34th European Cetacean Society Conference
Abstract book

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OUR OCEANS, OUR FUTURE

Marine Mammal Behavioural Ecology & The Sustainable Use of Marine Resources

When talking about sustainability and fair use of marine resources, it is inevitable to address and recognize the importance of a better understanding of the ecology and behaviour of marine mammals and their environment. Like marine mammals, many human communities depend directly or indirectly on marine ecosystems and their biodiversity for their livelihoods. This is the case in Galicia, where fishing and aquaculture are among the most representative economic activities associated with the use of marine resources. Effective management of marine biodiversity conservation is based on science. Likewise, the conservation of marine mammals represents a fundamental field of action to guarantee the balance of marine ecosystems.

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The **Bottlenose Dolphin Research Institute** (BDRI) is a marine science center dedicated to research, education, and conservation of marine mammals. The mission of the BDRI since 2005 has been to study marine biodiversity and to educate scientists, students, decision-makers, and the public on scientific research and how to contribute to marine conservation. BDRI scientists conduct research across a wide range of subject areas such as the link between marine mammals and their environment, cetacean society and population dynamics, the interaction between marine megafauna and human activities, and cetacean behaviour and acoustic communication. Our research team also trains future generations of marine scientists and are committed to understanding and reducing the impact of human activities on the marine ecosystems. BDRI's reputation and success rest solidly on its ability to publish multiple scientific studies in prestigious scientific journals.

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INVITED SPEAKERS

- Bernd Würsig

Marine Mammals, Humans, and Nature

Authors: Bernd Würsig & Giuseppe Notarbartolo di Sciara

Many humans consider marine mammals special. Over millions of years, they adapted for life in water, and as airbreathing warm-blooded animals have made significant compromises of living in disparate physical systems for the furred ones and giving birth underwater for the furless ones. Some have developed echolocation not unlike bats also in a three-dimensional environment, some have developed the largest physical batch-feeding capabilities on Earth. At the same time, and probably largely due to extreme environments full of danger, they are also incredibly social. Some are rather large-brained, behaviorally flexible, and societal, but we do not know much about "intelligences" in them or in us. Many humans - perhaps most in this hall - have empathy for them and see them as powerful indicators of often beleaguered nature. We want to conserve them for physical well-being, but also for psychological health, as there seems little point in maintaining stable populations if survival of individuals requires constant struggle to avoid fishing gear, prey depletion, ship strikes, intolerable noise and chemical intoxication. But as we learn more about intricacies of nature, we may realize that they are no more special than African wild dogs and dung beetles, than mighty oak trees and seedling willows. All of nature is special, as in the concepts of biophilia and “natural goodness”. This is the biocentric view, not at odds with the anthropocentric view of conserving nature for the good of humanity, if we reject the dualist notion that humanity is a separate entity from nature. As we blend the two, we realize that to truly do good for nature does good for humans also, and the better stewards of - in this case - water environments we become (we are not there yet), the better chances marine mammals and all of nature have to thrive.

- **Alex Aguilar**

The business of annihilation: 20th century whaling in the Iberian Peninsula

The northern coast of the Iberian Peninsula was the cradle of whaling and sustained an almost continuous whaling activity for a millennium. During at least 800 years, the Basques chased the right whale in this area and precipitated the extinction of the species in European waters. The 19th century was a period of pause, with limited exploitation by American and English whalers taking modest numbers of sperm whales offshore. However, in 1921 large-scale whaling resumed, this time led by Norwegian and British whalers equipped with modern steamboats and guns. A chain of land and floating factories dotted the front of the Iberian Peninsula, from the Strait of Gibraltar to Galicia including Portugal. This time, the target was the large rorquals and the sperm whale. The mortality that occurred was unprecedented. The figure of 30-40 whales a year caught by traditional whalers jumped to 1,000-1,500 whales a year. This new exploitation never aspired to be sustainable. The intensity of the harvest was intentionally devastating and the factory buildings and machinery were designed to move quickly to a new location once the local whale populations had been wiped out. The behaviour of the companies was a clear reflection of this policy: over the course of half a century, one of them jumped from Norway to Iceland, then to the Hebrides, Spain, Newfoundland, Namibia and finally to the Antarctic Ocean; in none of these locations it stayed for more than five years. As a result, whale populations were decimated in the Iberian Peninsula in just six years, and the first round of activities ceased in 1927. From 1944, timid attempts were made to resume action, but the whale populations were so depleted that all initiatives ended up bankrupt. Only one company managed to remain modestly active in Galicia from 1951 until the arrival in 1985 of the moratorium that meant the definitive liquidation of the activity on the peninsula. More than 35 years later, this history of rampant exploitation has left a legacy from which local populations of whales are still recovering.

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- **Natacha Aguilar de Soto**

Deep Knowledge Needed for Ocean Protection

Deep oceanic waters constitute the largest and most unknown ecosystem of planet Earth. Oceanic communities are vulnerable to impacts derived from encroaching human activities such as deep-sea fishing and mining, marine traffic, etc. Megafauna are key and indicator species, thus, it is essential to learn about their ecological requirements and vulnerability to aid our understanding of oceanic ecosystems. Further, megafauna are often the most direct way to study the deep ecosystem. Here we present a comparative analysis of the acoustic ecology of oceanic megafauna from three taxa of deep diving cetaceans: sperm, pilot and beaked whales. They have evolved to solve the challenges of feeding at depth, communicating and caring for young in very different ways rendering niche diversification. Further, their different way of life modulates their vulnerability and resilience to human impacts. We present results integrating acoustic and movement biologging sensors to describe the foraging ecology, prey selection and hunting tactics of the species. This is analysed in relation to internal factors such as the physiology and ontogenetic stage of the animals, and to external factors such as circadian changes in the distribution of biomass throughout the water column. The later is derived from acoustic probing with echosounders and from the echolocation activity of the whales themselves acting as bio-echosounders. Also, the behaviour of the whales in the context of a soundscape of fear to reduce predation pressure influences their responses to human noise, ranging from apparently null to stress. These responses or the lack of them can render lethal effects such as ship-strikes, mass mortalities related to underwater anthropogenic noise, etc. We need knowledge to design effective mitigation methods, but we also need to apply the precautionary principle given the challenges in quantifying population effects of human impacts on deep sea megafauna.

Scientific Program

ORAL PRESENTATIONS

- Ecology

Where there's a whirl there's a whale: habitat partitioning in mesoscale features

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Niche partitioning reduces competition among species and facilitates their coexistence. In the ocean, mesoscale features such as fronts and eddies represent rich foraging hotspots; differential use of types of mesoscale features may be a mechanism for niche partitioning for species with similar foraging ecologies. Here, we combine satellite-altimetry-derived finite-size Lyapunov exponents (FSLEs) and eddy positions with visual marine mammal surveys to investigate the relationships of six cetacean species with mesoscale features in the Southern California Bight from 2004-2021. We found that blue, fin, and humpback whales showed habitat partitioning through a combination of geographic separation and species-specific preferences for certain mesoscale features. Blue whales showed a preference for FSLEs but no selection for or against eddies; fin whales showed a preference for FSLEs and a preference for cyclonic eddies; for humpback whales we found weak evidence of a preference for FSLEs and a strong preference for areas without eddies. Pacific white-sided dolphins also showed a preference for areas without eddies. Short-beaked common dolphins showed a slight preference for cyclonic eddies in the summer and a weak preference for FSLEs in the fall. Dall's porpoises had a strong association with rare, intense FSLE ridges ≤ -0.2 day-1. These results show that mesoscale features are targeted by several cetacean species in the Southern California Current. Additionally, mesoscale features seem to provide physical structures for habitat partitioning among closely related baleen whales.

Out of Habitat Marine Mammals – Challenges and Solutions

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Globally there appears to have been an increase in marine mammals recorded outside their normal range and habitat. These have been styled 'Out of Habitat' (OOH) animals. The species most concerned include those better know from polar regions, mainly belugas (*Delphinapterus leucas*), walruses (*Odobenus rosmarus*) and leopard seals (*Hydrurga leptonyx*). Several dolphin species have also been involved in OOH events. In some cases the notion that these animals are outside of where they naturally belong may be a perception based on recent distributions rather than historical ones. Many such animals, especially when they come into areas of high human activity, present problems in terms of management, including both high public interest and concern. Examples include cetaceans entering ports or river systems. Some OOH animals have also damaged property and raised concerns about human safety. Responses to these animals have included trying to scare them away, adapting the local situation to encourage them not to haul out where they are not wanted, attempted repatriation and, in at least one instance, lethal removal. There is speculation that the animals may be responding to changes in their environment, for example the distribution of their prey and, for Arctic species, the extent of polar ice habitat. This is arguably supported by studies showing changes in distribution of some marine mammal populations that may be linked to climate change. This presentation will explore this and it may be that as climate change progresses, these incidences of OOH animals will increase. In order to prepare better for these often very difficult situations, we have convened two recent workshops of experts and have widely consulted with others and we will present our main findings. Recommendations include having carefully prepared contingency plans for such events, establishing an international contact list of experts and developing and sharing best practice.

Why did so many common dolphins strand along the French coasts of the Bay of Biscay? From the sky and on the beaches, overview of recent knowledge.

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Since 2016, level of stranded cetaceans reached unprecedented records along the French coasts of the Bay of Biscay (BoB). Mainly observed in winter, these extreme events concerned mostly common dolphins *Delphinus delphis* (90% of strandings); 80% of them with bycatch evidence. Mortality areas inferred from strandings highlighted a shift from southern to northern BoB since 2016. Can this evolution be related to changes in fishing activities or an increase of common dolphin abundance? The aim of this work is to explore these two hypotheses. Aerial surveys dedicated to marine megafauna carried out in French waters in winters 2011-12 and 2021, suggested stability in common dolphin abundance: 164,000 (97,400-278,800) in 2012 and 181,600 (128,600-258,052) in 2021 estimated by Conventional Distance Sampling. Mostly distributed along the continental slope of the BoB and the Celtic Sea in winter 2011-12, their distribution expanded on the shelf and coastal areas of BoB in winter 2021. To understand their winter fine-scale dynamics, aerial surveys were conducted at monthly resolution at regional scale during winter 2020. They highlighted rapid changes of their occurrence within a month. Review of spatial and temporal fishing effort in the Bay of Biscay demonstrated a relative stability of fishing activity at the resolution of regulatory data required under the Common Fisheries Policy. However, recent analysis of fishing practices at individual level suggested changes in fine scale fishing strategies that could also contribute to the increase of bycatch risk. At first glance, changes in common dolphin winter distribution on the continental shelf and short-term dynamics can contribute to an increase in bycatch level in the northern BoB. Further work in modelling the bycatch risk according to the distribution of common dolphins and their preys, bycatch areas, fishing effort and practices, and their relative contribution could significantly improve the understanding of bycatch process.

Identification of cetacean species in multi-purpose surveys using environmental DNA metabarcoding and visual monitoring

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Environmental DNA (eDNA) metabarcoding has recently emerged as a promising method to study the diversity of aquatic vertebrates in marine environments supporting the traditional monitoring. However, only a handful of eDNA studies have evaluated the detection of marine mammal species and compared information obtained from eDNA and visual monitoring methods. In this work, we used eDNA isolated from water samples and MarVer3 metabarcoding primers previously published by Valsecchi et al. (2020) to detect and identify cetacean species. A total of 77 water samples were collected during the PELACUS 2021 survey along the continental shelf waters of the northern and northwestern Iberian Peninsula. Water sampling was conducted every approximately 20 nmi (nautical miles) along the line-transect while marine mammal sightings were recorded with the distance sampling methodology. The results showed that four cetacean species (bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), minke whale (*Balaenoptera acutorostrata*) and Cuvier's beaked whale (*Ziphius cavirostris*) were identified by eDNA and visual methods. In addition, eDNA samples revealed the presence of fin whale (*Balaenoptera physalus*), which was overlooked by visual monitoring. However, long-finned pilot whale (*Globicephala melas*) and striped dolphin (*Stenella coeruleoalba*) were only sighted by observers. These findings support the eDNA analysis as a complementary tool to traditional visual surveys, which are currently the primary method for monitoring the health status of cetacean populations.

Comparative trophic ecology of deep-diving toothed whales

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Deep diving toothed whales evolved to predate on the biggest biomass on Earth in the Deep-Scattering-Layer (DSL) and Benthic-Boundary-Layer (BBL). The behavioural ecology of these more than 20 species of air-breathing predators might include interspecific competition leading to spatial segregation or coexistence. Here we used DTAGs to investigate the vertical foraging niches of 10 Cuvier´s (Zc) and 16 Blainville's (Md) beaked whales, and 27 short-finned pilot (Gm) and 4 sperm (Pm) whales. Pm and Zc were tagged in the Ligurian Sea and Md and Gm were tagged off El Hierro and Tenerife. Depth and altitude above the seafloor of the whales while emitting echolocation clicks and buzzes indicate that: i) The four species mainly hunt in the mesopelagic realm; ii) Zc is the only species routinely targeting the bathypelagic while iii) Gm exploits the migration of the DSL to epipelagic waters to feed at night; iv) all prey on benthopelagic resources although Gm does so rarely. We show that all the studied species have niche overlap, and this is higher during the day than at night. Niche overlap and social structure might explain observations of interspecific agonistic behaviours in species with large body size (Pm) or large group sizes (Gm) that allow them to defend territories, in contrast with the spatial coexistence of species with small group sizes (Md and Zc) in spite of high niche overlap. The reliance of deep diving apex predators on resources of the DSL and BBL means that they would be negatively affected by emergent human activities such as fishing of the DSL or deep-sea mining.

Climate-related changes in marine mammals occupancy and human activities in the Central Arctic Ocean

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A number of species of marine mammals have documented occurrence in the Central Arctic Ocean among which ringed seals, polar bears, narwhals, beluga whales, hooded seals and walruses. The presence in the area of most of these species is seasonal and some, like walrus, are occasional. Others, like bowhead, harp, bearded, ribbon and spotted seals, are mainly present in the marginal ice zone. Seasonally ice-free areas by the Atlantic gateway are visited by cosmopolitan species such as minke, fin, blue and humpback whales while corresponding areas in the Pacific gateway are increasingly visited by grey whales. Climate-related changes in ice cover are not only influencing the spatial distribution and seasonality of the presence of marine mammals but also the range, type and intensity of human activities in the area. In recent years military, scientific, fishing, extractive and tourist activities have intensified, mostly at the periphery of the Arctic, and traffic along the Northern Sea Route and the Northwest Passage has increased significantly. A precautionary, multilateral Agreement to Prevent the Unregulated High Seas Fisheries in the Central Arctic Ocean, signed by 10 nations entered into force in 2021 and is the first of its kind. The Tuvaijuittuq Marine Protected Area off the northwest coast of Ellesmere Island, Nunavut in the Arctic Ocean provides interim protection for a limited number of years. Although relevant policy recommendations for the area are provided by working groups under the Arctic Council and regional organizations, e.g. OSPAR, the region still lacks comprehensive legal instruments for the protection of its biodiversity in rapidly changing environmental conditions. There are also ongoing negotiations that should lead to a new global treaty on the conservation of marine biodiversity in areas beyond national jurisdiction, which would provide the legal basis for designating MAPs in the high seas portion of the CAO.

Disentangling whale diets in the Azores feeding area

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Understanding open ocean food webs is critical for cetacean conservation. Mesopelagic organisms are thought to play an important role as cetacean prey, yet their specific contribution to their diet remains unclear. The major source of dietary data of large cetaceans has widely been the taxonomic identification through visual stomach content analysis of stranded specimens, which are few and potentially not representative of healthy populations. Alternatively, faecal DNA analysis has demonstrated to be a promising non-invasive method for marine mammal ecological studies. Here, we have studied the diet of large cetacean species in the Azores archipelago through faecal DNA metabarcoding. A total of 40 faecal samples of 4 different species (*Balaenoptera musculus*, *Balaenoptera physalus*, *Balaenoptera borealis* and *Physeter macrocephalus*) were opportunistically collected during a 9-year period (2012-2021) around Faial and Pico islands. A multiple-marker approach was developed for amplification of fish and cephalopod DNA, and resulting sequences were analysed for taxonomic composition and relative abundance. Our approach will be key for the study of predator-prey interactions in oceanic islands, such as the Azores archipelago, where organisms of all trophic levels meet and interact. In a context of overfishing and climate change, detailed identification of prey and the location of cetacean feeding grounds is necessary information to promote sustainable use of marine resources and ensure the health of the world cetacean populations.

Hidden gems? A multi-method approach to study the diet of harbour porpoises (*Phocoena phocoena*) in the southern North Sea

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Studies on the foraging ecology of harbour porpoises in the North Sea are scarce and largely outdated. Yet, they are needed for sound species conservation and management. Generally, diet studies are based on classical hard part analysis (HPA). Disadvantages of HPA, e.g., no recoverable hard remains, require the use of additional dietary analysis tools. A new approach in aquatic foraging studies is metabarcoding. One major advantage is that, depending on the primer used, metabarcoding can also target soft-bodied prey species. In addition, stable isotope analysis (SIA) can establish the trophic position and feeding habitat of an animal. This study aimed to elucidate the diet of harbour porpoises in the southern North Sea. Further, by combining the three complimentary methods, it was aimed to establish whether there is a difference in the short (prior to death) and long-term diet of stranded individuals. Here, stomach and intestinal content (HPA and metabarcoding) and muscle samples (SIA) of the same individuals (n=42), collected between 2014–2021, were used to identify prey species. For metabarcoding two 16S primers, for fish and jellyfish respectively, were applied. Preliminary results showed that metabarcoding offered a higher species detection rate than HPA. No jellyfish traces were found in the treated metabarcoding samples (n=25). Based on HPA and metabarcoding most common prey families were Ammodytidae, Gobiidae, Soleidae, Clupeidae and Gadidae. Average delta C13 and N15 values were -17.68 and 17.59, respectively. Whereas HPA and metabarcoding reflect a snapshot of an individual's diet (~48 hours), SIA provides information about the assimilated prey (~three months). To our knowledge, this is the first study combining SIA, HPA and metabarcoding to analyse cetacean diets and the first study applying a 16S jellyfish primer to stomach samples of harbour porpoises. Understanding long-term dietary trends will support harbour porpoise conservation in a changing, anthropogenic-shaped marine environment.

Nutrient concentrations in minke whale faeces and the potential impact on dissolved nutrient pools off Svalbard, Norway

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There is increasing interest in assessing the impact of whales on nutrient and carbon cycling in the ocean. By fertilising surface waters with nutrient-rich faeces, whales may stimulate primary production and thus carbon uptake, but robust assessments of such effects are lacking. Based on the analysis of faeces collected from minke whales (n=31) off Svalbard, Norway, this study quantified the concentration of macro-and micronutrients in whale faeces prior to their release in seawater. Concentrations of the macronutrients nitrogen (N) and phosphorous (P) in minke whale faeces were 50.1 ± 10.3 and 70.9 ± 12.1 g kg-1 dry weight, respectively, while the most important micronutrients were zinc (Zn), iron (Fe), manganese (Mn) and copper (Cu). By combining measured faecal nutrient concentrations with estimated prey-consumption and prey-assimilation rates, we calculate that the current population of approximately 15 000 individuals in the small management area (SMA) of Svalbard defecate daily 7 ± 1.4 tonnes (t) N and 10 ± 1.7 t P during summer. The molar ratio of N:P in minke whale faeces was 1.6:1, meaning that N was proportionally limiting. In case of no N-limitation in surface waters at that time, the release of elemental P through defecation in surface waters has the potential to stimulate 407 ± 70 t of carbon per day during summer as new or regenerated primary production in the SMA of Svalbard. This amounts to 0.2 to 4 % of daily net primary production to this region. This study provides the first assessment of nutrient concentration in whale faeces prior to their dissolution in sea water. Further research, namely on the amount of N released via urine and seasonal changes in excreted nutrients, is needed to better assess the full potential of whale nutrient additions to dissolved nutrient pools in surface waters at regional and global scales.

- **Conservation**

What's happening to the Harbour Porpoise; decreasing abundance across all of Ireland's Special Areas of Conservation (SACs)

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Ireland has three designated coastal SACs with the harbour porpoise listed as a qualifying interest. Since 2007, the National Parks and Wildlife Service (NPWS), has commissioned surveys at these sites as part of their site management and surveillance. These have been dedicated boat-based surveys, using single-platform distance sampling. Typically, surveys are carried out at each of the sites every few years to derive density and abundance estimates from June to September. Density estimates within the Blasket Islands SAC (SW Ireland) have been declining since a peak estimation in 2008 of 1.65 per km^2. A survey in 2014 reported densities of 0.64 harbour porpoise per km^2, a decline of 61% on the 2008 estimate, and similar in 2018 with a further decline of 56%, to an all-time low of 0.08 per km2 in 2022. At Roaringwater Bay and Islands SAC, a similar trend was evident where estimates in 2008 were 1.18 porpoises per km2, peaking in 2015 at 2.02 porpoises per km^2, compared with the most recent in 2020 at 0.61 per km2. At the third site on the East Coast, the Rockabill to Dalkey Island SAC, the density estimate in 2021 (0.83 harbour porpoise per km^2) was 44% of that reported in 2013 and 2016. There is a clear decline in harbour porpoise density at each of these SACs, but the most recent at the Blasket Islands is the most calamitous with a decline of 95% over the 14 years between 2008 and 2022. The drivers of these declines across multiple SACs need to be identified and put into context across the wider population in Irish waters.

Prediction of Potentially Usable Habitat to set the thresholds for Marine Strategy Framework Directive noise descriptors: the QuietMED/QuietSEAS methodology

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Underwater noise is included in the Descriptor 11 for determining the Good Environmental Status (GES) in the European Marine Strategy Framework Directive (MSFD, 2008/56/EC). Considering the criteria and the methodological standards defined in Commission Decision (EU) 2017/848, the Technical Group on Underwater Noise (TG Noise) advice to set the EU Threshold Values for GES assessment regarding both impulsive and continuous underwater noise in terms of a Tolerable Impacted Area (as percentage of the Habitat of interest) within the assessment period, depending on the Level of Onset of Biologically Adverse Effects (LOBE) for the target species of interest. The status of the habitat of interest is characterised as tolerable (which could imply that GES is maintained or achieved in the relevant Marine Reporting Unit) if the tolerable impacted area is not exceeded within the assessment period considered. Within the QUIETMED2 and QUIETSEAS project, a methodological framework was developed for the Mediterranean Sea, following the recommendations by TG Noise, thus allowing to quantify the reduction of potential habitat of the main cetacean species in the Mediterranean Sea respectively induced by impulsive and continuous noise sources. The proposed methodology relies on habitat models, enabling to predict the potential habitat of selected species based on bathymetric characteristics in terms of presence probability, and acoustic propagation models of the considered noise sources. Examples of the methodology application are given for the most frequent cetacean species in the Mediterranean region, considering both impulsive and continuous noise sources. The study also provides elements for defining LOBE for the selected target species, the role of which is critical in setting Threshold Values. The proposed methodology is potentially open to species other than cetaceans for which suitable habitat can be predicted, and it may support the GES assessment and the implementation of effective conservation and management policies to control underwater noise.

Setúbal Deepening: monitoring a major dredging operation in bottlenose dolphin habitat

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The Harbour of Setúbal, on the central west coast of Portugal, conducted a dredging operation to remove about 3,500,000 cubic meters of sediment from the lower part of the Sado estuary, which is also the navigational channel serving the city harbour. The sediment was extracted by trailing suction hopper dredgers, and it was either dumped ashore or deposited in predefined areas offshore or near the river mouth. Our team was appointed to recommend mitigation measures for this operation focused on the bottlenose dolphins resident in the region, to track the dolphin movements and population composition before, during and after the dredging, to monitor their presence near the ships and in the impacted area, and to measure the underwater noise generated by the ships during dredging, transport and deposition of the sediment. Dolphin movements and activities were tracked from two vantage points on land and in dedicated boat trips, during which photo-identification records were obtained. Two known individuals (of 29, initially) have not been seen since december 2020, but no indication exists of any causal relation with the dredging. Dolphin behaviour in relation to the operating dredge was monitored weekly aboard the ships. Dolphins were observed from the ship´s bridge on 13 different occasions, generally at distances over 500 m, and no dangerous interactions were detected. Sound pressure levels were measured at known distances from the dredges, and peak sound pressure estimated at the source was 176 dB re 1 µPa, during dredging, in line with previous reports for this type of operations, and within the SPL range of other large ships sailing the Sado estuary. In sum, no major effects of this harbour operation could be detected in the resident dolphins and their activities, but the long-term monitoring is critical, considering the reduced population size and its age structure.

SPACEWHALE: Using satellite imagery to survey whales in remote areas and thus to enhance conservation efforts

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Monitoring whales using satellite imagery can overcome challenges of traditional survey methods. Ship-based and aerial surveys tend to cover relatively small areas and can be time-consuming, expensive and pose safety risks to surveyors; while acoustic monitoring is difficult to convert into counts of individuals for most species. With satellite, the number and distribution of large whales can be determined quickly and over wide areas, yet at a similar cost to traditional surveys. The method uses very high-resolution satellite imagery with a resolution of 31 cm per pixel. It takes a “snapshot” of the area of interest and has the capability to capture very large and remote areas almost instantaneously. We teamed up a semi-automatic process to evaluate satellite images that combines state-of-the-art artificial intelligence and marine mammal experts’ quality assurance. We can answer key questions about how many whales, which species and when do they inhabit certain areas. Currently, we are conducting a study together with Whale and Dolphin Conversation and with support from Deloitte over an area of 4,000 km² near the Mascarene Islands, with humpback and sperm whales among the qualifying species for this Important Marine Mammal Area. Historically, populations of large whales have declined in all oceans, but many species are now showing signs of recovery. Nevertheless, conservation efforts must continue to provide an early warning mechanism to identify problems and secure the future of whale populations. Our data will, for the first time, be central to evidence presented in support of the designation of Marine Protected Areas. We are at a step where satellite-based data informs applied conservation and provides useful guidance to find solutions that balance species conservation with human use of the seas; it has the potential to elevate conservation efforts to appropriate spatial scales for wide ranging species.

