

#UKIRSC24

# Book of Abstracts



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## Anthropogenic Threats



## Arctic vessel traffic is increasing, what does this mean for Arctic whales?

**Emily Hague**, Lauren McWhinnie

*Heriot-Watt University*

The remote and harsh habitat that endemic Arctic whales (bowhead, narwhal and beluga) reside in has so far limited their exposure to human activities. However, Arctic industrialisation coupled with increasingly accessible ice-free waters means these species increasingly co-occur, and are exposed to, a number of potentially impactful activities, many of which are directly or indirectly associated with marine vessels. Therefore, we conducted a systematic review to summarise the current levels of understanding relating to how Arctic whales respond to vessels and their associated activities. The study identified a limited volume of literature and research (n=169), with disparity in volume between Arctic whale species, subpopulations, locations, and vessel types. The potential impacts of several vessel types that are increasing their Arctic presence (e.g. cruise ships) have so far received limited consideration. Similarly, several 'Endangered' subpopulations have received little focus. Our limited understanding of the potential impacts is alarming given the unprecedented increases in Arctic shipping over previous decades. This talk will summarise the review, gaps in knowledge and understanding of vessel impacts, and will identify areas for future focus. Only with sufficient understanding of how Arctic whales will be affected by increasing vessel presence can we develop appropriate management and mitigation measures which can proactively conserve these unique, vulnerable and inherently valuable species.

## Bycatch rates for threatened coastal Cambodian cetaceans

**Sarah Tubbs**, Lekkaman El, Nathan Nop, Hanafy Res, Rith Khang, Per Berggren

*Newcastle University*

Bycatch is recognised as the biggest threat to marine mammals globally. Coastal small cetaceans face intense bycatch threats due to the overlap of their habitat with humans. Lack of knowledge on the extent of bycatch threats in developing countries often hinders the tailoring of bycatch mitigation strategies. Cambodia's coastal waters support populations of three threatened cetacean species: the Irrawaddy dolphin, the Indo-Pacific humpback dolphin and the Indo-Pacific finless porpoise. To estimate country-wide bycatch rates for these species, questionnaires were conducted with 435 fishers from 37 communities across Cambodia's coastline between September – November 2023. All interviewed fishers used gillnets, traps, longlines, trawls or seine nets. Preliminary analysis was conducted to produce per vessel bycatch rates for each species and gear type. Rates were extrapolated to produce bycatch estimates for the full fishery using FAO data on the number of vessels per gear type. Preliminary results suggest Irrawaddy dolphins had the highest annual bycatch rate of 283 individuals/year, followed by Indo-Pacific finless porpoise with an estimated bycatch of 133 individuals/year, and Indo-Pacific humpback dolphins with an estimate of 49 individuals/year. Gillnets had the highest Irrawaddy dolphin bycatch rate (0.1 dolphins/vessel/year) and accounted for 74% of total species bycatch. Trawlers had the highest Indo-Pacific finless porpoise bycatch rate (0.05 individuals/vessel/year) and accounted for 59% of total species bycatch. Lines had the highest Indo-Pacific humpback dolphin bycatch rate (0.03 dolphins/fisher/year) however gillnets accounted for the highest percent of total species bycatch (39%). Given the conservation concerns and statuses of the study species, the bycatch rates observed in this study are likely unsustainable. However, understanding the extent to which bycatch rates affect population growth rates will require yet to be collected data on regional population sizes. Study findings can be used by resource managers to prioritise species and gears for bycatch mitigation strategies.

## Are governmental strategies to boost blue economy in line with cetacean conservation needs? The Irish coast example.

**Rita Meireles de Castro**

*Atlantic Technological University*

Ireland's offshore waters present a unique set of features that are optimal for cetacean occurrence in European waters and are the habitat of 25 species. Under the Wildlife Act (1976) and the EU Habitats Directive (1992), all cetacean species are protected within the Irish EEZ. But how is policy working towards creating more Marine Protected Areas and Natura 2000 sites? How are governmental strategies protecting cetaceans in Irish waters? Within the current social and economic climate, there has been increasing demands for marine resources and alternative ways of energy – all eyes are now turning to the ocean. The industry has woken up to the massive potential of the Irish coast to blue economy and has endeavoured recently on a hectic run for project licensing on multiple offshore and coastal sectors. Nonetheless, anthropogenic activities such as offshore windfarms, shipping, fishing, and recreational traffic are among the most impactful activities in the ocean, disrupting marine mammals' habitats and ecological patterns. Before unleashing the full potential of new and more commercial projects, it is imperative to understand the extent of these impacts on cetaceans and promote a balanced and sustainable growth of blue economy in Ireland. Learning from past mistakes, government should halt advances until studies provide answers. Thus, to better inform management strategies and policy makers, this project aims to identify hotspots of marine anthropogenic activities and correlate it with cetacean distribution patterns in Irish waters, highlighting cumulative impacts of different industry sectors. Species distribution modelling will be applied on a long-term occurrence dataset of all cetaceans present in Irish waters over the last 20 years. Ultimately, this project will contribute to demonstrate whether or not the governmental strategy to boost economy and source greener energy is in line with the conservation needs of cetaceans and marine habitats, long overdue.

