanging at the surface, had skin rashes and lesions of unknown etiology. Inspectors subsequently recommended all orca be released which took place in the summer of 2019. By that time one young male orca perished. 10 individuals were released - 6 females and 4 males. Upon release, each orca was satellite tagged but these stopped transmitting shortly after the release. Due to the remote location of the release information about the encounters with released animals is limited. Accidental in-field observations and photo-ID have since confirmed that at least three orca have successfully re-adapted to life in the wild and have integrated with wild orca families. Two, who were held together in the same pen, were resighted together in 2022 and 2023. Another was sighted twice in amongst the same wild pod successfully hunting (2019) and traveling (2024) with it. Based on behavioral observations of the same individuals in the wild and photographic evidence the released orca have recovered and no longer exhibited poor health status indications. These observations provide strong evidence that orca have significant adaptive potential allowing for long term post-captivity survival in the wild and successful reintegration with wild conspecifics.



HW-13. First medical findings on Dusky dolphins (*Lagenorhynchus obscurus*) with high levels of mercury in Peru

Yaipen-Llanos, Carlos F. ¹

1. *Organization for Research and Conservation of Aquatic Animals -ORCA PERU*

Pollutants, especially methyl-mercury (CH₃Hg)⁺ is taking the central stage in ecological and medical marine mammal research, however, knowledge about the effects on the health of cetaceans are developing, and it is unknown in Peru. The aim of this presentation is to describe for the first time the medical findings on dusky dolphins (*Lagenorhynchus obscurus*) exposed to methyl-mercury in the central coast of Peru, between 12°08'46.16"S-77°01'32.04"W and 12°23'42.55"S-76°46'41.84"W. The South Pacific Marine Mammal Center of ORCA PERU rescued six live specimens between 2012 and 2024, all in terminal condition. Data collected included accession numbers, geo-position, gender, age class, biometrics, blood samples for hematology and methyl-mercury analysis, and necropsies for macro and microscopic analysis. Mercury levels were analyzed using Inductive Coupling Plasma-Mass Spectrometry method, where the ACGIH (American Conference of Governmental Industrial Hygienists) indicates that above 50ug/L are toxic levels, over 15ug/L are exposure levels, and less than 10ug/L are values common to non-exposed individuals. Five specimens were females, four adults and two juveniles. Medical findings confirmed all specimens were carriers of high levels of methyl-mercury ranging from 34,6ug/L to 112ug/L in circulating blood and were severely immune-suppressed, although RBC, Hemoglobin and Hematocrit counts were acceptable. While weakness, swimming disability, and severe gastritis were also diagnosed in all specimens, three cases showed neoplasm affecting pancreas and lymph nodes. These dusky dolphins stranded within Lima city, the densest area of the country. It is of serious concern to notice the progressive increment of methyl-mercury in this endemic species, especially since one showed signs of human interaction for consumption. Their role as sentinels of the ocean's One Health involving dolphins, the environment and the public becomes critical as dolphins consume the same prey as humans, therefore revealing a long-term damage of the pollutant to the marine ecosystem and a risk to human's health.



HW-14. Diversity of *Candida* species in the respiratory samples of bottlenose dolphins (*Tursiops truncatus*)

Leal, Miriam¹; Barny, Rita²; Guerra, Joana²; Lourenço, Miguel²; Vicente, Catarina³; Urbani, Nuno²; N. Marques, Gonçalo²

1. Zoomarine Portugal – Mundo Aquático S.A. – E.N. 125 KM 65, 8201-864 Guia, Portugal MARE-ISPA– Rua Jardim do Tabaco 34, 1149-041 Lisboa, Portugal
2. Zoomarine Portugal – Mundo Aquático S.A. – E.N. 125 KM 65, 8201-864 Guia, Portugal
3. Faculdade de Medicina Veterinária, Universidade Lusófona – Campo Grande, 376 1749-024 Lisboa, Portugal

Pneumonia is one of the most common diseases among managed and free-ranging bottlenose dolphins (*Tursiops truncatus*), and pulmonary fungal infections are reported to be the most common mycoses in dolphins. The close relationship between respiratory function and systemic health underscores the importance of monitoring respiratory microbiota as part of preventive care and conservation efforts. While *Candida* spp. are an established constituent of the respiratory microbiota in dolphins, fungal overgrowth can lead to respiratory infections particularly associated with the development of filamentous elements in addition to yeast forms. This study investigates the diversity of *Candida* species in respiratory samples of bottlenose dolphins under professional care, aiming to establish a preliminary baseline for future research on the mycobiota of cetaceans. An in-house protocol for sampling and culturing respiratory fungi was developed as part of routine preventive veterinary practices, ensuring consistent collection, inoculation, incubation, and identification of these microorganisms. Respiratory samples were inoculated on CHROMagar™ *Candida* Plus, a chromogenic medium specifically designed to differentiate *Candida* species. This medium facilitated the rapid identification of key species through distinct colony coloration after 48 hours of incubation at 37°C. A total of 131 respiratory samples were collected from 26 bottlenose dolphins (16 males, 10 females) over two years. Analysis revealed a diverse *Candida* spp. microbiota, with 89 isolates of *Candida albicans*, 54 of *Candida glabrata*, 10 of *Candida tropicalis*, 2 of *Candida krusei*, and 1 unidentified *Candida* species. Seventeen samples exhibited no fungal growth. This study establishes a baseline for the diversity of *Candida* species in bottlenose dolphins under professional care, highlighting the importance of integrating microbiological analysis into routine health monitoring. These findings provide a foundation for future studies on wild dolphin populations, and contributing to a broader understanding of health-ecosystem interactions within the One Health framework.



HW-15. Stranding patterns and causes of death in Atlantic spotted dolphins (*Stenella frontalis*) in the Canary Islands (2020-2024)

Arbelo, Manuel ¹; Sierra, Eva ¹; Bernaldo de Quirós, Yara ¹; Fiorito, Carla ²; Puig-Lozano, Raquel ¹; Consoli, Francesco ¹; Suárez-González, Zuleima ¹; Alonso-Almorox, Paula ¹; Molpeceres-Diego, Ignacio ¹; Iglesias-González, Claudia ¹; Reyes-Matute, Alonso ¹; García-Álvarez, Natalia ³; Fernández, Antonio ¹

1. *Veterinary Histology and Pathology, Atlantic Center for Cetacean Research (CAIC), University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC). Trasmontaña s/n, 35413 Arucas. Canary Islands, Spain.*
2. *Centro para el Estudio de Sistemas Marinos (CESIMAR), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), 9120 Puerto Madryn, Chubut, Argentina.*
3. *Animal Health Department. Veterinary School. University of León. Campus de Vegazana, s/n. 24071 León, Spain.*

Within the high biodiversity of cetacean species inhabiting the waters of the Canary Archipelago, the Atlantic spotted dolphin (*Stenella frontalis*) is one of the most frequently encountered species, both in sightings and strandings. According to data from the Canary Islands' stranding network, 78 individuals of this species have stranded over the past five years (an average of 15.6 per year), with events recorded on all islands except El Hierro, and throughout the year except in September, with the highest occurrences in the first half of the year (January–June). Of the stranded individuals, 23% (18 out of 78) were found alive, and 7 were reintroduced into the wild. For the remaining specimens found dead or those that died during the stranding event, full post-mortem studies were conducted in 84.5% of cases (60 out of 71). Among the studied cases, a probable cause of death was determined in 90% (54 out of 60), with natural causes being the most frequently identified, accounting for 76%. Of particular interest is the increasing diagnosis of trauma cases associated with interspecific interactions (20,4%), either with other cetacean species or sharks. Additionally, this species shows a notable increase in mortality cases due to interactions with fishing activities, compared to others studied in the same area, accounting for 24% of all diagnoses. Specifically, the number of deaths caused by interactions with hooks used in artisanal tuna fishing has grown in recent years, representing 18.5% of the total. Although this type of interaction in the archipelago's waters presumably occurs at relatively low numbers and proportions compared to the overall population, it remains a cause for concern due to ethical considerations regarding animal health and welfare. Therefore, collaboration among the fishing sector, government authorities, and scientific institutions is essential to explore prevention and mitigation measures that could be implemented.



HW-16. Pathological investigation of highly pathogenic avian influenza (HPAI) H5N1 infection in Pinnipeds confirms neurotropism and reveals vertical transmission and new tissue tropism of the virus

Sierra, Eva ¹; Colom-Rivero, Ana ¹; Fernández, Antonio ¹; Alonso-Almorox, Paula ¹; Andrada, Marisa ¹; Lombardo, Daniel ^{2,3}; Fiorito, Carla ^{2,4}

1. *Veterinary Histology and Pathology, University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria, Spain*
2. *Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina*
3. *Universidad de Buenos Aires, Facultad de Ciencias Veterinarias. Instituto de Investigación y Tecnología en Reproducción Animal (INITRA), Buenos Aires, Argentina.*
4. *Centro para el Estudio de Sistemas Marinos (CESIMAR-CONICET), Chubut, Argentina.*

In 2023, an unprecedented outbreak of highly pathogenic avian influenza (HPAI) H5N1 resulted in the death of thousands of pinnipeds along the Argentinean coast, raising concerns about its ecological and epidemiological impact. Despite the large number of affected South American Sea Lions (SASLs) (*Otaria flavescens*) and Southern Elephant Seal (SES) (*Mirounga leonina*) during the South American outbreak, research on the pathology of infection with recent HPAI H5 viruses in these species remains limited. This study aimed to present clinical, pathological, and molecular findings associated with HPAI H5N1 infection in pinnipeds that died in Chubut, Argentina, between August and October 2023. Necropsies were conducted on three SASLs and one SES followed by histopathological, immunohistochemical and RT-sqPCR analyses. Neurological clinical signs were observed in two SASLs, with one also exhibiting respiratory distress. Neuropathological findings included lymphoneutrophilic meningoencephalomyelitis and choroiditis, neuronal necrosis, gliosis, hemorrhages, and perivascular cuffing. Viral antigen was localized in neurons, glial cells, choroid plexus epithelial cells, ependymal cells, and the neuropil. Systemic manifestations included HPAI-related necrotizing myocarditis in the SES and placental necrosis in a SASL, with fetal tissues testing positive for HPAIV. Pulmonary lesions were minimal, limited to bronchial glands in one individual. RT-sqPCR confirmed HPAI H5 in all tested animals. Two distinct sequences were identified, which shared 99.00% similarity and were confirmed as HPAI H5N1 clade 2.3.4.4b based on hemagglutinin (HA) segment sequences. These sequences showed 96.5% to 95.39% identity with partial HA gene segments from various avian and mammalian species sampled across North and South America between 2022 and 2024, including two SESs and a SASL collected in Argentina. Our findings highlight the neurotropism of HPAI H5N1 in pinnipeds, and expand the known systemic effects of the virus, revealing new tissue tropism and vertical transmission.