- **Genetics and Evolution**

Fine scale population genomics of the bottlenose dolphin off Western Iberia (northeast Atlantic)

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Bottlenose dolphin (*Tursiops truncatus*) populations sampled across various geographic regions show fine-scale patterns of genetic structure, likely associated with local habitat preferences. Several population genetic studies have focused on populations from the northeast Atlantic Ocean (NEA), very few including the Portuguese coast. This study investigated the population structure and demographic history of the bottlenose dolphin in this region using double digest restriction site associated DNA sequencing (ddRAD-seq). Samples were collected from the Iberian Peninsula including SW Spain, the Portuguese coast (including Sado estuary), NW Spain and from two Portuguese Macaronesian archipelagos, Madeira and Azores (N=110 samples). We genotyped thousands of single nucleotide polymorphisms markers to study the fine-scale population structure, inbreeding levels and demographic history. Bayesian clustering and Principal Component Analyses showed three major genetic clusters: Pelagic (incl. Madeira and Azores; North Galicia, Portugal coast), Southern/Mediterranean (incl. Gibraltar/Cadiz, previously identified as of Mediterranean origin, and Portugal coast), and Resident (Sado and south Galicia). These clusters differ from each other in terms of genetic diversity and inbreeding levels. While the Pelagic and Southern/Med clusters shows high genetic diversity and a wide geographic distribution, the Resident populations show the opposite. The Resident cluster can be subdivided in Galicia and Sado populations, the latter revealing concerning levels of inbreeding. Preliminary demographic analyses suggest that the Resident populations diverged from the others prior to the Southern/Med-Pelagic divergence, although further analyses are needed. Our results suggest that i) the Resident populations of the Iberian Peninsula should be considered as different management units; ii) bottlenose dolphins sampled along the Portuguese coast are highly genetically diverse, including individuals from the three different clusters; and iii) the Sado population faces a critical situation. Within the framework of the recently proposed SACs for bottlenose dolphins in Portugal, these results highlight the importance of discussions on conservation and management policies.

New insights on the critically endangered population of bottlenose dolphins from Sado estuary (Portugal)

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Identifying threatened populations and quantifying their vulnerability is crucial for establishing priorities for conservation and providing robust information for decision-making. Small population size is a fundamental factor increasing the risk of extinction, owing to demographic and genetic stochasticity. When populations become too small, additional threats to stability and persistence arise, which can exacerbate the difficulty of stopping or reversing the decline. The bottlenose dolphin (*Tursiops truncatus*) population inhabiting the Sado estuary region (Portugal) is one of the smallest resident populations of this species in Europe. Dedicated research over the last four decades has revealed year-round long-term site fidelity to the estuary, very low levels of immigration, high calf/juvenile mortality, and an ageing, declining population. In this collaborative study, we update previous information on population dynamics and add important information about the genetic diversity (microsatellites, mtDNA, SNPs markers), inbreeding levels, population structure, and persistent organic pollutants (PCBs, DDTs, PBDEs, and HBCDs) loads. Presently, the Sado population has 25 individuals (10M; 8F; 7 Unknown sex), of which six individuals are more than 40 years old. We found lower genetic diversity, presence of unique maternal lineages, and high levels of relatedness (r>0.412). These animals are genetically differentiated from the other bottlenose dolphins sampled in the area (Iberian Peninsula, Azores and Madeira) suggesting an isolated population. For PCBs, five (62%) animals had concentrations higher than the highest threshold for PCB toxicology (>41mg/kg lipid weight, can cause immunosuppression and/or reproductive impairment) including one calf less than 6 months old. This, together with the fact that this population inhabits one of the most polluted estuaries in Portugal, characterized by multiple sources of contamination and increasing anthropogenic pressures (e.g. dredging, boat traffic, and dolphin-watching activities) highlights the critical situation of this resident bottlenose dolphin population and the urgency to implement stringent and effective conservation measures.

Morphological evolution of cetacean humerus shows functional and phylogenetic signals

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Mammalian humerus shape is strongly predicted by loading and other functional factors. This constraint is lifted for cetaceans; therefore, it could reflect other specific evolutionary trends. For testing this hypothesis we analyzed 3D shape by methods of geometric morphometry (using 499 semilandmarks) for 32 cetacean taxa which included Protocetidae, Basilosauridae, early diverging and crown baleen, and toothed whales. It was shown that the main vector seen in the shape variance is associated with the parallel progressive evolution of diverging baleen and toothed whales. Paleogene and Neogene/modern cetaceans occupy different areas in the morphospace showing the gradual advance of general aquatic adaptation and transition to elaborated aquatic locomotion, with the trends of humeral head twist, diaphysis shortening and straightening, and epiphyses enlargement. Meanwhile, phylogenetic signal is also seen in the morphospace and can be described as developments in the size and position of the humeral head and greater tubercle and diaphysis proportions. Interestingly, patterns of evolution of distal HoxD genes (HoxD8-HoxD11) in cetaceans correspond to their major anatomical transformations and mostly reveal themselves as unique substitutions, insertions and deletions, including highly conservative regions. Some of these genes show relaxed selection in cetaceans as a whole or in certain cetacean clades; others (e.g., HoxD10, HoxD11) even show positive selection in the Delphinidae clade. The highly transformed states of anatomical and genetic traits found in the Delphinidae family that corresponds well to their well-developed swimming adaptations.

Population identity of North Atlantic humpback whales: an ocean-wide analysis of genetic population structure

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North Atlantic (NA) humpback whales (Megaptera novaeangliae) undertake seasonal migrations between high latitude feeding areas (ranging from the US coast to the Barents Sea) and low latitude winter breeding grounds in the Caribbean and the eastern NA (e.g., the Cabo Verde Archipelago). We assessed the genetic structure in the NA analyzing genetic data from ~3,000 humpback whales sampled in 14 different locations across the NA as well as off Gabon, a South Atlantic breeding ground. Each individual was sexed, genotyped at 19 microsatellite loci and the mitochondrial control region (mtCR) was sequenced. Bayesian cluster analyses and fixation indices detected two breeding populations within the NA and an additional population off Gabon. A high degree of genetic divergence was detected among the mtCR sequences between the western and eastern NA high latitude summer feeding areas indicative of long-term maternal site-fidelity to these two regions. Kinship-based analyses revealed the high latitude feeding areas in the NA as the summer destination for individuals wintering in the Cabo Verde Archipelago. There were clear signs of gene flow and introgression into the eastern NA breeding population from the Caribbean breeding population; evident by immigrants from the Caribbean breeding population and admixed individuals. The individuals on the eastern NA breeding grounds with a 100% eastern NA ancestry, all shared the same, unique mtCR haplotype; i.e., all belonging to the same single matrilineal lineage. This maternal lineage is endemic to the eastern NA, highlighting the rarity, and thus endangered, of the eastern NA breeding population. Furthermore, the study uncovered evidence of migration from the Southern to the Northern Hemisphere. Overall, our results provide a comprehensive overview of the population structure of NA humpback whales throughout the ocean basin.

Phenotypes Lost: evolution by loss and the adaptation of Cetacea to aquatic environments

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Cetacea are the iconic poster child of macroevolution. The transition from a terrestrial ancestor into an obligate aquatic mammal, implied a number of striking alterations in the body plan. Secondary modifications and evolutionary novelties in Cetacea species entailed multiple aspects of morphology, behavior and physiology. Among these the hairless skin, the underwater vision and hearing, the energetic nutrient switch, or the increase relative brain size, are some the singular phenotypes of these species. To track the molecular foundations of these morpho-physiological adaptations is a fundamental quest of evolutionary biology. Significantly, the emergence of numerous and high-quality Cetacea genomes has modified our capacity to understand and clarify the origin of these singular phenotypes. Here, we explore the molecular basis of some of these iconic Cetacea phenotypes. By employing a wide array of tools including comparative genomics and functional assays, we show that the gene composition of multiple genetic pathways (e.g. lipid, endocrine, circadian rhythmicity, and energetic metabolism) in marine mammals such as Cetacea is diminished, and parallels the adaptive process of skin, behavior and energy phenotypes. Our findings illustrate that this evolutionary path was accompanied by the remarkable variation of phenotypic traits in association with genomic changes mostly, Gene Loss. Overall, we show that the sophisticated and complex history of highly modified mammalian phenotypes was drastically dependent on gene loss as a key evolutionary driver.

Genomics reveal contrasting patterns of population structure in two cryptic oceanic dolphins (*Lagenorhynchus acutus* and *Lagenorhynchus albirostris*)

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Assessing genetic population structure in cetaceans is important for informing policy concerning the delineation of appropriate management units. Acquisition of representative range wide sample sets and generation of high resolution genomic data, often needed to assess fine scale structure, is difficult. This is especially true in species inhabiting inaccessible regions where logistical challenges and high sampling costs constrain research efforts. The paraphyletic genus *Lagenorhynchus* is currently represented by two species in the North Atlantic Ocean, the Atlantic white-sided (*Lagenorhynchus acutus*; AWSD) and the white beaked dolphin (*Lagenorhynchus albirostris*; WBD). Despite their vulnerability to climate change induced habitat contraction due to their narrow cold water distribution range, the population structure of these two species remains unknown. Here, we acquired range wide sample sets for both species (AWSD n=152, WBD n=226) from strandings and biopsies of free ranging animals. We utilised a combined approach of reduced representation sequencing (DArTseq™), whole genome sequencing, and sequencing of the mitochondrial control region to generate Single Nucleotide Polymorphisms (SNPs) for the inference of population genetic parameters, genetic diversity and individual relatedness. We detect a striking pattern of contrasting population structure between the two species. Bayesian and multivariate analyses show that AWSD exhibits high ocean wide connectivity, whereas WBD exhibits differentiated populations. Current management units for both species are partly in contrast with the results provided here and thus, the results have relevance for the conservation management of both species, highlighting the importance of genetic studies for identifying ecological differences in cryptic species. We recommend further research on species specific ecology, which should be designed based on the detected population structure, to understand how different populations may be impacted by changing environments and anthropogenic threats.

- **New technologies**

Short-term movement patterns of Cuvier's beaked whales Ziphius cavirostris in the Western Mediterranean Sea inferred from telemetry data

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Recent genetic assessments found that Cuvier's beaked whales (*Ziphius cavirostris* G. Cuvier, 1823) inhabiting the Mediterranean Sea are clustered in two different evolutionarily significant units (ESUs). Such ESUs have low genetic diversity and historical demography indicative of population contraction. There are no known links between the two ESUs but movement patterns of this species in the basin have not been investigated. To address this gap, we present telemetry data from tagged Cuvier's beaked whales in the Mediterranean Sea. In summer 2021, eight whales were equipped with satellite-linked tags in the Ligurian Sea (NW Mediterranean). Three animals were tagged with LIMPET SPLASH10-333C satellite-linked depth-recording tags that provided Argos positions, and five animals were tracked using LIMPET SPLASH10-F-333B tags with Fastloc GPS providing highly accurate GPS locations. Deployments ranged from 12.05 to 52.14 days and a total of 2638 Argos locations and 764 FastGPS locations were successfully received. Raw positions were compared with known locations from visual surveys and locations inferred from the signal level of the Argos messages received by a radiogoniometer, to remove outliers. We predicted maximum likelihood locations of each animal at regular 1-hour intervals by fitting a Continuous-Time Correlated Random Walk model to the filtered locations. Total travel distances across individuals ranged from 207 to 2160 km in 12.05 and 52.14 days respectively. The whales travelled approximately 17 to 42 km per day. Each movement strategy adopted by the single individual at multiple temporal scales was investigated using both net squared displacement (NSD) and a discrete-time hidden Markov model (HMM). Finally, kernel density estimation helped to identify high use areas of the tagged individuals. No animal ventured outside the Ligurian sea (maximum net displacement was 60.8 km for the longest-duration tag). This resident movement pattern is consistent with the lack of geneflow between Mediterranean populations.

Fin whale satellite telemetry to enhance place-based conservation efforts and mitigate threats in the North-Western Mediterranean Sea

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The current biodiversity crisis highlights the need to develop effective conservation measures for wildlife. Biologging offers an ideal method for informing management aimed at mitigating anthropogenic pressures on marine species. Here, we analysed satellite telemetry data to assess the movements and behaviour of endangered Mediterranean fin whales *Balaenoptera physalus*, a genetically isolated sub-population, during their regular spring aggregation in Catalan coastal waters. Eight individuals were equipped with Argos satellite transmitters in May 2021 (n = 3) and May 2022 (n = 5), with transmissions lasting 20 ± 8.5 days. Utilisation distributions were calculated to identify Core (50%) and Home (95% isopleths) range areas. A Hidden-Markov Model (HMM) was used to distinguish between two focal behaviours: area-restricted search (ARS; commonly associated with foraging) and transit. Dive profiles for one individual equipped with a depth-sensor were also analysed, as time spent at the surface has implications for ship strike risk. Tagged individuals were consistent in their behaviour across years and spent only ~45% of their time within the recently declared 'Cetacean Migration Corridor' Specially Protected Area of Mediterranean Importance (SPAMI). The HMM revealed that whales split their activity budgets approximately evenly between ARS (47%) and transit (53%). Depth-data recorded deeper dives during the day than the night, probably reflecting the diel vertical migration of their main prey Northern krill Meganyctiphanes norvegica. Our results provide behavioural detail to complement existing long-term survey data, confirming inter-annual consistency in core feeding grounds within the Balearic Sea and Gulf of Lion. As foraging behaviour occurred mostly outside currently protected areas, we propose enhancing conservation actions to mitigate ship strike pressure in an area of exceptionally high boat traffic. Strengthening ongoing transmitter deployments would increase both our understanding of this sub-population and its protection through place-based conservation efforts.

Using UAS-photogrammetry to monitor the age-structure and growth curve of a critically endangered Mediterranean subpopulation of bottlenose dolphins

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Understanding the health status and population demographics of long-lived and slow-reproducing species is critical for their effective management. To inform conservation efforts, early detection of possible impacts of environmental and anthropogenic stressors on vital rates (e.g., fertility, survival) may aid in forecasting changes in population dynamics. However, it can take decades to detect population-level effects of perturbation using traditional monitoring approaches. Hence, having the ability to readily detect changes in biologically important parameters may provide an early warning of future trends in population dynamics. We used Unoccupied Aerial System-(UAS) photogrammetry to monitor the critically endangered Bottlenose Dolphin (*Tursiops truncatus*) subpopulation of the semi-enclosed Gulf of Ambracia in western Greece. UAS-based videos and boat-based photo-identification photographs of dolphins were collected for two one-week-long campaigns conducted in August 2021 and July 2022. A total of 10 days at sea, resulted in 149 identified individuals measured via UAS-photogrammetry methods, with 47 of those measured in both years, including 14 calves and juveniles. This work will present the results obtained from these measurements. First, we will calculate UAS-estimates of the dolphin’s total body length (TL). This will be done either directly, when individuals displayed a full body length, or indirectly, by using the distance between the blowhole and the anterior of the dorsal fin, exposed when surfacing. Then, we will develop the first age-length growth curve for this population and assess its age-structure combining UAS-estimates of TL and the known age of these individuals. Finally, we will attempt to detect pregnancy stages for the females sampled during Summer, using known or estimated dates of birth during Fall. Our work indicates that UAS-photogrammetry has the potential to be a powerful approach to readily and remotely monitor demographic parameters of free-ranging populations, particularly when traditional approaches may not be available.

Using neural network to determine the variation in the dorsal fin's morphology within Killer whale ecotypes

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In the northwestern Pacific Ocean, there are two ecotypes of killer whales: residents (fish-eaters) and transients (marine-mammal eaters). All prior efforts to distinguish between them morphologically were limited to descriptive variations. In the present study, both ecotypes' images were classified by machine learning (neural network). A total of 1084 images have been selected from photo-identification studies over 15 years off Eastern Kamchatka and the Commander Islands. Image processing (rotating, aligning, and cropping) was performed manually before their loading into the model. The model was based on transfer learning of the MobileNetV2 in Edge Impulse environment. The Edge Impulse platform was used for training and testing machine learning algorithms. During testing, the model had an accuracy of 91.12% where residents' classification had 89.6 % accuracy with 6.6% error and 3.8% uncertain while Transients' classification had 92.6 % accuracy with 3.7% error and 3.7% uncertain. Those results indicate that the neural network can learn to differentiate ecotypes even on this small dataset and this can be applied to differentiate killer whale ecotypes even with a small-scale dataset, which emphasizes their long-term reproductive isolation. Furthermore, machine learning can be used as another tool for assessing population variation and recognition of ecological and evolutionary processes in living cetaceans.

Parentage, polygamy, and reproductive success in beluga whales from Bristol Bay, Alaska

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Understanding mating systems and reproductive strategies of cetaceans is critical for discerning evolutionary processes including sexual selection, the emergence of culture, and menopause. Additionally, it is important for developing effective conservation strategies for endangered species and populations affected by climate change. The mating systems and breeding behavior of cetaceans, however, are still largely a mystery. Their aquatic and mobile mode of life creates unique challenges for scientific investigations, especially for species that live in large, remote, ice-covered regions like the Arctic and sub-Arctic, where there is little infrastructure to support research. We investigated mating systems in a small population (< 2,000) of beluga whales (*Delphinapterus leucas*) in Bristol Bay, Alaska, using genetic techniques in concert with a decade-long biopsy sampling program conducted in partnership with local communities. We screened samples from 800 individuals for 22 microsatellite markers and 510bp of the mtDNA genome. Sex was identified via PCR, age class estimated via body color, grouping patterns and behavioral activity were assessed in the field at time of sampling. Variance in reproductive success was detected in both males and females, within and across years. Polygamy was detected in both sexes. We identified full siblings but did not find substantial evidence of mate fidelity in either sex. We detected half-sibships that formed into extended 'loose' pedigrees connecting many individuals. Estimated effective population size, Ne, was much smaller than census size, Nc, but we did not find evidence for substantial inbreeding. These findings are among the first for beluga whales and reflect a combination of reproductive strategies in this species that increase fitness and decrease risk, even in small populations, by maximizing mate choice and minimizing inbreeding.

Exploring the relation between habitat and reproductive success in wild common bottlenose dolphins (*Tursiops truncatus*)

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Identifying variation in interbirth interval, weaning age and reproductive seasonality is essential to increase knowledge about female reproductive success in long-lived mammals. While variability in reproductive success between populations has been accounted for habitat differences, relatively few studies have focused on this topic. Here, we used life history data of two populations of wild common bottlenose dolphins (*Tursiops truncatus*) from two 9-year field studies to examine whether habitat was related to female reproductive success. Particularly, we investigated the variation in interbirth interval, weaning age and reproductive seasonality within and between these populations living in different habitats (Galicia, NE Atlantic: highly productive waters; Sardinia, Mediterranean Sea: oligotrophic waters). Our results indicated that reproductive seasonality was similar for both populations (birth season started in June and ended in September, with a peak in July and August). Findings highlighted that Atlantic bottlenose dolphin calves were weaned at an earlier age when compared to Mediterranean bottlenose dolphins. Variation in weaning age is likely related to food availability and therefore to mothers' reproductive ability. In both populations, weaning mostly occurred at the end of the pregnancy and the loss of an infant significantly shortened the interbirth interval. Survival analyses revealed a significant difference in the median interbirth intervals and weaning age, Atlantic bottlenose dolphins exhibiting shorter interbirth intervals than Mediterranean bottlenose dolphins. This comparative pattern may reflect differences in food availability between the two study areas. These findings provide valuable insight into the reproductive success of bottlenose dolphins and its relation with habitat characteristics.

A gaze into the abyss: sperm whales echolocating behaviour during the descent phase

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Sperm whales are known for producing powerful clicks that allow them to echolocate mesopelagic prey at long ranges in the darkness of the deep ocean, during long and deep dives. However, sperm whales sometimes switch from pelagic to benthic or benthopelagic foraging at or near the highly reflective seafloor, raising the question of how the most powerful biosonar system in the world is operated in such a highly reverberant environment. We hypothesized that sperm whales foraging near the seafloor produce faster but weaker echolocation clicks. Using data from DTAGs deployed on seven sperm whales from populations in the Mediterranean Sea and the Gulf of Mexico, we compared echolocation sound production in the descent and bottom phase of benthic (n=23) and pelagic (n=19) dives. During descents, whales employed around 3 dB weaker apparent output levels (AOL) and 0.2 s shorter inter-click-intervals (ICIs) in benthic dives compared to pelagic dives, consistent with a shorter acoustic scene ending at the seafloor. Furthermore, whales gradually reduced ICI and AOL during benthic descents, likely to reduce backward masking from the seafloor. In comparison, AOL adjustment showed fewer stepped slopes in pelagic dives. Surprisingly, we observed no biosonar adjustments in the bottom phase of benthic dives. Instead, the whales spent a 12.3% longer time swimming horizontally upside-down during the benthic dives. As the hearing of sperm whales is located in their lower jaw, the large body of the whale likely blocks returning echoes from the seafloor, thereby allowing for a long-range biosonar strategy while swimming upside-down. Hence, sperm whales employ contextual adjustments of their biosonar sampling scheme, acoustic gaze, and body orientation to facilitate prey search and capture in different foraging habitats.

Grouping dynamics of mother-calf pairs of common dolphins in the South coast of Portugal

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Grouping dynamics for mothers are influenced by a trade-off between the protection of their infant from predation, male harassment, and reduction of scramble competition. We used an unmanned aerial vehicle to assess the grouping dynamics in common dolphin (*Delphinus delphis*) parties containing mother-calf (MC) pairs to address these hypotheses. We estimated: (i) the effect of party size, cohesion and month on calf proportion using Generalised Additive Mixed Models (GAMMs), as well as the effect of party size and calf proportion on the number of socio-sexual events, (ii) the effect of calf distance to the nearest neighbour (NN) and socio-sexual behaviour on calf distance to the mother, and (iii) the effect of party size and cohesion on the calf distance to its NN. Additionally, we modelled party formation using multinomial Generalised Estimating Equations. Nursery groups corresponded to 43.6% of all observations. Calf proportion was higher in very compact parties and in parties of 10 to 20 individuals, but decreased as parties became larger. The frequency of socio-sexual behaviours increased in larger parties and decreased in parties with a higher calf proportion. Calf distance to NN decreased with increasing party size and cohesion. With a higher proportion of calves, scatter formation was less frequent when compared to parallel formation. Pack formation was less common as cohesion decreased when compared to parties in parallel formation and very compact. The NN of a calf was mainly a non-mother (56.3%) followed by another MC pair (43.7%). Calves showed a preference for being in the front centre of the party. Maternal strategies and the presence of MC pairs play a crucial role in the grouping dynamics of common dolphins in the South of Portugal. Our results offer strong support for the predation and infant safety hypotheses and partial support for the scramble competition hypothesis.

Decision-making in a different dimension: the challenges of aquatic mammals when making collective decisions

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Collective decision-making is an essential part of day-to-day life for group-living mammals, but the processes through which groups arrive at a decision is poorly understood in many species. These decisions can be unshared (e.g., leadership) or shared (e.g., consensus). Aquatic mammals face particular challenges when making collective decisions, including a three-dimensional habitat that can make group navigation and coordination a challenge. We systematically reviewed literature about decision-making in non-human mammals by examining the types of collective decisions observed and hypotheses used to structure analyses. Most of the current literature was centred around terrestrial species, particularly within primates and artiodactyls. However, both unshared and shared decision-making was reported in aquatic mammals, with leadership found in killer whales Orcinus orca and bottlenose dolphins Tursiops sp. and consensus decisions in sperm whales Physeter macrocephalus. Five recommendations for future decision-making studies include: 1) delineating the temporal components of a study; 2) designing research for comparisons; 3) examining hypotheses for both shared and unshared decision-making; 4) studying decision-making across behavioural contexts; and 5) moving away from anthropomorphized terminology. Future research and intraspecies comparisons of collective decision-making will help us better understand how non-human mammals overcome environmental and contextual challenges – particularly in the case of aquatic species such as cetaceans, who face different challenges related to their aquatic environment and exhibit phenomena such as mass strandings.

Migratory behaviour of Atlantic baleen whales in a changing world

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Migratory behaviour in the great whales has evolved in response to spatially segregated selection pressures. Selection for good metabolic condition has led to whales feeding on dense aggregations of nutrient-rich prey in high latitude, cold-water habitats. However, selection for reproductive success has favoured warmer, oligotrophic habitats at lower latitudes. Using two case studies, southwest Atlantic humpback whales and northeast Atlantic Balaenopterid whales, we discuss some of the implications of this behaviour in a changing world. Humpback whales breeding in Brazilian coastal habitats during the austral winter, synchronously migrate to the South Sandwich Islands and South Georgia region where hitherto predictable concentrations of Antarctic krill occur in summer, and rapidly accumulate lipids in blubber. On return to breeding habitats they are thought to feed little and this population therefore largely conforms to the conventional paradigm of an annual cycle of feasting in summer, fasting in winter. In the northeast Atlantic however, sei and blue whales migrate to highly productive upwelling systems off northwest Africa in winter and we summarise new and published evidence for their feeding in these habitats. We raise the question to what extent this has always been the case, or has winter feeding increased in these populations in response to recent changes in Arctic ecosystems. If the latter is the case, we argue that it may impact fecundity, mediated by physiological processes involving the hormones leptin and ghrelin, and recommend that further studies should include monitoring the levels of these hormones as indicators of metabolic condition. We conclude that a global approach is needed to better understand the ecology of migratory whales and the pressures they face through their migratory cycles, in order to contribute to effective conservation planning.

- **Modelling**

Estimating bycatch at regional scale in the MFSD context: Adapting carcass drift modelling to common dolphins in the Iberian Peninsula

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Strandings of common dolphins (*Delphinus delphis*) with bycatch evidence have been increasing in recent years along southern Atlantic European coasts. From these strandings, it is possible to infer likely mortality areas of bycaught common dolphins by using a drift modelling approach. The drift prediction model (MOTHY) requires several physical parameters (atmospheric predictions or currents) and biological variables (e.g. drift duration and buoyancy). First, this method allows the likely at-sea origin of the stranded carcasses to be predicted. They are then weighted by the probability that dead cetaceans dying in specific area reach the coast, named stranding probability. Finally, the last correction remains the proportion of floating dolphins, estimated at 24% (IC95% [17% - 32%]) in the Bay of Biscay, and allows to infer bycatch estimates. Used as a national indicator for French Good Environmental Status evaluation under the Marine Strategy Framework Directive (MSFD), this method has been adapted to the west coast of the Iberian Peninsula in the framework of the CETAMBICION project. Bycaught dead dolphins tagged on fishing vessels, released at sea and recovered along the Galician coasts allowed to select the model with the most realistic trajectory prediction, and appropriate physical parameters. Stranded bycaught dolphins originated mostly from the continental shelf, especially between Northern Portugal and Southern Galicia (50% of stranding). In winter, the origin of stranded dolphins expanded up to 240 km beyond the continental shelf whereas they remained very coastal during summer months. The stranding probability was maximum (up to 80%) in the north of Portugal and Galicia, and the lowest in southern Portuguese waters (close to 10%). These probabilities could explain the highest number of stranding originated from this area. These steps will allow the evaluation of total bycatch mortalities that could be compared to the sustainable threshold for the population under the MSFD.

S.T.R.E.S.S. - Statistical Toxicological Risk Elaboration System in Stenella coeruleoalba: which is the potential hazard associated with organochlorines in the Mediterranean subpopulation?