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## General Marine Mammal Science





## Swimming with a twist: Exploring spinal curvature in delphinids

**Imogen Sawyer**

*Scottish Association of Marine Science*

Scoliosis, kyphosis and lordosis, forms of spinal curvature, have been recorded in many species of mammal. Limited understanding of factors leading to spinal curvature in delphinids impedes identification of specific anthropogenic pressures and appropriate mitigation. Outlining current understanding and gaps as a starting point to focus future efforts, this review examines cases identified in wild swimming individuals and through examination of skeletal remains.

## Temporal trends and environmental drivers of pregnancy in the Gulf of St Lawrence's minke whales (*Balaenoptera acutorostrata*)

**Devonne Gardiner**, Christian Ramp, Richard Sears, Laura Paling, Davina Derous, Joanna Kershaw

*University of Aberdeen*

Evaluating the health of baleen whale populations is crucial for understanding the effects of environmental change on these top predators, but has been difficult historically.

Methodological advances, particularly in endocrine profiling, have enabled reproductive rates of populations to be measured as a proxy for population health. In this study, endocrine profiling, sightings data, and environmental data are combined to investigate the reproductive rates of minke whales (*Balaenoptera acutorostrata*) in the Gulf of St Lawrence, Canada from 2007-2015. This area is an important summer feeding ground for several baleen whale species in the North Atlantic but has undergone major ecosystem change. Minke whales have been observed to behave differently to other mysticetes in the GSL, for example, sexing of animals revealed a predominantly female population and very few calves sighted throughout the study period. The present work examines the health of the minke population in the GSL and investigates the impacts of fluctuations in prey availability on pregnancy rates. Blubber biopsy samples (n = 129) were used to assign pregnancy status at the time of sampling through quantification of progesterone. Annual pregnancy rates were significantly higher than other mysticetes in the same area, with >50% of minke whales biopsied identified as pregnant each year, and no significant decline in pregnancy rates observed over the study period. Pregnancy rates in female minke whales is partially explained by differences in prey availability in the previous year. These data support the theory that minke whales in the GSL are predominantly pregnant females using the area as a feeding ground prior to giving birth elsewhere. Being generalist feeders, it is likely minke whales have enough plasticity to cope with fluctuating food availability, with additional drivers of pregnancy rates and population health yet to be determined.

## Plastic pollution and ocean giants: Investigating the extent and impacts of plastic ingestion by marine megafauna

**Emma Hunter**, Brendan Godley, Penelope Lindeque, Rob Deaville, James Barnett, Sarah Nelms

*University of Exeter*

The widespread and pervasive nature of plastic pollution has resulted in a growing body of evidence documenting the detrimental effects of anthropogenic waste on marine organisms. Over the last two decades, the number of marine species known to be impacted by debris, the majority of which is plastic, has more than trebled. Of particular concern are the marine megafauna, namely marine mammals (e.g. cetaceans and pinnipeds), elasmobranchs (sharks and rays), and marine turtles. These large marine vertebrates play key roles in the functioning and maintenance of marine habitats and are often considered indicators of marine ecosystem health. Many are also of conservation concern due to the plethora of anthropogenic pressures exerted on them. Plastic ingestion by marine megafauna can lead to a range of lethal and sub-lethal impacts, including intestinal blockage and internal injury, dietary dilution, malnutrition, exposure to chemical contaminants and increased vulnerability to disease. Our understanding of the fate of very small plastic particles, such as microplastics and nanoplastics, within mammalian gastrointestinal tracts, and the potential health implications, is extremely limited. This PhD topic aims to address this knowledge gap.

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## Occurrence and Distribution



## Dynamic Habitat Suitability Models of Minke Whales on the West Coast of Scotland

**Tim Awbery**, Denise Risch, Ben Wilson, Lauren Hartny-Mills, Lauren McWhinnie, Joseph Onoufriou, Alison Lomax

*Scottish Association for Marine Science*

Minke whales are the most frequently encountered baleen whale species in Scottish waters but despite them being regularly sighted during summer months, there is a lack of understanding about their habitat usage and movements in western Scottish waters. In the current study data were collected during visual random line transects conducted off the west coast of Scotland between 2003 and 2019 from the Hebridean Whale and Dolphin Trust's research vessel.

Transects were divided into smaller segments and binomial generalized additive models were used to ascertain the relative importance of a range of static and dynamic environmental variables on minke whale presence at a daily, weekly and monthly scale. These models were then used to generate predictions of minke whale distribution and abundance for each month of the summer season.

The models showed a general movement from the south to north of the Scottish west coast and a general movement inshore as the season proceeded. The south-west of the study area appears to be particularly important for minke whales from May to August whereas the northern region of the study area appears the most heavily used in September.

Minke whales most commonly used the Sea of Hebrides Marine Protected Area in June and July but were largely absent from it in other months, when they were using areas to the north of it.

This study extends our knowledge of minke whale distribution on the west coast of Scotland, using data collected on a considerably larger spatial and temporal scale than previously used. The results suggests that whilst the effectiveness of the designated MPA needs continuously revisiting to account for variations in distribution of minke whales and anthropogenic threats (particularly entanglement), it will provide a concentrated area to investigate, understand and mitigate risks.