HW-17. *Halocercus* lungworms from a Sowerby's beaked whale (*Mesoplodon bidens*) stranded in Galicia, Spain

Saldaña, Ana ¹; Martínez-Calabuig, Néstor ¹; Covelo, Pablo ²; López, Alfredo ^{2,3}; Pin, Xabier ²; García-Dios, David ¹; Remesar, Susana ¹; Díaz, Pablo ¹; López, Ceferino Manuel ¹; Morrondo, Patrocínio ¹; Díez-Baños, Pablo ¹; Panadero, Rosario ¹

1. INVESAGA Group, Faculty of Veterinary Sciences, University of Santiago de Compostela, 27002, Lugo, Spain
2. Coordinadora para o Estudo dos Mamíferos Mariños, CEMMA, 36350, Nigrán, Spain
3. Department of Biology & CESAM, University of Aveiro, 3810-193, Aveiro, Portugal

Moser and Rhinehart (1993)* documented the stranding of a beaked whale (*Mesoplodon* sp.) calf in California. It was 265 cm long and exhibited a strong suckling response, and was estimated to be under six months old. In the lungs they found cysts, containing adult female nematodes and a single male. Based on the male's anatomy "distal extremities had three branches with striated alae and the two spicules each were 0.684 mm long" they identified the nematodes as belonging to the genus *Halocercus*, making this the first record of *Halocercus* parasitizing the genus *Mesoplodon*. In 2022, a male Sowerby's beaked whale (*Mesoplodon bidens*) stranded alive in A Coruña, Spain. Despite rescue efforts, it was euthanized. It was 450 cm long and sexually immature. Necropsy revealed no cause of stranding, but in the lungs, we found four nematodes (three females —two of them incomplete— and one male). The female measured 35.33 mm long and 0.17 mm wide. The male measured 22.95 mm long and 0.19 mm wide. The bursa was 59.41 µm long and 97.73 µm wide, and contained five rays: two ventral rays with one large medial papilla, two lateral rays with two equal papillae each, and one dorsal ray with two equal papillae; the gubernaculum was keratinized (57 µm by 19 µm). The spicules averaged 145 µm in length (144.97 µm and 146.48 µm). Since Moser and Rhinehart did not specify the host species and, considering that Sowerby's beaked whales are not native to Californian waters, to our knowledge this represents the first report of *Halocercus* sp. parasitizing this species. Despite similarities, the difference in spicule length (0.684 mm vs. 0.145 mm) suggests different nematode species. This raises the question: are these nematodes from a known *Halocercus* species, or do they represent a new one? Hopefully DNA will tell. *<https://doi.org/10.7589/0090-3558-29.3.507>

HW-18. *Crassicauda anthonyi* renovascular disease (RVD) in stranded Cuvier's beaked whale in the Canary Islands

Fernandez, Antonio ¹; Suárez-González, Zuleima ¹; Sierra, Eva ¹; Bernaldo de Quirós, Yara ¹; Felipe-Jimenez, Idaira ¹; Suarez-Santana, Christian ¹; Arregui, Marina ¹; Alonso-Almorox, Paula ¹; Achiile-Consoli, Francesco ¹; Fernandez-Maldonado, Carolina ²; Colom, Ana ¹; Cámara, Nakita ¹; Rivero, Miguel A ¹; Fioritto, Carla ¹; Molpeceres, Ignacio ¹; Iglesias-Gonzalez, Claudia ¹; Grandia, Raiden ¹; Jepson, Paul ¹; Di Guardo, Giovanni ³; Díaz-Santana, Pablo ¹; Díaz-Delgado, Josue ⁴; De la Fuente, Jesus ¹; Martin, Vidal ⁵; Carrillo, Manuel ⁶; Velazquez-Wallrauf, Alicia ¹; Puig-Lozano, Raquel ¹; Reyes-Matute, Alonso ¹; Castro, Ayoze ¹; Caballero, MJ ¹; Arbelo, Manuel ¹

1. *Veterinary Histology and Pathology, University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria. Spain*
2. *SEASHORE. Veterinary Histology and Pathology, University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria. Spain*
3. *Teramo University. Italy.*
4. *Texas AM. Veterinary Histology and Pathology, University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria. Spain*
5. *SECAC*
6. *Tenerife Conservación*

The Canary Islands host both resident and transient populations of Cuvier's beaked whales (CBWs), *Ziphius cavirostris*. CBWs face anthropic threats such as entanglement in fishing gear, ingestion of marine debris, ship collisions, and exposure to antisubmarine military sonar. Understanding their health condition to resist to these stressors is paramount. With this goal, we carried out a retrospective pathological study on 55 CBWs stranded in the Canary Islands between 1995 and 2003. Systematic full necropsies were carried out on every stranded beaked whale by veterinary pathologists from a multidisciplinary team (IUSA-ULPGC-Canary Islands VIGIA Stranding Network). In carcasses with advanced decomposition code, partial necropsies (data and selective sample collection) were performed. Histological routine analysis was done in every necropsied and sampled CBW. Microbiological (virus, bacteria) and parasitological studies were performed upon request due to morphological lesions (Dx) (gross and or histology). Additional laboratory analyses (i.e. contaminants) were requested mainly with research purposes. Regardless, causes of death, we want to call special attention to the severity of renal lesions associated with *Crassicauda* sp., (identified molecularly as *Crassicauda anthonyi* in 6 samples out of 6 different CBWs). These renal lesions were also associated with chronic extensive vascular lesions in all stranded CBWs (N=51), except for neonates (N=1), or very young calves (N=3). Our results are conclusive: CBWs show a high prevalence of renovascular pathology with many vascular and organic associated lesions (including "mesenteric intestinal ischemia") as well as neo-vascular



compensatory proliferation. Hence we propose to name this “renovascular pathological based entity” in CBWs as “Cuvier’s Renovascular Disease (RVD)”.



HW-19. Trends in seal rehabilitation admission data in south west England and the impacts of climate change

Arrow, Natalie ¹; Satsias, Zoe ¹; Jarvis, Daniel ¹

1. *British Divers Marine Life Rescue*

This project aims to review four years of rehabilitation admission data for seals in south west England, and how changing trends call attention to threats to their conservation, welfare and the response network. Admission data from the British Divers Marine Life Rescue Cornwall Seal Hospital was collated between 2021 and 2025, totalling 362 animals comprising 360 grey seals (*Halichoerus grypus*) and two common seals (*Phoca vitulina*). Collated data included the date of rescue, sex, weight and body condition and reasons for admission. Age estimation was based on developmental factors such as moult stage and degree of eruption of the permanent dentition. The temporal range of admissions spanned from mid September to early May, peaking in November. Overall, 205 (57%) animals were male and 157 (43%) were female, corresponding with similar studies, and remained consistent each season. Average admission weight decreased from 17.6kg to 15.7kg, while estimated age by canine length decreased from 12.5mm to 10.5mm. The number of pre-moult pups remained stable, as did the number of entanglement cases. A pattern was found in the number of admissions with traumatic injuries that correlated with increased storminess in the 2022/23 and 2023/24 seasons, leading to increased maternal separation, malnourishment and likelihood of trauma due to rough seas. The findings reveal that the severity and frequency of winter storms had a positive correlation on admissions due to traumatic injury and potentially maternal separation, although direct anthropogenic disturbance may also be a significant factor in the latter. Elevated rates of admissions have put much greater pressure on already limited and overall decreasing rehabilitation capacity in the UK. Given human-driven climate change forecasts indicate increasing storminess, the authors call for further investigation of these issues and for improved resources for rehabilitation in strategic locations nationally.



HW-20. Microbiota from bottlenose dolphin blow: evaluation of collection methods on animals under human care to develop a non-invasive field sampling protocol

Dugeny, Elyne ¹; Ceolotto, Luca ¹; Andres Hervias, Carmen ²; Alvarez Costa, Eva ³; Esposti, Erika ⁴; Gonzalvo, Joan ²; Pesce, Gaia ³; Mazzariol, Sandro ¹; Centelleghes, Cinzia ¹

1. Department of Comparative Biomedicine and Food Science (BCA), University of Padua, Padua, Italy
2. Tethys Research Institute, Italy
3. Edutainment, Acquario di Genova, Genova (GE), Italy
4. Zoosafari di Fasano, Contrada sant'Elia 72015 Fasano BR, Italy

Sampling protocols using UAVs are receiving increasing interest due to the non-invasive character of the method, as they avoid stressing animals through manipulation. Previous studies have highlighted how drone-based sampling of cetacean exhaled breath condensate allows researchers to access health information, like the state of the associated microbial community. The present work has been carried out with the aim of developing a robust and coherent protocol for dolphin blow sampling using UAVs in the wild. Trials of 5 different blow collection tools (two DNA stabilization solutions DNA/RNA Shield and RNA later, dry and pre-moistened biocide-free cellulose sampling sponges, and indicating FTA cards) have been each performed 1m above 5 bottlenose dolphins (*Tursiops truncatus*) under human care for capturing respiratory microbes. Overall, FTA cards and DNA/RNA Shield have demonstrated the most convincing results. Even considering the convenience of storage conditions on a field campaign for FTA cards as the easiest tool to implement, DNA/RNA Shield was the best solution for storage and provided the best DNA yield, about four times higher than the other blow collection tools. Metabarcoding analyses of the microbial communities, showed that blow collection tool type drove differences in the composition and structure of the dolphin's respiratory microbiome rather than dolphin individual, highlighting the importance of the chosen technique. Considering the higher DNA yield of the DNA/RNA Shield, it seems to be the most reliable method for community analyses. We applied these techniques on free ranging bottlenose dolphins in a sampling campaign.



HW-21. Gas bubbles related pathology in a stranded atlantic short-finned pilot whale (*Globicephala macrorhynchus*) in Canary Islands

Reyes-Matute, Alonso ^{1,2}; Velázquez-Wallraf, Alicia ¹; Sierra, Eva ²; Caballero-Cansino, María José ¹; Bernaldo de Quirós, Yara ¹; Fernández, Antonio ¹

1. *Veterinary Histology and Pathology, Atlantic Center for Cetacean Research (CAIC). University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC). Canary Islands, Spain.*
2. *Pathology Department, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México (FMVZ-UNAM). México city, México*

Acute gas embolism consistent with Decompression-like Disease is a rare pathology in cetaceans. It has only been described in stranded beaked whales associated temporally and geographically with naval exercises and in Risso's dolphins linked to stressful fighting with a squid during feeding. This study aims to describe, for the first time, pathological findings of acute systemic gas bubble related pathology in a Pilot whale (PW) (*Globicephala macrorhynchus*). A 374 cm-long, female, adult PW was floating adrift and submitted for postmortem examination. On gross examination, the animal was fresh (code 2) and in good body condition. Gas bubbles sometimes forming long discontinuities were observed in subcutaneous, epicardial, mesenteric and brain vasculature. The gas score was 8 out of 10. Systemic congestion and hemorrhages were observed. A cystic polypoid fibrous mass was protruding through the oropharynx. Microscopically systemic congestion with pulmonary angiomatosis was observed. Gas bubbles, congestion and/or hemorrhages were observed within lungs, liver, kidneys, brain, spleen and lymph nodes. In brain, gas bubbles were scarce to moderately abundant in cranial and caudal cortex, and abundant in white matter from midbrain and through pons and medulla oblongata. Scarce hemorrhage associated with the air bubbles were found. *Photobacterium damsela* was detected in brain, blood, lung and kidney samples. *Staphylococcus epidermidis* was detected in brain tissue. Gas bubbles associated with anthropic causes were discarded in absence of epidemiological data or compatible lesions. The role of *P. damsela* as a pathogenic bacterium is still uncertain and gas production has not been described. Although the primary cause(s) remain unknown, we described gas embolism-associated lesions in PW, another deep-diving species. These findings contribute to a broader understanding of decompression-like syndrome in marine mammals, offering insights into the physiological challenges faced by deep-diving cetaceans and representing a significant step forward in identifying pathological markers for such conditions.