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The levels of organochlorine compounds (OCs) reported in the tissues of cetacean species from the Mediterranean Sea are still elevated based on common cetacean toxicological thresholds. Increasing evidence suggests impacts on their health linked to the bioaccumulation of high concentrations of these substances. Most research so far has concentrated on determining the OC loads in marine mammal populations, but further effort is needed to assess the ecotoxicological hazard due to these contaminants. In this study, data regarding the toxicological status related to PCB, DDT, and HCB levels in stranded (n=166) and free-ranging (n=260) specimens of Mediterranean striped dolphins (*Stenella coeruleoalba*), collected over the last three decades (1985-2016), have been reviewed. A statistical approach named S.T.R.E.S.S. (Statistical Toxicological Risk Elaboration System in *Stenella coeruleoalba*) was developed to evaluate the potential hazard associated with OCs in this subpopulation. Five theoretical toxicological models were formulated considering live specimens in good health as control population and comparing them to stranded individuals. Findings seem to suggest a greater degree of toxicological stress due to OCs in cetaceans inhabiting the Ligurian Sea, the heart of the Pelagos Sanctuary, compared to specimens living in other Italian coastal areas. Considering the OC immunosuppressive potential, S.T.R.E.S.S. may represent a valuable tool to identify any possible correlations between the high levels of chlorinated xenobiotics and a greater susceptibility of animals to disease. Ultimately, the proposed models may be beneficial for continuing surveillance of the toxicological health status of this subpopulation and of the entire Mediterranean ecosystem to promote management measures for biodiversity conservation.

Population viability analysis for harbour porpoise and common dolphin in the Iberian Peninsula, incorporating fishery bycatch mortality and expected effects of PCB bioaccumulation on individual fecundity

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Population viability analysis offers a means to examine the expected trajectories of populations and explore the consequences of conservation management measures. Common dolphin and harbour porpoise are among the most frequently seen cetaceans along the Atlantic coast of the Iberian Peninsula. Both species are known to suffer significant fishery bycatch mortality and to have high concentrations of PCBs in their blubber, although there is also high between-individual variability. Stochastic population models were constructed using the best available mortality rate data derived from strandings for the Iberian Peninsula. Empirical data on PCB concentrations in blubber versus age in males and in neonates were used to derive plausible initial PCB burdens and annual rates of PCB intake. The plausibility of these estimates was checked, comparing them respectively with estimates derived from expected daily food intake and PCB concentrations in fish, and published estimates of maternal transfer of PCBs from female dolphins to their calves. Individual fecundity was initially set to the maximum plausible value of 1.0 (100% of reproduction probability) prior to accounting for effects of PCBs, assuming a linear decline in fecundity between the lower threshold for onset of reproductive effects and the upper threshold for infertility based on published values. Population level fecundity was then a function of age at maturity and population age structure, which was initially set to a plausible distribution based on strandings data, adjusted for underrepresentation of the youngest animals. Results indicate a high likelihood of extinction within a few decades in the case of the small Iberian porpoise population while the Iberian portion of the Northeast Atlantic common dolphin population shows different trajectories depending mainly in the amount of bycatch events.

Forecasting climate-induced distribution shifts in the sexually dimorphic Antarctic fur seal

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Predicting the consequences of global warming in the distribution of sexually dimorphic species is particularly challenging, because males and females may differ in their patterns of habitat use. The Antarctic fur seal Arctocephalus gazella is a highly dimorphic species and a major consumer of Antarctic krill off West Antarctica, but nothing is known about its response to future global warming scenarios. Here, we used satellite tracking data from individuals of both sexes and outputs from four Earth System Models to develop species distribution models and predict changes in habitat suitability for each sex in two climate forcing scenarios (SSP1-2.6 and SSP5-8.5) all the way to 2100. Our results indicate that the suitable habitats for both sexes during the non-breeding period (i.e. winter months) will displace southward, as expected, but the extent of habitat loss will be much larger for females than for males. This is because warming will create new patches of suitable habitat for males close to the sea ice limit in the Bellingshausen and Weddell Sea. Furthermore, female distribution during the breeding season will not change, as they are central place foragers at that time of the year and distance to the colony is the main determinant of their habitat use pattern in summer. This suggests that global warming might have a neutral or slightly negative effect on male Antarctic fur seals but a strong negative impact on females, because of reduced habitat availability in winter and decreased food availability in their summer foraging grounds, unless they colonize and start breeding in new ice-free beaches in southern locations. However, the high philopatry of females might limit such adaptability.

- **Health**

Allocation and use of body energy reservoirs in striped dolphins (*Stenella coeruleoalba*) and Blainville's beaked whales (*Mesoplodon densirostris*): the snowball effect in negative energetic balances.

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Climate change, overfishing, and other human activities can temporarily or permanently change prey abundance and distribution and energy density. This can negatively impact the energetic balance of cetaceans by reducing their energy intake. While these changes occur, cetaceans must continue to meet their energy needs for thermoregulation, locomotion, etc. Meeting these demands in the marine environment is more challenging, given the physical properties of water compared to air and the paradox of breathing atmospheric air while feeding underwater. The resilience of cetaceans to negative energy balance periods is unknown. In this study, we analyzed where striped dolphins, a medium-sized dolphin of shallow-intermediate diving habitats, and Blainville's beaked whales, a larger odontocete with an extreme diving profile, store their energy reserves and how they use that energy. To accomplish this, we performed mass dissections of fresh dead adults of similar total body lengths but with different body masses. We determined the lipid and protein content of blubber and skeletal muscle and converted it to kcal. We also calculated oxygen stores and the aerobic dive limit. Our results indicate that skeletal muscle proteins were the largest energy storage for both species, followed by lipids in the blubber and skeletal muscle. Both species used these energy storages simultaneously when losing body mass, although the striped dolphins preferentially used the energy stored in the blubber compared to Blainville's beaked whales. We suggest that cetaceans most likely use the energy stored in the skeletal muscle and blubber simultaneously not to impair the ancillary functions of either. When impaired, it may result in a cascade of increased metabolic field and decreased energy intake, decreasing their resilience to adapt to environmental changes or disturbances, making them more susceptible to infectious and parasitic diseases, and ultimately resulting in death by starvation.

Are *Kogia* sp. whales hiding a secret concerning anisakid biodiversity?

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Anisakid nematodes are a ubiquitous taxon of marine mammal parasites, with complex life cycles also involving invertebrates and fish. Studies investigating the biodiversity of Anisakis species in various cetacean hosts showed a clear pattern of host preference of anisakid species at cetacean family level, as result of co-evolutionary processes between these parasites and their hosts. However, anisakid biodiversity and parasite/host associations in kogiid whales remain unclear. To date, mature adults of A. brevispiculata, A. paggiae, A. physeteris, Pseudoterranova ceticola, and P. kogiae, have been reported in Kogia breviceps and K. sima. The present study investigated the anisakid biodiversity in stranded specimens of K. breviceps from the NE Atlantic Ocean. Adult nematodes from eight individuals of pygmy sperm whale K. breviceps from the Galician coast (NW Spain) and a single specimen from Scottish waters were characterized based on mtDNA cox2 and ITS rDNA sequences. Anisakis brevispiculata, A. paggiae, P. ceticola, and an undescribed genotype (likely P. kogiae) were identified, often co-infecting the same individual host. A. simplex (s.s.) and A. pegreffii were also found, mostly as immature adults, probably reflecting their low fitness in this cetacean species. The findings indicate that K. breviceps hosts a diverse and peculiar assemblage of anisakid nematodes, thus representing an important definitive host for these parasite species, maintaining anisakid biodiversity in the mesopelagic/deep-sea food web. The association between these anisakid parasites and their kogiid hosts may reflect a long co-evolutionary history, driven by common trophic adaptation, most likely connected to the mesopelagic or deep-sea realm. In this context, kogiids species could help to shed light on the evolutionary radiation of these cosmopolitan anisakids within their marine mammal hosts, while their parasites could whisper us some clues on their mysterious hosts.

Natural selection in cetacean species immunogenome in relation to Morbillivirus exposure

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The Cetacean morbillivirus (CeMV) is a marine mammal pathogen responsible for multiple well known epizootics worldwide, and a contributing factor in the decline of some cetacean populations. Differences in disease outcome between cetacean species, ranging from isolated cases to high mortality epizootics, suggests disease resistance could be influenced by adaptive mechanisms. Adaptations in immune response to the virus through natural selection then could be detected from specific patterns in cetacean immunogenomes. In this study, we integrate genomic information with known patterns of Morbillivirus susceptibility in different cetacean host species, to identify candidate genes involved in determining different pathogenesis to this disease.
We first retrieved full genome sequences of 35 cetacean species from publicly available databases. Exon sequences of 1622 genes with known function in immune system were then retrieved from each cetacean genome and aligned using a custom pipeline. The sequence alignments were then tested for signals of natural selection using model-based dN/dS method. We identified 208 Genes showing signatures of natural selection, which showed over-representation in functional pathways related to response against respiratory diseases, neurophysiology and actin cytoskeleton physiology. Branch-site tests of natural selection revealed multiple genes under species-specific selection in species with past Morbillivirus epizootics, most frequently in *Globicephala melas*. These results are consistent with the hypothesis that differences in cetacean susceptibility to CeMV contain a genetic component. We also identify a potentially relevant mechanism not previously associated with CeMV resistance in cetaceans Our study shows that genetic analyses of host species can bring more clarity to the evolutionary history of CeMV infections in cetaceans, as well as potential mechanisms of adaptive response in different species.

Molecular biomarkers to evaluate the exposure to emerging contaminants in fin whale and striped dolphin from the North-Western Mediterranean Sea

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The fin whale (*Balaenoptera physalus*) and striped dolphin (*Stenella coeruleoalba*) living in the North-western Mediterranean Sea share an habitat subject to numerous threats of anthropogenic nature, including legacy and emerging contaminants. Being long-living, top predator species and species of ecological importance, it is necessary to evaluate the health status of wild populations. Molecular biomarkers based on the quantification of mRNA levels, as early warning signals, have been evaluated on skin biopsies of free-ranging fin whales (n=17) and striped dolphins (n=22) in the Pelagos Sanctuary (NW Mediterranean Sea). A set of genes involved in different biological processes, from energy metabolism alteration (e.g. FABP4, THRa, THRb, GR, PPARA) to exposure to endocrine disruptors and emerging contaminants (e.g. AhR, CYP1a, ER1, PPARG) have been evaluated by droplet digital PCR (ddPCR). The expression of the target genes has been analyzed to evaluate the interspecific differences in the response to stress, the intersexual differences due to the different ability of accumulating contaminants in males and females and according to the levels of phthalate esters (PAEs) measured in the blubber of the same individuals. The results show different expression profiles in the two species, different pattern of accumulation of PAEs (higher in the striped dolphin than in fin whale) and the up- and down regulation of specific target genes involved in multiple biological functions. This study underline the need to evaluate a multiple set of diagnostic signal to have a more comprehensive picture and early warnings of the exposure to anthropogenic stress of cetacean wild populations.

Histological Assessment of Harbour Porpoise Ovaries; Insights into Lifetime Reproductive Output

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Reproduction is undeniably key to species survival, and often the main driver for population dynamics of slow-growing taxa. Reproductive rates display higher temporal fluctuations than most other demographic parameters, and monitoring trends in reproductive fitness can provide timely indications for population change. Current assessments of reproductive fitness of cetaceans are limited to calculations of pregnancy rates, which are a summation of stranding network's total datasets, and non-informative regarding an individual's reproductive history. Evaluation of corpora scars on ovaries collected at post-mortem can provide an alternative metric that is representative of a longer timeframe. Following ovulation, a corpus luteum is formed on the ovary which disintegrates into a persisting scar: the corpus albicans (CA). There is however considerable uncertainty regarding the length of time CAs can be observed, and their potential use for analysis of conception history has not been examined in detail to date. Here we report the findings of a pilot study of harbour porpoises, providing insight into the added value of histological assessment of ovarian tissues by utilisation of CA counts and other microscopic observations, for estimations of an individual's lifetime reproductive output. Ovaries from 20 adults stranded on the UK coastline were assessed macroscopically, before they were processed for histology, semi-serially sectioned, stained with haematoxylin and eosin and Masson's trichrome (to highlight collagen fibres), and subjected to histological assessment. These data were added to other life history parameters (including number of reproductively active years) to develop a likelihood distribution function of lifetime reproductive success for each female under the observed circumstances. We found variation between females and cell structures around the CA, indicative of breeding attempts over varied timeframes. We discuss the relevance of utilising this method as an indicator for reproductive fitness, and the significance of these initial findings for population health monitoring in the future.

First steps towards developing a welfare assessment framework for stranded cetaceans

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Live cetaceans strandings often involve compromised individuals. A lack of empirical data informing response procedures, risks inappropriate interventions occurring. This is a major concern for cetacean welfare and requires the development of optimal response procedures. An understanding of the key concerns and identification of feasible indicators to assess impacts is required. We solicited the opinions of international, interdisciplinary experts (n=63) using a two stage Delphi method to identify key concerns, and potentially valuable and practical indicators. Results highlighted inextricable links between stranded cetacean welfare and survival likelihood, with key concerns for both including difficulty breathing, organ compression, skin damage, physical trauma, separation from conspecifics, and "stress" which animals may experience due to stranding and human intervention. Indicators identified by experts to be both valuable and practical for assessing stranded cetacean welfare and survival likelihood included animal-based indices of body and skin condition, evidence of physical trauma, respiration rate and various behaviours. Resource-/management-based indicators related primarily to human intervention and should be correlated with animal-based indices to provide relevant evaluations. Next, we identified and evaluated indicators from video of live stranded cetaceans (n=53), which identified several animal- and resource-/management-based indicators to be feasible. We provide the first identification and characterisation of stranded odontocete behaviour (n=30) and human intervention types (n=13). Collectively, our research provides novel, baseline welfare-centric data required to develop a stranding specific welfare assessment framework that can be integrated within conservation management. Further data collection and correlation among multiple measures, known stranding outcomes and pathology is recommended to scientifically validate these indicators. We call for an increase in welfare-centric data collection at strandings to enable robust animal assessments and welfare-informed decision-making.

Estimating demographic parameters for a Bahamian population of melon-headed whales (*Peponocephala electra*) on a US Navy testing range

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Identifying demographic changes is paramount to understand population dynamics, particularly for places where human activities may disturb populations. Demographic parameters such as population trends, estimates of population sizes, survival and recruitment rates are some of the most used to support effective management and conservation strategies. Mark-recapture models were implemented using photo-identification data of melon-headed whales (*Peponocephala electra*), gathered between 2009 and 2015 at the US Navy's Atlantic Undersea Test and Evaluation Center (AUTEC), in The Bahamas. Population models were fitted to estimate abundance, survival, recruitment and capture probabilities and implemented in a Bayesian framework via Markov Chain Monte Carlo (MCMC). During six years, a total of 410 distinctive individuals were photographed with resights ranging from one to six times. The results suggest a decline in the population size, which might be linked to low recruitment rates over time. Estimates suggest that 558 (95% CRI = 547.00 – 561.00) individuals used the studied area at least once, during the course of the study. Estimates of mean survival were 0.81 (95% CRI = 0.48 - 0.98) and capture probability was 0.36 (95% CRI = 0.33 – 0.41). This work suggests a seasonal open population with an occupation range that extends beyond the AUTEC range. Resighting data implies a regular use of the area in the spring/summer period. This study establishes baseline estimates of abundance, survival and recruitment rates for melon-headed whales inhabiting the AUTEC range, and highlights the importance of multi-year surveys to reliably assess demographic parameters. Knowledge on melon-headed whales is sparse and future studies are key features to develop our understanding of this species.

Winter and summer cetacean distribution and relative abundance in Irish waters with data obtained from aerial surveys

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Aerial surveys are an efficient method to collect data on marine megafauna, particularly suited for offshore areas, and have been widely used to estimate cetacean abundance and distribution. The ObSERVE project aims to expand our understanding of marine megafauna within Ireland's EEZ (approx. 450,000 km2). Aerial surveys were conducted from a fixed wing aircraft, recording all cetaceans within 500m either side of the aircraft in four summers and three winter seasons (summer 2015, 2016, 2021 and 2022, and winter 2015, 2016 and 2022). Approximately 68,000 km of survey transects were conducted with between 290 and 656 sightings recorded in each survey season. In total, 19 species (15 odontocetes and four mysticetes) were recorded. Common dolphins (26.86% of the sightings), bottlenose dolphins (22.91%), and harbour porpoises (13.89%) were the most frequently recorded species. Encounter rate (ER, sightings/km) and relative abundance (RA, individuals/km2) in a 50x50 km grid were calculated for each survey season for bottlenose, common and Risso's dolphins, harbour porpoises, minke whales, large whales (fin, sei and humpback), beaked whales (Cuvier's, Sowerby's and Northern bottlenose) and long-finned pilot whales. Seasonal differences were recorded for many species, with some species being most frequently recorded in winter than summer and at higher densities, for example, bottlenose dolphin (mean ER: summer = 0.0055, winter = 0.0197; large whales (mean ER: summer = 0.0007, winter = 0.0025), whereas Risso's dolphin ((mean ER: summer = 0.001, winter = 0.0002) and common dolphin (mean ER: summer = 0.0147, winter = 0.0059) were more frequently encountered in summer. However, these four species/groups also showed marked interannual variation in ER and RA. This study suggests seasonal and interannual differences in distribution and relative abundance for different species of cetaceans within Ireland's EEZ and highlights the need for frequent robust estimates to detect trends in distribution and abundance.

Testing methodologies for range/habitat assessment of three low density cetacean species in the Mediterranean Sea

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Despite the legislative framework, 78% of cetacean species are in 'unknown' conservation status under the EU Habitat Directive, mostly due to lack of data and standard methodological approaches for assessment. The Life CONCEPTU MARIS contributes to fill information gaps and identify appropriate indicators/methodological approaches for species status assessment. Using the dataset collected within the FLT-MedNet program since 2007 (nearly 7,500 sightings; 500,000 km of effort) this project aims at testing methodologies for range/habitat assessment of three low-density/elusive species (*G.griseus*, *G.melas*, *Z.cavirostris*). Firstly, different SDM approaches (GLM, GAM, GAM-nb, GAM-tw, MaxEnt, RF) were tested (296 records) and validated also through independent dataset (i.e., ORCA, ASI-ACCOBAMS, Ketos-Marecamp, 145 records). Then, the best performing model (i.e., Maxent), was used to assess short-term trends over two 6-years periods (2013-2019/2008-2012), testing four potential indicators: 1) change in Observed Distributional Range based on known occurrence, calculated through the Kernel smoother within the effort area; 2) change in Ecological Potential Range extent, predicted through Spatial Distribution Models; 3) Range Pattern, assessed as overlap and shift of core-areas between periods; 4) changes in Observed/Ecological Potential Range. Most Observed and Ecological Potential areas confirmed persistence of some known important sites (i.e., mostly in Western-Mediterranean), highlighted potential suitable areas in unsurveyed locations, exhibited contraction or expansion in distribution, and a general offshore shift, likely indicating exploitation of new areas or operating pressures. Study outcomes allowed identifying the most appropriate modeling tools, considering the sampling design and characteristic of dataset. The use of complementary indicators proved valuable to disclose the significance of changes, and concurrent analyses of more species with similar ecology was critical to assess whether the detected changes are species-specific or representative of global trends. The FLT-Net sampling design resulted adequate for trend assessment in Western-Mediterranean and Adriatic, while more transects are needed to intercept the central-Mediterranean/Levantine ecological variability.

Monitoring framework to define local cetacean population and estimate demographic parameters: the case of short-finned pilot whales in Madeira

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Even for wide-ranging species, local inshore cetacean populations are more likely to be exposed to anthropogenic pressures than individuals mainly using offshore waters. Demographic parameters of these local populations should be monitored to assess Good Environmental Status under the European Marine Strategy Framework Directive (MSFD). Therefore, a framework was proposed and applied to short-finned pilot whales (*Globicephala macrorhynchus*) of the oceanic Madeira archipelago. First, site fidelity structure based on photo-identification of marked animals using a standardized method based on K-means analysis to define the local population, i.e., individuals with higher site fidelity. Then, a capture-recapture robust design model was used to estimate demographic parameters between 2003 and 2019. Finally, the effect of a growing number of whale watching boats was tested. The results showed no temporary emigration, demonstrating that the site fidelity methodology accurately identified the local population. High adult survival rates and stable abundance estimates were found, which should be used as a baseline for future MSFD cycles. No effect of the increase in whale watching boats was observed on demographic parameters for adult individuals. Nevertheless, young animals are expected to be more vulnerable to local pressures but they were not included in the analyses. Potential effects on reproduction rates were not considered either. Therefore, a negative effect of whale watching on the local population cannot be excluded. This monitoring framework should be further tested on other species and study areas to confirm its wide application to help management decisions reaching better conservation status for cetacean species.

- **Acoustics**

Call type combination patterns in Icelandic killer whales

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Acoustic signals can be combined to expand a limited repertoire and thus increase the variety of information that can be communicated. Acoustic sequences can either consist of repetitions of the same signal or a combination of different sound types. In killer whales (*Orcinus orca*) repetition of calls (call type matching) is common, but less is known about the sequential ordering of different call types. We use data from dtags attached to killer whales to describe and quantify call combinations produced by Icelandic killer whales. The acoustic record of each tag was examined and calls were rated as low, medium, or high quality. Only high-quality calls were extracted, classified to call type and subtype, and their sequential ordering was analysed. The results show that a small subset of call types was combined into sequences that followed an ordering paradigm. These call combinations consist of two or more calls of different types that were clearly separated from other sounds by shorter silent intervals between them (mean 0.4 ±0.3 seconds) than intervals between other sounds (mean 21.3 ±46.7 seconds). Most of the call types that were part of these combinations were rarely recorded outside combinations. The same call type combinations were found widely in acoustic recordings of this population. Preliminary analyses of dive profiles, acoustic indicators of feeding behaviour (i.e., tail slaps), and photo-identification data, used to determine the behavioural and group context in which call combinations occur, suggest their function is not directly linked to feeding. However, further research is needed to clearly establish whether call combinations are specific to certain groups or behaviours. The combination of calls could provide a mechanism for the evolution of new call types and structurally complex sounds, providing insights into how repertoires change over time.

Bio-inspired acoustic beacons to limit fishery by-catch of common dolphins *Delphinus delphis*

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Fishery by-catch is the main direct threat to marine mammals globally. Acoustic repellent pingers have been developed to reduce dolphin by-catch. However, mixed results regarding their efficiency have been reported. Within the DOLPHINFREE project "Dolphins free from fishery by-catch", we develop prototypes of a new generation, bio-inspired, acoustic beacon. They emit returning echoes of echolocation clicks of a common dolphin *Delphinus delphis* from a fishing net to help dolphins in detecting its presence. Ultimately, the objective is to reduce their by-catch in the Bay of Biscay, France. In addition, a passive acoustic listening system to identify dolphin presence, allowing beacon emission only when detected, has been developed by the LICADO project and benefits to the bio-inspired beacon. Furthermore, prototypes of energetic modules are developed to increase beacon autonomy and to facilitate fishermen handling. Several energy options have been studied and assessed (i.e. piezo-,tribo-, hydro-, solar electricity), among which induction has finally been identified as the most suitable possibility for easy beacon recharge. Behavioral responses of common dolphins in response to beacon emission have been assessed by experiments at sea during summers 2020 and 2021. The results highlighted that the device led dolphins to echolocate and communicate more (x2.46 and x3.38 in mean, respectively), thus would favor net detection, and calmly left the source emission's area. Tests made during 1043 fishing operations (FOs) of professional gill netters, to assess the practicality and to provide preliminary data on the efficiency of the new device, have been performed with observers onboard during 228 days at sea in 2021 and 2022. While preliminary results are encouraging, complementary tests of bio-inspired acoustic beacons during FOs of professional gill netters, including more boats and number of FOs, will be necessary to assess statistically its efficiency in reducing common dolphin by-catch.

The power of talk: vocal communication and social context in wild bottlenose dolphins

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A fundamental question in animal behaviour is the role of vocal communication in the regulation of social interactions in species that organise themselves into social groups. Context dependence and seasonality in vocalizations are present in the communication of many species, although very little research has addressed this dependence in marine mammals. The study presented here examined variations in the rate at which free-ranging dyads of bottlenose dolphins emit social-signals in an effort to better understand the relationship between vocal communication and social context. Between November 2004 and December 2013, a total of 1706 acoustic recordings synchronised with behavioural data were collected from 454 groups of bottlenose dolphins. The results demonstrate that changes in the social-signal production in bottlenose dolphins are related to the sex of the partner, mating season and social affiliation between the components of the dyad. In a context of foraging behaviour on the same feeding ground, mixed (male–female) dyads were found to emit more pulsed burst sounds during the mating season. Another relevant aspect of the study seems to be the greater production of agonistic social-signals in the dyads formed by individuals with a lower degree of social affiliation. Overall, this study confirms a clear relationship between dyad composition and context-specific social signals that could reflect the motivational state of individuals linked to seasonal changes in vocal behaviour.

The need for ACCURATE cue rates in passive acoustic density estimation

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Estimates of density or abundance are fundamental for effective management of wildlife. Cetaceans produce sounds that can be readily detected on hydrophones, but which can be hard to survey by conventional visual methods. Therefore, perhaps unsurprising, passive acoustic density estimation has seen a surge in recent years. There are several approaches to estimate animal density from passive acoustic monitoring data. Arguably one of the most often used is cue counting, where an estimate of animal density is obtained once the number of detected sounds of interest is corrected for detector performance (false positives and false negatives) and for the number of sounds produced per animal per unit time, a.k.a. cue rates. Not surprisingly, estimates of animal density will be biased unless we obtain unbiased estimates of the cue rate: cue rates that correspond to the time and place the survey took place. We describe advances in cue rate estimation obtained on project ACCURATE, a large collaborative project funded by the US Navy Living Marine Resources program. We discuss factors that affect cue rates and report on cue rate estimates for some of the species we have been working on, using sperm whales as a prime example. For baleen whales, since their calls are low frequency, it is especially hard to distinguish the tagged animal sounds from their nearby conspecifics, which if ignored could lead to positive bias in cue rates. We report on advances regarding the identification of the caller ID for baleen whales. We further report about the possibility of estimating cue rates from tags without acoustic data, by linking data from tags with and without acoustic data via statistical models. Finally, we discuss the possibility of considering cue rates which might be site specific based on information within the data collected by the survey hydrophones.

Vessel noise exposure impacts harbour porpoise energy balance

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Harbour porpoises (*Phocoena phocoena*) live in coastal waters that face some of the highest shipping densities in the world. Studies suggest that moderate to high levels of vessel noise disrupt their behaviour, but it is not known how often such exposures occur, whether the response to vessel noise is context-dependent, nor the impact that noise-induced behavioural disruptions have on harbour porpoise energy balance (i.e., energy intake vs. expenditure). Here, we test the hypotheses that (i) responses to vessel noise are mediated by diel patterns in individual behaviour, and (ii) that vessel noise reduces net energy gain either by reducing foraging and/or by increased energy expenditure. Using 18 high-resolution sound and movement recording digital tag (DTAGs) deployments on wild porpoises (356 hours of data), we show that porpoises in the Kattegat and Belt Seas are on average exposed to 11 vessel passes (>90dB re 1µPa in the 16 kHz decidecade band) a day. Tagged porpoises during vessel-noise exposures decrease the number of prey-capture attempts (i.e., energy intake) by on average 33% during daytime and 17% during nighttime. Respiration rates (i.e., energy expenditure) also slightly decrease (2%) during daytime exposures, but increase by 4% during nighttime. These changes in foraging and respirations have a cumulative impact on the energy balance of the exposed porpoises that reduces their daily net energy gain by ~5%. Unless compensated for by increased foraging, this deficit may have important energetic consequences for the growth, reproduction and survival of porpoise populations in industrial coastal areas. Direct measures of the associated energetic costs of exposure are critically needed for Population Consequence of Disturbance (PCoD) models linking disturbance parameters to fitness and population dynamics. Our results can thus inform the management of underwater noise levels and mitigation measures that will aid the conservation of wild populations of porpoises.