## Montenegro Dolphin Research: Seven Years of Insights and Conservation Implications for the first Long-term Cetacean Study in the East South Adriatic Sea

**Evie White**, Tina Michot, Ceyda Özdemir, Atakan Dalkılıç, Aylin Akkaya

*DMAD - Marine Mammal Research Association*

The Montenegro Dolphin Research project has been conducting surveys in the coastal waters of Montenegro since 2016 and is the first long-term survey of cetaceans within the Eastern South Adriatic Sea. This project has been collecting data on delphinids via both land and boat-based surveys, with a dedicated annual and seasonal survey-effort. Building a strong database combined with associated analysis is the key stepping-stone to contributing to effective and tailored conservation management strategies in this region. The annual, seasonal and sightings rates, combined with behavioural states observed, group sizes, calf presence, and associated anthropogenic pressures has been assessed for this region to curate a report on the project success for the seven-year study period ongoing to September 2023. Annual and seasonal presences have delineated temporal area usage, with a fluctuation in sightings occurring throughout the study period, which could be associated with temporary anthropogenic phenomenon ongoing in the region and worldwide. Due to the limited data on the striped dolphin (*Stenella coeruleoalba*), the focus of further reporting is the common bottlenose dolphin (*Tursiops truncatus*). The behavioural states of this species are predominantly diving behaviours, indicative of foraging activities, with travelling and travel-diving behaviours also observed in abundance. The group-sizes in this region show an overall decline annually. Sub-adult presence has shown a similar pattern of yearly decline with some fluctuation, yet there are higher seasonal observations of calves in the Autumn, following the proposed Adriatic calving season, Summer. The analysis alongside anthropogenic threats, with a particular focus on tourism, a key economic sector in Montenegro, has highlighted that areas of extreme pressure are overlapping with important areas of dolphin distribution. The data from this report highlights the need for further research, alongside the development of dedicated protective measures in Montenegrin waters.

## Estimating the abundance and distribution of marine mammals using passive acoustic monitoring and biotelemetry

**Amy Feakes**, Paul White, Ryan Reisinger, Jon Bull

*University of Southampton*

Commercial whaling prior to the IWC moratorium reduced global whale populations, with fin whales among the most heavily exploited species. In recent years, the recovery of southern hemisphere fin whales has been observed with the return to ancestral feeding grounds - Elephant Island, Antarctica; a krill-rich area, allowing efficient feeding.

There is still limited understanding of this population. We aim to carry out research to gain a further understanding of this population's abundance and distribution, specifically at the feeding grounds through integrating data types. We will use both passive acoustic monitoring (PAM) and biologging, common methods of monitoring marine mammals. These two approaches differ in the insights that they provide on marine mammals, Eulerian versus Lagrangian, respectively.

The experimental design involves deploying passive acoustic recorders on the shelf around Elephant Island at 150m depth. Then, applying machine learning techniques to discriminate the vocalisations of fin whales. Concurrently, fin whales will be tagged to gain an understanding of their movements during the feeding season. This tracking data will be used to develop density surface models. Then, investigation will begin to develop methods of fusing this data to provide improved abundance and distribution estimates of the Southern Hemisphere Fin Whale population.

## Cetacean presence and distribution in the waters off British Columbia: exploring the use of opportunistic aerial surveys

**Valeria Ferrari**, Patrick O'Hara, Kim Pearce, Karen Alexander, Lauren McWhinnie

*Heriot-Watt University*

Cetaceans are notoriously difficult species to study due to their highly mobile nature, often cryptic behaviour and the considerable amount of time they spent underwater. Research efforts are often concentrated within coastal waters, which are more accessible and affordable to observe, while offshore studies necessitate mobile platforms making such surveys more expensive and often constrained in both time and space. One potential method for capturing cetacean data in offshore waters could be the use of opportunistic aerial platforms, as these allow coverage of larger study areas at a reduced cost thanks to the shared use of existing services (i.e. fisheries observers, transport surveillance). This study aims to 1) assess cetacean distribution for British Columbia's Exclusive Economic Zone (EEZ) through frequent, opportunistic, random sampling, aerial surveys and 2) develop an approach for handling data collected during opportunistic surveys. In this talk specifically, I will report the beginning stages of the data handling process and some preliminary results on cetacean presence obtained from the National Aerial Surveillance Program (NASP) of Transport Canada from 2015 to 2022.



## Abundance and distribution of cetaceans in the western English Channel, and exposure to key threats

**Beth Harvey**, Clare Embling, Rosalyn Putland, Simon Ingram

*University of Plymouth/Cefas*

The English Channel is the most heavily impacted coastal region in the UK with one of the world's busiest shipping lanes and industries including fisheries, offshore wind and recreational boating. These waters are also habitat for multiple cetacean species including: harbour porpoises (*Phocoena phocoena*), minke whales (*Balaenoptera acutorostrata*), common (Delphinus delphis), bottlenose (*Tursiops truncatus*), Risso's (*Grampus griseus*) and white-beaked (*Lagenorhynchus albirostris*) dolphins. Despite this, cetacean abundance and distribution in the western English Channel are poorly understood, with few scientific or long-term surveys in the region. Knowledge of exposure to key threats is vital for development of appropriate and meaningful conservation measures.