HW-22. Emerging bacterial and viral pathogens in dolphins of the Eastern Mediterranean: insights from *Streptococcus agalactiae*, *Photobacterium damsela*, and Gammaherpesvirus cases

Morick, Danny ¹; Scheinin, Aviad ²; Tchernov, Dani ³

1. Department of Blue Biotechnologies and Sustainable Mariculture, The Leon H. Charney School of Marine Sciences, University of Haifa, Haifa 3498838, Israel
2. Morris Kahn Marine Research Station, Leon H. Charney School of Marine Sciences, University of Haifa, Sdot Yam, Israel
3. Department of Marine Biology, The Leon H. Charney School of Marine Sciences, University of Haifa, Haifa 3498838, Israel

We recently conducted a series of studies investigating infectious agents in stranded dolphins from the Eastern Mediterranean Sea, focusing on *Streptococcus agalactiae*, *Photobacterium damsela* subspecies *damsela*, and gammaherpesvirus infections. In one study, we reported the first isolation and characterization of *S. agalactiae* from a stranded wild common dolphin (*Delphinus delphis*). A male dolphin found dead near Bat-Yam, Israel, in September 2020, was examined post-mortem, revealing the presence of this bacterium. This finding underscores the need for ongoing monitoring of infectious agents in marine mammals to inform conservation efforts. The same male dolphin exhibited a small, raised penile lesion. Histological analysis and molecular characterization confirmed the presence of a gammaherpesvirus. This case highlights the importance of long-term assessments to establish viral infection databases in cetaceans, especially in the context of climate change, which may exacerbate infectious disease outbreaks in marine mammals. Additionally, we reported a case of severe chronic suppurative pneumonia caused by *P. damsela* subsp. *damsela* in a stranded bottlenose dolphin (*Tursiops truncatus*) found near Ashdod, Israel, in January 2021. This pathogen, known to affect various marine animals, was identified as the causative agent, marking the first reported instance of such an infection leading to fatal pneumonia in a dolphin from the Eastern Mediterranean Sea. This finding adds to the growing baseline data regarding the health of these marine mammals and provides molecular information for a pathogen capable of infecting a large variety of animals in the marine environment, as well as humans. These studies provide critical insights into the presence of bacterial and viral pathogens in dolphins in the Eastern Mediterranean, emphasizing the necessity for continuous surveillance to support the health and conservation of these marine mammals.



HW-23. Bibliographic and Methodological Review of the determination of the Post-mortem Interval (PMI) in Stranded Cetaceans

Velázquez-Wallraf, Alicia ¹; Arbelo, Manuel ¹; Caballero, Maria José ¹; Montesdeoca, Eva ¹; Caballero-Hernández, Lucía ¹; Fernández, Antonio ¹; Castro-Alonso, Ayoze ¹

1. *Veterinary Histology and Pathology, Atlantic Center for Cetacean Research, University Institute of Animal Health and Food Safety (IUSA). Veterinary School. University of Las Palmas de Gran Canaria (ULPGC). Canary Islands, Spain.*

Progressing towards improvements in the accuracy of post-mortem interval (PMI) determination in stranded cetaceans will result in better forensic investigations and diagnosis and more efficient biodiversity protection and conservation efforts. In this context, we hypothesize that combining various promising PMI indicators, as defined in scientific literature, could support an increase in PMI determination accuracy of stranded cetaceans dead due to collisions with vessels. In this way, it could approach a realistic temporal framework of the moment of the animal death, that could be a highly valuable tool, combined with oceanography sciences, to delimit high-risk collision areas which contribute to establish risk management plans to mitigate ship strikes. The work aimed to implement a bibliographic review to assess the current state of the art of PMI estimation techniques in veterinary sciences and the potential adaptations and reliable application to marine species, particularly, in cetacean carcasses. A systematic review of scientific databases was conducted, selecting 83 articles from 1958 to 2024. The methodologies analyzed included external and internal macroscopic changes, forensic entomology, biochemical fluid analysis, temperature measurement, microbial analysis, imaging techniques, protein biomarkers, and molecular methods. Studies on humans, terrestrial, and marine animals were reviewed, including experimental models with cetaceans and fish for PMI estimation. A total of 62 PMI indicators were highlighted and chronologically organized to emphasize those methods applicable to cetaceans, as traditional techniques for humans and terrestrial animals are limited in marine environments. Our review identified promising methods for cetaceans: macroscopic decomposition changes, temperature measurements, imaging techniques, muscle protein analysis, and molecular methods. Based on these findings, a sample collection protocol and an experimental design are proposed to progress on establishing improvements in the PMI estimation accuracy for stranded cetaceans. This review has been supported by the project Atlantic Whale Deal (INTERREG-Atlantic Area) funded by the European Commission.

HW-24. Gathering before the grounding: group formations in stranding-prone long-finned pilot whales

Zwamborn, Elizabeth M. J. ¹; Boys, Rebecca M. ²; Hawkes, Louisa ³; Mrusczok, Marie-Thérèse ⁴; Neave-Webb, Emma ⁵; Pirotta, Vanessa ⁶; Raudino, Holly C. ⁷; Stefánsson, Róbert A. ⁸; Sprogis, Kate R. ⁹; Stockin, Karen A. ¹⁰; Waples, Kelly A. ⁷; Wimmer, Tonya ¹¹

1. Trinity Western University, Department of Biology, Langley, British Columbia, Canada Dalhousie University, Department of Biology, Halifax, Nova Scotia, Canada
2. Cetacean Ecology Research Group, College of Sciences, Massey University, Private Bag 102-904, Auckland, New Zealand
3. Project Jonah, Nelson, New Zealand
4. West Iceland Nature Research Centre (Náttúrustofa Vesturlands), Stykkishólmur, Iceland Orca Guardians Iceland, Grundarfjörður, Iceland
5. Strandings Initiative, International Whaling Commission, Cambridge, UK
6. Marine Predator Research Group, School of Natural Sciences, Macquarie University, Sydney, Australia
7. Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions, Kensington, WA 6151 Australia
8. West Iceland Nature Research Centre (Náttúrustofa Vesturlands)
9. The UWA Oceans Institute and School of Biological Sciences, The University of Western Australia, Great Southern Marine Research Facility, Albany, WA, 6330, Australia
10. Cetacean Ecology Research Group, College of Sciences, Massey University, Private Bag 102-904, Auckland, New Zealand Animal Welfare Science and Bioethics Centre, School of Veterinary Science, College of Sciences, Massey University, Private Bag 11-222, Palmerston North, New Zealand
11. Marine Animal Response Society, Halifax, Nova Scotia

Long-finned pilot whales (*Globicephala melas*) are the most commonly mass stranded species of cetacean. Despite the investigation of a number of hypothesized stranding drivers (e.g., navigational error, disease, anthropogenic stressors), relatively little is known about the group-level changes that occur prior to these stranding events. Anecdotal accounts from stranding response organizations and the public occasionally refer to unusual clustering and other abnormal behaviours. Here, we provide the first quantitative description of how the group formations of stranding-prone long-finned pilot whales compare to their free-swimming conspecifics. To do this, eight different variables – quantitatively describing group formation aspects such as circularity, individual spacing and heading variation, were measured from time series taken from drone footage of stranding-prone long-finned pilot whales across four different events from 2018-2024 (two in Western Australia and two in Western Iceland). Extracted data from stranding-prone groups ($n = 40$) were then compared to measures of the same variables from free-swimming long-finned pilot whales ($n = 208$) using a principal components analysis and multivariate analysis of variance. We hypothesized that the formations of these stranding-prone groups would be visually and statistically different from those observed in free-swimming pilot whales, the latter typically displaying collinear spatial arrangements that are broadly



spread perpendicular to the direction of travel. This methodology presents a novel approach for comparing known group formations of free-swimming cetaceans with their stranding-prone conspecifics to determine whether these formations are characteristic and can be used as an indicator of stranding potential. This information is intended to assist responders in determining whether to intervene in order to mitigate the risk of stranding, particularly in countries and locations with the capacity for active responses to mass strandings.



HW-25. Pseudotuberculosis infection in free-ranging cetaceans

Davison, Nicholas ¹; Raverty, Stephen ²; Broens, Els ³; Brownlow, Andrew ¹; Dagleish, Mark ⁴; Grone, Andrea ⁵; van Schalkwijk, Linde ⁵; IJsseldijk, Lonneke ⁵

1. Scottish Marine Animal Stranding Scheme, University of Glasgow, UK
2. Ministry of Agriculture, Food and Fisheries, Abbotsford, British Columbia, Canada
3. Veterinary Microbiological Diagnostic Center, Department of Biomolecular Health Sciences, Faculty of Veterinary Medicine, Utrecht University, Netherlands
4. Division of Veterinary Pathology, Public Health and Disease Investigation and Veterinary Anatomic Pathology, University of Glasgow, UK
5. Division of Pathology, Department of Biomolecular Health Sciences, Faculty of Veterinary Medicine, Utrecht University, Netherlands

Yersinia pseudotuberculosis is a recognised zoonosis that has been recovered from a variety of companion, production, laboratory, wildlife, and avian species. The prevalence of this bacterium varies geographically but is generally considered widespread within the terrestrial environment with human exposure principally by ingestion of contaminated food or water. Pseudotuberculosis, due to *Y. pseudotuberculosis*, is a common cause of mortality in captive exotic birds and the OIE WAHIS-Wild Interface ranks it as the 8th most frequently reported diseases/infections for worldwide wildlife. This report increases the number of recognized species susceptible to pseudotuberculosis and expands the environmental distribution of this bacterium into the marine habitat with four *Y. pseudotuberculosis* culture positive cases in three cetacean species; three from the North Sea (a single bottlenose dolphin and two harbour porpoise) one from the northeastern Pacific Ocean (a hybrid Dall's x harbour porpoise). Gross pathology included atelectasis, multifocal petechiae and coalescing ecchymoses in the lung, mediastinum, pericardium, brainstem and meninges and, more typical of pseudotuberculosis, yellow or white miliary foci in the liver. Sepsis was present in three cases. This case series is the first to report pseudotuberculosis in obligate marine mammals. At present, there is insufficient information on the natural history of *Y. pseudotuberculosis* infections in marine mammals to determine if the infection originated from a terrestrial source or if it can persist and cycle exclusively in the marine environment.



HW-26. Cadmium, lead, and total arsenic levels in dolphin species stranded over the last fifteen years along the coastline of the Region of Murcia (Southeast Spain)

Baños-Doménech, Laura ¹

1. Area of Toxicology, Department of Health Sciences, Oceanosfera Group, Faculty of Veterinary, University of Murcia, Campus of Espinardo, 30100, Murcia, Spain.

The coastal area of the Region of Murcia, in the eastern Gulf of Vera, blends Atlantic and Mediterranean influences, fostering high marine biodiversity, including cetaceans. However, the region has faced severe environmental crises due to toxic heavy metal discharges. Therefore, our main objective was to evaluate concentrations of cadmium (Cd), lead (Pb) and arsenic (As), in the internal tissues (liver, kidney and muscle) of 176 cetaceans, stranded along Murcia's coastline between 2009 and 2023. The sample included 148 striped dolphins (*Stenella coeruleoalba*), 23 bottlenose dolphins (*Tursiops truncatus*), and 5 common dolphins (*Delphinus delphis*). Furthermore, we studied several stress biomarkers and biochemical parameters, including glutathione-S-transferase (GST), catalase (CAT), thiobarbituric acid reactive substances (TBARS), alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), lactate dehydrogenase (LDH), paraoxonase 1 (PON1) and acetylcholinesterase (AChE), to assess tissular and metabolic responses to these pollutants. All metals were detected in all cetacean individuals. The tissue that most frequently presented concentrations of these contaminants was the muscle (52.27%), followed by the liver (46.06%) and kidney (41.91%). The peak concentrations, which were Cd in the kidney (2.39 ± 2.08 mg/kg), As in the liver (0.99 ± 1.20 mg/kg) and Pb in the muscle (0.058 ± 0.420), exceeded levels reported in the Mediterranean Sea but remained below those considered responsible for toxic effects. Cadmium concentrations in liver and kidney showed statistically significant differences by species and age ($H=13.064$, $p=0.001$ and $H=27.56$, $p=0.001$ for liver; $H=13.90$, $p<0.001$ and $H=19.226$, $p<0.001$ for kidney), being higher in bottlenose dolphins and adults. Arsenic had the most significant enzymatic impact on hepatic, renal, and muscular profiles, correlating positively with TBARS, GST, ALT, ALP, LDH, PON and AChE. This study holds significant importance as it provides useful data for developing conservation strategies in the Mediterranean Sea and informs future research efforts.