Individually-specific calling in East Greenland narwhals (*Monodon monoceros*)

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Narwhals (Monodon monoceros) are toothed whales endemic to the Arctic. They produce a broad range of signals, including highly stereotyped, pulsed-based calls. Previous studies of these vocalizations have indicated that these calls are specific to the producing whale; a basic criterion for qualifying signature sounds in the narwhal vocal repertoire. However, early studies of these vocalizations were limited by small sample sizes, so it is unknown whether this calling behavior is species consistent. Here we provide for the first time, a comprehensive catalog of individually-specific narwhal calls from 17 whales in the Scoresby Sound fjord system (East Greenland, 2013–2019). Whales were fitted with AcousondeTM tags which provided approximately 3000 hours of acoustic and movement data. We manually assessed over 22,000 sounds from these data, and found that the record for each whale contained a unique, highly stereotyped pulsed-based call, likely belonging to the tagged individual. These calls were largely comprised of pulsed components, akin to simple contact calls described for belugas, although three whales produced biphonations similar to beluga complex contact calls. We also found that for 7 out of the 17 tagged whales, multiple call types fitting our classification criteria potentially belonged to the tagged individual. The characteristics (e.g., signal component types, duration, aural quality) of these additional sounds were similar across individuals. In one case, a highly stereotyped pulsed call was apparently shared between two associated males. These findings suggest that narwhals may not have straightforward, true vocal signatures like what has been shown for bottlenose dolphins and indicated for beluga whales. For example, the prominence of simple, pulsed-based calling underscores a potential reliance on morphologically based voice cues for this species. Further research combining more detailed measurements of associations and life history would aid in informing the questions we raise here.

SHORT-TALKS

Health condition, trophic ecology and mercury relationships of two small delphinid species with temporal segregation in the Madeira oceanic habitat: preliminary analysis from a multimethodological approach

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Nutrition plays a pivotal role in species-environment interactions. Thus, understanding the feeding behaviours of apex predators that act as biomonitoring models is critical to assess impacted oceans. We combined RNA/DNA ratios (sRD), stable isotopes (SI) and mercury (Hg) to infer the health/nutrition condition, trophic ecology, and metal relationships of apparently healthy and adult free-ranging *Delphinus delphis* (n=47, 19♀ 28♂) and Stenella frontalis (n=33, 14♀ 19♂) biopsied during 2017-2019 in Madeira Island (Eastern North Atlantic), where they exhibit temporal segregation. In addition, for each species, we explored daily accumulation rates of RNA/DNA and Hg for their respective arrival, mid, and departure periods. No significant differences were found between the sexes in any of the analyses, nor in Hg concentrations between species. The SI ratios partially overlapped between species, with lower carbon (δ13C: 13C/12C) and nitrogen (δ15N: 15N/14N) values for *D. delphis*. The daily accumulation rates showed an increase of RNA and sRD only for *D. delphis*, suggesting an enhancement in the nutritional and health status between this species' arrival (around December) and departure (around May) from Madeira. These findings are coincidental with blooms of chlorophyll a (Chl-a) and high levels of sardine landings known as preferred prey for D. delphis. Higher daily Hg accumulation rates were also obtained for *D. delphis*, likely influenced by mostly preying upon fish. These preliminary analyses suggest that, while both species of dolphins feed regularly in Madeiran waters, they might have distinct seasonal ecological roles. Thus, it could be hypothesised that *D. delphis* exploits the area as a feeding winter ground, whereas *S. frontalis* could use Madeiran waters during summer as an ideal environment for mating and reproduction. Such complex ecological questions require a novel multidimensional approach like the one proposed herein that links biochemical indices, biotracers and contaminants and can contribute towards ocean management.

Preliminary investigation into the effect of harbour porpoise (*Phocoena phocoena*) faeces on marine phytoplankton growth

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In a laboratory setting, the effects of harbour porpoise (*Phocoena Phocoena*) faeces on the growth of four marine phytoplankton species were examined: *Phaeodactylum tricornutum*, *Nannochloropsis oceanica*, *Skeletonema costatum* and *Phaeocystis globosa*. These phytoplankton species are present in the North Sea and are commercially available. The faeces were obtained from the rectum of stranded individuals at necropsy (Utrecht University. The Netherlands). Six different treatments were tested in triplicate over 14 days for each phytoplankton species: positive control (modified f/2 culture medium), negative control (no medium) and four faecal treatments ranging from 18 ml to 100 ml of a mixed faeces stock solution (5.6 gram feaces per liter). The number of cells were counted every other day using the Bürker-Türk method. The results showed faecal dose-dependent growth of three of the four phytoplankton species (*P. tricornutum*, *N. oceanica* and *S. costatum*) compared to the negative controls. However, P. globosa showed no increased growth after adding porpoise feaces. The highest growth rate after addition of faeces was observed for *P. tricornutum*. The number of cells increased 238 fold (day 0: 125 x 103 cells, day 14: 30 x 106 cells). In comparison, the positive controls showed a 45 fold increase (day 0: 268 x 103 cells, day 14: 12 x 106 cells). Although this is a preliminary study, our results indicate that harbour porpoise faeces enhances the growth of several species of marine phytoplankton. Therefore, the role of small cetaceans should be considered with regard to nutrient recycling in the marine ecosystem. Further research on the effects of cetaceans on carbon sequestration and climate change should, in addition to the great whales, also include small cetaceans.

- **Conservation**

Contribution of European stranding networks to understanding and quantifying marine mammal bycatch mortality

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Fisheries bycatch has a major impact on marine mammals worldwide. Marine mammal strandings can provide key information to assess bycatch mortality and its impact on populations. The present study explores the role of European stranding networks in assessing bycatch mortality, compiling information on monitoring protocols and bycatch diagnosis. It is based on a questionnaire prepared under the auspices of the ICES Working Group on Marine Mammal Ecology and sent to coordinators of strandings monitoring networks in 2021 and 2022. The 34 responses received (from 15 countries), highlight wide variation in the period over which the networks have operated, their aims, structure and resources, the main marine mammal species stranded and the frequency of diagnosed bycatch mortality (focusing on the year 2019). Most strandings were of dead animals and, on average, 12.5% (range 0 to 95%) were necropsied. There is a general lack of understanding of the causes of mortality in marine mammals, including the importance of bycatch, and this is especially remarkable in seals. According to our data, cetacean bycatch in Europe is an important cause of death for harbour porpoises, pelagic delphinids and baleen whales. Several regions reported upward trends in bycatch mortality, in the above-mentioned groups and in seals. Most respondents agreed that bycatch is an important or very important source of mortality in their regions, and was associated with a wide variety of gear (static, towed and floating gears, traps, pots, and pole and line fisheries). Highlighted needs include better coordination of data collection, standardised pathological investigations and reporting nationally and internationally. Reported strengths and weaknesses of the networks, as well as identified assessment and quality and data gaps, provide useful information to enhance the potential of these networks to contribute to bycatch assessment.

Acoustic identification of an important floodplain habitat for the Amazonian manatee (*Trichechus inunguis*) in a Brazilian protected area

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While once abundant in the Amazon basin, Amazonian manatee (Trichechus inunguis) populations are currently considered declining but current assessment lacks reliable population estimates. Being quite inconspicuous at the water surface and inhabiting murky waters, Amazonian manatees are notoriously difficult to monitor via traditional visual surveys. Here we used passive acoustics combined with Convolutional Neural Networks (CNN) to assess manatee presence at the entrance of the Mamirauá Lake, a floodplain lake situated in the Mamirauá Sustainable Development Reserve (MSDR) in Brazil. We recorded acoustic data during two consecutive years at high water in 2021 and 2022. We used a subset of data to manually label manatee calls and to train a CNN classifier. The performance of the classifier to correctly identify manatee vocalizations was high, with an average precision of 0.98. Our results showed that at Mamirauá Lake manatees were recorded almost every day between late May and early July 2021, with manatee vocalizations identified during up to 12 hours a day. In 2022, manatees were rarely detected during the first half of the high-water season (mid-January to April) but detections increased in April-May with 40% of the recording days showing manatee presence. The calling rate in 2021 reached values up to 32 calls/min. Based on values published on manatee calling rates and considering the similarities in frequency contours in the call sequences, our results indicate that this high calling rate likely corresponds to vocalizations exchanged between female and calf. Our results suggest that this specific area in the MSDR appears to be regularly visited by manatees, including cows and calves, during the high-water period especially from May to July. This first report of regular manatee occurrence in this area advances our understanding of the manatee distribution in the floodplains during the high-water season.

How to detect the impact of multiple stressors in cetaceans inhabiting the Mediterranean sea: the first time use of exposomics

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The Mediterranean Sea is a biodiversity planetary hotspot, but also one of the areas most exposed to anthropogenic stressors in the planet. Concern is growing regarding hazards to cetaceans that simultaneously face concurrent exposure to multiple stressors, such as marine litter (including microplastics), climate change, bioaccumulation of anthropogenic chemical contaminants, as well as infectious diseases, resulting in dramatic effects on population stability. Plastic Busters MPAs is an Interreg EU Med-project aiming to contribute to maintaining biodiversity in Mediterranean marine protected areas, and to preserving these natural ecosystems against marine litter. Cetaceans inhabiting the largest pelagic SPAMI of the Mediterranean Sea, the Pelagos Sanctuary, are facing the exposure to multiple stress represented by chemical pollution and marine litter. A total of 140 samples of superficial microplastics were collected in the SPAMI area, carrying out monitoring of surface macrolitter with simultaneously monitoring of biota, with the goal to identify the possible marine litter hotspot areas, and the potential impact on biodiversity. During the sampling campaign, skin biopsies of striped dolphin (*Stenella coeruleoalba*; n=24) and fin whale (*Balaenoptera physalus*; n=17) from the Mediterrenean Sea, as well as and from the pristine area of the Sea of Cortez (Gulf of California) were collected for ecotoxicological investigation. Fin whale samples were analyzed integrating gas and liquid chromatography (GC, LC) ultrahigh-resolution mass spectrometry (Orbitrap) for a full coverage of the exposome, which revealed environmental exposures to anthropogenic chemicals including legacy pollutants (PCBs, DDT, dioxins) and novel entities of emerging concern (PFAS, bisphenols, phthalates, prescription drugs, and other commercial products). Together, exposomics and molecular endpoint analysis can provide insights on the toxicological effects on the pathways modulated by xenobiotics exposure, and applied as a powerful tool for discriminating the impact of cumulative stressors, including emerging chemicals and microplastics, on cetaceans inhabiting this fragile and highly anthropized ecosystem.

- **Genetics/Evolution**

The last piece of the puzzle: a broad population genomics study in *Globicephala macrorhynchus*

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The short-finned pilot whale (SFPW), *Globicephala macrorhynchus*, has a pan-tropical and -temperate distribution. The existence of two morphologically and genetically distinct forms (Naisa and Shiho) suggests a complex speciation process, which remains to be deciphered. Here, we used whole genome data of 56 individuals from three poorly surveyed regions (Macaronesian islands - Eastern central Atlantic, China and Brazil) to assess the patterns of population structure and genetic diversity of the SFPW. We inferred population structure from admixture and principal component analyses. Additionally, we determined patterns of differentiation of the maternally-inherited mitogenomes. We estimated changes in population size through time using the Pairwise Sequentially Markovian Coalescent (PSMC) analysis. Finally, we searched for genomic regions of high differentiation in each assigned population using the population branch statistics and performed a windows-based analysis to uncover the top outliers of genetic differentiation, corresponding to regions that are potentially under selection. Our results provide evidence for three main genetic clusters of SPFW populations across the analysed individuals, emphasizing the genomic distinctiveness of Atlantic individuals compared with other individuals belonging to the Naisa form – known to be present in the western/central Pacific and Indian Oceans. The exception to this pattern is a Naisa mitochondrial and nuclear genotype found in one individual from Brazil. Moreover, PSMC suggests a shared recent evolutionary history in all three assigned populations. Our study provides a significant contribution to the overall understanding of the demographic history and spatial patterns of genetic diversity in SPFW, by complementing data previously described.

Molecular adaptations to hypoxia in the muscle transcriptome of parasitic infested harbour porpoises (*Phocoena phocoena*)

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The harbour porpoise (*Phocoena phocoena*) is the only native cetacean in German waters. Anthropogenic activities in the North and Baltic Sea have been ever-expanding, simultaneously affecting the porpoise populations. To avoid underwater noise, harbour porpoises have been observed to perform unplanned dives. It also has been observed that harbour porpoises do not use their complete, possible lung volume. Additionally, increasing pathological lesions in the respiratory tract partly caused by parasites or bacteria have been found in porpoises over the last few decades. Few studies have analysed if these damages impair the diving ability and ultimately the foraging success. Damaged lungs could imply a lower oxygen uptake, which could hinder the effective oxygen supply to the swimming musculature, resulting in an insufficient diving ability. This project aims to analyse whether harbour porpoises developed novel molecular compensatory adaptations, thus remaining viable and competitive. Initial comparative transcriptomic analyses indicate an elevated response to hypoxia and inflammation in the muscle of infected vs. healthy individuals. The strongest upregulation was found for Tripartite Motif Containing 63, an indicator of muscle atrophy in humans. Downregulation of transcripts involved in cell adhesion implies a disturbed cell maintenance and communication. An enhanced myogenesis may accelerate the regeneration of damaged tissue and can indicate the tightly controlled, intrinsic muscle response to injury. Further, elevated antioxidant and antiapoptotic gene expression was confirmed in muscle of infected animals as a compensatory effect to hypoxia. Carbonic anhydrase 7, which is involved in respiration, oxidative stress response and biosynthetic processes, showed a high expression, while its inefficient isoform CA3 was strongly downregulated. Lipid catabolism and amino acid biosynthesis were upregulated and may uphold muscle energy supply and tissue function. These novel insights will be functionally analysed in cell culture via an Overexpression- or Knock-out assay and corresponding lung transcriptome analyses will be performed.

Glacial refugium for killer whales off Japan revealed through genetic and cultural evidence

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During glacial periods, highly mobile species were forced to shift their ranges to warmer regions that remained ice-free – so-called 'refugia'. Refugia often preserved higher levels of genetic diversity than areas that were colonized after the retreat of glaciers. This pattern is well documented in many terrestrial species, but is less obvious in marine megafauna due to their dynamic nature and the lack of physical barriers in the open ocean. In this study, we examined genetic and vocal variation in R-type ("resident") killer whales from Nemuro Strait in the western North Pacific to test the hypothesis that environmentally stable marine regions may have preserved refugial populations of the killer whale that retained historical genetic and cultural diversity. The data for this study were collected from free-ranging killer whales in Nemuro Strait in May-June 2021 and 2022. We recorded underwater sounds and collected biopsy samples from individually recognisable animals. We found three distinct mtDNA control region haplotypes and stereotyped calls that differed significantly from the repertoire of a population further north off Kamchatka and the adjacent western North Pacific. Therefore, both genetic and cultural evidence suggest that at least some killer whales from Nemuro Strait represent a separate maternal lineage. The haplotype diversity for Nemuro Strait is comparable to the haplotype diversity for the rest of the North Pacific. The data presented here provide the first evidence for the south-western glacial refugium in the waters off northern Japan and supports the hypothesis that multiple genetic bottlenecks occurred in the ancestors of present-day high latitude killer whale populations.

- **New technologies**

Risso's dolphins (*Grampus griseus*) use social calls during deep daytime foraging

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Deep diving odontocetes tend to disperse while feeding and rely on vocalizations to remain in contact. Little is known about their use of social calls across behavioural contexts, as most of the behaviour of free-ranging dolphins occurs out of sight. Off Terceira Island, Azores, Risso's dolphins (*Grampus griseus*) have been observed to start foraging in the afternoon, utilizing two foraging dive types: deep daytime spinning and more shallow night-time non-spinning dives. We hypothesized that a) social calls facilitate the foraging onset and relocation at the surface, b) different dive types ask for different use of social calls, and c) more calls are produced during the night when the use of visual cues is further impeded. To assess these hypotheses, the acoustic and diving behaviour of Azorean Risso's dolphins (n=9) was studied using bio-logging tags (DTAGv3). We investigated if the use of one of their main social calls, the burst-pulse, differed as a function of 1) dive cycle 2), dive type and 3) time of day. Burst pulse numbers were found to be the highest at the surface, 5 minutes pre- and post-diving. Calls were recorded during the descent and ascent but remained absent during the foraging phase (first till the last buzz). During the descent phase of a dive, the occurrence of a burst pulse was significantly higher during spin day dives (GEE, $p<0.001$) than during non-spinning or nighttime dives. Interestingly, burst pulses during the descent phase were almost exclusively (92%) produced during daytime deep spinning dives. Whereas we could confirm the first two hypotheses, Risso's dolphins only rarely used social calls during nocturnal foraging, even when diving deep. Hence, Risso's dolphins use social calls during foraging, but only so during specific foraging contexts. The explanation behind this remarkable diel variation in foraging communication remains to be elucidated.

Dolphin anatomy and virtual reality: exploring open source and free 3D software tools

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In studying anatomopathology, the classical methods used in classroom education are 2D images or videos. Since they are used to explain 3- or 4-dimensional processes, they often require creative approaches that inherently leave an amount of uncertainty to the understanding of in-vivo structures and processes, and are therefore accompanied by hands-on learning. Marine mammal necropsy training follows this model, where opportunities to have hands-on experience are scarce, and most of the available resources are in the books and minds of a few experts. The rapid development of immersive technologies in various industries, together with communities involved in developing free and open-source software, provides an opportunity to try and fill this gap. A virtual reality (VR) experience was created starting from medical CT-scans from a striped dolphin (postmortem), and a living sea turtle, with a resolution down to 1 mm. Six main organ systems were identified and segmented manually using 3DSlicer. Surface meshes were processed using Meshlab and Blender, assigned a material, and imported in Unity to create the game-like experience. These tools allow the user to perform a postmortem evaluation of a dolphin and sea turtle, in a completely immersive virtual environment, using VR goggles and manual controllers, according to the standard necropsy protocols as in a videogame with multiple levels. Here we present a live demonstration of the VR application, accompanied by still and moving imagery of the various steps in the necropsy experience, from the external observation to the sampling of the organ systems in a dolphin and a sea turtle. We also show how these tools can be applied in education and training to acquire knowledge and experience, at 'virtually' no cost.

Fixed-wing drones for monitoring cetaceans: a pilot study in the Pelagos Sanctuary (north-western Mediterranean Sea)

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Unmanned aerial vehicles are increasingly being recognized as potentially useful for monitoring cetaceans. While most of the studies are conducted with multirotor drones, the use of fixed-wing is still very limited. Recently, the European Maritime Safety Agency (EMSA) provided Remotely Piloted Aircraft Systems (RPAS) to the Italian Coast Guard. This aircraft, used for multipurpose maritime surveillance, and search and rescue missions, was a TEKEVER AR5 Evolution, a medium-size (7.30x4.03m), fixed-wing RPAS, with 12 hours of endurance. The aircraft operated Beyond Radio Line Of Sight, with a satellite communication system, and was equipped with one electro-optical video camera (1080p), one Midwave Infrared sensor (512p), and one 20MP digital still camera. The pilot project "Eye in the Sky" was conducted within a partnership between the Italian Coast Guard and Tethys Research Institute to test the RPAS for cetacean monitoring. The survey took place in a small portion (1,041 km2) of the Pelagos Sanctuary from July to November 2022, covering 23 horizontal transects (34 km long and spaced 1.3 km). Different altitudes, frames, and survey methodologies were tested. During the study period, 36 missions were conducted for a total of 100 hours and 10,126 km of observations, of which 63% were on transects, 13% were ad libitum, and 23% were with cetaceans, and 13,130 km of transfer. A total of six cetacean species were observed during 56 sightings: 20 fin whales, 12 striped dolphins, 7 sperm whales, 3 long-finned pilot whales, 2 Cuvier's beaked whales, 1 Risso's dolphin, and 11 unidentified species. RPAS are human-risk-free, non-invasive, with a small carbon footprint. Further tests are needed to improve the data collection system, but these encouraging preliminary results suggest that RPAS are an efficient tool for performing systematic monitoring of cetaceans in large marine areas and may represent a valuable complement to traditional survey platforms.

Using underwater cameras to assess dolphin-trawler interactions: evaluation of bottlenose dolphin (*Tursiops truncatus*) underwater behaviour interacting with trawl nets in the Mediterranean Sea

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Interactions between bottom trawlers and common bottlenose dolphins (CBDs) (*Tursiops truncatus*) frequently occur in northern Catalan waters (NW Mediterranean), where 86% of CBD sightings are associated with trawler presence. However, the risk that this interaction entails both for dolphins and the economic activity in this area is unknown. Although dolphin-trawler foraging interactions are well-documented worldwide, these have been inferred mainly from observations of dolphins' surface behaviour. In this regard, nowadays, there is minimal knowledge of underwater dolphin behaviour. In this study, for the first time in the Mediterranean Sea, underwater cameras were deployed on bottom trawler nets in order to assess the underwater behaviour of dolphins and determine the nature and risk of dolphin-trawler interactions. Between two and five cameras of two different models were deployed on the gear of 3 trawling vessels operating at 50 - 150 meters depth in Catalan waters. After analysing footage from 43 different hauls, 329 dolphin behavioural events were recorded by the underwater cameras. These events were classified into three main state behaviours: foraging (53%), travelling (46%), and others (1%). CBDs were exclusively observed foraging outside the nets and extracting the prey caught in the mesh of the net, especially on its sides. CBDs were observed feeding individually, without cooperation, and usually orientated towards the vessel. Neither any risk situation, dolphin injury or incidental catch nor damage to the nets was recorded. Therefore, the use of underwater cameras proves to be a good measure to understand CBDs' behaviour and a valuable tool to assess the impact of this interaction on fisheries and the risk of injury or bycatch for dolphins. This study contributes to a better understanding of dolphin-trawler interactions and highlights the relevance of collaboration between fishermen and scientists in working towards marine mammal conservation.

Effect of body size on respiration rates, swim speed, and nursing duration of white-beaked dolphin calves in Skjálfandi Bay, IcelandSilva

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Little is known about the ontogeny and behavioral development of white-beaked dolphins (WBD; *Lagenorhynchus albirostris*). In this study, we investigated size-dependent changes in respiration rates, swim speed, and nursing duration of WBD calves. We conducted unmanned aerial vehicle (UAV) focal follows of WBD mother-calf pairs between Aug 2021 and Sep 2022 in Skjálfandi Bay, Iceland. We successfully completed 38 behavioral focal follows of mother-calf pairs, with a total flight time of 3:44:55 across 10 days in the field. The UAV was flown at an altitude of ≥ 20m to minimize disturbance, with each focal follow lasting 4.36-25.97 min (mean = 11.93 ± 4.40 min). Additionally, morphometric measurements on mother-calf pairs were extracted from the UAV video footage to measure the calf relative body length (% of maternal length). The relative calf body length ranged from 0.39 to 0.83 (mean = 0.61 ± 0.11), while the mean respiration rate (breaths min-1) was 3.33 ± 1.08 (min = 1.75; max = 6.44). The average swim speed was 2.14 ± 0.63 m s-1 (min = 1.39; max = 3.31), and the proportion of time spent nursing was 0.02 ± 0.03 (min = 0; max = 0.07). Calf respiration rates and swim speed decreased with the body size of the calves, suggesting a decrease in mass-specific metabolic rate and energy expenditure. In contrast, the proportion of time spent nursing increased with calf body size, possibly as a result of increased absolute energy requirements of calves as they grow larger. Our findings are of importance for understanding the bioenergetics and overall energy requirements of WBD, an endemic species in the North Atlantic.

Reproductive parameters of a critically endangered Mediterranean subpopulation of bottlenose dolphins (*Tursiops truncatus*)

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The bottlenose dolphin (*Tursiops truncatus*) is the only cetacean species present in the semi-enclosed Gulf of Ambracia, in Western Greece. While local density of dolphins is among the highest recorded in the Mediterranean Sea, this is not indicative of favourable conservation status or pristine habitat. This subpopulation was recently listed as Critically Endangered by the IUCN Red List of Threatened Species. In this study we examined reproductive parameters of female bottlenose dolphins inhabiting the Gulf, using over two decades of photo-id data (2001-2022) collected during 1,118 daily boat surveys, which allowed us to track the reproductive life of 40 females and their 112 calves. Our results showed that the calving season concentrates from May to October, reaching its peak in June, and a mean inter-birth interval of 3.8 ± 1.9 years (n= 71). By looking at the time of association between mothers and their offspring, we determined that 42 (38%) calves were successfully weaned, whilst 52 (46%) of them died within their first year of life, showing higher mortality rates than those described for other well-studied bottlenose dolphin populations (e.g., Port River Estuary and Shark Bay, Australia; Sarasota Bay, USA). For 7 reproductive females that we could track from birth, firstly identified as calves, we established 9.7 ± 2.3 years as their mean reproductive age, ranging from 7 to 12 years; none of their first new-borns survived. Data demonstrated variation in reproductive success among females, which suggest that some of them are more reproductively fit and, therefore, more important for the viability of the population. Our findings highlight the relevance of long-term dolphin studies as they can provide essential data on individual- and population-level parameters, with important implications for their conservation and management.

- **Modelling**

Machine learning algorithm selection for modelling striped dolphin (*Stenella coeruleoalba*) distribution in the Adriatic and Ionian Seas

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This study aims to test different machine learning algorithms for modelling striped dolphin (*Stenella coeruleoalba*) distributions within the Adriatic and Ionian Seas and investigate the importance of different explanatory variables. From January 2015 to December 2019, striped dolphins were monitored from ferries, along the Ancona-Patra transect, by experienced observers (FLT– Network). Monitoring effort, the number of sightings and encounter rate were calculated for 1x1 km cells. A binary presence-absence of the sighting was then computed. Geomorphological characteristics, climate variables and maritime traffic density were considered as explanatory variables. Different models from the seven following main machine learning algorithms were tested: 1. Ensemble: random forest (RF), gradient boosting decision trees (GBDT); 2. Regression: Generalized additive model (GAM); 3. Logistic Regression (LR); 4. Decision tree (DT); 5. Instance-based: K-nearest neighbours (KNN); 6. Support Vector Machine (SVM): SVM with radial kernel (SVMradial); 7. Deep Learning: Neural network (NN). The encounter rate was employed first, and then the binary presence-absence of the sighting was selected as targets for multiple classifiers to improve model performance. Finally, the machine learning algorithms were compared with results from MaxEnt, an algorithm commonly used in ecology to model species distributions. Unlike previous algorithms, MaxEnt models could involve all environmental data, regardless of their overlap with monitoring effort. Based on the performance metrics, both MaxEnt and GAM can predict the potential distribution of striped dolphins under current climate conditions. Nevertheless, because GAM requires binary presence-absence data and MaxEnt only presence data, it is hard to compare them. MaxEnt is useful when presence-only data are available, but sampling intensity should be standardized objectively. GAM is promising for species distribution modelling under future climate. Geomorphological characteristics and SST resulted the most critical predictors, together with boat traffic. Their pattern raises concern for future species' conservation under climate change and increasing human pressure.