In collaboration with Cefas, this PhD will utilise data from the University of Plymouth's ongoing visual and passive acoustic surveys of cetaceans combined with a passive acoustic hydrophone mooring in Plymouth Sound to assess: 1) abundance and distribution of cetaceans in the western English Channel; 2) soundscape analysis and anthropogenic noise in Plymouth Sound; 3) exposure of cetaceans to shipping noise; and 4) to other key threats, for example bycatch and offshore wind developments. The project outputs will provide a valuable resource for conservation management and planning decisions and will contribute to positive conservation outcomes for coastal cetaceans in noisy environments.

## From Whaling Echoes to Cetacean Strandings: Trinidad and Tobago's Conservation Path

**Anna Karamiseva**, Syam Nath, Olivier Adam, Carla Phillips-Savage, Rod Seupaul, Wade Sookeran

### *Trinidad and Tobago Cetacean Sighting Network (TTCSN)*

Trinidad and Tobago's maritime history intertwines traditional whaling practices with contemporary cetacean conservation concerns. This study aims to trace this trajectory by examining archival whaling records and modern cetacean stranding data, shedding light on historical species diversity and contemporary conservation challenges. This planned study is a fundamental work that will highlight Trinidad and Tobago's changing attitude to cetacean conservation by utilising various data sources, including historical whaling records, species distribution datasets and stranding databases. It emphasises the inherent worth of cetaceans within marine ecosystems and highlights their function as sentinel species that serve as indicators of the general health of the ocean. Necropsy results and a thorough examination of cetacean strandings offer insights into species variety, causes of mortality, and stranding patterns. By integrating these varied datasets, this research seeks to uncover not only historical patterns but also the contemporary conservation challenges faced by marine mammals in Trinidad and Tobago's waters. Bridging the historical legacy of whaling with current conservation imperatives, this study contributes to the development of targeted strategies to mitigate anthropogenic impacts and ensure the sustainable coexistence of marine mammals and human activities in Trinidad and Tobago. The findings aim to inform policymakers, researchers, and local communities towards collaborative efforts for effective marine conservation.

## Explaining process, pattern and dynamics of marine predator hotspots in the Southern Ocean

**Joshua Wilson**, Ryan Reisinger

*University of Southampton/British Antarctic Survey*

The Southern Ocean is a rich and dynamic ecosystem that exhibits drastic change within and between years. Multiannual climatic processes like El Niño Southern Oscillation and Southern Annular Mode cause large-scale changes in environmental conditions here. Similarly, ephemeral mesoscale features like eddies and fronts are known to impact the foraging behaviour of Antarctic marine life. Effective conservation of this ecosystem therefore requires an understanding of the environmental drivers of species distribution in both space and time.

The Retrospective Analysis of Antarctic Tracking Data (RAATD) combines Southern Ocean tracking data for 4060 individuals of 17 species of marine mammals and birds, spanning 24 years. This dataset offers a unique opportunity to study ecosystem-wide effects of temporal environmental variability on predator distributions. The RAATD has already been used to identify Areas of Ecological Significance (AESs), which are characterised as regions preferred by multiple predator species. Tracked species are seen as sentinels for the whole ecosystem, and so AESs represent prey distribution too. However, AES model predictions are based on long-term climatological averages of environmental spatial datasets. Climatological averages can fail to capture the effects of mesoscale features and account for interannual variation in predictions. Therefore, further work is needed to improve current habitat selection models.

This project aims to further our understanding of species-habitat relationships by incorporating dynamic environmental predictors into species distribution models. Initial work will investigate which temporal resolution is most appropriate for capturing the effects of mesoscale features on predator distribution. Then, the effects of intra- and inter-annual variation on AES presence and persistence will be modelled using this resolution. It is hoped that this research can inform dynamic conservation management plans and describe how AES predictions change within and between years.

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## Acoustics



## Temporal acoustic presence of Southern Right Whales off Elephant Island in Antarctica

**Autumn Chang**, Elena Schall, Elke Burkhardt, Chiara Papetti

*University of Padua*

Very little is known about wildlife presence in Antarctica. The climate and landscape make it inaccessible by humans for many months of the year. Passive Acoustic Monitoring (PAM) is advantageous in this situation since it can collect months- or years-long data without needing human interference. The southern right whale (*Eubalaena australis*) (SRW) is a baleen whale found in the Southern Hemisphere. They make a unique species-specific sound called the "upcall" that can be identified in acoustic recordings. Detecting their upcalls in acoustic recordings can tell us important information about their distribution and temporal presence. PAM was used to sample audio recordings from Elephant Island, an island off of the Antarctic Peninsula, over approximately 3 years (2013, 2017, and 2019/2020). A detector was created from 3 upcall acoustic templates in order to automatically scan all of the audio recordings to identify the upcall detections using binary point matching. The results indicate that SRWs had the highest presence off of Elephant Island in 2013. There were significantly fewer upcall detections in 2019/2020, possibly as an effect of El Nino. Additionally, there was an evident bimodal hourly distribution over the course of a day, with peaks at 12 am and 12 pm. The Summer Season saw a higher peak at 12 am, and the Winter Season saw a higher peak at 12 pm. This study is important in the field of bioacoustics since it cuts down on the physically taxing and time consuming labor of manually scanning audio recordings. Further research would be helpful to find out possible environmental factors that affect the temporal presence of SRWs and how these have further implications for SRW conservation.