HW-27. Investigating the significance of *Erysipelothrix rhusiopathiae* in free-ranging harbour porpoises (*Phocoena phocoena*)

Neimanis, Aleksija ^{1,2}; Thorsson, Elina ¹; Roos, Anna ³; Naalisvaara Engman, Moa ¹; Averhed, Gustav ¹; van de Velde, Norbert ¹; Wattrang, Eva ⁴; Eriksson, Helena ⁵; Söderlund, Robert ⁴

1. Department of Pathology and Wildlife Diseases, Swedish Veterinary Agency, Uppsala, Sweden
2. Department of Animal Biosciences, Swedish University of Agricultural Sciences, Uppsala, Sweden
3. Department of Environmental Monitoring and Research, Swedish Museum of Natural History, Stockholm, Sweden
4. Department of Microbiology, Swedish Veterinary Agency, Uppsala, Sweden
5. Department of Animal Health and Antimicrobial Strategies, Swedish Veterinary Agency, Uppsala, Sweden

The zoonotic bacterium *Erysipelothrix rhusiopathiae* may act as a commensal bacterium or a pathogen. Although it has been associated with disease in cetaceans, our understanding of *E. rhusiopathiae* in marine mammals is limited. The aim of this study was to investigate the occurrence and significance of *E. rhusiopathiae* in harbour porpoises (*Phocoena phocoena*) in Sweden. We used data from porpoises examined by necropsy from 2006-2024 (n=325). Prior to 2020, bacterial culture only was performed if infection was suspected, whereas from 2020, lungs were routinely cultured for bacteria (n = 152). Following a cluster of *E. rhusiopathiae* cases in 2021-2022, targeted culture of tonsils for *E. rhusiopathiae* was also performed routinely (n = 89). To better understand the cluster of cases, bacterial isolates from 2019-2022 (n=7) were characterized by whole genome sequencing. *E. rhusiopathiae* was cultured from 13 animals (lung=6; tonsil=7) collected from 2019-2024. In five of the six porpoises with lung infections, *E. rhusiopathiae* was associated with disease and death (pneumonia or sepsis). The sixth animal was bycaught but also had pneumonia. A cluster of four of these cases occurred in winter 2021-2022. Since then, *E. rhusiopathiae* has only been found in tonsils and was unrelated to the cause of death, suggesting subclinical carriage. Genotyping revealed that the isolates from 2021-2022, including an additional isolate from the tonsil of an otherwise healthy animal, were nearly identical and clustered in clade 3, supporting a common origin. It is unclear if this strain is more pathogenic for porpoises or if host health was otherwise comprised allowing for opportunistic infection. Isolates from 2019 and 2020 differed significantly. Like other species, presence of *E. rhusiopathiae* in porpoises has varying outcomes and likely depends on a combination of bacterial strain and host status. Continued investigation including genotyping and comparison of more recent isolates is warranted.



HW-28. PCBs, ever-present old friends, are also present in cetaceans from Galician waters (NW Iberian Peninsula)

Gutiérrez-Muñoz, Paula ¹; Pérez-Fernández, Begoña ¹; Saavedra, Camilo ¹; Covelo, Pablo ²; Méndez-Fernández, Paula ³; López, Alfredo ²; Viñas, Lucía ¹; Pierce, Graham J. ⁴

1. Instituto Español de Oceanografía (IEO-CSIC)
2. Coordenadora para o Estudo dos Mamíferos Mariños (CEMMA)
3. Observatoire Pelagis (La Rochelle Université)
4. Instituto de Investigaciones Marinas (IIM-CSIC)

While organic pollutants, such as polychlorinated biphenyls (PCBs), are increasingly regulated in their production and use, they still remain a significant threat to marine life. Due to their high position in the food chain, odontocete cetaceans can be greatly affected by even low levels of pollutants in the environment, as most of them biomagnify up the food chain. In this study, concentrations of PCBs were analysed in the blubber of the three most frequent odontocete cetacean species in NW Spain (NE Atlantic): common dolphin (*Delphinus delphis*) (n = 42), bottlenose dolphin (*Tursiops truncatus*) (n = 17) and harbour porpoise (*Phocoena phocoena*) (n = 19). Samples were collected from stranded individuals between 2009 and 2023. Individual concentrations ranged from 0.32 to 160.74 µg/g lipid weight (l.w., Σ14PCBs), with the highest levels observed, by far, in bottlenose dolphins (its median concentration is three times higher than that of other species). Our results, along with those of previous studies, indicate that most of the species exhibit a declining trend in PCB levels, except for the harbour porpoise. Many of the values observed also exceed one of the most common and agreed threshold value used for these species (17 µg/g l.w.), with 51.28% of the individuals analysed surpassing this limit. This suggests that a high percentage of the individuals analysed may be at risk from PCBs despite an apparent global decrease in environmental levels. PCBs, along with other anthropogenic stressors, may negatively impact cetacean populations. Therefore, monitoring PCB levels in cetaceans is crucial for assessing their health status at both individual and population levels.



HW-29. Hydrophobic pollutants in the deep sea: a case study on Sowerby's beaked whales

Yuan, Bo ^{1,2}; de Wit, Cynthia ¹; Neimanis, Aleksija ^{3,4}; Roos, Anna Maria ⁵

1. *Department of Environmental Science (ACES), Stockholm University, SE-106 92 Stockholm, Sweden,*
2. *Department of Chemistry, Norwegian University of Science and Technology, NO-7491 Trondheim, Norway*
3. *Department of Pathology and Wildlife Diseases, Swedish Veterinary Agency, Uppsala, Sweden.*
4. *Department of Animal Biosciences, Swedish University of Agricultural Sciences, Uppsala, Sweden.*
5. *Department of Environmental Monitoring and Research, Swedish Museum of Natural History, Box 50007, 10405 Stockholm, Sweden*

The objective of this study was to evaluate concentrations and distribution of several organochlorine contaminants in an elusive deep-water living cetacean, the Sowerby's beaked whale (*Mesoplodon bidens*). Five subadult whales stranded along the coast of Sweden between 2015 and 2019. Three were transported to the Swedish Veterinary Agency in Uppsala for full necropsy. One was sampled by zoologists in the field, and one was necropsied in the field by a pathologist and biologists. Legacy and emerging hydrophobic pollutants, including organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), hexabromocyclododecane (HBCD), and polychlorinated alkanes (PCAs, also known as chlorinated paraffins) were analyzed in blubber, muscle, liver, lung, spleen, whole blood, brain and testicle samples. Blubber concentrations of OCPs and PCBs were approximately one to two orders of magnitude higher than those of PBDEs and PCAs, with HBCD exhibiting the lowest median and mean values. Across all other tissues, PBDE concentrations were nearly one order of magnitude lower than PCAs. Very surprisingly, PCA concentrations in blood (median 2170 ng/g l.w.) were exceptionally high, compared to DDE (976 ng/g) and PCBs (860 ng/g). PCA levels in blubber (52.6 ng/g) were only 1/40 of those in blood, ranking them among the lowest pollutants in blubber, whereas in other tissues, PCAs were consistently among the highest, such as in brain tissue and blood. These findings not only reflect the environmental presence of PCAs as one of the most widely used industrial chemicals globally but also suggests that potential contaminant-mediated effects may be tissue- or blood-specific. Traditional biomonitoring approaches often focus on blubber as the target tissue for hydrophobic pollutants, including PCAs. However, this approach may substantially underestimate PCA accumulation within ecosystems, highlighting the critical need for broader, tissue-specific analyses to more accurately assess the environmental and ecological impacts of emerging pollutants.



HW-30. *Mycoplasma* sp. survey in cetaceans of northern Spain: preliminary results

Pereira Méndez, Alba ¹; Ewbank, Ana Carolina ²; Sacristán Yagüe, Carlos ²; Fayos, Manena ^{3,4}; Wipf-Martínez, Adrián ³; Grande Gómez, Rebeca ³; Varas Cobo, Manuel Jesús ³; de la Torre, Ana ²

1. Universidad Autónoma de Madrid (UAM)
2. Centro de Investigación en Sanidad Animal (CISA-INIA), CSIC, Valdeolmos, Madrid, 28130, Spain
3. Centro de Recuperación de Fauna Silvestre de Cantabria, Obregón, Cantabria, 39690, Spain
4. Universidad Nacional de Educación a Distancia (UNED), Escuela Internacional de Doctorado, Madrid, Madrid, 28015, Spain.

Cetaceans are essential for maintaining the balance of marine ecosystems and biological indicators of ecological changes. Emerging pathogens are among the most important threats for cetacean conservation. *Mycoplasma* sp. are wall-less bacteria, classified as hemotropic (hemoplasmas) and non-hemotropic, able to cause disease or even death in immunosuppressed individuals. In cetaceans, hemoplasmas were recently described in several species of the Americas, including Brazil (Amazon basin and Brazilian marine coast) and Mexico. Nevertheless, their presence in cetaceans of Europe has not yet been documented. The goal of this study is to assess the presence of hemoplasmas in stranded cetaceans along the coast of Cantabria, northern Spain. The initial hypothesis is that, given the description of *Mycoplasma* sp. in cetaceans from other geographical regions, cetaceans from northern Spain would also present this bacterium. In this study, we analyzed spleen samples from 20 cetaceans of the following species: striped dolphin (*Stenella coeruleoalba*, n=6), harbor porpoise (*Phocoena phocoena*, n=4), long-finned pilot whale (*Globicephala melas*, n=1), short-beaked common dolphin (*Delphinus delphis*, n=5) pygmy sperm whale (*Kogia breviceps*, n=3), and Cuvier's beaked whale (*Ziphius cavirostris*, n=1) stranded along the Cantabrian coast during 2023, and necropsied by the Cantabria Stranding Network (REVARCA). Following DNA extraction, the presence of *Mycoplasma* spp. was tested using real-time PCR. All of the spleen samples were hemoplasma-negative. Of note, hemoplasma was previously detected in some of the species analyzed in our study (striped dolphin, short-beaked common dolphin, and pygmy sperm whale), in a survey performed in Brazil, where prevalences ranging from 14.8% (18/130) and 64.0% (32/50) were found in marine and riverine cetaceans, respectively. Our next steps will be the evaluation of a higher number of animals and of organs per individual to determine if *Mycoplasma* spp. infects cetaceans present in European waters, and if so, the eco-epidemiological characteristics of this bacterial infection.