Modelling prey availability of the Mediterranean monk seal (*Monachus monachus*) along a gradient of marine protection

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The Mediterranean monk seal *Monachus monachus* is considered one of the most endangered species of marine mammal globally. The Madeira archipelago (NE Atlantic) represents the last refuge of *M. monachus* in the European Atlantic, with only 20 individuals thought to remain. Prey availability has been identified as one of the main concerns regarding the recovery of *M. monachus* in Madeira. The abundance and distribution of prey is heavily impacted by fishing, yet marine reserves may offer varying levels of protection. To address this, we deployed 142 baited remote underwater video (BRUV) surveys to identify the abundance and distribution of *M. monachus* prey species across fully, partially, and unprotected areas. An ensemble modelling approach was applied to project species-specific habitat maps to identify areas of high prey density. To understand predator-prey overlap with level of protection, coastal sighting records of *M. monachus* were collated from the Madeira archipelago between 2012-2022. Together, this study fills a critical information gap to characterise the prey availability under various levels of fishing pressure and whether this influences *M. monachus* distribution. Our analysis offers novel insights towards incorporating prey distribution into future spatial conservation decisions to improve protection of critical habitats of *M. monachus*.

Cetacean energyscapes and biomass consumption of forage resources in the Mediterranean Basin

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Overfishing is directly threatening many cetacean populations worldwide, either through bycatch or through reduction of the forage resources. Yet, fisheries are crucial for the Mediterranean economy. In that context, knowing the needs of the cetacean community in terms of quantity and spatial distribution of prey is crucial to tune both conservation strategies and fisheries management in effective ways. Here, our aim was to provide the first spatially explicit and basin-scale estimation of the forage species biomass necessary to sustain the cetacean community. By collating information on abundance, diet composition and body mass, we spatially estimated the species energetic requirements and the total biomass foraged by the community over the Mediterranean Sea in summer. A Monte Carlo approach was used to propagate uncertainties throughout analyses. Pelagic cephalopods were the dominant prey group in cetacean diets, and as such they were the most predated group: we estimated the cetaceans to eat a total of 530.103 t of pelagic cephalopods, 208.103 t of demersal fish, 177.103 t of pelagic fish, 52.103 t of benthic cephalopods and 4719.103 t of krill. The spatial distribution of the foraged biomasses exhibited a strong longitudinal gradient, with largest biomasses consumed in the western Mediterranean. As to compare the consumption of the cetacean community to the total biomass caught by Mediterranean fisheries, we retrieved the total catches per marine ecoregions from the Sea Around Us project. The spatial distributions of catches and cetacean foraged biomass were congruent. Pelagic and demersal fishes represented the majority of the catches (1100.103 t), mainly in the western basin. We can thus expect that most of conflicts for resources between cetaceans and fisheries would occur in this area, and should mostly concern striped and bottlenose dolphins whose diet composition overlaps the most with the catch composition.

Screening for influenza and morbillivirus in seals and porpoises in the Baltic Sea-North Sea region

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Historically, the seals and harbour porpoises of the Baltic Sea and North Sea have been subjected to hunting, chemical pollutants and repeated mass mortalities, leading to significant population declines. The protection of the species in the 1950s-1970s resulted in significant increases in grey, harbour and ringed seal populations. Despite the conservation implications and the zoonotic potential associated with viral disease outbreaks in wildlife, limited information is available on the circulation of viral pathogens in Baltic Sea seals and harbour porpoises. Here, we investigated the presence of influenza A virus and morbilliviruses in tracheal swabs and lung tissue samples from 99 harbour seals, 126 grey seals, 73 ringed seals and 81 harbour porpoises collected in the Baltic Sea and North Sea between 2002-2019. Despite screening 379 marine mammals collected over nearly two decades, we only detected morbillivirus and influenza virus infection events linked to the documented viral outbreaks in seals in 2002 and 2014, respectively. Thus, our results show no significant circulation of these viruses during intervening years. Still, reports of isolated cases of phocine distemper virus in North Sea harbour seals and increasing reports of influenza A virus (H5N8) in Baltic and North Sea grey seals suggest introductions of those pathogens within the sampling period. As such, our negative results are most likely an artifact of a limited sample size and should not be interpreted as reflecting complete absence of the viruses. To aid future monitoring efforts, we stress the need for standardized and continuous collection of swabs, tissue, blood and pathological samples in more areas.

Viral skin diseases in odontocete cetaceans: gross, histopathological, and molecular characterization of selected pathogens

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55 skin lesions from 31 stranded cetaceans along the Canary coasts (2011-2021) were yield under macroscopical, histological, and molecular analysis to corroborate infection. Macroscopically, skin lesions were classified according to their color, shape, size, and consistency, obtaining in this manner the following eight categories and subcategories: tattoo-like (oval-shaped, coalesced, and serpiginous); black and white-fringed, pale; ulcerative; target-like; ring; and tortuous. Regarding molecular results, cetacean poxvirus was detected in 54.54% of the skin lesions through real-time and conventional PCRs based on the DNA polymerase gene. Additionally, molecular isolation of herpesvirus and morbillivirus in 43.63% and 1.82% of the cutaneous lesions were also achieved, respectively. As an exceptional finding, coinfection of poxvirus and herpesvirus was detected in nine of them (16.36%), being the first report of comorbidity of both pathogens in skin lesions in cetaceans. Microscopically, hyperkeratosis, acanthosis, and intracellular oedema as well as ballooning degeneration and intracytoplasmic inclusion bodies in vacuolized keratinocytes through stratum spinosum were common histopathological findings in poxvirus skin lesions. Herpesvirus was characteristically associated with prominent acanthotic epidermis with fused rete ridges, and moderate vascular congestion with predominantly neutrophilic inflammatory cell infiltration. Besides, distinctively necrosis, dyskeratosis, and irregular keratinocytes with both cellular and nuclei pleomorphism were remarked. In coinfected lesions, common histopathological findings of both pathogens were noted, being those prompted from herpesvirus significantly more appreciated. Intending to characterize skin lesions in a versatile perspective, lesions that presented tattoo-like patterns and those that displayed tortuous tracts, showed correlation between gross, molecular, and microscopic observations. Further multidisciplinary diagnostic studies of infected skin lesions are needed to understand the mechanisms of pathogenicity and host-pathogen dynamics of these emerging diseases.

Implications of non-lethal entanglement and parasite load on Icelandic minke whales using scar-based analysis

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Entanglement in fishing gear threatens cetacean populations worldwide with several fitness implications. Despite being the most abundant baleen whale, the common minke whale (*Balaenoptera acutorostrata*) is frequently reported dead when entangled. Furthermore, surveys conducted in the central North Atlantic show a significant decrease in the population. This study aimed to estimate frequency of non-lethal entanglement in Icelandic minke whales using scar analysis. Parasite scarring was also evaluated as a secondary identification feature. Photographic data was collected in Northeast Iceland (Skjálfandi Bay and Eyjafjörður) coastal waters from 2014 to 2021. Scars on the body were assessed as indicators of past entanglement and parasite attachment, following photograph quality assessment. A total of 50 individual minke whales were included, and results determined that a minimum of 20.0% (n = 10, 95% Confidence interval (CI): 8.91-31.09%) and a maximum of 72% (n = 36, CI: 59.55-84.45%) were previously entangled. Less than half of the minke whales (n = 21) exhibited parasite-related scarring, and most parasitic marks on resighted individuals healed beyond recognition over the study period. Currently, photo-identification and scar analysis of minke whales in Faxaflói bay (Southwest Iceland) is being conducted and combined with data from the Northeast to obtain a more robust overview of non-lethal entanglement in Iceland. Based on preliminary analysis, it is expected that adding the Faxaflói data will increase the estimated frequency of non-lethal entanglement in the final results. Compared to other cetacean species, the preliminary results reveal a lower entanglement prevalence. The difference might be caused by lower fishing efforts in Iceland or high levels of lethal entanglement. Long-term monitoring of this population is needed to evaluate changes in scarring over time. Using this knowledge, future mitigation measures will support effective conservation actions.

Summer distribution of harbour porpoises in Irish waters using aerial survey data

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Given the upcoming expansion of marine renewable energy in Europe, it is critical to obtain reliable information on important areas for sensitive marine species including harbour porpoise (*Phocoena phocoena*), an Annex II-listed species under the EU Habitats Directive. Extensive aerial surveys were conducted within Ireland's EEZ during the period 2015 – 2017 (Phase I) and 2021-2023 (Phase II). Standard line-transect methods were used, with a search area extending 500 m from both sides of the aircraft. A total of 30,973 km of survey lines were covered in the summer of 2016, 2021 and 2022. 323 harbour porpoises and 11 calves were encountered on effort from 239 sightings, of which 140 were recorded in 2016, 67 in 2021, and 32 in 2022, respectively. The majority of observations were of a single animal, with a maximum group size of nine. Overall, harbour porpoises were concentrated on shelf waters, with consistently high densities in the Irish Sea and along the south coast of Ireland. These preliminary results suggest a possible shift in the distribution of harbour porpoises across years and/or a declining trend, but highlights consistent areas of importance for this species. To better understand the distribution and habitat use of harbour porpoises in Irish waters, analysis will focus on habitat modelling using environmental predictors of distribution including proxies of prey availability, fishing effort and vessel activities. Key outputs will provide valuable information for harbour porpoise conservation efforts and marine spatial planning around Ireland.

A better understanding of bottlenose dolphins (*Tursiops truncatus*) population structure in Irish waters

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The identification of discrete populations through genetic data is a fundamental step toward the delineation of conservation units, which is needed to guide management and conservation efforts. This study investigated the population structure and connectivity of bottlenose dolphins (*Tursiops truncatus*) in Irish waters using 15 highly polymorphic microsatellite markers. DNA was extracted from 67 tissue samples collected along the Irish coastline from free-ranging dolphins and dead stranded individuals. The newly generated genetic data was combined with previously published data to obtain the largest sample set analysed from Ireland (n = 127). Results of genetic diversity were found to be comparable to previous studies of bottlenose dolphin population structure in the North-East Atlantic. The evidence of bottlenose dolphin fine population structure in Irish waters was confirmed; with three distinct populations identified, two residing along the Irish coastline (Shannon Estuary and Connemara-Mayo) and one from offshore waters. All three populations showed widely different levels of genetic diversity and demographic dispersion. In particular the two coastal populations, whose habitat is partially protected by means of Special Areas of Conservations (SACs), showed reduced allele diversity and patterns of genetic and demographic isolation. Furthermore, this study provided new insights on population boundaries that indicate the need for a better strategy towards the conservation of bottlenose dolphins in Irish waters by delineating new potential SACs/MPAs and expanding the geographical coverage of existing ones.

New abundance estimate of Mediterranean fin whales

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The Mediterranean fin whale population, *Balaenoptera physalus*, is resident, with almost no exchanges with the Atlantic population. The entire population was estimated at 1,300 or 13,300 individuals by a recent project depending on the platform used. This disparity shows the importance of a long-term monitoring with a unique protocol of survey. Capture-recapture approaches using dorsal photographs and genetic identity collections over a 10-years period were used to estimate the abundance of the north-western Mediterranean fin whale. We identified 332 individuals using photographs and 470 using genotypes, with a total of 546 individuals identified between 2008 and 2019, when some whales were double marked. The inter-annual percentage of recapture varied between 15 and 17% respectively for genotypes and photographs methods. Using Cormack-Jolly-Seber models, the abundance of fin whales in the north-western Mediterranean is estimated at 1,295 individuals (95%CI: 1,116-1,474) with a survival probability of 0.945 (95%CI: 0.690-0.993) from genotypes. Abundance estimates from combined collections (photographs and genotypes) and corrected photograph estimates were similar to the genetic ones. Future studies might prioritise the genetic approach which is the least biased and with a narrower confidence interval. The genetic abundance estimates show relative stability over time, when compared to 1990 estimates, and should be included in future conservation actions.

- **Acoustics**

What's in a Whistle? Towards accurate acoustic classification of UK delphinid species

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Passive acoustic monitoring provides cost- and labour- efficient methods for monitoring the presence of free-ranging delphinids but remains hindered by the lack of a reliable means of identifying species by their vocalizations. Dolphin whistles are highly variable in their acoustic structure and are known to exhibit significant overlap in their acoustic parameters across species, making species identification difficult. Additionally, many species exhibit geographic variation in whistle characteristics and so developing an accurate automated acoustic classifier for delphinid species across different regions is improbable. Classifiers must instead be developed per-region, as they have been for the Northwest Atlantic and Eastern Pacific. We addressed the lack of such a classifier for the seven commonly occurring delphinid species in UK waters by developing and testing a random forest model to discriminate between these species using 50 measurements taken from whistle frequency modulation patterns. Measurements used for analysis were calculated from contours traced using the open-source PAMGuard ROCCA (Real-time Odontocete Call Classification Algorithm) module, from whistles detected manually in Raven Pro 1.6.4. When classifying individual whistles to species, accuracy of the model ranged from 33.4% for Grampus griseus to 59.1% for Orcinus orca. Average accuracy dropped by a significant 13.2% ($p < 0.001$) when novel recording sessions were used to test the model. This step exemplified the importance of using independent data when testing an acoustic classifier and helped assess the generalizability of our classifier. Classifier accuracy was improved by 9.3% by extending classification to the encounter-level (vs individual whistle level), classifying separate recording sessions (isolated by 30 minutes) to species with the highest proportion of whistle classifications. To improve accuracy further, we are working to add new variables from echolocation clicks and burst pulses and utilise novel methods in deep learning for classification. Classifiers will be made available for free use at PAMGuard.org.

Seasonal and diel patterns in Black Sea harbour porpoise acoustic activity in 2020-2022

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The Black Sea is a semi-enclosed inland sea with an extensive coastal shelf area and anoxic deep waters. It is inhabited by common and bottlenose dolphins and the harbour porpoise, all represented by local subspecies. All of them are threatened by habitat degradation, bycatch, pollution, and noise. Research teams from five Black Sea countries (Bulgaria, Georgia, Romania, Türkiye, and Ukraine) have been studying cetaceans using 20 F-POD acoustic loggers. Between September 2020 and October 2022, 300 million harbour porpoise clicks were logged and validated for investigating diel and seasonal patterns in Detection Positive Minutes using generalised additive models (GAMs). Here, we make the first attempt to describe diel and seasonal patterns of harbour porpoise acoustic activity in the Black Sea. We found strong seasonal patterns in harbour porpoise acoustic activity. In the Eastern and Southern parts of the Black Sea (Georgia and Türkiye) porpoises were active from January to April. In the North-Western part of the Black Sea (Ukraine) the pattern was also strong but different, with activity from April to October. The Western part of the Black Sea (Bulgaria and Romania) had a bimodal pattern characterised by a strong peak in activity in April and weaker one in September, apparently transitional between the other patterns. This regional progression in seasonal acoustic activity reflects migration patterns. Diel patterns in activity depended on the season. In the East and South, harbour porpoises were usually more active during the night, and this pattern was strongest in February. In the West, porpoises were mainly active during the night, but in September and October they were active only during the day. In the North-West during the warm season they were most active during the day. The main drivers of these patterns are likely to be changes in hydrological conditions, temperature, and prey availability.

Sound production during feeding by Icelandic herring-eating killer whales

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Killer whales can use echolocation for navigation and foraging. In Iceland, herring-eating killer whales use tailslaps to debilitate fish, but their acoustic behaviour during feeding, and the function of echolocation, is relatively little studied. We used acoustic data collected in Vestmannaeyjar using D-tags deployed in 2009 (n=4) and 2021 (n=9) to investigate sound production during feeding. The acoustic record was divided into 5-min bins. For each bin the presence of clicks, tailslaps, buzzes, herding calls and prey handling sounds (feeding on herring by suction) was marked. 72% of 5-min bins including echolocation clicks also included a tailslap, indicating that echolocation is linked to feeding. Next, the sound production in the 5-min prior and 1-min following each tailslap (i.e., feeding event) was examined in detail. Each feeding event was composed by, in this order, a click train, a pause, a tailslap, a pause, and, for 248 of 276 feeding events (90%), a buzz. Prey handling sounds were present in 91 of 276 events (33%) always following a buzz. In 2021, the herding call was found in 46 of 201 events (23%), always prior to a tailslap, but it was not present in 2009 (n= 75 feeding events). No feeding events occurred at night (from a total of 101 events recorded in 5 tags including 21 hrs nighttime and 64 hrs daytime). Finally, the mean duration of pauses between echolocation clicks and tailslaps was shorter in 2021 than in 2009. In summary, this study shows that the echolocation behaviour of killer whales in Iceland is tightly linked to feeding. It is likely less used for navigation, as the whales tend to travel in silence and close together. Yearly and diel variations in the acoustic behaviour of feeding killer whales might relate to group-specific differences or prey availability, and require further research.

POSTERS

Posters:

- **Abundance & Distribution**

Poster 1:

First assessment of occurrence, distribution, and encounter rates of cetaceans in Lisbon region (Portugal)

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Historical records and strandings information's suggest a regular presence of cetaceans in the Lisbon region. Over the last years, with the increase of tourist interest in the area and media attention, sightings of cetaceans seem to have been increasing. In this study, we analyse 6 years (2017-2022) of sighting records from opportunistic data to investigate for the first time the distribution, encounter rate, and habitat characteristics of cetaceans in Lisbon region. Patterns in occurrence characteristics, regarding temporal and oceanographic parameters, such as season, bathymetry, distance to the coast, tide were evaluated using a principal component analysis. In total, 9008 km were surveyed, and 305 encounters of 8 identified species, including delphinids, porpoise, and baleen whales, were recorded. The most common species in the area were, in decreasing occurrence, the common dolphin, the bottlenose dolphin, harbour porpoise and stripped dolphin. The least sighted species was the Risso's dolphin and the fin whale. Only two of these species were sighted inside the Tagus Estuary, the common dolphin – the most sighted – and the bottlenose dolphin. The summer occurrence of common dolphins was associated with low tide, which was not expected because potential prey is mostly associated with high tide. This result suggests that common dolphin occurrence in the area depends on additional factors other than prey. Photo-identification was possible for some individuals of common dolphins, bottlenose dolphins, killer whales and Risso's dolphins. Some bottlenose dolphins were resighted in surrounding areas, as well as killer whales (all identified as from subpopulation of the Strait of Gibraltar). The use of platforms of opportunity provides a cost-effective tool to study cetaceans, offering a broader overview of cetacean diversity and occurrence in the region where there is a lack of information, that could be further investigated using a more refined survey methodology.

Poster 2:

Filling in knowledge gaps on the Risso's dolphin (*Grampus griseus*) in the Balearic Islands, Mediterranean Sea, and notes on their value as an indicator species for open sea MPAs

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The Risso's dolphin (*Grampus griseus*) has recently been re-classified as ENDANGERED in the Mediterranean sea based on an inferred population reduction of over 50% in the last decade (Lanfredi *et al*, 2022). However, little is still known about the population inhabiting the waters around the Balearic Islands, where the species is sighted regularly including within the boundaries of MPAs such as the Cabrera Archipelago National Park. Here, ALNITAK presents current information from 54 sightings compiled between 2011-2022. The photoidentification catalogue's (left and right side) include over 250 animals each, with some individuals having been re-sighted 4 or 5 times. Dolphins are regularly observed with calves, and performing behaviours associated with feeding, thus beginning to shed light on their habitat use. A road map of next steps is also presented, included comparing the photoID catalogues with those of adjacent study areas, validating ACCOBAMS' ASI (2019) observations on Risso's dolphins presence in the Balearics, and actions such as promoting responsible interactions with cetaceans and citizen science.

Poster 3:

A preliminary report on the overlap between the distribution of *Tursiops truncatus* and Cruise ships in Montenegrin territorial waters between 2017 and 2021.

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Cruise ships are abundant in Montenegrin territorial waters, with Kotor being a major port for cruise ship activity from May to October. Montenegro is dependent on tourism in coastal areas, but still has a developing tourism sector, with cruise ships being viewed as economically beneficial. However, marine traffic is recognised to have a considerable impact on marine life, and management is often near non-existent. Bottlenose dolphins (*Tursiops truncatus*) are frequently sighted in Montenegrin waters and although this is a data deficient region, survey effort has been ongoing since 2016. Recent studies have highlighted that Montenegro holds important habitats for bottlenose dolphins all year round and as such can be used as important flagship or indicator species. Because both tourism and the dolphins depend directly on the study area it is important to obtain knowledge of their interactions. This study examines the overlap of cruise ship and dolphin distribution per year and season between 2017 and 2021. Dolphin presence data was collected via land and boat based survey effort, and "tested" alongside cruise ship data obtained from EMODNet. An overlap between bottlenose dolphin and cruise ship distribution was detected, with seasonal and yearly variations. Boka Kotorska is an important marine resource in itself, utilized by both human and marine life. This important ecological site faces a multitude of anthropogenic threats, and cruise ships play a major role in its degradation affecting the bottlenose dolphin population in the area. It is of the utmost significance that effective management is implemented to limit the devastation caused by the presence of cruise ships in the Bay of Kotor. Further studies will build on our baseline understanding of cruise and delphinid interactions in Montenegro, and allow for the improvement of legislation.

Poster 4:

Estimating sperm whale availability for sperm whale (*Physeter macrocephalus*) density surveys

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Estimating the density of cetaceans from visual or acoustic surveys must include estimates of availability, otherwise density will be underestimated. This presents a major challenge for both visual and acoustic surveys, since animals can spend a large fraction of their time silent and/or at depth. Methods might include towed, drifting or bottom mounted cue counting or snapshot approaches for passive acoustic surveys and aerial or ship-based surveys for visual surveys. Here we report on availability for both visual and acoustic surveys for sperm whales (*Physeter macrocephalus*) based on 104 DTAGs, from 8 different locations over several years. When available, the sex of the tagged animal was recorded. We investigate the impact of different thresholds for considering a detection on the estimated availability, namely the number of sounds required for a detection from PAM, the length of the considered survey snapshots, or the depth for detection from visual or boat surveys. Overall, the instant acoustic availability is around 0.59 and that value increases smoothly with the duration of the snapshot up to 0.93 for a full hour. Regarding visual surveys, proportion of time spent by animals above or at 1, 3, 5 and 10 meters is 0.17±0.07, 0.18±0.07, 0.19±0.08 and 0.21±0.11, respectively. Furthermore, we found evidence for differences in availability between sexes, with males showing higher acoustic availability than females, and between locations. While visual or acoustic surveys can be severely biased down if availability is ignored, this bias can be corrected by estimating it from tag data. However, differences found across locations, times, or sexes, if real, illustrate the dangers of considering estimates of availability from other places or times than those for the actual survey.

Poster 5:

Long-term abundance estimates of bottlenose dolphin (*Tursiops truncatus*) in the gulf of Cádiz

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The Gulf of Cadiz, located in the SW Iberian Peninsula, is a high-productive and overexploited marine area. There, bottlenose dolphins are widely distributed in coastal waters holding a top-down role effect on the marine food web. Monitoring of this ecological management unit is required to assess Good Environmental Status under the EU Marine Strategy Framework Directive.The main objective of this study was to estimate the abundance dynamics of the Gulf of Cádiz bottlenose dolphin management unit along four consecutive periods (2001-2003, 2005-2006, 2009-2010, and 2012-2013) by using mark-recapture techniques. Dedicated surveys were carried out from 2001 to 2013 obtaining 51 sightings of bottlenose dolphins, during which photographs of dorsal fins were collected for all individuals. For the present study only left side dorsal fins were analysed to determine the abundance of this management unit. Capture-recapture models were used to estimate the population size in the study area using the program MARK. Results show similar abundance estimates between the studied periods, indicating a stable population, although with large confidence intervals. We recommend increasing the photographic effort in the area to achieve more precise abundance estimates to ensure a proper monitoring of this ecological management unit and to design adequate management plans for this species.

Poster 6:

Using citizen science to determine the frequency and distribution of Harbour porpoise sightings across Sussex

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The Sussex coastline, situated along the south coast of England has a variety of habitats from bedrock between Selsey Bay and Brighton, to chalk reefs and blue mussel *Mytilus edulis* beds at Beachy Head and Hastings. The region's coast supports rich invertebrate populations, communities of seaweeds, and spawning areas for various fish species. Recordings of harbour porpoise *Phocoena phocoena* in the region's nearshore waters have become more regular. The intense tourist industry along the Sussex coast has created one of the most densely urbanised coastal zones in the UK providing the opportunity of increased casual sightings of harbour porpoise along the coast. The aim of this study was to use the casual sightings data submitted by members of the public to the Sussex Dolphin Project to identify the areas in Sussex with the highest reported sightings of harbour porpoise. Along with establishing the seasons and the year with the most reported sightings. Data submitted by the public from 2017 to 2022 showed that the summer season (June to August), the year 2021 and the area between Beachy Head to Eastbourne harbour had the most reported sightings. These "by chance" casual sightings are arguably a reflection of public behaviour. However, it is important to note that the area with the most sightings, corresponds to the Beachy Head West and Beach Head East Marine Conservation Zones. Future monitoring efforts are required to determine a better understanding of the harbour porpoise distribution along the Sussex coastline. Citizen science has proven to be a useful and cost-effective tool in collecting data. Therefore, efforts are currently being made to develop a citizen science land watch programme to collect "on effort" data along the Sussex coast contributing to the conservation management of the species.

Poster 7:

Using Citizen Science to better understand presence Risso's dolphins (*Grampus griseus*) in north-east Scotland and the Northern Isles

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The use of citizen science data to advance the scientific understanding of the marine environment and enhance public participation with important environmental issues is increasingly recognised and is becoming valued by governments, policy makers and the scientific community. At sites where sightings can be made close to shore, local volunteers, wildlife enthusiasts or citizen scientists can contribute valuable data to improve the understanding of spatial and temporal patterns in local cetacean populations. By collecting, predominantly opportunistic, photos of Risso's dolphins from waters around the Northern Isles (Orkney and Shetland) and the North and Northeast coasts of mainland Scotland, we undertook a citizen science-based Photo-Identification study. As a result of collaboration with other researchers, members of the public, wildlife enthusiasts and tour operators, we were able to publish two Photo-ID catalogues for Risso's dolphins - one identifying 112 individual dolphins seen in the waters of Orkney and north-east Scotland and the other detailing 42 individuals who have been spotted around Shetland and Fair Isle. Our initial analysis is showing similar to what we have documented on the west coast of Scotland, where there are long-term associations between individual dolphins and evidence of site fidelity. This project has helped significantly in furthering the information known on the presence and habitat use of Risso's dolphins in Scottish waters and will continue to do so as it evolves and feeds into associated work on Risso's dolphins elsewhere in Scotland and the wider UK.