## Did you hear that? Comparing the detection capabilities of a CNN delphinid detector to the C-POD.

**Ellen White**, Paul White, Jon Bull, Denise Risch

*University of Southampton*

Passive acoustic monitoring (PAM) is an important tool for monitoring the ecological health of marine ecosystems, with marine mammal signals often detected as ecosystem indicators. Collecting broadband PAM data allows researchers to not only detect a species of interest but to also examine the ambient noise (the background environmental noise) of the environment the species is present in, and gather base-line noise data in an ever-changing marine environment. The C-POD is a popular platform for marine monitoring projects, automatically detecting the presence of delphinid click trains from the regional soundscape, but does not store any raw PAM data for further analyses or validation. In this work we examine the comparative performance of the C-POD with a custom developed small-scale multi-sound source convolutional neural network (CNN), which works on broadband PAM data, for delphinid detection on the west coast of Scotland. Detection metrics are compared, along with environmental drivers that influence each platform's performance. We found the CNN to report similar false-positive rates to the C-POD, but significantly less false-negatives (missed detections) reporting a higher overall precision and recall score across a variety of seasonal acoustic conditions. The C-POD frequently under reported delphinid presence, particularly when presence is temporally sparse. Our work encourages the collection of broadband acoustic data (rather than binary presence, absence data) which can be rapidly analysed upon retrieval for marine mammal presence. Anthropogenic activity is rapidly increasing in coastal marine habitats and the collection of baseline acoustic data is essential for answering questions that account for more than the presence of a single species.

## Harnessing the power of machine learning algorithms for the detection of marine mammal species in large acoustic datasets

**Laia Garrobé Fonollosa**

*Sea Mammal Research Unit, University of St Andrews*

Passive Acoustic Monitoring (PAM) involves surveying and monitoring wildlife and environments using deployed acoustic recorders, offering the advantage of continuous data collection for marine animals, even under adverse weather conditions or when visual surveys are unfeasible. As our capacity for collecting large quantities of acoustic data continues to grow, so does the demand for automated detection systems to effectively process and analyse it. Deep Learning (DL) methods have gained popularity in such tasks, achieving unprecedented results in detection and classification tasks for marine mammal vocalisations. Nonetheless, underwater acoustic datasets pose a unique set of challenges when it comes to training DL methods. Some of these challenges arise from the substantial cost associated with data collection and auditing, the scarcity of events in the datasets, and the huge variability in both background noise and the target vocalisations. This PhD aims to explore the best ways to leverage existing labelled bioacoustics data to train robust DL methods across different tasks and datasets, investigate the potential of unsupervised DL algorithms for tasks such as call type classification, which often rely on human interpretation and subjectivity, and examine the sources of bias and error in DL algorithms to better incorporate them into PAM biological studies.

## Testing low-cost acoustic recorders – Longevity and quality of cetacean recordings

**Jasmine Stavenow Jerremalm**, Mark Jessopp, Ailbhe Kavanagh, Emer Rogan

*University College Cork*

Traditional acoustic monitoring of cetaceans come with a range of limitations, such as costs, duration of deployment, and handling time. HydroMoths - small (7x6x3cm) and affordable (< US \$200 per unit) underwater recorders, have recently been developed, and may overcome some of these issues. However, to be useful as a tool in cetacean acoustic monitoring, there is a need to assess their abilities. How well do they record vocalisations of cetaceans, and for how long time will recordings cover, with different configurations?

We tested the utility of HydroMoths using recordings of known cetacean species in a natural field setting in 2023. Recordings of known species were conducted using the devices within 100m from a boat with engines turned off. Depending on target species, sample rate was set to either 48khz, 96khz, 250khz or 384khz. Recorded sounds were visually processed by annotating cetacean sounds within spectrograms to confirm that recordings of the target species had been made. The same sound files were then processed in PamGuard, using inbuilt detectors. PamGuard detections were then compared to the detections from the visually validated vocalisations of known species. For the battery longevity experiment 20 HydroMoths, duty cycled, and with different sampling rates were deployed in field. After two months their recording capacities were assessed, and if the recordings were limited by battery or memory card size.

This study confirms that the newly developed underwater recording devices successfully record validated cetacean species, but with some limitations and questions remaining to be answered. The battery longevity experiment showed that they are able to record for longer time periods. Our results indicate that HydroMoths might be promising alternatives or complements to traditional acoustic monitoring of cetaceans.



## Feeding ecology



## Zooplankton diversity and abundance linked to cetacean population distribution in the Galapagos Marine Reserve

**Dione Sofia Orellana Kehayova**, Daniela Alarcaon, Santiago Diaz, Jonathan Sharples

*University of Exeter*

The “Canal Bolivar” located in the west of the Galapagos Islands is known for its cetacean aggregation and significant influence from cold currents that enter the archipelago. Currently, multiple areas within the Canal Bolivar have shown 4-6 positive degree anomalies in comparison to the monthly average for previous years. It is hypothesised that this sea surface temperature anomaly is due to the occurrence of an El Nino event. These positive temperature anomalies may influence changes in the zooplankton communities, the primary food source of many cetacean species found at these surface waters. There has also recently been a decline in cetacean sightings in the area, and these phenomena may be interrelated. Working in conjunction with The Galapagos Cetacea Programme, The Galapagos Science Centre, The Murray Foundation and The University of Liverpool we wish to present the first zooplankton identification guide of the “Canal Bolivar”, and thus the first zooplankton ID guide in the Galapagos Islands.