HW-31. A review of studies on the occurrence of pathogens in captive and wild killer whales

Mrowiec, Aleksandra ¹; Świechowska, Emilia ¹; Rakus, Krzysztof ²

1. *Student Naturalists' Club of Jagiellonian University, Faculty of Biology, Jagiellonian University, Krakow, Poland*
2. *Department of Evolutionary Immunology, Institute of Zoology and Biomedical Research, Faculty of Biology, Jagiellonian University, Krakow, Poland*

An increased combination of diverse abiotic (e.g. climate changes and pollution) and biotic stressors may lead to an increase in disease susceptibility, risk of potential pathogen spread, and finally disease development in sea organisms. This study aimed to analyze research on the occurrence of pathogens such as viruses, bacteria, fungi, and parasites in killer whales (*Orcinus orca*) and to identify differences in their prevalence between individuals living in captivity and in the wild. The literature from 1979 to 2024 has been thoroughly reviewed, presenting case studies of diseases and distinguishing specific pathogens in killer whales. The analysis included studies that unequivocally confirmed the presence of pathogens at least at the genus level. Evidence for pathogen presence included the detection of specific antibodies against studied pathogens, pathogen isolation, PCR results, or identification based on clinical symptoms. A total of 27 studies describing 43 individuals (including 18 individuals kept in captivity) were included. In most cases, a single pathogen was detected per individual killer whale. In total, 6 different viruses, 17 types of bacteria, 6 types of fungi, and 1 parasite species were identified. All fungi, and parasites were observed in individuals living in captivity, whereas bacteria and viruses were detected in individuals living in captivity and in the wild. Three cases of bacterial diseases and one with the virus were diagnosed postmortem among wild individuals. Analysis shows that captive killer whales are exposed to a greater diversity and number of pathogens, particularly those also found in humans, compared to wild individuals. These findings highlight that killer whales living in captivity are at a higher risk of being exposed to a wide range of pathogens that can seriously affect their welfare. The study also underscores the need for more effective strategies for monitoring, preventing, and treating diseases in captivity.



HW-32. Ecto- and endoparasites of a Pygmy sperm whale (*Kogia breviceps*) stranded in the Southern Bay of Biscay

Galindez, Itziar ¹; Álvarez, Luis Miguel ²; Balsera, Ramón ²; García-Álvarez, Natalia ³; García, Bella ⁴; Expósito, Ginés ⁴; Borrell, Yaisel ⁵; Miralles, Laura ⁵

1. Department of Functional Biology. Genetics Area. University of Oviedo. Oviedo. Spain. 2. TRAGSATEC. Grupo Tragsa-SEPI. Proyectos AGSA-MAPI Asturias. Oviedo. Spain.
2. Consejería de Medio Rural y Política Agraria. Principado de Asturias. Oviedo. Spain.
3. Department of Animal Health. University of León. León Spain.
4. TRAGSATEC. Grupo Tragsa-SEPI. Proyectos AGSA-MAPI Asturias. Oviedo. Spain.
5. Department of Functional Biology. Genetics Area. University of Oviedo. Oviedo. Spain.

Parasites play an important role in regulating wild populations and are key in the biodiversity of marine ecosystems. However, little is known about parasitism in the pygmy sperm whale *Kogia breviceps* (de Blainville, 1838). Studying the parasites of marine mammals such as pygmy sperm whales provide biological and ecological information on its hosts and can contribute to understanding the causes of stranding and mortality, supporting the conservation of these protected species. Here, the occurrence of ecto- and endoparasites in a male pygmy sperm whale that stranded alive and died afterwards in San Lorenzo Beach, Asturias (Spain) in November 2024, is reported. The aim of this study was to investigate the parasites' species diversity. Species were assigned based on morphology and were genetically identified by sequencing analysis of the mtDNA cox2 gene and the rDNA ITS region. Four individuals of the parasitic copepod, *Pennella* spp were reported on the body surface. Only one individual could be recovered during the necropsy for genetics analysis resulting as a *Pennella balaenopterae* (Linnaeus, 1758). Moreover, multiple nematods mainly of the genus *Anisakis* and *Crassicauda* were found in the abdominal cavity, reporting several species. To our knowledge, the findings of this study represent the first observation of *Pennella* as parasite of a pygmy sperm whale in Europe and the third worldwide. The present study revealed valuable information to understand the parasitic incidence in *Kogia breviceps* that has been understudied to date.



HW-33. Cetacean health through the lens of breath: optimizing methods for studying the respiratory microbiome

Valente, Raul ¹; Suárez-Bregua, Paula ²; Costas-Imbernón, Daniel ³; Saura, María ³; Afonso, Luís ⁴; Saavedra, Camilo ²; Rodriguez, Rebeca ³; Correia, Ana Mafalda ¹; Rotllant, Josep ³; Pierce, Graham ³; Magalhães, Catarina ⁵

1. CIIMAR/CIMAR LA – Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal
2. Instituto Español de Oceanografía - Consejo Superior de Investigaciones Científicas (IEO-CSIC), Centro Oceanográfico de Vigo, Vigo, Spain
3. Instituto de Investigaciones Mariñas - Consejo Superior de Investigaciones Científicas (IIM-CSIC), 36208 Vigo, Spain
4. CIIMAR/CIMAR LA – Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal ICBAS - School of Medicine and Biomedical Sciences, University of Porto, Porto, Portugal
5. CIIMAR/CIMAR LA – Interdisciplinary Centre of Marine and Environmental Research, University of Porto, 4450-208, Matosinhos, Portugal FCUP - Faculty of Sciences, Biology Department, University of Porto, Porto, Portugal

As anthropogenic pressures increasingly threaten cetacean species, developing novel methodologies to assess their health status is vital. Among non-invasive approaches, the use of exhaled breath condensate (EBC) to evaluate the health of individual cetaceans has gained significant traction in recent years. The primary aim of using this biological matrix is to provide an accurate assessment of a cetacean's health by analysing the diversity and abundance of the respiratory tract microbiome, including potential pathogens. In this study, we aimed to optimize sampling, DNA isolation, and sequencing methodologies to ensure the successful application of high-throughput sequencing for microbiome analyses of EBC from free-ranging cetaceans. To evaluate various methods for collection, extraction, and analysis, we conducted an experiment using 12 EBC samples collected from a captive bottlenose dolphin (*Tursiops truncatus*), distributed into randomized subgroups. These subgroups were used to compare two sampling methods (six samples with Petri dishes vs. six samples with swabs). Samples were subsequently analysed using two DNA extraction kits (PowerSoil DNA Isolation Kit vs. MasterPure Complete DNA Purification Kit) and sequenced using two sequencing technologies (Illumina vs. PacBio). Our results revealed higher DNA concentrations in samples collected with Petri dishes (ranging from 4.61 to 34.2 ng/μl) compared to swabs (0.06 to 7.17 ng/μl), regardless of the extraction method. To mitigate potential sampling location bias, we recommend using a combination of both methods in the wild. Both extraction kits yielded significant amounts of DNA, with the



MasterPure kit demonstrating better DNA recovery, achieving a highest DNA concentration of 34.2 ng/ μ l compared to 7.46 ng/ μ l with the PowerSoil kit. Additionally, a comparison of sequencing platforms showed that PacBio seem to consistently offer greater taxonomic resolution. In conclusion, this study establishes a foundation for implementing non-invasive methods as effective tools for assessing the health of these threatened species.



HW-34. Parasite burden in dolphins: insights into *Anisakis* prevalence and egg output in the marine environment – a study from Galicia

Ivaylova, Silvina ¹; Hernandez-Gonzalez, Alberto ¹; Pierce, Graham ¹; Macário, Joana ^{1,2}; López, Alfredo ³; Covelo, Pablo ⁴; Pin, Xabier ⁴; González, Mónica ^{4,5}; Vázquez, Uxía ⁴; Rueda, Elisa ^{1,5}; González, Ángel ¹; Pascual, Santiago ¹

1. Instituto de Investigaciones Marinas (IIM-CSIC)
2. Universidad de Oporto
3. Universidade de Aveiro and Coordinadora para o Estudo dos Mamíferos Mariños (CEMMA)
4. Coordinadora para o Estudo dos Mamíferos Mariños (CEMMA)
5. Universidade de Vigo

Nematodes of the genus *Anisakis* pose a significant hazard to human health and also impact marine ecosystems through their complex life cycle, which involves the transfer of eggs and larvae via the marine food web. This study, based on samples provided by the Galician stranding network (CEMMA), examined the digestive tract of twenty six common dolphins (*Delphinus delphis*) and four bottlenose dolphins (*Tursiops truncatus*) in 2024 to collect data on the abundance of larval, adult *Anisakis* numbers, and the concentration of *Anisakis* eggs along the intestinal tract, including in the final segment, which represents fecal output into the marine environment. Our findings revealed a high prevalence of *Anisakis*, with 86.7% of dolphins infested (24/26 common dolphins and 2/4 bottlenose dolphins). Most parasites were larvae, with an average of 1,553 larvae and 244 adults per stomach. There was a weak positive correlation between common dolphins length and number of *Anisakis* found in the digestive tract (Pearson's linear correlation: $r = 0.52$), which may be due to the limited sample size ($n = 26$). Adult nematodes were predominantly female, with a female-to-male ratio of 1.8:1. Egg concentration, per gram, increased progressively along the intestinal tract towards the colon, peaking in the final portion ($p = 0.0048$). Based on the egg concentration and the likely rate of throughput of faeces, we estimated that a single common dolphin can release up to 40,453,662 eggs per day into the marine environment. Considering the high fecal output of *Anisakis* eggs observed in this study, and the potential for these eggs to survive a few months in marine environments, our results underscore the critical need for further research into the ecological impacts of this parasite on marine biodiversity and its implications for human health.



HW-35. Apparent association between poor nutritional status and higher muscle-to-blubber ratios of polychlorinated biphenyls in harbour porpoises (*Phocoena phocoena*)

Vecchiato, Marco ¹; Deaville, Robert ¹; Perkins, Matthew ¹; L. Barber, Jonathan ²; Barnett, James ³; D. Jepson, Paul ⁴; Williams, Rosie ¹

1. Cetacean Strandings Investigation Programme, Institute of Zoology, ZSL, Regent's Park, London NW1 4RY, United Kingdom
2. Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Pakefield Road, Lowestoft NR33 0HT, United Kingdom
3. Cornwall Marine Pathology Team, Fishers Well, Higher Brill, Cornwall, TR11, United Kingdom
4. Adelaide Road, Chalk Farm, London, NW3, United Kingdom

Polychlorinated biphenyls (PCBs) are toxic chemical compounds that bioaccumulate and persist in marine species, including in top predators of the marine ecosystem, such as harbour porpoises (*Phocoena phocoena*). In United Kingdom waters, this coastal species is widely present, and the collaborative Cetacean Stranding Investigation Programme (CSIP) has been investigating stranded individuals along the coasts of England and Wales since 1990. Blubber is commonly used as the target tissue to monitor PCB levels, as they accumulate in adipose tissue due to their lipophilic properties; however, there is limited data regarding the distribution of CB congeners in other tissues and whether distribution varies according to nutritional condition. We performed statistical analyses of the concentrations of 25 CB congeners in muscle and blubber tissues in a subset of male harbour porpoises (30/59) that stranded between 2010 and 2017 during colder winter months (October to March). Individuals' nutritional status was assessed using their relative body weight as a proxy, based on a body weight vs length regression model derived from data held in the CSIP dataset on 1028 male harbour porpoises examined between 1990 and 2019. Preliminary results investigating muscle-to-blubber ratios of CB congeners grouped by degree of chlorination and their Structural Activity Group show an increase in the relative concentration of CB congeners in the muscle tissues of nutritionally compromised animals. These results suggest that when animals undergo inanition and consequent mobilisation of lipids, PCBs previously sequestered within the blubber layer are released and redistributed to other tissues, potentially increasing the risk of toxic effects. This study highlights the potential issue of PCB-mediated impacts in animals that undergo periods of inanition. It also highlights synergistic effects in species that are sensitive to anthropogenic disturbances including climate change or marine noise, which may cause movement to less favourable habitats and potentially increase lipid mobilisation.