Poster 8:

Bottlenose dolphin's habitat use in Faro coastal and inshore waters: Preliminary results

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Bottlenose dolphins (*Tursiops truncatus*) are amongst the most widely distributed species of cetaceans. In the coastal waters of mainland Portugal, bottlenose dolphins are one the most commonly observed species. Mortality of this species is often associated with human activities such as fishing and boating. Understanding the habitat use of the species throughout the coast is fundamental in order to assess the overlapping risks with human activities and to implement effective conservation plans. In this study, we try to understand bottlenose dolphins' behavioral patterns around Faro coastline for both coastal and inshore waters. This area in the Southeastern Portuguese coast has a very unique and dynamic ecosystem, with a semi-closed lagoon bordering the end of the continental shelf, with deep waters relatively close to shore. Bottlenose are found both in open seas and inshore marshland areas (Ria Formosa Natural Park). From 2020 until December 2022, opportunistic data was collected on a commercial dolphin watching vessel, following random transect lines. A total of 657 surveys were conducted, and 360 bottlenose dolphin sightings were recorded. Behavioral data and GPS positions were logged in every trip with all behavioral states observed, as well as group composition. First results suggest that bottlenose dolphins use the lagoon inshore waters exclusively for foraging purposes, mostly during the summer months. In the open coastal areas, the most observed behavioral states were travelling (33%) and foraging (26%). Most of the pods seen feeding were spotted under 4nm from shore. Group composition changed between 1 individual and an estimated pod of 150 animals. Calves and newborn calves were present all year round with minor differences throughout the seasons. This study indicates that bottlenose feed all year round in nearshore areas with a few pods using inshore waters for the same purpose during summer months.

Poster 9:

Baleen Whales in Southeastern Portugal: short review on Seasonal Occurrence

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Seasonal occurrence is fundamental to comprehending how marine species can use different regions worldwide. Since the whaling period, baleen whales (mysticeti) have been reported in mainland Portugal, and more recently from dedicated projects gathering information on strandings and evaluation of interactions of cetaceans with fisheries. In the southeastern Portuguese coast, at least six of these species have been observed, however, very little is known about their occurrence patterns. This study aims to give the first insights into baleen whales' seasonal occurrence in the southeastern coast (Algarve´s leeward area), by combining four different approaches within December 2019 to November 2022: strandings, acoustic data (60 recording days), vessel-surveys (657 events) and land-based observations (63 days). Overall, 92 baleen whale sightings were recorded based on vessel, land surveys and strandings. Vessel-surveys recorded 57 sightings, 17 by land observers, and 18 baleen-whales stranded dead and registered by the regional stranding network in the time period. Five species were registered: Fin whale (*Balaenoptera physalus*), Minke whale (*Balaenoptera acutorostrata*), Sei whale (*Balaenoptera borealis*), Bryde´s whale (*Balaenoptera edeni*) and the Humpback whale (*Megaptera novaeangliae*). The most sighted species was the fin whale, while minke whales comprise most of the strandings´ data (83 % of the total stranded). From the vessel-surveys, the observed fin whales group composition ranged from 1 to 8 individuals, whereas sei, minke and Bryde's whales ranged from 1 to 2 animals. Moreover, both boat-based surveys and stranding data confirmed the occurrence of several juveniles of all the five species. Analysis on acoustic data is still ongoing, but our results so far confirm the all year-round presence of some mysticeti species, with higher frequency during spring and summer seasons.

Poster 10:

The BICREF-RMSR cetacean monitoring in the Central Mediterranean

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The Rolex Middle Sea Race is an annual sailing boat race held in October, covering at least 1120 km starting from Malta to Capo Passero, through Messina, Edolie Islands, Favignana, Pantelleria, Lampedusa, and back to Malta. The NGO BICREF and the Royal Malta Yacht Club have been collaborating on cetacean sightings project open to racers since 2000. The RMSR 2022 edition saw over 100 boats participate and sail through this extended track through calm weather conditions facilitating sighting records. After the race, filled-in forms with details of each cetacean sighting and referenced photos and or videos were received by BICREF together with visual media. The cetacean sightings included: Bottlenose, Stripped, Common dolphins, and Sperm whales. Owing to the sailing mode of traveling, the participating yachts have a marked lesser chance to disturb the cetaceans through vessel noise allowing for closer encounters. This is obvious from the experience collected over the years this BICREF/RMYC initiative has been undergoing. Furthermore, due to the number of participating yachts, the detailed data reported, and the media provided, offer more accurate confirmation and composition of the sightings along the whole track during a short temporal interval of a few days. The reported sightings are then analysed after integrating this data with data relating to tracks of shipping and anthropogenic activities available through the AIS data repository. The racetrack traverses the central Mediterranean region which is known for cetacean presence and conservation requirements. Therefore, providing an effective snapshot monitoring of cetacean species presence, habitat preferences, group numbers in different areas, side by side with anthropogenic activities. This year's results are also compared with previous years in this long-term monitoring project to provide interannual dynamics in cetacean area fidelity during autumn.

Poster 11:

Abundance of Cuvier's beaked whale (*Ziphius cavirostris*) in the Alboran Sea

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Beaked whales are the most unknown of the cetaceans, mainly due to the amount of dive time they can endure. In fact, many species have been studied mainly through strandings. Information on distribution and abundance of Cuvier's beaked whale (*Ziphius cavirostris*) within the Mediterranean is limited and it is classified by the IUCN as "data deficient". The eastern Alboran Sea seems to be a priority area within the basin, so estimating its current abundance is essential for the conservation of this species. In this study, we sampled the area located between two Sites of Community Importance (SCI): “South of Almería-Seco de los Olivos [LIC-ESZZ16003]” and the “Alboran Sea” [LIC-ESZZ16005]”. The research area includes some geomorphological formations that provide Cuvier's beaked whale with a great diversity of prey. Linear transects were carried out during 2022 following the Distance Sampling methodology to cover all the research area. For each sighting the angle and distance at which the animal was located with respect to the trajectory of the boat was registered. After navigating 1337 km in line transect, 26 sightings of 83 individuals were obtained. Based on these data, the abundance of Cuvier's beaked whale in this area is calculated of 109 (IC:43-189). Our results highlight that the northern Alboran Sea continue to be an important area for this elusive species. This information is crucial for the correct delimitation of protected areas for the conservation of this species in the Alboran Sea, probably one of the most important area for the species within the Mediterranean Sea.

Poster 12:

SCANS-IV: Small cetacean abundance in European Atlantic waters and the North Sea in 2022

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A series of coordinated large-scale surveys for small cetaceans in the North Sea and adjacent waters was initiated in 1994 (SCANS) with the aim to obtain first comprehensive estimates of abundance of regularly occurring species to place estimates of bycatch and other anthropogenic mortality in a population context. Previous surveys (SCANS-II 2005/CODA 2007, SCANS-III 2016) have been completed on a decadal basis to monitor species and provide data to estimate trends. However, more frequent estimates (every 6 years) are needed to provide output for European Union Member States that need to report under both the Marine Strategy Framework Directive (Article 8) and the Habitats Directive (Article 17) as well as to complete indicator assessment under OSPAR and HELCOM. In summer 2022, SCANS-IV was successfully completed in a study area of approximately 1.8 million km^2 ranging from the Strait of Gibraltar to southern Norway, thus achieving the largest coverage and effort of all SCANS surveys to date. Data were collected by aerial survey (> 70,000 km covered) using the circle-back method for eight teams, and by a ship survey (> 4,500 km covered) in offshore waters of the Bay of Biscay using the two-team tracker method to account for animals missed on the transect line. More than 5,000 sightings of 17 cetacean species were recorded. Design-based abundance estimates for several species will be presented, including harbour porpoise, common, striped, bottlenose and white-beaked dolphin, minke, fin, sperm and beaked whales. Using these new estimates, which total more than 1.5 million animals, the aim is to thoroughly evaluate and assess the conservation status of different species and Good Environmental Status (GES) of the covered areas as well as multiple other evidence needs for cetaceans in European Atlantic waters.

Poster 13:

False killer whales (*Pseudorca crassidens*) in São Miguel Island, Azores: Long-term resightings and associations

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False killer whales (*Pseudorca crassidens*) are a widely distributed pelagic cetacean known to occur close to oceanic islands, such as Hawaii and Azores (Portugal). However, even in known places of its incidence, sightings are rare, resulting in lack of data for most of its global range. The habitat use, general occurrence and resightings of false killer whales are examined for the first time in São Miguel, the main Azorean Island. Opportunistic data were collected aboard whale watching boats from 2008 to 2022. Throughout the years, encounters with false killer whales were rare. However, they were observed in all years and seasons, except for 2011. False killer whales were observed in groups ranging from 1 to 100 individuals. They were in association with common bottlenose dolphins (*Tursiops truncatus*) in 19.1% of the encounters and 8.8% with other cetacean species, including mysticetes and other odontocetes. A total of 107 individuals were identified, with 28.0% (n=30) of them being sighted two or more times, and 3.7% (n=4) being sighted five times or more. Resightings were recorded over a maximum period of 11 years, and a pair was seen together over a period of 8 years. The photo-identification results support the idea of long-term associations among individuals, which may suggest the existence of stable groups, already described in the literature for other areas. Although the sightings of false killer whales in São Miguel Island showed to be occasional, some individuals demonstrate a recurrent use of the area, indicating a certain degree of site fidelity around the island and, likely, around the archipelago. This introduces an identification catalog and first insights regarding temporal distribution, and intra and interspecific associations of false killer whales around São Miguel Island. It highlights the importance of opportunistic long-term data, particularly when studying species that are only observed occasionally worldwide.

Poster 14:

Orcas in the Azores: Photo-identification & description of an apex predator visiting São Miguel

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Orcas (*Orcinus orca*) are widespread throughout the North Atlantic, but there is still insufficient data to properly address the status and distribution of their populations, especially in mid-Atlantic waters such as the Azores. In this study, we used opportunistic data collected between 2006 and 2022 from whale watching vessels of Futurismo Azores Adventures operating off São Miguel Island (Azores), and from the MONICET platform, which compiles cetacean data collected by other companies in the archipelago. This study aims to (1) assess the orca spatiotemporal distribution in São Miguel; (2) update the photo-identification catalogue and compare it with catalogues from other regions; and (3) morphologically describe the identified individuals. Orcas were sighted in 11 years of the study, mostly between March and May. A total of 63 individuals were identified, of which 21 were re-sighted, mostly within a few consecutive days. Three individuals were sighted together 9 and 10 years apart. The photo-identification catalogue was officially compared with other areas: Iceland (Orca Guardians catalogue), Strait of Gibraltar (CETIDMED catalogue) and Genova (Menkab), where no confirmed matches were found to date. It is still under comparison with Madeira and Canary Islands (Museu da Baleia da Madeira), the eastern Canadian Arctic (Fisheries and Oceans Canada) and NW Iberia (CEMMA catalogue). No distinctive morphological patterns were described, and around 57% of the individuals presented barnacles on their fins and flukes, which in some cases makes photo-identification difficult to confirm. More comparisons with other catalogues of the archipelago and the North Atlantic are needed to improve our understanding of orcas in mid-Atlantic waters. Although opportunistic data present some limitations, advantages such as long-term data with regular spatial coverage, make whale watching platforms a highly valuable tool to expand our knowledge about rarely sighted species.

Poster 15:

Small cetacean distribution in North Atlantic Iberian Peninsula waters 2007-2019

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Information on cetacean distribution is needed at a range of scales, such as European, national, subregional or regional level. Providing detailed information at larger scales, with the highest possible spatial resolution, is essential to adequately assess and evaluate the impacts of human activities at the population or subpopulation level, as required by several legal instruments and international agreements (e.g., OSPAR or ASCOBANS). In this study, we modelled the distribution and relative abundance of common dolphin (*Delphinus delphis*), bottlenose dolphin (*Tursiops truncatus*), and pilot whale (*Globicephala melas*) in continental shelf waters of the Spanish North Atlantic waters, using a time series of 13 years of sightings collected on the PELACUS multipurpose survey in spring months by means of Distance Sampling methodology. Species distribution models were fitted using geographical and biological explanatory variables. The more than 20,000 km of effort, regularly distributed over the study area throughout the time series, provided more than 400 sightings of the species of interest. The three species showed interannual variability in distribution and relative abundance. These annual differences might reflect changes in their movement patterns due to the different timing of oceanographic and biological processes between years, as shown by the models and the variables analysed. The results prove the relevance of the continental shelf in southern Galicia (the Rias Baixas) as an area of importance for these species. The maps produced have several applications, including the identification of relevant areas for these species and, when combined with other data (e.g., fishing effort, underwater noise), quantitative risk analysis to different anthropogenic activities.

Poster 16:

Sighting durations during commercial whale-watching recorded in three years in the Pelagos Sanctuary

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In the Pelagos Sanctuary (North-western Mediterranean sea), the whale watching activities does not have any national legislation granting permits. To embed the sustainability, the two international agreements for cetacean conservation (Pelagos Sanctuary and ACCOBAMS) developed and deployed the High Quality Whale Watching® certificate -HQWW®- for commercial operators. Certified operators must commit to a number of actions including the respect of the code of good conduct for observing cetaceans. One point of the code sets to thirty minutes the sighting duration (fifteen minutes when other boats approached the individual or the group). The present study aimed to calculate the sighting duration in all trips done in 3 years (2020-2022) for a single operator after being certified with the HQWW® in 2019. Data have been collected by the company Consorzio Liguria Via Mare operating in the Gulf of Genoa. Then data have been validated according to full-track and sighting records. The numbers of trips by year were 33, 49 and 66 and the number of sightings were respectively 137, 126 and 188. The full-sighting duration was calculated for each sightings according to the time spent in the precautionary area (100-300m) at low speed. For medium and large species, the surface-sighting duration was also established removing the diving-duration from the full-sighting time to assess the duration of "direct" approach. Full-sighting duration analysis shows that 19.1% of the duration were higher than thirty minutes. The surface-sighting duration was higher in 12.7%. These results give a concrete indication on how a single company commit to the sighting duration. However this methodology is clearly limited: most of companies, even thought they are HQWW® certified, do not want to share their data. Thus it is fundamental to improve data collection raising awareness of the benefits of a collaboration based on trust.

Poster 17:

Dolphins in the city: towards a collaborative framework to assess dolphins' occurrences in Tagus estuary, Portugal

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Although cetaceans are known to be key species for marine conservation strategies, either as environmental sentinels, composition indicators or flagship taxa, baseline information is still scarce in many regions worldwide. In Tagus estuary, Portugal, the presence of delphinids, such *D. delphins*, *T. truncatus* and *P. phocoena* listed in Habitats EU Directive, has been anecdotally reported for decades. Still, systematic information on diversity, distribution patterns and habitat use are very limited. To build up knowledge on these occurrences and to raise awareness regarding dolphins' presence near a European capital – Lisbon, a collaborative volunteer-based initiative was launched. The «Observatório Golfinhos no Tejo» was created within the scope of a scientific project, led by I&D center (MARE-ISPA) in partnership with an environmental NGO (ANP|WWF). From March 2022, researchers and trained volunteers started collecting data, from a high vantage point (VTS tower of Lisbon Port Authority), on dolphins' occurrences. Continuous horizon scans, using binoculars and a telescope, during daylight periods (8am-4pm), enable to document regular visits of common dolphins (36 days) and the sporadic presence of bottlenose dolphins (2 encounters). Aside from its scientific value, «Observatório Golfinhos no Tejo» also has an enormous advocacy potential and. offers the opportunity to involve different stakeholders, including municipalities, resource managers, authorities, and users of the area. During last year, the observatory received participative initiatives promoted by Lisbon Port Authority, was included in «Earth's Day» commemoration events, and was visited by the Portuguese Secretary of State for Maritime Affairs on World Ocean Day. This pioneer project is the first of its kind to specifically target delphinids' occurrences in Tagus estuary. «Observatório Golfinhos no Tejo», with dolphins as flagship species, sets the tone towards a greatly needed collaborative framework in the region, as it raises awareness to the many threats Tagus estuary faces and calls stakeholders to action.

Poster 18:

Changes in the distribution and abundance of marine mammals in the North Sea associated with present and future wind farm developments

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Marine top predators in shelf seas have faced a changing seascape across recent decades, with evidence for shifts in their distribution and abundance. In the North Sea, new infrastructure has largely consisted of offshore wind farm (OWF) installations, and extensive areas have been set-aside for further developments in forthcoming years. To date, impacts of OWF construction on marine mammals has received most attention. However, large-scale developments will also alter hydrological conditions in both near- and far-field habitats. The behaviour and distribution of prey is strongly influenced by hydrological conditions, and changes in currents and water column mixing around installations could impact marine mammal distributions at regional scales. Understanding links between oceanographic processes, prey availability, and marine top predators is key to understanding and predicting potential changes to their distributions. This study combines long-term marine mammal and prey surveys with high-resolution hydrodynamic model outputs to understand these links in the North Sea. A mechanistic modelling approach will be taken to understand the impact of physics on prey availability, and subsequently the impact of prey availability on marine mammals. This mechanistic approach aims to: (1) identify critical habitats for marine mammal communities in the North Sea, (2) explain changes in abundance and distributions over recent decades, and (3) predict changes following array installations. By considering both hydrodynamics and prey availability, rather than just the former, this approach should provide detailed insights into the processes affecting marine mammal distribution, improving predictions across future decades, and aiding marine spatial planning and management in the region.

Poster 19:

Residency patterns and site fidelity of Risso's dolphins (*Grampus griseus*) in the central Catalan coast (Northwest Mediterranean Sea)

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Risso's dolphin (*Grampus griseus*) is a deep-diving species that in the central Catalan coast (northwest Mediterranean Sea) inhabit waters relatively close to shore due to the presence of deep canyons situated perpendicular to the coast. These habitats are exposed to numerous anthropogenic threats such as highly intense fishing pressure, anthropogenic noise and maritime traffic among others. In order to properly manage this species, it is imperative to understand their residency patterns and site fidelity. In this study, we used boat-based surveys and photo-identification data between March 2014 and December 2021. During this time, we recorded 30 sightings of Risso's dolphins in which we identified 326 different individuals. Unmarked individuals or those with pictures of insufficient quality were not used for the analysis. In total, 262 Risso's dolphins were used to study the monthly and seasonal residency rates and the side fidelity of the species in the area. Risso's dolphins showed low mean monthly (0.02 ± 0.001) and seasonal (0.04 ± 0.001) residency rates and side fidelity indexes (0.036 ± 0.006) compared to other areas in the Mediterranean sea. However, multi-year and within-year resightings were present for some individuals, suggesting that some Risso's dolphins spend considerable time off the central Catalan coast. This study suggests that the central Catalan coast might be a crucial area for Risso's dolphins in the Mediterranean Sea. A more intense surveying effort should provide more detailed information on the residency patterns of certain individuals in the area. At the same time future research efforts on the whole western Mediterranean coast is recommended to better understand the population dynamics in the area. We recommend the long term monitoring of this vulnerable species, as little information is available in the basin, hindering scientific informed management.

Poster 20:

Cross-sightings between the Azorean and Iberian killer whale (*Orcinus orca*) populations

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In the North-eastern Atlantic, killer whales have been described in the North Sea, all around the Iberian Peninsula's Atlantic coastline, Strait of Gibraltar, and occasionally, in the Macaronesian archipelagoes. Supported by killer whale catalogues from Spain and Azores and a total of 226 analyzed pictures, 2 individuals were identified, one from each population, seen in the other's range, becoming the very first matches between the two populations. This brings a need to pay attention to this kind of cross-sightings, as it could reveal a possible link between the two populations, with the possibility of cultural transmission, such as changes in prey preferences and/or contagious disruptive behavior, as well as new migration routes for the two groups.

Poster 21:

Western gray whales (*Eschrichtius robustus*) on their summer feeding ground off Kamchatka, Russia in 2022

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Feeding grounds of the western gray whale population, which is listed on the IUCN Red List as endangered, are located in the coastal waters of Sakhalin and Kamchatka, Russia. Long-term studies of the gray whales are conducted off Sakhalin Island. The Kamchatka feeding ground is poorly studied. Up to 80 individuals were encountered annually off the east coast of Kamchatka. It was assumed that the whales stay here briefly on their way to the main feeding grounds off Sakhalin. In 2022, we conducted the study in the Kronotsky Gulf of the Kamchatka Peninsula (Olga Bay). We carried the work out from June 6 to September 7 (93 calendar days), 38 boat surveys were conducted. We identified 97 gray whales, including 7 mother-calf pairs. A maximum of 29 whales (on 29 July) were sighted in one survey, with an average of 18 (SD=6) whales sighted per survey. The whales remained in Olga Bay from 1 to 93 days (the period between the first and the last sightings). Twenty-one whales were sighted once, 29 whales spent 2-10 days in the study area, 10 whales spent 11-20 days, 19 whales spent 21-60 days, and 18 whales spent over 60 days. Some whales were encountered regularly, while others appeared at long intervals. The appearance of new individuals in the area was regular throughout the season. Obviously, some individuals use other feeding areas, such as the Sakhalin coast, but for some whales Olga Bay is the main feeding ground. The body condition of most whales has improved during their stay in Olga Bay. However, in August and September, 9 animals were in poor body condition, including 4 lactating females. The results of the study suggest that the feeding ground in Olga Bay is important for gray whales.

Poster 22:

Pinniped records in Atlantic coasts of Spain and Portugal between 1990 and 2019

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Several pinniped species travel long distances to unusual locations, where they are frequently interpreted as vagrants. Between 1990 and 2019, a total of 578 pinnipeds from the Atlantic coasts of Spain and Portugal were recorded through stranding and sighting networks, representing 86.6% of all historical records for the area (123 records before 1990), belonging to seven species: *Halichoerus grypus* (68.2%), *Cystophora cristata* (10.9%); *Phoca vitulina* (5.1%), Pagophilus groenlandicus (0.7%), *Odobenus rosmarus* (0.6%), *Phoca hispida* (0.6%) and *Erignathus barbatus* (1.2%), and 12.6% unidentified specimens. These species do not reproduce in the area (the only exception is *Monachus monachus*, reproductive in Madeira but not included in this work). The north coast of the study area (Cantabria and north Galicia), registered most of the records, with more than 2 individuals stranded for every 10 km of coastline (S/10km), on a regularly basis (annual) and with a strong seasonality. Strandings occurred to a lesser extent in southern Galicia, mainland Portugal and Andalucia, with 1 to 2 S/10km, whereas the presence in the Macaronesian islands is sporadic with 0,04-0,2S/10km and can be considered extralimital for all species. Concerning age classes, most of the individuals (90%) were pups that stranded after the post-weaning period and juveniles. The grey seals strandings accounted with 69.8% pups and 23.6% juveniles, and the hooded seals had 33.3% pups and 57.1% juveniles. The records show a clear seasonality during the year, with December-February being the period with most of the records for grey seal and July-October for hooded seal. A total of 214 individuals were observed alive and some of them (n=134) required a rehabilitation process, after which 63.5% could be returned to their environment. 7.7% of pinnipeds died from accidental capture in fisheries.

Poster 23:

Preliminary results of a cetacean small scale monitoring around Western Sicily (Central Med Sea)

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Small-scale presence and distribution of cetaceans are still poorly investigated in certain areas of the Mediterranean Sea, and especially in the pelagic realm. To contribute further data in this respect, the waters of Western Sicily and minor islands were chosen to perform a seasonal visual monitoring along five ferry routes connecting Palermo to Ustica and Tunis, Trapani to Egadi Island and Pantelleria, and Porto Empedocle to Lampedusa. The survey activity was carried out for two years (2021-2022) from May to October in the framework of the Fixed Line Transect Med Monitoring Network and the Interreg Italy-Malta SEA MARVEL project, using passenger ferries as platforms of observation.Along more than 14000 km of effort, 166 sightings of cetaceans were recorded, including 7 different species. Bottlenose and striped dolphin were consistently sighted during the study period (SPUEbottlenose= 0.076±0.01; SPUEstriped 0.042±0.007). The former occurred regularly throughout the study area, with a preference for more coastal waters, while the second was registered almost only beyond the continental platform. Risso's and common dolphins, and Cuvier's beaked whales were seen occasionally and exclusively in the pelagic realm. Interestingly, two sightings of sperm and fin whales were recorded just outside Palermo harbor and in the shallow waters south of Egadi Island. Species richnessxcell was higher in the northern part of the study area, especially outside the gulf of Palermo and in the waters north of Egadi Island.These preliminary results represent the first step to thoroughly comprehending the spatial and temporal distribution, and habitat preferences, of these vulnerable species. The investigated area, while being a hotspot of biodiversity and hosting several MPAs, is however characterized by the presence of multiple anthropogenic pressures. Hence, further analyses are planned to perform a spatial risk assessment underpinning the most threatened areas and seasons.

Poster 24:

Distribution and year variation in population estimates of the short-finned pilot whale (*Globicephala macrorhynchus*) in the southwest of Tenerife (Canary Islands).

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Short-finned pilot whales (SFPW) are commonly spotted around all Canary Islands but distributed non-uniformly around the archipelago, with high concentration areas located around La Gomera and the SW of Tenerife. To study its distribution and abundance in the Special Area for Conservation (SAC) Teno-Rasca (SW Tenerife), long-term photo-ID studies have been conducted since 2015, using a combination of land and sea observations. Ecological niche models were performed to obtain the habitat suitability for the species in the area, using a selected database of 266 sightings. The following set of environmental variables was used: 1) depth, 2) slope of the bottom, 3) distance to the 500m bathymetric line, 4) distance to submarine canyons, and 5) surface temperature of seawater. The area under the curve (AUC) was used to evaluate the models, resulting in a value of 0.91, which indicates excellent performance. Best-selected models show that SFPWs prefer deep waters of about 1000 m depth, showing two interconnected preferential sub-areas. Moreover, 42,163 photographs were analysed, and an online open-source photo-ID catalogue with 644 identifiable animals was created. Year abundances based on mark-recapture analyses showed no significant variation when compared with previous studies during consecutive years, with the best estimates being 371 resident animals (CI=288-665) and 636 (CI=507-881) for all SFPWs inhabiting the SW of Tenerife (regardless of their site fidelity level). These findings provide essential information to assess the impact of human activities on this species and, therefore, improve appropriate management and conservation actions in the SAC Teno-Rasca.