## Is fate Sealed? Stable isotopes reveal competitive ecosystem dynamics between two marine sentinel communities

**Zaahir P Santhanam**, Luis A Huckstadt, Debbie JF Russell

*University of Exeter/University of North Carolina Wilmington*

Interspecific competition is a driving force of natural selection, but is difficult to quantify in the marine realm. Comprehending competition necessitates understanding the feeding ecology of study species, which is critical to human management of marine predators, fish communities, and other marine resources. Here, we used stable isotope analysis (SIA) to quantify the feeding ecology of two sympatric pinniped species, grey (*Halichoerus grypus*) and harbour (*Phoca vitulina*) seals in the Shetland Islands, Scotland, UK. Using Bayesian isotopic ellipse and stable isotope mixing models, we identified diet overlap between the two species over multiple time domains, indicating probable competition. Further, we find that grey seals have a smaller isotopic niche than harbour seals, despite a higher number of probable prey components. Our results show that grey seals are likely outcompeting harbour seals for higher-quality food, forcing harbour seals to forage more broadly and/or spend more time foraging at sea. These results support hypotheses that grey seal populations rebounding from culls in the 20th century are contributing to an ongoing decline of harbour seal populations in this region. This assessment of competition between two marine predators demonstrates the complexity of the marine environment, and lays groundwork for adequate modelling to inform more comprehensive management.

## An initial investigation of the Lunar cycle on the bottlenose dolphins of Montenegrin coastal waters

**Charlotte o Smith**, Evie White, Jessica Roberts, Aylin Akkaya

*University of Portsmouth*

The lunar cycle's influence over marine species has recently come under the scope of research. Many studies on organisms at each stage of the trophic web have been recorded, however, research regarding the lunar cycle's influence on marine megafauna within the Adriatic sea is limited. With a large amount of research investigating the tidal influence on marine life, peer-reviewed research regarding the irradiance of the moon is lacking. We hypothesized that there would be an increase of surface feeding behaviour when plankton and prey have migrated to a more accessible area in the water column with diel vertical migration, thus attracting tertiary consumers. To investigate the influence of the lunar cycle and the Montenegrin bottlenose dolphin populations, 514 morning surveys were conducted between 2016-2023, with a total of 273 focal groups. All statistical analysis showed no significant result. Although no significant relationship was found, surface-feeding behaviour was most common during periods of reduced illumination. The findings of this study contradict many studies globally, as the lunar cycle has been seen to significantly influence other marine mammals, including delphinids, around the world. Perhaps the results could be affected by the oceanic conditions within the Mediterranean, more specifically Montenegro's neritic waters, due to the shallow bathymetry and low tidal range. Further research looking into the differences between the inside of the bay of Boka Kotorska and the coastal waters would be of interest.

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Poster Session

## Towards improved conservation of the east coast of Scotland bottlenose dolphin population: quantifying and understanding a major range expansion into northeast England.

**Grant Ellis**, Monica Arso Civil, Barbara Cheney, Rona Sinclair, Ophelie Humphrey, Philip Hammond, Carol Sparling

*University of St Andrews*

Successful conservation planning for protected populations requires robust information on distributional range, abundance and population trends. Since 1989 the east coast Scotland bottlenose dolphin (*Tursiops truncatus*) population has been monitored by the University of Aberdeen's Lighthouse Field Station and the Sea Mammal Research Unit in two main study areas: the Moray Firth Special Area of Conservation (SAC) and the Tay estuary and adjacent waters. The population is currently undergoing a major range expansion from Scotland into northeast England, as indicated from public sightings and citizen science photographic data. However, there is a lack of empirical data on abundance and distribution of bottlenose dolphins south of the Scotland-England border. This presents a challenge to assessing the conservation status of this protected population, which is required by law under respective Habitats Regulations in England and Scotland.

The objectives of this PhD are as follows:

- 1) To quantify evidence of a distributional range expansion
- 2) To establish the distribution and abundance of bottlenose dolphins in northeast England.
- 3) To measure population connectivity throughout the distributional range on the UK east coast.
- 4) To investigate the role of metapopulation dynamics in the range expansion.
- 5) To undertake a comprehensive appraisal of policy relevant to the east coast bottlenose dolphin population.

Key methods will include spatial analysis, population modelling, social analyses, and photo-ID and laser photogrammetry during dedicated surveys and from citizen science across the UK east coast. Overall, this project will improve conservation and management of bottlenose dolphins in UK waters by applying a multi-disciplinary approach which combines empirical studies and policy review. I aim to enhance environmental assessments of, for example, the potential impacts of offshore wind developments. This work will also have wider implications for the management of mobile marine species undergoing range shifts due to climate change and other anthropogenic pressures.

## Seasonal Differences in Bottlenose Dolphin Behaviour

**Emma Holden**

*University of Cumbria*

According to Bejder et al., (2006) the number of vessels on the water is expected to increase worldwide. Marine mammals such as bottlenose dolphins can be disturbed by boat presence, resulting in avoidance (Wright et al., 2007). Avoidance has shown to vary in studies such as Bristow (2001) due to resource availability in the area of disturbance.