HW-36. Incidence of ulcerative lesions caused by *Anisakis* spp. in cetaceans from the Northeast Atlantic: a long-term update

Pons-Bordas, Claudia ¹; Hernández-González, Alberto ²; Ivaylova, Silvina ²; López, Alfredo ³; Covelo, Pablo ³; Pierce, Graham John ²; Aznar, Francisco Javier ¹

1. Marine Zoology Unit, Science Park, University of Valencia, Valencia, Spain
2. Instituto de Investigaciones Marinas (CSIC), Vigo, Spain
3. CEMMA (Coordinadora para o Estudo dos Mamíferos Mariños), Gondomar, Spain

Ulcerative lesions caused by nematodes of genus *Anisakis* spp. are known to provoke mild to severe damage in the stomach wall, mainly on the forestomach, of cetaceans worldwide. In severe infections, profuse hemorrhages or gastric perforations can lead to life-threatening complications, with perforations potentially causing peritonitis; either condition may result in death. In a previous study, we reported a significant increase in the prevalence and severity of lesions in most cetacean species along the Galician coastline (Iberian Atlantic coast) between the periods 1991-1996 and 2017-2018. Here, we compare those samples with data from 6 cetacean species in the period 2019-2024, including common dolphin, *Delphinus delphis* (n hosts: 109; prevalence of lesions: 68.8%), striped dolphin, *Stenella coeruleoalba* (9; 77.8%), common bottlenose dolphin, *Tursiops truncatus* (11; 45.5%), harbor porpoise, *Phocoena phocoena* (10; 30%), Risso's dolphin, *Grampus griseus* (4; 75.0%), and white-sided dolphin, *Lagenorhynchus acutus* (1; 0%). In common dolphins, the prevalence per year, considering both active and healing lesions was 77.8% (2019); 66.7% (2020); 64.7% (2021); 93.8% (2022); 87.5% (2023); 96.4% (2024). The mean abundance (95% CI) of open ulcers per host was 2.0 (1.6-2.5) and their maximum diameter (SD) 63.1 (48.8) mm. We did not find significant differences among years in the infection patterns or lesion diameter. The prevalence of open ulcers in 2019-24 was similar to that observed in 2017-18, suggesting that the recent increase in their incidence is temporarily stable. However, the mean number of open ulcers per host was higher in 2019-24 (2.0 vs. 1.1). Interestingly, we also noticed, in 2023 and 2024, an apparent increase of ulcerative lesions in the glandular stomach coupled with severe ulceration in the forestomach; these ulcers were found on the nodules caused by the digenean *Pholeter gastrophilus*. We interpret that, in these cases, *Anisakis* spp. opportunistically colonized a previously damaged tissue.



HW-37. Trophic transfer of paralytic shellfish toxins to marine mammals in Golfo Nuevo, Península Valdés, Argentina

Arregui, Marina ^{1,2}; D'Agostino, Valeria ³; Degradi, Mariana ³; Nocera, Ariadna C. ³; Krock, Bernd ¹

1. Alfred Wegener Institut-Helmholtz Zentrum für Polar-und Meeresforschung, Chemische Ökologie, Germany
2. Instituto Universitario de Sanidad Animal y Seguridad Alimentaria (IUSA), Universidad de Las Palmas de Gran Canaria, Spain
3. Centro para el Estudio de Sistemas Marinos (CESIMAR - CONICET), Argentina.

Phycotoxins are transferred and accumulated through the marine food web, causing intoxication of consumers at higher trophic levels and potentially compromising their reproductive success and survival. In this study, we analyze the trophic transfer of paralytic shellfish toxins (PSTs) to top predators during a marine fauna mortality event that occurred between September and November 2022 in Golfo Nuevo, Península Valdés, Argentina, associated with these phycotoxins. To investigate this, samples from different groups were collected, including phytoplankton, zooplankton, clams (*Aulacomya atra*), anchovies (*Engraulis anchoita*), five adult female sea lions (*Otaria flavescens*) that were stranded dead (three of which were pregnant), and three fecal samples from live southern right whales (*Eubalaena australis*). Samples of various tissues and fluids were taken from the adult sea lions and fetuses. PSTs were detected in the plankton samples, with levels in the phytoplankton reaching 0.63 ng STX/L of filtered seawater and 305.6 ng STX/g of sample in the zooplankton. Additionally, these phycotoxins were detected in the clam (469.3 ng STX/g dry weight) and anchovy (203.5 ng STX/g dry weight) samples. In sea lions, positive samples for PST included feces, lung, kidney, liver, muscle, amniotic fluid, umbilical cord, and placenta. The highest values were detected in the fecal samples of a pregnant female (5112 ng STX/g dry weight). Furthermore, PSTs were detected in the amniotic fluid, umbilical cord, and placenta of pregnant females, reaching levels of 249.3 ng STX/g dry weight in the amniotic fluid. All whale fecal samples tested positive for PST, reaching 4251.8 ng STX/g dry weight. This study demonstrates the transfer of PST to top predators feeding in Golfo Nuevo. Moreover, the detection of PST in samples from fetuses suggests the transfer of toxins from mothers to their offspring.



HW-38. Causes of death and pathological findings in stranded grey seals (*Halichoerus grypus*), harbour seals (*Phoca vitulina*) and a ringed seal (*Pusa hispida*) from Swedish waters 2020-2024

Naalisvaara Engman, Moa ¹; Thorsson, Elina ¹; van de Velde, Norbert ¹; Averhed, Gustav ¹; Tibell, Julia ¹; Larsson Pettersson, Ulrika ¹; Neimanis, Aleksija ¹

1. Department of Pathology and Wildlife Diseases, Swedish Veterinary Agency, Uppsala, Sweden.

In 2020, an expanded national health and disease surveillance program for marine mammals was launched in Sweden. Jointly delivered by the Swedish Veterinary Agency (SVA) and the Swedish Museum of Natural History (SMNH), funded by the Swedish Agency for Marine and Water Management (SwAM) as a part of Sweden's environmental monitoring. This program provides knowledge on health, diseases, causes of death and threats to seals and cetaceans to inform management and protection of these populations. While results from stranded cetaceans previously have been published, results from stranded seals have not. Here we summarize results from stranded seals examined at SVA. Seal carcasses are collected from the field for complete necropsy examination. A comprehensive suite of data and tissues are collected, archived and available for ongoing and future research. Additionally, targeted surveillance for Influenza A virus, morbilliviruses and bacterial culture of lung is performed routinely. Organ samples from hunted and bycaught seals are received from SMNH for analyses of Influenza A virus. Between 2020-2024, 104 seals have been examined: Grey seals (*Halichoerus grypus*) (n=52), harbour seals (*Phoca vitulina*) (n=51), and one ringed seal (*Pusa hispida*). The most common causes of death were infectious diseases and various types of traumas (blunt trauma, predation and gunshot wound). Young seals were often emaciated with a high number of parasites. Death from liver failure or ruptured gall bladder caused by the trematode *Pseudamphistomum truncatum* was observed in all species. Active Influenza A infection (H5N8) was found in one grey seal in 2021, and undetermined cause of death. This surveillance program is continuous, enabling identification of trends that may indicate changes in the health of seals and the ecosystems they live in.



HW-39. How does your seal smell? Is it relevant to bird flu?

Leeming, Gail ¹; Collison, Riley ¹; Barnett, James ²

1. *School of Veterinary Science, University of Liverpool, Leahurst Campus CH64 7TE UK*

2. *Cornwall Marine Pathology Team, Fishers Well, Higher Brill, Constantine, Falmouth, Cornwall TR11 5QG*

The nasal cavity in mammals contains several types of epithelia including squamous, respiratory and olfactory epithelium, varying with location and in function. In some domestic species the distribution is very well described, but this is not the case in seals. Overall, the olfactory bulb of the brain and the size and number of nasal turbinates is reduced in pinnipeds compared to wholly terrestrial carnivores, but evidence of an acute sense of smell has been demonstrated. As well as providing the sense of smell, the olfactory nerves provide a route of direct entry to the brain for pathogens, most notably viruses, including Avian Influenza Virus (IAV). Although this route of infection has not been demonstrated in pinnipeds, it has in people and in ferrets, in which intra-nasal H5N1 inoculation can lead to infection of the olfactory epithelium and subsequently the brain, but not ciliated (i.e. nasal respiratory) epithelium. The aim of this study was to describe the distribution of olfactory epithelium in a grey seal pup, using computed tomography, gross imaging and histology. The olfactory epithelium was confined to a relatively small proportion of the nasal mucosa, in the most caudal turbinates. It was not possible to access this epithelium with a nasal swab in this animal, and we suggest that the turbinate anatomy would also preclude access in an adult. The nasal anatomy of other species of pinnipeds also requires investigation. Therefore, until the pathogenesis of IAV in pinnipeds is better understood, it should be considered that nasal swabs taken for screening for IAV infection in seals may provide false negative results.



HW-40. Metagenomic analysis of the Caspian Seals (*Pusa caspica*) virome

Kydyrmanov, Aidyn ¹; Kumar, Marat ¹; Karamendin, Kobey ¹; Kasymbekov, Yermukhammet ¹; Sabyrzhan, Temirlan ¹; Nuralibekov, Sardor ¹; Goodman, Simon ²

1. Laboratory for Ecology of Viruses, Research and Production Center for Microbiology and Virology, Almaty, Kazakhstan
2. School of Biology, Faculty of Biological Sciences, University of Leeds, Leeds, United Kingdom

Viral diseases of pinnipeds cause substantial mortality and morbidity and can influence population demography. Therefore, viral metagenomic studies can play an important role in pinniped health assessments and disease surveillance relevant to both individual species and in a “One Health” context. This study used a metagenomic approach with high throughput sequencing to make the first assessment of viral diversity in Caspian seals (*Pusa caspica*), the only marine mammal species endemic to the Caspian Sea. Sequencing libraries from 35 individuals of the Caspian seals sampled 2009–2020 were analysed, finding sequences from the viral families Circoviridae, Parvoviridae, Herpesviridae, Papillomaviridae, Picornaviridae, Caliciviridae, Cruciviridae, Anelloviridae, Smacoviridae, and Orthomyxoviridae, with additional detection of Adenoviridae via PCR. Of the 10 viral families found in metagenomic sequencing, confirmatory PCR amplicons were recovered only for viruses from Herpesviridae and Orthomyxoviridae. The similarity of viral contigs from the Caspian seal to sequences recovered from other pinnipeds ranged from 63.74% (San Miguel sea lion calicivirus) to 78.79% (Seal anellovirus 4). Some findings represent novel viral species, but overall, the viral repertoire of Caspian seals is similar to available viromes from other pinnipeds. Among the sequences recovered were partial contigs for influenza B, representing only the second such molecular identification in marine mammals. Previously, we reported molecular and serological evidence for ongoing circulation of Canine morbillivirus (CDV), a member of the family Paramyxoviridae, in Caspian seals. No CDV contigs were detected for metagenomic sequencing of samples collected 2009–2020. Analysis of the age-specific virus patterns revealed a notable disparity in the prevalence of circovirus and parvovirus contigs, with juveniles exhibiting a higher abundance compared to adults. This work provides a foundation for further studies of viral communities in Caspian seals, the diversity of viromes in pinnipeds more generally, and contributes data relevant for disease risk assessments in marine mammals.