Poster 25:

A photo-identification study of a foraging aggregation of male sperm whales in Northern Norway

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Sperm whales have a sex segregated social structure where mature individuals only meet for breeding. Outside of reproduction, adult males occupy high latitude feeding grounds while females and calves remain at low latitudes. In the North Atlantic, male sperm whales migrate from breeding grounds at low latitudes (ca < 45° N) towards feeding grounds at higher latitudes (ca > 60° N). Male sperm whales have been found in Norwegian waters year-round mainly along the continental shelf edge. The deep-water Bleik canyon, located off the coast of Andøya island in Northern Norway, is a previously known feeding ground for male sperm whales. Previous photo-identification studies conducted in this area have shown short residency times and continuous sightings of new individuals suggesting a high dynamism within the aggregation. However, male sperm whales have until the recent years only been studied during the summer months (May – September). The present study extends the photo-identification effort and includes year-round observations during 2009 – 2022 done by a whale watching company. Therefore, we aimed to explore seasonal aggregation dynamics of male sperm whales on this northern foraging ground. It included more than 1400 sightings of more than 400 individuals during the thirteen years of study. Three fourths of the individuals were sighted only for one year. Resighted individuals showed seasonal trends in their occurrence pattern with some individuals being only observed in winter-spring (February – May), and others only in summer (June – September). Furthermore, males appeared to gather in pairs or larger groups more frequently in winter and spring compared to summer highlighting seasonal variability in their behavior. This indicated that male sperm whales are present in Bleik canyon the whole year-round, and that they show seasonal differences, from their occurrence to their social behavior, highlighting the high dynamism of the aggregation.

Poster 26:

Distribution pattern of short-beaked common dolphin (*Delphinus delphis*) in the Dodecanese archipelago (Eastern Aegean Sea, North-Eastern Mediterranean Sea)

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Cetaceans are considered bioindicators of marine ecosystems, due to their significant top-down control role in the food webs. Their distribution across ecosystems is determined by a combination of spatial and temporal scales, being influenced by both anthropogenic impacts and environment. However, identifying the factors that locally influence distribution patterns remains a challenge mostly when effective conservation actions are requested by the management system. *Delphinus delphis* (short-beaked common dolphin, DD) sighting data collected between 2017 and 2021, during 284 standardized vessel-based surveys were used to set a presence/absence distribution model in the Dodecanese archipelago (Eastern Aegean Sea, Western Mediterranean Sea). Binomial GAMs (Generalized Additive Models) with logit as link function have been performed using the R package mgcv (REML method) and different bio-geo-chemical explanatory variables collected from different sources (EMODnet portal, Copernicus portal and Euclidean distance for the distance to shore). Correlations between continuous explanatory variables, investigated using correlation coefficients (threshold = 0.7) and variance inflation factors (VIF, threshold = 3) pinpointed that uncorrelated variables were: longitude, latitude, depth/distance to shore, salinity, Chlorophyll-a, dissolved Carbon, dissolved Nitrates. A 10-fold cross-validation method for each model and a random data splitting procedure of 70/30% for each model calibration and testing was performed and allowed to select models with the highest deviance explained and AUC > 0.75. The variables with the highest impact on the model were depth and the smoothing interaction between longitude and latitude. Results indicate that long-term time-series of satellite-derived data may be used to assess spatial distribution pattern of DD, allowing a better assessment of their mesoscale, seasonal and long-term variable occurrence in the marine ecosystem.

Poster 27:

The effect of season, annual variation, and bathymetry on bottlenose dolphin (*Tursiops truncatus*) occurrence and abundance in Sussex, U.K. with the use of citizen science sightings data.

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Bottlenose dolphins (*Turrsiops truncatus*) are wide ranging marine mammals that inhabit both offshore and costal locations. A broad and established body of research exists for the species across their global distribution however, very little is known about their occurrence and abundance in Sussex, southeast England. Using citizen science sightings data, the aim of this study was to initiate a baseline of research and determine the effects of season, annual variation and bathymetry on bottlenose dolphins observed in Sussex. Two sets of citizen science data from two different organisations were used for this analysis; Sussex Biodiversity Records Centre (SxBRC) and Sussex Dolphin Project (SDP) covering a combined time period of 1913 – 2021.The results demonstrated that sightings have increased each year and peak in the Summer season (June – August) for both data sets; SxBRC: ($F(4, 391) = 11.4$ $p=<.001$) and SDP ($F(4,79) = 13.03$ $p=<.001$). The total mean sea depth recorded for SxBRC was -98.1m and - 7.7m for SDP, the significance of this is not entirely determined but does suggest a coastal preference the species. Spatial density analysis ascertained species hotspots in relation to highest observed abundances and highest frequency of sightings. Hotspots were identified and located in areas of high human population density. Conclusions can be drawn that peak sightings coinciding with summer months are linked to increased anthropogenic activity on the coast at this time. This study therefore seeks to provide baseline evidence to inform on policy decisions with the aim to increase the protection of this species, as well as associated habitats, along the Sussex coast. Particularly to help mitigate anthropogenic pressures with the ever-present threat from climate change.

Poster 28:

Mark−recapture estimates of bottlenose dolphins on the south coast of Portugal

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The common bottlenose dolphins (*Tursiops truncatus*) are among the most frequently observed cetaceans in the Algarve, south coast of Portugal. Nevertheless, the information regarding the population demographics of bottlenose dolphins is limited, hampering the development of strategies aiming at the effective management and conservation of this species in the Algarve. Moreover, the bottlenose dolphins in the study area are exposed to several anthropogenic disturbances such as touristic activities and fisheries interactions which may represent a serious threat to the species' prevalence. To improve the current understanding of the population demographics of bottlenose dolphins and support this species' conservation in the Algarve, we combined photo-identification methods with open population mark-recapture models to estimate site fidelity, apparent survival and annual abundance. Photographs of the dorsal fins were taken during dedicated cetacean surveys (research boat) and opportunistic surveys (dolphin-watching boat) mostly between May and October from 2009 to 2016. The population demographics of bottlenose dolphins were estimated using year as the sampling period. A total of 774 sightings of bottlenose dolphins were recorded, resulting in 5650 high-quality photographs and 548 distinctive individuals identified. The identified bottlenose dolphins revealed low values of site fidelity suggesting that the study area may work as a transit area or migratory route. According to our models, the estimates for the annual abundance of bottlenose dolphins in the study area ranged from a few hundred to close to a thousand individuals while the apparent survival was estimated at 0.71. The relatively high estimate of survival suggests that the Algarve waters offer suitable conditions for the occurrence of bottlenose dolphins. Knowing these different demographic parameters about a population is very important to assess effective long-term conservation measures and support the design of marine protected areas.

Poster 29:

Occurrence and Haul-out Pattern of a Mediterranean Monk Seal Colony Inhabiting the Inner Ionian Sea Archipelago, Greece.

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Mediterranean monk seal (*Monachus monachus*) distribution within the Mediterranean Sea is changing. Confirmed observations of monk seals, in areas where they were previously considered eradicated from, are increasingly reported. Favorable improved conditions, namely reduction on intentional killings, access to key habitat and prey may benefit the species, leading to its re-establishment through stragglers arriving from better-established adjacent populations. Here we present the results of four years of monk seal monitoring in Formicula, an islet within the Inner Ionian Sea Archipelago (Nat 2000 site GR2220003), Greece. Two autonomous monitoring systems were installed inside two caves used by seals. Each system, run independently and took a picture of the haul out site inside the caves every 15 minutes. Between May 2019 and October 2022, a total of 1,040 days of effective monitoring were conducted resulting in 99,840 images. Monk seal presence was established in 34.7% of the days in 2019, 42.6% in 2020, 77.1% in 2021 and 41.4% in 2022. Seal presence was observed across the year, being autumn the most frequented season (57.3%). Concerning the haul-out pattern seals arrived at the caves primarily around sunset-midnight (range 20:00h - 01:00h) and remained inside an average of 9h 15 min (range 2h 30min - 15h 15min). Typically, seals left the caves at sunrise, being the most common hour 06:00h-07:00h (35,5% of monitored haul-out events). Monk seal aggregations included all age categories and both sexes, ranging from a single seal to up to 11 individuals. Some births were also registered in October 2021 and 2022. The present study sheds light on the use of haul-out sites in an area providing key habitat for Mediterranean monk seals. Data resulting from monitoring this endangered species, counting their aggregations and collecting evidence on their reproductive success will have important implications for the design of adequate management and conservation measures.

Poster 30:

Multi-scale analysis of killer whale habitat use in Icelandic waters

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Killer whales, the ocean's apex predators, are considered to be generalists as a species, but can exhibit strict diet specialisation at the population level. This has important implications during fluctuations of their principal prey. In Iceland, herring appears to constitute a major part of the diet of the killer whales, however this is an unpredictable prey that can undergo dramatic changes in availability and distribution. At present, the extent of killer whale specialisation on herring is unknown. To advance our understanding of the occurrence and consequences of predator dietary specialisation in a changing environment this study aims to investigate the habitat use of killer whales and how it is affected by variation in prey abundance and distribution. This will be tested using a combination of observational data, on predator and prey, and modelling approaches at two different scales. Firstly, a multi-model ensemble forecasting approach (BIOMOD) will be used to investigate the relationship between the distribution of killer whales in Icelandic waters with respect to environmental variables (e.g. depth, slope, sea surface temperature, chlorophyll a concentration, and distance to the shore), as well as prey and modelled zooplankton abundance and distribution to predict areas of high suitability for this species. Secondly, fine-scale habitat use and patterns of occurrence of individual killer whales and groups will be examined at herring spawning grounds in Vestmannaeyjar, south Iceland, by using occupancy models. A long-term killer whale photo-identification dataset will be used in combination with data on herring abundance in Icelandic waters, in situ prey measurements from the study area, and environmental variables. The findings of this study will create new insights on predator-prey dynamics and their drivers and consequences of dietary specialisation in marine top predators. These findings will also serve as input for ecosystem-based management decisions, supporting both conservation and fishery needs.

Poster 31:

Calibration indexes for boat-based estimates of Striped dolphin (*Stenella coeruleoalba*, Meyen 1833) group size

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Generating accurate dolphin group size estimates from boat-based surveys can be challenging because much of dolphin's activity occurs below the water surface. Bias varies greatly within observers and sea state, however it was detected a general tendency to underestimate group size of about 25%, with the percentage of underestimation being greater the larger the actual size of the dolphin group was. This work provides information about the proportion of the individuals - in a group – that are visible at surface at any time during the sighting. Data were collected between 2017 and 2022 using a commercial small vertical take-off and landing (VTOL) Unoccupied Aerial System (UAS). Nadiral videos were collected from 42 different groups of striped in the Ligurian Sea (NW Mediterranean Sea). Groups were classified according to the predominant behavior into two categories: socializing and travelling. The average group ratio of dolphins present at the surface at any time (RI) was 0,29 (SD= 0,25, CV= 0,87). Results statistically differed when stratified by behavior type, and the average RI changed from 0,19 (SD= 0,15, CV=0,78) recorded in travelling groups to 0,52 (SD=0,27, CV= 0,51) in socializing groups. When in travelling, striped dolphins remained underwater between each surfacing (i.e. breath) for 14,94 sec on average (SD= 11,85, CV= 0,79) while the intra-surfacing period was of 6,04 sec (SD= 6,17, CV= 1,02) when there were social interactions among the individuals belonging to the same group. Overall, this work provided evidences on how dolphin group behavior can affect boat-based estimates of group size and how the resulted bias may be compensated for.

Poster 32:

Habitat preference of Risso's dolphins (*Grampus griseus*) in the south coast of Portugal

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The Risso's dolphin (*Grampus griseus*) is a widespread species, with a range across different ocean basins. Nevertheless, this species is considered rare in mainland Portugal and its ecology is unknown. This study presents results of 11 years (2010-2020) of both dedicated megafauna surveys and opportunistic surveys (dolphin watching tours) in the southern coast of Portugal to bring insights into the Risso's dolphins' habitat preference in this region. A total of 63 sightings of Risso's dolphins were recorded corresponding to a total effort of 8485h. Groups were composed on average of 9.7 ± 8.5 individuals, 68% of which included immature individuals (i.e., juveniles and calves). We used Generalized Additive Models to model the presence-absence of Risso's dolphins according to environmental conditions. Models were fitted using a binomial distribution and the most relevant environmental variables were selected using a backward selection process based on the Akaike Information Criterion. The environmental variables were selected according to the ecological relevance for the species (e.g. sea surface temperature (SST), mixed layer depth).We found that the presence-absence of Risso's dolphins was significantly influenced by SST and distance to shore. Risso's dolphins were more frequently observed when SST was higher and in areas closer to the coastline. The high presence of groups containing immature individuals may partially explain the preference for warmer waters and areas close to the coast, suggesting that this region might be used by this species as a nursing ground. The south coast of Portugal is a popular area for dolphin-watching activities in mainland Portugal, which may pose substantial threats to the presence of the Risso's dolphins in this region. Further studies, including behavior and habitat use are necessary to better understand the presence of this species in this area and to provide a better assessment of this species' conservation status.

Poster 33:

Vacation in Lisbon? Occurrence and habitat use of Delphinus delphis in the Tagus Estuary, Portugal

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Delphinus delphis use coastal areas as their preferred habitat or exclusively for nursery, but occurrences in estuaries are rare. For this species, spatial-temporal distribution seems to be linked with environmental fluctuations that affect the movements of their prey. Nonetheless, small groups can exhibit high site-fidelity in semi-enclosed waters when food resources are stable and predictable. In Tagus Estuary, Portugal, dolphins' presence has been anecdotally reported over the last two centuries. Still, systematic data collection and scientific reports on the presence of cetaceans in this region are lacking. To investigate the occurrence and habitat use of common dolphins in Tagus estuary, a land-based monitoring program was established in the VTS tower in Algés, Lisbon. From this vantage-point trained volunteers followed a standardized visual-scan protocol, using binoculars and a telescope, during daylight period (8h-16h). Here, we analyzed spatial distribution and activity patterns in the lower section of the Tagus estuary between march and september 2022. Over 450 h (57 days) were analyzed, of which 40.5% had sightings of common dolphins. Preliminary results from Spring season, show that group size varied between 1 and 12 individuals and calves were present in 53.6% of the encounters. Common dolphins spent most of their time foraging (N=47.5 min/day) and travelling (N=44.2 min/day), feeding and socializing were only observed once and no resting was recorded in the study area. Sightings were unevenly distributed within the study area (K-W=7.99, $p<0.05$). Sector 2, a deeper section with sandy bottom, had a significantly higher usage (N=41.6 min/day) than sector 5 (N=7.4 min/day), a shallower zone located close to the estuary mouth. These results provide important insights on habitat use of Tagus estuary by small groups of common dolphins during warmer months, hinting that this estuary may serve as a feeding hotspot and, possibly, a nursery area.

Poster 34:

First catalogue of Risso's dolphin (*Grampus griseus*) in Normand-Breton Gulf and preliminary study on their habitat use

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Classified as "Data Deficient" on the IUCN Red List, Risso's Dolphin (*Grampus griseus*) is little studied in the Normand-Breton Gulf. Boat-survey sampling allowed gathering data and pictures, that leads to the first catalogue in this area. Georeferenced data were collected from 2017 to 2022 and represent a research effort of 3266h and 25 sightings of Risso's dolphins. Kruskal-Wallis test (p=0.00031) and Wilcoxon pairwise comparison (p= 0.0056) showed that summer encounter rates are significantly higher than others. Group size varies from 1 to 13 individuals (median=4). From 2007 to 2022, 8044 photographs were taken, whose 66 % allowed 44 individuals to be catalogued: 28 adults, 15 juveniles et 1 new-born (at first capture); 4 other new-borns were identified but not catalogued. 52% of the individuals were resighted, on average 3 times, some with a 8-9 years periodicity between resightings and 20% of the individuals were followed by calves or juveniles. Among them, one dolphin first seen in 2007 was resighted 14 times, almost all years (3 years without recapture) and always followed by calf. These results emphasize a high degree of site fidelity and suggest a use of the area for calving and nursing. A juvenile sighted every consecutive summer since 2016 shown an important evolution in its natural marks since 2020, suggesting a potential transition to adult age-class. It highlights the importance of year-round and long-term study to improve characterization and to minimize errors during photo-id analysis. Risso's dolphins were observed at an average depth of 10 meters. Observation periods and locations correspond to cuttlefish summer migration for reproduction in the area (Gras, 2013). It suggests a habitat use also linked to prey availability. This highlights the need to carry on studies to better understand the distribution, abundance, habitat, and marine resources used by this species in this region.

Poster 35:

A pilot study confirming an annual aggregation of harbour porpoise (*Phocoena phocoena*) in the Longhope Bay area of Scapa Flow, Orkney

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There is little information regarding the presence and distribution of harbour porpoise (*Phocoena phocoena*) around the Orkney archipelago, but anecdotal evidence over the last few decades has suggested a possible aggregation of an estimated 150 – 250 harbour porpoises gathering annually in Longhope Bay and surrounding area, Orkney in the Autumn. Although listed on the IUCN Red List as Least Concern, anthropogenic threats to the conservation of the species include aquaculture and noise pollution. As a species using an area relatively high in vessel traffic and fish farming industry the harbour porpoise is a priority species requiring the protection of a Marine Mammal Protected Area (MMPA). This pilot study aimed to confirm the presence of an aggregation as well as ascertain the number of animals involved as well as an indication of behaviour of harbour porpoises using the area during the aggregation. From mid-September to end of October 2022, trained volunteers completed twice weekly land-based effort surveys and recorded location, numbers of individuals, group size and behaviour. A total of 549 sightings and a total of 3638 individuals were recorded of which 303 were calves over the six-week period of the study. Distribution in the bay was mapped and compared to water depth and environmental conditions such as tidal state. Behaviour was recorded according to type. All the harbour porpoises were recorded within our survey area of 16.5 km^2 and in waters with a maximum depth of 24 metres. These results show that Longhope Bay and the surround area is a seasonally important area for harbour porpoises and that planned further study is necessary so the reasons behind this aggregation are better understood and that evidence can support the implementation of an MMPA.

Poster 36:

Distribution and habitat use of common dolphins (*Delphinus delphis*) in the Northern coast of Continental Portugal

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The common dolphin (*Delphinus delphis*) is the most abundant cetacean species in Portugal, however, its ecology in the Northern Continental Portuguese waters is poorly studied. Year-round surveys are essential to assess the distribution, seasonality and habitat use of common dolphins in the region. Under the ATLANTIDA Project, at-sea surveys are being carried out for dedicated cetacean monitoring, covering the area from Espinho to Caminha (Portugal) up to 12 nautical miles offshore. In total, we had 59 encounters with common dolphins during an 18-month period. We recorded 2.0 sightings per survey (SPUE), collected throughout the year, although with higher SPUE between July and September (2.7). Group size ranged from 2 to 40 individuals with an average of 10 individuals per group. Encounters were most frequent off the coast of Esposende, and no sightings were recorded at the Northern limit of the sampled area. With photo-ID techniques, we have identified one re-sighting between March and August 2022, suggesting residency from winter/spring to summer. Groups were frequently seen travelling, feeding, and socializing (including mating). We have recorded several mother-calf pairs year-round, with the presence of calves in 39% of the sightings. Overall, calves occurred in larger groups, in less deep areas and slightly closer to the coast. These results suggest that the Northern coast of Continental Portugal is an important breeding area with some degree of residency for common dolphins on the Iberian coast. Further dedicated monitoring is needed to track changes in distribution patterns over space and time and identify potential threats to populations.

Poster 37:

Around the Atlantic Ocean in 136 days: An opportunistic visual, acoustic, and molecular survey of marine mammals on a 23,500 km journey

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Marine mammals are important ecosystem engineers and indicator species of ocean health, necessitating knowledge on their habitat, abundance, and distribution. However, due to human impacts and climate change, approximately 37% of known species are of conservation concern, while a striking 40% of marine mammal species are data deficient, making it challenging to assess their conservation status. Marine mammal monitoring, particularly line-transect surveys, are largely absent from substantial parts of the world's oceans. Here, we present a unique, opportunistic marine mammal transect survey combining visual, acoustic, and environmental DNA (eDNA) detections to map the occurrence of marine mammals along a 23,500 km north-south transect across the Atlantic Ocean. A total of 916 hours were spent on visual effort, 1,916 hours on acoustic effort and 108 eDNA samples were collected. The acoustic survey returned the highest amount of detections (n=1595), followed by the visual survey (n=363) and eDNA survey (n=19). As determining species identity acoustically can be challenging, the visual survey provided the most numerous and diverse taxonomic identifications (27 species) and the eDNA survey captured approximately 50% of the cetacean species observed visually, and one species (harbour porpoise) was detected solely by eDNA.While opportunistic in nature, our study provides much needed information on the spatiotemporal occurrence of marine mammals across large parts of the Atlantic Ocean, which have rarely, if ever, been systematically surveyed. It further highlights the benefits of using multiple complementary methods when mapping the distribution of marine mammals - particularly rare and elusive species - and other marine biodiversity.

Poster 38:

Distribution, social structure and habitat use of the short-finned pilot whale (*Globicephala macrorhynchus*) in the Lesser Antilles.

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The short-finned pilot whale (*Globicephala macrorhynchus*) is a species of cetacean whose distribution extends from tropical to subtropical waters with a preference for depths ranging from 200 to 2000 m. This species, although present on the majority of the globe, is little represented in the literature. It is mainly studied in Japan, Madeira, the east coast of the United States, the Canary Islands and the Faroe Islands. Despite historical hunting that persists today in some Caribbean islands, very few studies have been done on this species in the Lesser Antilles. To overcome this lack of data, the Caribbean Cetacean Society conducted 12 scientific cetaceans monitoring across the lesser antilles under the Ti Whale An Nou program which consists of several scientific cetacean survey expeditions. These expeditions, conducted by sailboat, have made it possible to collect presence/absence data, acoustics recording and photo-identifications data from Grenada to Anguilla during 2021 and 2022. Thanks to the use of a species distribution model and the analysis of photo identifications, this study is the first to describe the distribution, social structure, and habitat use of the short-finned pilot whale throughout the Lesser Antilles.

Poster 39:

Abundance and residence patterns of Risso's dolphins (*Grampus griseus*) off Tenerife, Canary Islands

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Risso's dolphins (*Grampus griseus*) are found in the Canary Islands throughout the year. Although resident populations have been described in the eastern islands, little information is available in the western islands. The data were obtained during seasonal cruises carried out between August 2021 and April 2022 in front of Puerto de la Cruz and the surrounding area up to Garachico (Tenerife). A total of 56 individuals were observed (some of them more than once) in 5 groups (mean of 20 individuals per group, SD) during 11 surveys within the sampling period. Out of those, 60% of the animals were classified as residents (observed more than 3 times per year). Abundance was estimated using a mark-recapture technique of identifiable animals, using a "closed population" model, with a best estimate of 119 individuals (95% CI 93 to 150). The average depth of the sightings was 582 m (350-850m), corresponding to an average distance to the coast of 3 nm. This habitat preference seems consistent with reported foraging ecology of these deep-diving predators in other areas, where they consume both shallow- and deep water- prey. The present study demonstrates the year-round occurrence of the species in the north of Tenerife island, where, being the most common cetacean encountered in the area, it may represent a key species structuring the deep water communities.

Poster 40:

Advances in the knowledge of the Mediterranean-Atlantic migration of the fin whale (*Balaenoptera physalus*) in the Iberian Mediterranean corridor. Data collection, migration periods and swimming speeds

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A preliminary study on data collection combining land-based fix stations and vessels to monitor the migration of fin whales between Valencia and the Strait of Gibraltar during their movements towards the Atlantic is presented. Different entities as the Poliytechnic University of Valencia, Laboratory of Marine Biology (University of Seville), Ecolocaliza and Migres Foundation, deployed three land-stations located along the south-eastern coast of Spain. Photo ID information was collected by EDMAKTUB and UPV vessel in Valencia, Ecolocaliza in La Línea de la Concepción and the Whale Watching company, Turmares in Tarifa. From the 11th of June to the 30th of July all entities were actively observing and obtaining information from the different geographical areas. Three matchings of photo ID were obtained between Valencia and the Strait of Gibraltar and the timing of migration between the two locations was averaged. The coastal distance between the three stations was calculated, therefore the speed of the whales between the stations. Whales speed´s signification was analysed thorough the non-parametric Wilcoxon median test resulting non-significant. Several lapses of days were assumed between the number of individuals of the different stations to prove that the swimming speed coincided with the averaged through the Photo-ID matching times. Taking in consideration that photo-ID matchings were limited due to the difference in photographed sides of the whales between entities, the uniformity of protocol and the collaboration of entities along the coast of Spain can provide very important information in the fin whales migration routes and their timing of arrivals to the Strait of Gibraltar which could contribute to the management and conservation of this species in human impacted environments and heavy maritime traffic routes.

Poster 41:

Long-finned pilot whale abundance estimate in the western Mediterranean Sea

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Long-finned pilot whales (*Globicephala melas*) from the inner Mediterranean Sea have been recently classed as Vulnerable by the IUCN. A morbillivirus epizootic in 2007 decreased the survival rates of various social groups over the next three years. However, no new estimate was available for over a decade to assess the population size in the western Mediterranean, where the species is the most abundant. In 2020-2022, four distance sampling surveys, coupled with photo-identification, took place in an area of previously known high density, encompassing the eastern side of the north Alboran Sea and the Gulf of Vera. The abundance estimate for that area was 798 individuals (CV: 0.50; 95% CI: 328-1946) based on density estimate and 1070 individuals (CV: 0.167; 95% CI: 789-1505) based on closed population capture-recapture model. Both these numbers are much lower than expected, especially compared to the 2888 individuals (95% CI: 2656-3270) estimated over the period 1992-2009 for Gibraltar Strait, north Alboran Sea and Gulf of Vera. In the Gulf of Vera, an annual survival rate of 0.932 (SE= 0.019; IC 95%: 0.884 – 0.961) was estimated, which is below that of a healthy population. These estimates further confirm their Vulnerable status and suggest a large mortality in the population. Large scale movements were unlikely to explain all the results and have not been detected in the large scale Mediterranean survey of the ACCOBAMS Survey Initiative. This large mortality was also observed in the Strait of Gibraltar where survival rates of both males and females were very low in some years over the 10 years following the first epizootic which could indicate other epizootics or further conservation problems that need to be investigated. Although long-finned pilot whales have been declared as Vulnerable in Spain in 2011, no conservation plan has been adopted yet.