I plan to assess seasonal variation in bottlenose dolphin behaviour caused by changes in boat traffic, resource availability, and environmental conditions. Understanding species behaviour, especially indicator species is crucial to improving conservation outcomes (Bräger, 1993, Vermeulen et al., 2015). Preliminary spatial analysis using GIS has already suggested habitat preference in the bay e.g., foraging off the reef.

The study will analyse existing data sets collected by Cardigan Bay Marine Wildlife Centre, New Quay, Wales (52°12'56.1"N 4°21'22.4"W). During sampling, observers record mammal sightings, covering location, species, numbers, and behaviours. Boats within 300m of groups of dolphins are recorded for behavioural change in the group.

Bejder, L., Samuels, A.M.Y., Whitehead, H.A.L., Gales, N., Mann, J., Connor, R., Heithaus, M., Watson-Capps, J.A.N.A., Flaherty, C. and Krützen, M. (2006) 'Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance', *Conservation Biology*, 20(6), pp. 1791–1798.

Bräger, S., (1993) Diurnal and seasonal behavior patterns of bottlenose dolphins (*Tursiops truncatus*). *Marine Mammal Science*, 9(4), pp.434-438.

Bristow, T. and Rees, E.I.S., (2001). Site fidelity and behaviour of bottlenose dolphins (*Tursiops truncatus*) in Cardigan Bay, Wales. *Aquatic Mammals*, 27(1), pp.1-10.

Vermeulen, E., Holsbeek, L. and Das, K. (2015) 'Diurnal and seasonal variation in the behaviour of bottlenose dolphins (*Tursiops truncatus*) in Bahía San Antonio, Patagonia, Argentina', *Aquatic Mammals*, 41(3), pp. 272–283.

## Environmental and anthropogenic drivers of bottlenose dolphin (*Tursiops truncatus*) occurrence in Aberdeen harbour

**Iona MacLeod**, Sarah Marley, Giverny Maidlow

*SRUC*

Aberdeen Harbour is widely recognised as a hot spot for bottlenose dolphins (*Tursiops truncatus*). Given recent infrastructure developments (e.g. new South Harbour, wind farms), and high-density vessel traffic supplying the UK oil and gas industry, it is important to study this population in terms of environmental and anthropogenic drivers of habitat-use. Data were collected June-August 2022 and June-September 2023. Data collection involved visual scan sampling to determine dolphin presence/absence and group size, as well as focal follows to capture detailed behavioural information. Variables like tidal state, sea surface temperature, and vessel traffic were also recorded. Results from this study will provide insight into the drivers of bottlenose dolphin occurrence in Aberdeen Harbour.



## Genomics approaches to uncovering eco-evolutionary adaptations in Pinnipeds

**Jeni Sidwell**, Simon Goodman, Ian Carr, Elizabeth Duncan, Mary O'Connell

*University of Leeds*

In evolutionary biology, species adaptation and response to changes in the environment is of key focus. Yet, little is known about the molecular underpinnings of these adaptive responses. Pinnipeds (seals, sea lions, walruses, and fur seals) are closely related species with wide trait diversity, making them an excellent study system for species adaptation on a genomic level. Strategies for breeding and lactation are especially diverse in Pinnipeds, driven by the group's ecologies and extreme range of habitats and latitudes. Exploring the environmental and ecological drivers of this trait diversity is of key conservation interest: understanding how species tend to evolve under environmental stressors can help us predict future adaptive response. This multifaceted genomics PhD project focuses on Pinniped ecology and evolution with the backdrop of climate change, paying special attention to patterns by which lactation traits and population dynamics tend to evolve under historical environmental events. The project will incorporate next-generation sequencing and bioinformatics technologies to answer questions about Pinniped adaptation on a genomic level. It involves i) Creating new high-quality reference genomes for previously unsequenced Pinnipeds, suitable for use in future genomics studies; ii) In silico analyses of the evolution of genes believed to drive unique lactation traits; iii) Following up on those same genes to explore their expression profiles; iv) Exploring the paleoenvironmental drivers shaping the demographic history of threatened seal populations.

## Evaluating total RNA quantity and quality in blubber collected within 100 hours since death in a marine mammal

**Alexandra Tranganida**, Joanna Kershaw, Davina Derous

*University of Aberdeen*

Omics and other molecular techniques are used to study marine mammal physiology, which is important in assessing the effects of the multiple anthropogenic and environmental stressors these animals face. Applying molecular techniques in marine mammal research is inhibited by challenges associated with collecting high quality and sufficient numbers of samples from free-ranging animals under fieldwork conditions. Sampling sites are often far from laboratory settings, and it is particularly important that samples are collected and preserved appropriately to minimise molecular degradation. Strandings provide an invaluable tissue source for research. However, there is lack of information on the suitability of samples from stranded marine mammals in molecular studies. Here, to address this knowledge gap, we evaluated the impact of postmortem interval on blubber total RNA quantity and quality, in samples stored under different conditions. Blubber samples (n=59) were collected over four days from the carcass of a freshly stranded grey seal (*Halichoerus grypus*) stored outside (ambient temperature: 4-10°C). Samples were either: 1) preserved in RNA stabilising buffer for 24 hours and then snap frozen, 2) snap frozen immediately upon collection, or 3), stored at -80°C directly with no prior preservation method. Total RNA was extracted using a standard phenol–chloroform protocol. RNA quantity was measured by spectrophotometry, and quality was assessed by gel electrophoresis and the RNA integrity number (RIN). Our results show that high quality samples (RIN>7) of sufficient quantity for downstream applications were extracted up to 100 hours postmortem. No significant differences were found in RNA yield and quality between the different preservation methods. These results suggest that blubber samples collected postmortem are suitable for downstream molecular applications.