HW-41. Spatiotemporal differences in body condition of harbour porpoises: baseline insights across the North Sea

Schotanus, Eva T. ¹; Ten Doeschate, Mariel ²; Authier, Matthieu ³; Brownlow, Andrew ²; Dabin, Willy ³; Deaville, Rob ⁴; Gröne, Andrea ¹; Haelters, Jan ⁵; Heesterbeek, Hans ¹; Jauniaux, Thierry ⁶; Lennon, Rachel ²; Peltier, Hélène ³; Bie Thøstesen, Charlotte ⁷; IJsseldijk, Lonneke ¹

1. *Utrecht University*
2. *University of Glasgow*
3. *Observatoire Pelagis*
4. *Institute of Zoology*
5. *Institute of Natural Sciences*
6. *University of Liège*
7. *Fisheries and Maritime Museum*

Understanding the impact of anthropogenic activities on the marine environment is a challenging task. In the North Sea, the internationally protected harbour porpoise (*Phocoena phocoena*) is a top predator that can be used as an indicator for environmental health. Harbour porpoises' small, round bodies and blubber layers are adapted to minimise heat loss. However, due to the relatively cold environment they live in, and their high surface to volume ratio, they require a high energy intake for thermoregulation. This high energy demand makes them vulnerable to changes in their habitat. Investigating the health and body condition of harbour porpoises can therefore inform on the health of a population. Predictive or bioenergetic models can provide valuable insights on the effect of disturbance on harbour porpoises. However, these models require large amounts of data and knowledge that are not often readily available, as studying the elusive harbour porpoise in the wild is difficult. The aim of this study is to provide baseline information on harbour porpoise body condition across the North Sea. For this, we included data from stranded or accidentally bycaught harbour porpoises from Scotland, England, France, Belgium, the Netherlands, and Denmark from 1990 to 2023 (N = 1671). Body mass index (BMI) was used to assess differences in body condition across seasons, years and regions. Variations in BMI were observed across the study area with harbour porpoises from the northern North Sea exhibiting a higher average BMI, while the southern counterparts had lower BMIs. Seasonal patterns were found as well, with porpoises showing lower BMI in summer months and higher BMI in winter months, though this was not necessarily consistent between areas. These results are a first step to using body condition as a proxy for the health of harbour porpoises and their vulnerability to human-induced disturbance.



HW-42. Close to the bone: gastro-oesophageal impaction in short beaked common dolphins in Cornwall, UK

Barnett, James ¹; Deaville, Rob ²; Leeming, Gail ³; Wessels, Mark ⁴

1. Cornwall Marine Pathology Team, Fishers Well, Higher Brill, Constantine, Falmouth TR11 5QG, UK
2. Cetacean Strandings Investigation Programme, The Wellcome Building, Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY, UK
3. Veterinary Anatomy, Physiology and Pathology, School of Veterinary Science, University of Liverpool, Leahurst, Chester High Road, Neston CH64 7TE, UK
4. MMPATH, Bellerby, Leyburn, North Yorkshire DL8 5QN, UK

The short beaked common dolphin (*Delphinus delphis*) is the most frequently recorded stranded cetacean species around the coast of Cornwall, southwest England, with typically over 100 animals stranding annually along the county's 700km coastline. Since 1990, over 550 common dolphins stranded in Cornwall and the nearby Isles of Scilly have been necropsied under the aegis of the collaborative Defra funded Cetacean Strandings Investigation Programme. In August 2016, two adult common dolphins were found to have cardiac stomachs impacted with large quantities of fish bones. This was a novel finding that has not been previously observed in stranded cetaceans in the UK and a further eight cases have been observed since. The extent of impaction varied with partial to complete impaction of the cardiac stomach with or without associated oesophageal impaction. Cases have been predominantly female (n=8), with both adult (n=6) and juvenile (n=4) animals affected. All animals were in suboptimal or poor nutritional state, and, although significant concurrent conditions were observed in some, these were not consistent findings. Gastric impaction in other species can be associated with intraluminal obstruction, physical intramural stenosis or functional, often segmental, abnormalities resulting in loss of peristalsis. In delphinids, fish bones are thought to be normally regurgitated and it has been speculated a form of dysautonomia affecting gastric motility may affect this in some dolphins. To further investigate the underlying pathological cause, comprehensive examination of the alimentary tract including the muscularis propria, enteric nervous system and associated autonomic ganglia would be required.

HW-43. Novel paramyxovirus in wild pinnipeds, Brazil

Ewbank, Ana Carolina ¹; Costa-Silva, Samira ²; Duarte-Benvenuto, Arícia ²; Sacristán, Carlos ¹; M. Soares, Rodrigo ³; Sánchez-Sarmiento, Angélica Maria ⁴; Silvestre-Perez, Natália ²; Volkmer Castilho, Pedro ⁵; M. Kolesnikovas, Cristiane K. ⁶; Freitas Pessi, Caroline ^{2,7}; Sardinha Murro, Rafael ⁷; B. Barbosa, Carla ⁴; B. Ferioli, Raquel ⁴; Catão-Dias, José Luiz ²; Borges Keid, Lara ³

1. Centro de Investigación en Sanidad Animal (CISA-INIA), CSIC, Valdeolmos, 28130, Spain.
2. Faculdade de Medicina Veterinária e Zootecnia, Universidade de São Paulo, São Paulo, 05508-270, SP, Brazil
3. Faculdade de Zootecnia e Engenharia de Alimentos, Universidade de São Paulo, Pirassununga, 13635-900, São Paulo, Brazil
4. Instituto Argonauta para Conservação Costeira e Marinha, Ubatuba, 11680-000, São Paulo, Brazil
5. Universidade do Estado de Santa Catarina-UDESC, Laguna, 88790-000, Santa Catarina, Brazil
6. Associação R3 Animal, Florianópolis, 88061-500, Santa Catarina, Brazil
7. Instituto de Pesquisas de Cananéia, Cananéia, 11990-000, São Paulo, Brazil

Most of the zoonotic viral emerging diseases originated in wildlife. The family Paramyxoviridae and Coronaviridae are two important viral families in terms of zoonotic potential and host diversity. To date, the only paramyxoviruses described in pinnipeds are those within the genus Morbillivirus, while an alphacoronavirus was reported in pinnipeds. Herein, we surveyed Paramyxoviridae and Coronaviridae in four pinniped species (n = 46) stranded along the coasts of Santa Catarina and São Paulo states, Brazil, between 2016 and 2022. A novel paramyxovirus (family Paramyxoviridae) was detected in an Antarctic fur seal (*Arctocephalus gazella*) and in two South American fur seals (*Arctocephalus australis*). The obtained sequences presented less than 83% amino acid identity with the closest paramyxovirus sequences from public databases, amplified in *Microchiroptera* sp. in Vietnam and in Asiatic yellow bats (*Scotophilus kuhlii*) in Cambodia. Following the phylogenetic analysis, the paramyxovirus sequences obtained herein were clustered into the genus Jeilongvirus. Upon necropsy, no related lesions were found, and its zoonotic potential is unknown. None of the animals were PCR-positive to coronavirus. To our knowledge, this is the first report of paramyxovirus infection in pinnipeds in Brazil and the first of a paramyxovirus not classified into the genus Morbillivirus in pinnipeds. Future pathological, serological, and molecular studies based on pan-Paramyxoviridae RT-PCRs are advised.



HW-44. First report of SARS-CoV-2 whole genome detection in faecal samples of free-ranging and alive Mediterranean sperm whales

Marangi, Marianna ¹; Airoidi, Sabina ²

1. Department of Clinical and Experimental Medicine, University of Foggia, Viale Luigi Pinto, 71122, Foggia, Italy
2. Tethys Research Institute, Viale G.B. Gadio 2, 20121 Milano, Italy

The environmental degradation and the discharge of agricultural, animal, and human waste into marine ecosystems have contributed to the spread of infectious diseases, posing potential risks to marine mammals. Regarding potential zoonotic diseases, epidemiological data on coronaviruses in wild marine mammals remain scarce, and SARS-CoV-2 has never been previously identified in cetaceans. The similarity between the SARS-CoV-2 receptor, the angiotensin-converting enzyme 2 (ACE2), in cetaceans and humans raises the possibility of a similar susceptibility to infection in cetacean species. As part of a research project on marine mammal ecology conducted between 2022 and 2024, faecal samples from 24 sperm whales (*Physeter macrocephalus*) were collected in the Pelagos Sanctuary (North-Western Mediterranean Sea) by the Tethys Research Institute. Samples were subjected to Allplex™ SARS-CoV-2 amplification platform and CleanPlex™ SARS-CoV-2 next-generation whole genome sequencing (Illumina platform). A potential relationship between SARS-CoV-2 variants and one or more gastrointestinal pathogens, previously detected in sperm whale faecal samples, was also analysed. Out of 24 faecal samples analysed, 2 tested positive for the SARS-CoV-2 amplification platform. After a whole genome sequencing, two SARS-CoV-2 omicron variants were identified. These were found in two samples that had previously tested positive for the gastrointestinal pathogens *Giardia duodenalis* Assemblage A and *Blastocystis* ST3 subtype. This study reports the first detection of SARS-CoV-2 whole genome in faecal samples from free-ranging and alive sperm whales in the Pelagos Sanctuary area. The presence of the virus in faeces could indicate a classical enteric tropism or a route of spread after systemic infection. This finding highlights the critical need to investigate the pathogenesis of coronaviruses in marine mammals and their health implications. Furthermore, interactions with other pathogens, such as gastrointestinal protozoa, may contribute to immunosuppression, potentially facilitating secondary coronavirus infections or predisposing individuals to opportunistic pathogens.



HW-45. Evaluating the welfare impacts of differing projectile types applied in ballistics euthanasia

Boys, Rebecca M ¹; Lye, Gordon ²; Stockin, Karen A ^{1,3}

1. *Cetacean Ecology Research Group, Massey University, Private Bag 102-904, Auckland, NZ*
2. *Animal Referral Centre, 224 Albany Highway, Schnapper Rock, Auckland 0632, New Zealand*
3. *Animal Welfare Science and Bioethics Centre, School of Veterinary Science, Massey University, Private Bag 11-222, Palmerston North, NZ*

Stranded cetaceans may require euthanasia due to animal welfare concerns. Euthanasia can be achieved via ballistics, which aims to cause instantaneous insensibility via significant brainstem disruption. Despite ballistics being widely applied, there is limited understanding of appropriate projectile types for euthanasia of differing species. We undertook an experimental ballistics trial to examine differences in cranial trauma induced by 5 differing projectile types using cadavers originating from prior cetacean stranding events. Projectiles were tested on 30 cadavers comprising three odontocete species of varying cranial morphology - bottlenose, common, and dusky dolphin. A .308 calibre rifle was used with 2 soft projectile types (non-bonded and bonded), understood to have reduced penetration ability and fragmentation, and 3 solid projectiles (full metal jacket, monolithic and hydrostatic), expected to remain intact with deep penetration. Post-trial, each cadaver underwent post-mortem computed tomography (PMCT) to examine for fractures in eight regions of the cranium, where sufficient disruption was deemed sufficient to render the animal instantly insensible. Our findings suggest that soft projectiles can penetrate and cause cranial disruption that should lead to indirect brainstem damage in common and dusky dolphins. In contrast, these projectiles had limited penetrative ability in bottlenose dolphins and are less likely to induce brainstem damage due to osteological density. However, solid monolithic projectiles achieved deep penetration in bottlenose dolphins, causing cranial damage that should induce indirect brainstem disruption. Our results highlight that ballistics can achieve cranial disruption likely to result in relatively rapid insensibility in stranded cetaceans. However, to ensure a humane death, species-specific considerations must be accounted for when projectiles are selected for euthanasia.



HW-46. Brucellosis in marine mammals stranded on the continental coastline of the southern North Sea and potential role of vectorial transmission

Jauniaux, Thierry ¹; De Trez, Melodie ¹; Ectors, Fabien ¹; Jouffroy, Kim ²; Lomba, Primaelle ¹; Sarlet, Michael ¹; Vroomen, Sophie ³; Wund, Sarah ⁴; Zouzou, Islam ¹; Garigliany, Mutien-Marie ¹

1. Department of Morphology and Pathology, Fundamental and Applied Research for Animals & Health Research Unit, University of Liège, Liege, Belgium
2. DDepartment of Morphology and Pathology, Fundamental and Applied Research for Animals & Health Research Unit, University of Liège, Liege, Belgium
3. Department of Morphology and Pathology, Fundamental and Applied Research for Animals & Health Research Unit, University of Liège, Belgium
4. Pelagis, Unité d'Appui et de Recherche UAR3462, Centre de Recherche Scientifique, La Rochelle University, La Rochelle, France

Since their discovery in 1994, marine *Brucella* spp. have been isolated from various marine mammals. *B. ceti* infects cetaceans, while *B. pinnipedialis* is found in pinnipeds, though cross- infections occur. Apart from abortions they can cause, these Gram-negative intracellular bacteria are not directly fatal and can cause organ infections and lesions, weakening the animal. The transmission pathways of marine *Brucella* spp. remain unclear, but there is evidence that marine mammals can contract brucellosis by vertical, horizontal, and vectorial transmission via parasites, in particular pulmonary nematodes carrying the bacteria. These lungworms play a role in spreading *Brucella* spp., as first-stage larvae may also contribute to transmission of the bacteria in the marine ecosystem. This study aims to confirm the presence of *Brucella* spp. in cetaceans and pinnipeds stranded on the continental coastline of the North Sea and the potential transmission by lungworm larvae. Selected marine mammals stranded on the coastline of Belgium and northern France have been necropsied and sampled using standard protocol. For *Brucella* spp. detection, samples of spleen, lung, lymph nodes and parasites (adult and larvae) have been collected for DNA extraction and PCR. In total, 8% of marine mammals were positive for *Brucella*. Larvae were isolated from seven brucellosis-positive individuals and four had larvae likely carrying *Brucella* spp., while one brucellosis-negative individual also had larvae testing slightly positive. These results support the hypothesis of a potential vectorial transmission of *Brucella* spp. by lungworms larvae in marine mammals, validating the study's methodology despite some limitations.



Other



O-01. Cetaceans as ambassadors of ocean literacy in the Black Sea

Popov, Dimitar ¹; Meshkova, Galina ¹

1. *Green Balkans - Stara Zagora NGO, Stara Zagora, Bulgaria*

Ocean literacy is increasingly recognized as a crucial component of global environmental education. It serves as a fundamental mechanism for achieving the objectives of the United Nations Decade of Ocean Science for Sustainable Development (2021–2030), which aims to reverse the degradation of ocean systems and stimulate new avenues for sustainable development. The Black Sea, a semi-enclosed marine basin, is connected to the Mediterranean Sea and the global ocean solely via the narrow Istanbul Strait. Its unique physicochemical properties, including low salinity and the prevalence of anoxic waters, make it a highly vulnerable marine ecosystem, home to three cetacean subspecies (harbour porpoise, common and bottlenose dolphin) redlisted by the International Union for Conservation of Nature (IUCN). Over the past five decades, the Black Sea ecosystem has experienced substantial modifications due to anthropogenic activities, leading to significant social, economic, and environmental consequences in the region. Addressing these challenges necessitates the implementation of effective policies and practices, particularly those focused on environmental sustainability education. Scientific research is often funded by policymakers who are not experts in the field, requiring scientists to utilize science communication strategies to convey their findings to the public. Science communication seeks to inform non-experts about scientific discoveries, their societal relevance, and their potential impacts, with the goal of raising public awareness, stimulating interest in scientific research, and influencing attitudes and behaviors. A flagship species is a species designated to represent or advocate for a specific environmental issue, campaign, or cause. In our research covering 24 ocean literacy initiatives and projects in the Black Sea, we found that 75% utilized cetaceans as flagship species to highlight the ecosystem's challenges and threats. These findings underline the role of cetaceans as ideal ambassadors for advancing ocean literacy in the Black Sea Basin.



O-02. Neither fish nor monster: The Portuguese 18th-century sources for the long-term history of cetology

Carvalho, Patrícia ¹; Vieira, Nina ¹; Brito, Cristina ²

1. CHAM - Centre for the Humanities of NOVA FCSH; ERC Synergy Grant 4-OCEANS

2. CHAM - Centre for the Humanities of NOVA FCSH; PI ERC Synergy Grant 4-OCEANS

Historical sources are known to be of utmost relevance for the history of animals, including cetaceans. These aquatic mammals were first considered as fish and many times described as monsters. It was the 10th edition of the taxonomic classification of Linnaeus that placed them in their own Mammalia category apart from fishes, providing different audiences a scientific name with a common meaning which was of great importance for the construction and circulation of knowledge about cetacean species. However, prior to this, information about species morphology, habitat, behaviour, feeding habits or abundance, was already available in different types of supports. These ranged from natural history observations, letters, travellers' accounts, newspapers, poems to visual sources, as drawings or paintings. Focusing on whales' observations, strandings and knowledge production, we will discuss early modern written and visual sources produced in Portugal. In detail we will present the unknown and unpublished manuscript *Piscilegio Lusitano* in comparison with the *Gazeta de Lisboa Occidental* newspaper and other coeval literature sources (18th century). This analysis is a new contribution to the long-term history of cetology in Europe. Sources include new data and show transfer and circulation of knowledge prior to C. Linnaeus classification (such as the publication of events occurring in Portugal by the Royal Society of London). The information about cetaceans contained in these sources is empirical and reveals a strong naturalist interest - it includes new observations (sightings and strandings), new practices (e.g. hunting techniques, and uses of extracted products), and details about anatomy, animal behaviors and inter-species' interactions. Our paper shows how historical data contribute to understand the corpus of science of the time and how new knowledge was acquired and appropriated by the society at multiple levels, from the interest in the natural world to metaphors for cultural realities.



O-03. 2023: A new record for marine mammals strandings on the French mainland coast

Dars, Cécile ¹; Méheust, Eléonore ¹; Caurant, Florence ¹; Dabin, Willy ¹; Demaret, Fabien ¹; Genu, Mathieu ¹; Guichard, Benjamin ²; Méndez-Fernandez, Paula ¹; Peltier, Hélène ¹; Spitz, Jérôme ³; Van Canneyt, Olivier ¹; Wund, Sarah ¹

1. *Observatoire Pelagis, UAR 3462- La Rochelle Université - CNRS, 5 Allées de L'océan, 17000, La Rochelle, France*
2. *Office Française de la Biodiversité, Rue Le Bris 29229 BREST cedex 2, France*
3. *Centre d'Etudes Biologiques de Chizé (CEBC), UMR 7372, 405 Route de Prissé la Charrière, 79360 Villiers-en-Bois*

Populations of marine mammals along the French coast are monitored in terms of relative abundance, distribution, demographic and ecological parameters, state of health status and causes of mortality through the French National Stranding Network (NSN). The aim of this network, coordinated by the Pelagis Observatory, is to build up a set of long-term data that will make it possible to assess the state of populations and identify the pressures weighing on these species. The vast majority of animals reported dead or in distress along the coast have been carried out and examined by a correspondent according to standardised procedures and protocols. As for the mainland, the number reached a record high in 2023, with 3,005 recorded, including 2,449 cetaceans (15 species) and 556 pinnipeds (2 species). This increase was mainly due to cetaceans along the Atlantic coast. The dominant species varied by region: common dolphin on the Atlantic coast, harbour porpoise in the Channel-North Sea and striped dolphin in the Mediterranean. The year was also marked by a wide diversity of rarer species and mass stranding events. Among the reports, 1,776 cetaceans and 403 pinnipeds were managed by the NSN. A significant effort has been made increasing the number of veterinary necropsies to 5% of the total (130). The results of the veterinary necropsies corroborate those of the non-veterinary correspondents, indicating that bycatch is the main cause of mortality of cetaceans found dead, particularly for common dolphins, with 76% identified by dissections and 60% by full necropsy. Natural deaths resulting from pathological conditions are predominantly identified in examinations of distressed cetaceans and pinnipeds regardless of the type of the report. This work has been made possible thanks to our national network and rigorous monitoring over more than 50 years, providing essential analysis for understanding mortality and supporting conservation efforts.



O-04. Life CONCEPTU MARIS marine citizen science approach to ensure long-term monitoring activities for conservation

Santini, Elena ¹; Carosso, Lara ²; García-Gutiérrez, Maria ²; Azzolin, Marta ³; Campana, Ilaria ⁴; Costantino, Matteo ⁵; Crosti, Roberto ¹; David, Lea ⁶; Farina, Marianna ⁷; Favaro, Livio ⁸; Fraija-Fernández, Natalia ⁹; Gregoriotti, Martina ¹; Maffucci, Fulvio ⁷; Masala, Valeria ²; Pasanisi, Eugenia ¹; Pecoraro, Marco ¹⁰; Servidio, Antonella ¹¹; Tepsich, Paola ¹²; Teti, Roberta ⁷; Tomasinelli, Francesco ¹¹; Vighi, Morgana ⁹; Arcangeli, Antonella ¹

1. *ISPRA -Italian National Institute for Environmental Protection and Research*
2. *Capo Carbonara Marine Protected Area*
3. *University of Turin, Gaia Research Institute Onlus, Gaia Research Institute Onlus*
4. *Accademia del Leviatano APS*
5. *University of Turin, Gaia Research Institute Onlus*
6. *EOI - EcoOcéan Institut*
7. *Stazione Zoologica Anton Dohrn - Italian National Institute for Marine Biology, Ecology and Biotechnology*
8. *University of Turin, Centro Interuniversitario per la Ricerca sui Cetacei (CIRCE)*
9. *University of Valencia*
10. *University of Palermo DISTeM, Department of Earth and Marine Sciences*
11. *Triton Research, Italy*
12. *CIMA Research Foundation*

Cetaceans and Pelagic Sea Turtles (CEPTU) in the Mediterranean face significant human pressures and environmental changes, yet their conservation status remains largely unknown due to data deficiencies, as highlighted by latest European Reports. LIFE Conceptu Maris project (LIFE20 NAT/IT/001371) aims to bridge these knowledge gaps in offshore areas, including setting up a citizen science approach in France, Spain, and Italy. The citizen science campaign was launched in 2023 on board ferries along 17 routes in the Mediterranean Sea, as part of the FLT MED Network. Guidelines were implemented to establish a citizen science program for recruiting, training, and involving citizens in monitoring activities. Training based on standardized protocols, appropriate measuring tools, and species identification sheets, combined with the constant oversight of the senior researchers on board, ensures the quality of data collected by citizen scientists. At the end of the campaign: - 399 applications were received, with 23% M and 73% F applicants, ranging in age from 19 to 72, representing 13 countries; - around 1,500 sea turtle and 2,900 cetacean sightings were recorded over two years in collaboration with citizens. The project training program ensured high-quality data collection, enabling robust analyses that improved understanding of CEPTU specie's ecological needs, distribution patterns, and shifts in these patterns. This newly generated knowledge helps identify more effective conservation measures for CEPTU species. Citizen science engagement allows citizens to gain scientific knowledge, ensures the continuity of monitoring through the gradual training of



expert observers, and the completion of onboard observers teams on specific routes. Within Conceptu Maris, marine Citizen Science contributes to generating new scientific knowledge, enhancing ocean literacy, raising awareness, and promoting sustainable use of marine environments. Overall, citizen science involvement will increase participation in European democracies enhancing citizens' ability to act as informed decision makers also in species conservation.





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