## The role of habitat and prey quality in marine mammal responses to developing offshore wind landscapes

**Philippa Wright**, Katherine Whyte, Cormac Booth, Sophie Smout, Gordon Hastie

*Sea Mammal Research Unit, University of St Andrews*

Harbour seals (*Phoca vitulina*) are key top predators in marine ecosystems, exerting top-down effects on fish communities and food web structures. With the increasing presence of offshore wind farms (OWF) in coastal waters, there is an urgent need to understand how these developments may impact these top predators and their interactions with surrounding ecosystems. Existing research has demonstrated that harbour seals alter their diving and movement behaviour in response to OWF construction, but the nature and magnitude of behavioural responses showed marked variation both within- and between-individuals. It remains unclear how factors such as an individual seal's behavioural state (e.g. foraging or travelling), and the underlying habitat and prey quality, may modify behavioural responses to OWF construction. Importantly, this lack of knowledge limits our ability to understand the nature and consequences of the observed responses, and our ability to predict and manage the effects of OWF developments in new areas. To address these knowledge gaps, this project investigates the effects OWF development on prey quality, and on harbour seal diving behaviour, movements, and energetics. Prey samples are being analysed using bomb calorimetry to determine energetic content (kJ/g) by species and size class. In addition, GPS tag data from wild harbour seals are being analysed to determine the influence of their behavioural state, habitat type, and prey quality, on seal behavioural responses to pile driving, with the aim of developing a series of context-specific dose-response relationships to pile driving sound. The findings from this project will improve our understanding of the underlying mechanisms driving seal responses to OWF developments and will aid in reducing uncertainty in the impact assessment process.

## Our Sponsors

This year we are kindly hosted by the University of Liverpool and sponsored by the University of St Andrews, Company of Biologists, Society for Experimental Biology, Inter-Research Scientific Publisher, SMRU Consulting, and Ocean Science Consulting Ltd. Workshops have been hosted by BDMLR (British Divers Marine Life Rescue), University of Liverpool (School of Veterinary Science) and Cet Law. VIKVAL AB (Whales et al. ART) have sponsored with prizes and illustrations. On behalf of the UKIRSC24 Committee and all the attendees of the UKIRSC24 conference, we would like to thank you for sponsoring the conference and supporting the next generation of researchers.

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<http://www.biologists.com>



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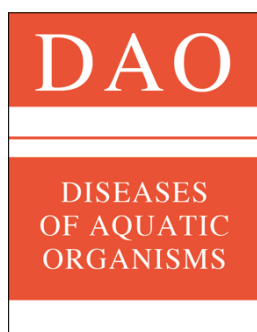
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Diseases of Aquatic Organisms publishes research on all aspects of disease phenomena in aquatic organisms.

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<https://www.smruconsulting.com>



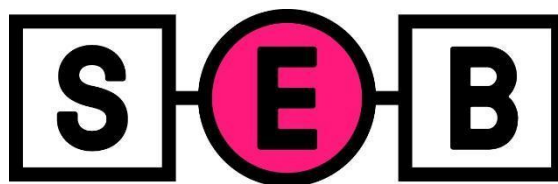
SMRU Consulting is a global leader in marine mammal consulting and research, delivering innovative, robust and environmentally sound solutions to clients active in the marine environment. They work across all marine sectors from wet renewables, civil engineering, infrastructure, oil and gas and decommissioning to government, defence, and scientific research and development where project risks are identified and managed, from pre-consenting consultation through to post-installation monitoring and reporting.

SMRU consulting strives to provide the highest quality service to their clients and focus on the appropriate design, collection and analysis of marine mammal survey data, both for broad site characterization surveys and specific impact assessment.

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## Society for Experimental Biology

<https://www.sebiology.org/>



SOCIETY FOR EXPERIMENTAL BIOLOGY

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They represent and bring together an international community of experimental biologists to support their scientific work, new ideas and experimental techniques, and establish connections between cell, plant, and animal biology.

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## British Divers Marine Life Rescue (BDMLR)

<https://bdmlr.org.uk/>



British Divers Marine Life Rescue (BDMLR) was formed in 1988, when a few like-minded divers got together in response to a mass mortality of common seals in the Wash area of East Anglia, to do what they could for the rescue effort in response to the Phocine Distemper Virus epidemic that resulted in thousands of deaths.

Every year, BDMLR trains over 1000 volunteer Marine Mammal Medics and has 20 whale rescue pontoons located at strategic points throughout the UK, waiting to help stranded whales and dolphins. Medics are trained to provide them with the basic knowledge, skills and expertise to enable our volunteer teams to respond to a callout and act on behalf of that animal's best welfare interests.



## Cet law

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## VIKVAL AB, Whales et al. ART

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Whales et al. ART is a webshop selling scientific water colour illustrations of whales and other aquatic animals, painted by Jasmine Stavenow Jerremalm. The webshop is run by the Swedish registered company VIKVAL AB, founded 2023 and sponsors UKIRSC2024 with prizes for the award ceremony and with illustrations.

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