Poster 42:

Bottlenose dolphins in the western Mediterranean Sea: abundance and interactions with fisheries

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Interactions between different type of fisheries and bottlenose dolphins (*Tursiops truncatus*) are commonplace in the Mediterranean Sea and can lead to negative impacts in certain scenarios. There are different types of fisheries occurring along the Spanish coast of the western Mediterranean Sea, including trawlers, purse seiners, artisanal fisheries (using mainly trammel nets and gillnets) and aquaculture. Over the last decade, the interactions between bottlenose dolphins and those fisheries have been reported to cause economic impact due to both depredation and damaging the nets. Surveys were designed to cover the most important habitats of bottlenose dolphins in southeast Spain, where those interactions were most likely to occur, to assess total abundance and social structure with photo-identification and to identify individuals involved in interactions with fisheries. The abundance estimate for that area was 779 individuals (95% CI: 591-1065) based on closed population capture-recapture model for 2021. For the 883 bottlenose dolphins included in the photo-identification catalogue from 94 sightings between 2000 and 2021, 341 (38,6%) were observed in association with fisheries: 186 (21,1%%) were with trawlers, 161 (18,2%) with aquaculture, 55 (6,2%) with artisanal fisheries and 6 (0,7%) with trap nets. Five social groups were identified, all of which include individuals who have been observed interacting with some type of fishery. There are important links between individuals observed interacting and those who have never been observed, showing a great potential for this behaviour to continue and spread. This was further observed from the long-distance movements made by different individuals that were seen up to 500 km away. These results show that an important proportion of bottlenose dolphins have been observed interacting with different types of fishing gears which call for mitigation measures.

Poster 43:

Combining acoustic and visual cetacean monitoring in Northern Portugal

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Long-term cetacean monitoring is challenging, given the elusive nature of the species. Thus, combination of different methodologies, allows an accurate assessment of spatial and temporal patterns in cetacean distribution. With this in mind, the objective of this work was to combine acoustic and sighting data to characterize cetacean occurrence, abundance and habitat in the northern coast of mainland Portugal. Under the scope of ATLANTIDA Project, two campaigns per year (summer and winter seasons) have been undertaken, covering the area between Espinho and Caminha, up to 12 nautical miles offshore. Thirty-two equidistant stations, connected by linear transects, were defined and monitored, allowing the recording of acoustic data. Sightings have been collected along the predefined tracks using a standard methodology. Visual (from cetaceans) and acoustic (cetaceans and shrimp) data were overlaid with environmental data to assess cetacean distribution in relation to environmental conditions. Linear and logistic regression models were used to study the relationships between environmental variables, cetacean presence (measured by acoustics), and the best (visual) estimation of individuals per group. Finally, a multivariate statistical analysis was used to study correlation between environmental and anthropogenic variables. A total of three species were identified: common dolphins (*Delphinus delphis*), bottlenose dolphins (*Tursiops truncatus*), and Risso's dolphins (*Grampus griseus*); being the most represented the common dolphin. The results showed differences in habitat conditions between seasons. In summer, dolphins are present in greater abundance, distributed over a wider habitat, whereas in winter they are predominantly found in colder waters and closer to the coast. In the study area, dolphins tipically avoid noisy areas and areas inhabited by shrimp. This is particularly important, as this area is highly disturbed by the presence of heavy shipping traffic, fishing activity and wind farming. In a nutshell, the results presented here reinforce the complementary use of these two techniques.

Poster 44:

Increasing presence of Risso's dolphins (*Grampus griseus*) in Arctic waters off the Norwegian coast

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Although Risso's dolphins are widely distributed, many aspects of their ecology are still unknown. According to the International Union for Conservation of Nature (IUCN, 2018) they are distributed between latitudes 64°N to 50°S (most common between 45°N and 30°S) along continental slopes from 400 to 1000 m water depths and temperatures above 10°C, with very few sightings further north than 64°N. However, since 2017, yearly sightings during summer have been made in Arctic Norway in Bleik canyon and surrounding areas at around 69°N. The presence of the whale watching companies Whalesafari Andenes and Whale2Sea as well as the scientific organization Norwegian Orca Survey has made it possible to collect data on these dolphins. A total number of 2,342 pictures of seven different encounters was analized. Additionally, there were encounters on which no pictures could be taken. The investigation of these pictures proved the presence of at least 40 different individuals with 8 dolphins being resighted on two and one on three different encounters. Whale watching has been carried out in these waters since 1989, with no registered sightings before 2017. Since then, Risso's dolphins were seen by either or both the whale watching companies or by the Norwegian Orca Survey on 29 days in total since 2017. The encountered group sizes ranged from one to an estimated of 40 individuals. The high number of sightings makes it probable that Risso's dolphins' occurrence is now more than incidental in arctic Norway. Possible explanations for this could be warming Arctic waters and a shift of their food sources to locations further north. In future images from the photoidentification catalogue established in Arctic Norway will be compared with existing catalogues from other areas in the Northeast Atlantic for potential resightings. This could improve our understanding of the behavior, social structure and habitat requirements for Risso's dolphins.

Poster 45:

Winter Presence and Distribution of Cetacean Species in the NW Mediterranean Sea

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Little knowledge still exists about distribution and habitat preferences of cetaceans in the NW Mediterranean Sea during winter. We used data collected from 2008 to 2020 along fixed transects crossing the NW Mediterranean Sea area to investigate cetacean presence, distribution and habitat preferences during winter (November - February). Species presence and distribution were examined at different spatial scales, to investigate intra-basin differences. In total, 51,030 km on-effort and 852 sightings were analyzed. During the study period, all eight cetacean species that regularly occur in the Mediterranean Sea were sighted. Fin whales, sperm whales, striped dolphins and bottlenose dolphins were regularly sighted throughout the study area, with a preference for central-western (ERfin whale = 0.931 ± 1.497; ERsperm whale = 0.136 ± 0.525; ERstriped dolphin = 0.956 ± 1.383) and eastern region (ERbottlenose dolphin = 0.023 ± 0.187). Cuvier's beaked whales, Risso's dolphins and long-finned pilot whales were mostly sighted in central-western and southwestern regions, respectively 8, 2 and 3 times in total.Species habitat preferences varied according to subareas. Fin whales selected areas with deeper, warmer, richer in chl and lower EKE values than the available habitat in the Central Western region, while warmer, with higher EKE and less productive waters were preferred in the Southwestern. No clear preference was shown in the other subareas, probably indicating traveling areas. For striped dolphins, preference for deeper, warmer and with higher EKE values than available habitat was shown in the Southwestern region, while only depth played a role in shaping species distribution in the rest of the basin. For sperm whales, the basin scale performed better in describing species habitat preference. Our findings confirmed that the NW Mediterranean Sea is a key area for cetaceans year-round, and winter habitat preferences might be used to address seasonal-specific conservation measures.

Poster 46:

Mark-recapture analysis of sperm whale (*Physeter macrocephalus*, Linnaeus 1758) movements in the Ligurian Sea, Tyrrhenian Sea and Gulf of Taranto through photo-identification analysis

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The sperm whale Mediterranean population is isolated from the Atlantic one and assessed as Endangered under IUCN criteria; the species routes have been poorly studied within the whole basin, and little evidence of displacements between the western and eastern Mediterranean has been reported. In this study, sperm whale movements were analysed by matching photo-identification catalogues from six Italian research organizations (two from the Ligurian Sea, two from the Central Tyrrhenian Sea, one from the Southern Tyrrhenian Sea, and one from the Gulf of Taranto, Ionian Sea). Of 349 individuals photo-identified, 40 were recaptured in more than one study area. Each area counted shared animals, with a maximum displacement of 840-1240 km between two consecutive recaptures of the same individual, and 16 years of maximum time span. Gender was determined for 37 shared animals (5%, n = 2, females; 52.5%, n = 21, males; 35%, n = 14, classified as “estimated males”). Type of encounter and group size were analysed per 185 recaptures of the shared animals, resulting in 9 Social Units, 11 Clusters, 65 Solitary individuals, and 100 Male aggregations. The mean group size was larger (>4) in the southern areas, where recaptures also occurred in Social Units. Our results from the mark-recapture analysis showed isolation between two of the three sub-regions defined within the area of interest, and the seasonality of displacements among these sub-regions was investigated. The movements of the males were found to be consistent between the Ligurian and Central Tyrrhenian Sea, peaking in summer. The females’ recaptures occurred only between the Central and Southern Tyrrhenian Sea, defining a possible important breeding ground in the area. Furthermore, two individuals performed dispersal movements between the western and eastern basins. These findings are noteworthy in comprehending the species connectivity pattern and degree of isolation among the Mediterranean basins.

Poster 47:

Multi-species occurrences of cetaceans in the western Mediterranean Sea: a proxy for the identification of biodiversity hotspots?

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The Mediterranean Sea is a semi-enclosed basin recognized as a biodiversity hotspot with a high variety of pelagic species, including cetaceans. Multi-species occurrence is considered favourable, improving foraging efficiency and reducing predation risks. By analyzing sightings collected between 2012-2021 along a trans-border transect crossing the mid-latitudes of Tyrrhenian and Sardinian-Balearic basins (FLT MED Monitoring Network), this work aims at characterizing cetaceans multi-species occurrences in representative areas of the Western Mediterranean where 8 species are usually observed. Multi-species occurrences were classified as "dolphin-dolphin", "dolphin-large cetacean", "large cetacean-large cetacean" and investigated with respect to environmental parameters. The areas of high multi-species occurrences were identified through the Kernel density estimator and the overlap with other macro-fauna (e.g. turtles, sharks, seabirds) observed during the same surveys was evaluated. During 122,547 km travelled on effort, 56 multi-species occurrences were recorded, mostly during spring (46%) and summer (36%), involving *S. coeruleoalba*, *B. physalus*, *P. macrocephalus*, and *T. truncatus*. Dolphin-dolphin co-occurrence exceeded 65% in all seasons except for autumn, when a higher proportion of dolphin-large cetaceans were observed. Fin and sperm whales co-occurrence was only recorded twice. Depth and chlorophyll concentration values were similar in sightings locations and the whole surveyed area in both basins, while slope values in sightings locations resulted significantly higher than the basin mean in the Tyrrhenian Sea. Small scattered areas of higher co-occurrence emerged in all basins during autumn and in the Sardinian Sea during winter, while larger hotspots resulted during spring/summer throughout the surveyed transect. Of the 957 sightings of other macro-fauna, 26% were recorded within the hotspots of cetaceans co-occurrence. The overlap was the lowest during winter (3%) and increased in spring/summer (>11%), suggesting seasonal areas of high biodiversity concentration. Our results showed limited relationship of multi-species occurrences with environmental parameters, calling for deeper investigation, also at larger geographic scale.

Poster 48:

Changing patterns: are nursery and mating areas of Southern Right Whales – *Eubalaena australis* (Desmoulins, 1822) – getting overlapped?

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The only species of whale that breeds on the Brazilian coast and is locally endangered is the southern right whale - *Eubalaena australis* (Desmoulins, 1822), accordingly with Brazilian list for endangered species. Southern Brazil region is majorly occupied by female and calf groups (Fe). However, the increasingly occurrence of social groups and adults without calves (Ad) has been observed, suggesting a possible overlap of nursery and mating areas. To investigate the potential overlap between these areas, distribution and abundance data of Southern Right Whales were used. Dataset was obtained from a systematic aerial survey from 2013 to 2021. The study area comprises the southern Brazilian coast, from Palhoça (27.907 º) to Torres (29.367º). Southern Right Whale home range was estimated with the 50% and 95% Kernel density estimators and analysis were made at Qgis 3.22.3. The total number of sightings were 339 Fe and 51 Ad. The mating area (composed of Ads) estimated with KDE 50% was 169 km², and the nursery area (composed of Fe) was 298 km², with overlap between them of 167 km². With KDE 95%, nursery area (estimated in 720 km²) and mating area (606 km²) showed an overlap of 533 km². The highest density of Fe was between Paulo Lopes/SC and Laguna/SC, while the Ads were aggregated between Imbituba/SC and Laguna/SC, the same overlap region estimated by KDE 50%. The results agree with prior data which indicated high overlap between mating and nursery areas. However, there are still some areas of southern Brazil coast that are exclusively occupied by mother and calf pairs. This knowledge is highly important considering that at those areas the behavior of the animals tend to be a lot different, therefore, management needs to be different too.

Poster 49:

Threatened cetaceans off the coast of Israel and long-range movement of a sperm whale

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The Mediterranean Sea is impacted by anthropogenic pressures that interact synergistically with climate change. Cetacean communities are diverse, and some Mediterranean populations are globally distinct. Surveys in the western Mediterranean have shown that sperm (*Physeter macrocephalus*) and Cuvier's beaked whales (*Ziphius cavirostris*) are small, distinct populations that face numerous threats and are in decline. The Eastern Mediterranean is less well studied, and few surveys have investigated the composition of cetacean communities. In this study, we conducted visual-acoustic surveys off the coast of Israel during April–May 2022. We detected sperm whales (three encounters), Cuvier's beaked whales (one encounter), bottlenose dolphins (one encounter, (*Tursiops truncatus*)) and unidentified delphinids (17 encounters). Sperm whales were feeding approximately 10 km off Haifa, at 370–1720m deep. Codas corresponded to the Mediterranean dialect. One sub-adult male photographed is known from ten previous encounters in the Ligurian Sea. Israeli water clearly provide habitat for cetaceans, including two globally threatened subpopulations – sperm and Cuvier's beaked whales – that are of conservation concern and negatively impacted by noise. Given the intensity of human activities in Israeli waters, we suggest more survey effort is urgently needed and urge caution in issuing new permits for oil and gas prospecting and extraction.

- **Acoustics**

Poster 50:

Long term passive acoustical monitoring of coastal dolphins inhabiting the Israeli Mediterranean shallow shelf reveals the impact of marine fish farms on their habitat utilization

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The Israeli coastal shelf ecosystem supports small, stable, populations of two dolphin species, the common bottlenose dolphin (*Tursiops truncatus*, henceforth TT) and the common dolphin (*Delphinus delphis*, henceforth DD). In order to further define the year-round along-shore distribution, as influenced by geography, fish farms, and the new trawl-fishing regulations, this study aims to monitor and characterize dolphin habitat preference and usage through the use of passive acoustic monitoring methods. For the first time, we monitor and characterize dolphin distribution, preference, and usage of both natural and man-made habitats along the entire Israeli coastline, for a three-year period, by detecting pulsed sounds by C-PODs and F-PODs devices. We tested for potential distribution shifts in response to the new fishing regulations including trawler-prohibited versus trawler-permitted zones and trawler-prohibited period in the months of July-August versus the rest of the summer and versus the rest of the year. Sampling points were spaced along the coast in the north, center, and south of Israel with two more sampling points selected in proximity to open-water fish farms: The first fish farm, off Ashdod, and the second farm, off Michmoret. A hurdle model was used to examine the dolphin's presence (expressed as Detected Positive Minutes (DPM)) over habitat, diurnal cycle, and season. The visiting probability in the research area was higher during the 'trawlers' period ($p < 0.005$). Analyzing each habitat separately, at both Michmoret and Ashdod Farms, visiting probability was higher during the 'no trawlers' period (for both: $P<0.0001$). Similar low visiting probability/stay duration across all natural habitats suggest: 1) Homogenous coast-wide oligotrophy. 2) Exclusive residence of DD in the south contributes little to overall dolphin presence, likely mirroring their lower density relative to that of local TT. 3) It is as profitable for TT to exploit resources in the rejuvenated benthic system of the 'no trawl' north than to forage around trawlers. These results partly explain the shifts in dolphins' habitat use and the factors affecting their preferential presence and distribution.

Poster 51:

Whistles and bray-call variability in a Mediterranean bottlenose dolphin population: the effect of the context variables

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The common bottlenose dolphin (*Tursiops truncatus*, BD) is recognized as a species with high vocal plasticity, able to adjust the acoustic parameters of the emitted signals based on different environmental, social, and behavioral settings. The degree of the variations related to the context of emission and the weight of each influencing factor is still under investigation. Here we address this issue in a BD population in the central Mediterranean Sea, focusing on two sound types: whistles (frequency-modulated, narrowband sounds) and bray-calls (sequences of multi-unit rhythmic signals). Using Raven-Pro software, the expression of these vocalizations is quantitatively described with a series of acoustic parameters extracted from recordings collected between 2019 and 2021 in the Roman seas (Italy). Three types of potential influencing factors are considered: (i) Environmental: sea bottom type and depth; (ii) Social: group size and calf presence/absence; (iii) Behavioural: feeding, socializing and interaction with fishery. Two MANOVA and linear models (LM) are performed in R 4.0.3 considering whistles and bray-calls acoustic parameters and using context factors as independent variables. Results show that the acoustic parameters of both call types vary significantly in different contexts ($p<0.05$) and that environmental, social, and behavioral factors have a significant effect on calls' structure ($p<0.05$ for both MANOVA and LM models), suggesting a clear link between the type of situation, its putative valence, and the expression of the two calls in that situation. Although both vocalizations appear not context-specific, being expressed in all analyzed situations even if with different rates, their acoustic structure seems to change in relation to the specific combination of influencing factors. The implication of these variations in given contexts is discussed in relation to the ecology of the species and to the potential of phenotypic acoustic diversity driven by local environmental/social properties.

Poster 52:

Highlighting fin whale important areas in Mediterranean Spanish waters using passive acoustic monitoring

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Fin whale is the largest species in the Mediterranean Sea and is known to perform long seasonal migrations. Just in the Western Mediterranean Sea, along the Spanish coastline, fin whales have been observed to migrate southwards in summer and northwards in winter, contrary to traditional observations, crossing the Strait of Gibraltar. We investigated fin whale acoustic presence along the Mediterranean Iberian Peninsula coast by analysing more than 9400 hours of Passive Acoustic Monitoring recordings. Seven locations were monitored within the framework of four projects (LIFE PortSounds, Fin Whale Project, CaboRorcual Project and additional data coming from IEO-CSIC acquired in the framework of MSFD D11 implementation) between June 2021 and September 2022. The locations include the Garraf coast (Northwest Mediterranean Sea), San Antonio and Nao Capes (three different locations), Mazarrón escarpments (SAC), Almería coast and the Gulf of Cadiz. We found all the different types of sounds described as fin whale vocalisations: 20Hz pulses, in some cases attached with 130Hz pulses, 80-40Hz down-sweep sounds and Backbeats. On the Garraf coast, the fin whale acoustic activity was found almost daily in April and the first weeks of May. In San Antonio and Nao Capes, we found fin whale acoustic presence almost throughout the year, with a peak of detections during summer. In Mazarrón and Almería, the most abundant sounds found were 80-40Hz down-sweeps. Finally, in the Gulf of Cadiz, the analysis was more difficult to perform than in the other cases because of the high noise levels due to marine traffic. These results highlight some new areas (Garraf coast, Nao Cape) that should be considered necessary for managing this vulnerable species.

Poster 53:

An Acoustic Alert System to mitigate dolphin depredation of fishing nets

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One specialized behaviour of cetaceans is the depredation of the fishing gears, which consists in the partial or complete removal of the catches from the gear leading to its damage and loss of catch. This opportunistic behaviour applied by dolphins for their feeding activities responds to optimisation models that foresee spending the minimum energies to have the highest gain. This issue has a high socio-economic impact on fisheries, especially the small-scale ones, which appear the most affected by interaction cases with coastal species of cetaceans. Over time, several attempts have been made to solve conflicts by employing mitigation devices such as acoustic deterrents to push away dolphins from fishing gears. However, to date, there is still no effective measure capable of loosening the establishment of this type of interaction in the Mediterranean, so the conservation of vulnerable cetacean species and the sustainability of small-scale fisheries are still in danger and require urgent management plans. Following a pilot project carried out in the Gulf of Catania (Ionian Sea, Italy), we made a trial to develop an Acoustic Alert System (AAS) to mitigate the effects of the "feeding in net" behaviour applied by the bottlenose dolphin on artisanal gillnets and trammel nets. This system, the first of its kind in the world, simulates an alarm for fishers, indicating the presence of dolphins detecting feeding sounds they emitted close to the nets in order to haul up them before suffering some damage. The action is included in the "Mitigating dolphin depredation in Mediterranean fisheries – Joining efforts for strengthening cetacean conservation and sustainable fisheries" project (Depredation-2). Preliminary results promise a decrease in depredation events when the AAS is applied, with a consequent increase in catches and a decrease in the risk of by-catch for the dolphins that usually feed on the nets.

Poster 54:

Use of a kurtosis adjustment to received levels for predicting sound exposure in marine mammals

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When predicting hearing loss in marine mammals exposed to anthropogenic sound, a distinction between 'impulsive' and 'non-impulsive' sounds is often made. In the United States, regulatory thresholds are 13 to 18 dB lower for impulsive sounds compared to non-impulsive sounds (DoN 2017, NMFS 2018). The method for determining whether to apply the thresholds for impulsive sounds or non-impulsive sounds, however, is qualitative and associated with the sound source rather than the sound (NMFS 2018). Sources such as airguns and impact pile driving are assumed to always produce impulsive sounds while sonar-type sources are assumed to always produce non-impulsive sounds (NMFS 2018). This approach is problematic because sources may produce a variety of sounds and because the characteristics of a sound change as it propagates away from the source. Sound tends to spread out in time as it moves away from a source, such that sounds like those produced by airguns or impact pile driving may be pulsatile near the source but a rumble far from the source. The use of kurtosis, a measure of the probability distribution of received sound levels, appears to aid in predicting hearing loss from exposure to sounds with differing distribution of high sound level (transient) content. The kurtosis of a signal can be used as an adjustment to the received level, allowing for a smooth transition between impulsive and non-impulsive sound and shifts the focus to the sounds instead of the sources. With a kurtosis adjustment the effects of propagation can be included, as well as multiple sources and sound types. Here we explore the use of a received-level kurtosis adjustment in predicting hearing loss in marine mammals using an agent-based modeling approach to track sound exposure levels in typical scenarios.

Poster 55:

Whistle parameters in bottlenose dolphins (*Tursiops truncatus*) in the Gulf of Trieste, northern Adriatic Sea

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Bottlenose dolphins (*Tursiops truncatus*), like many other odontocetes, use vocalizations as a fundamental form of communication, navigation, and finding prey. Previous studies have found that whistles in particular can be used as a form of conveying the identity of the individual (signature whistles) or other types of communication between individuals (generic whistles). Dolphin whistles can vary substantially within and among populations and can reveal important characteristics of the population dynamics and connectivity. In this study, we aim to better understand the acoustic behaviour of the resident population of bottlenose dolphins in the Gulf of Trieste, studied for the past 20 years, with the analysis of acoustic recordings during focal follows. We used the HTI-96-MIN hydrophone with the TASCAM DR-680MKII recorder to obtain recordings during focal follows, and the program Raven Pro to investigate various whistle parameters. We describe these whistle parameters, including max frequency, min frequency, frequency range, start frequency, end frequency, inflection points, and harmonics and place them into context in relation to other studied bottlenose dolphin populations. Understanding the vocal repertoire of this population is relevant in relation to individual identification, previously identified social structure, passive acoustic monitoring and impacts of different anthropogenic activities such as fishing, shipping, and recreational boating on this population, which can contribute to improved conservation efforts.

Poster 56:

Volitional Control of Vocalisations in Bottlenose Dolphins (*Tursiops truncatus*)

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A cornerstone of human communication is our ability to voluntarily produce or withhold vocal signals. This kind of control, however, is not necessarily present in all animals. Previous studies on primates and pinnipeds have highlighted that these animals can be trained to give different vocalizations to selected hand signals but studies on other animals have been less successful. Here we tested volitional control to emit vocalizations in five bottlenose dolphins (*Tursiops truncatus*), aged 14-58, by training them to produce up to four different signals from their repertoire in response to specific hand-signals and to withhold vocalisations in the absence of these gestures. Across the dolphins, six distinct vocalisations were trained to be produced in response to five different hand-signals with a trial period of six months. To ensure the hand-signals had no effect on the production of vocalisations the corresponding correct vocalisation was changed between the dolphins. The study showed that bottlenose dolphins have volitional control over vocalisations. They reliably produced vocal signals that are temporally relevant to the visual stimuli being presented, achieving success rates of 85.6%-100.0%. They consistently withheld vocal signals in the absence of visual stimuli producing false alarm rates of 0.3%-2.0%. Comparable studies used up to two call types per subject for analysis, here we show that dolphins have volitional control over multiple vocalisations that are present within their repertoire. The dolphins achieved comparable results to other vocal learning species and showed that volitional control of vocalisations extends into the upper age limit of the species unlike in rhesus monkeys. In this presentation I will compare vocalisation rates and types within and outside of trials, highlight the differences between the volitional control of social vocal signals and arbitrary ones, and evaluate the consistency of the produced vocal signals over the entire trial period.

Poster 57:

Marco? Polo! – An exploration of repeated call types and their role in enabling matriline-specific dialects to occur within the Short-finned pilot whale population of Tenerife's South West coast

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Cetacean bioacoustics is a continuously evolving field which focuses on the study of vocalisations and their communicative role in vision-limited underwater environments. Several studies have shown that vocal repertoire is learned via either vertical or horizontal cultural transmission. This phenomenon is especially prevalent in species that exhibit complex social structures such as Killer whales and Bottlenose dolphins. The same matrilineal structure is present within Short-finned pilot whales, resulting in the potential for acoustic dialects to arise. Nine months of consistent boat-based data collection enabled for hydrophone recordings to be taken along the Southwest coast of Tenerife in the Canary Islands. Fin identification efforts allowed for these recordings to be matched with pre-catalogued family groupings. This study has shown that not only do differences in dialect exist between matrilines distributed in this area, but that these may also be impacted by anthropogenic noise from nearby inter-island ferry routes. A second noteworthy finding is that two matrilines (previously thought to be genetically segregated) are likely sub-groups of the same, larger matriline due to significant similarities in their vocal repertoire which were discovered via acoustic analyses and call categorisation. These results are rewarding in that they have the potential to inform maritime traffic legislation as well as future management plans for this species. In other species with similar social structures, anthropogenic stressors have precipitated rapid population declines with slow or non-existent recovery. Dialect differentiation means genetic variation - warranting increased conservation, not just at a species level but of individual sub-populations too. Since this aspect of Short-finned pilot whales' life history is only recently emerging in the literature, this study has also helped lay the groundwork for future investigations which will better our understanding of this elusive deep-diving species.

Poster 58:

Acoustic estimation of the abundance of Sperm Whales in the Canary Islands: an archipelagic distance survey

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Sperm whales are classified as Vulnerable in conservation law. They inhabit the Canary Islands (Spain) year-round. Here, they suffer a high ship-strike mortality, which increased since 1999 in coincidence with the rise of speed and number of ferries in the archipelago. It is essential to monitor the population in order to assess if this anthropogenic mortality may impact the local abundance of the species. In 2010, a team from La Laguna University performed an acoustic survey of sperm whales summing 2668 km of transects within an area of 52933 km^2 covering the 12 nm Spanish territorial waters around the Canary Islands. We replicated the same survey design to provide an updated and comparable abundance estimation. A line-transect acoustic Distance survey was performed using a stereo towed hydrophone array in autum-winter 2020-2021 (same season than the 2010 survey). A total of 23 survey blocks with 99 transects as an equidistant zig-zag transect design was used, with a random start to the zigzags within each block, and with a similar coverage rate across all blocks. Acoustic detections of sperm whale clicks were extracted and processed in PamGuard software to obtain perpendicular distances of the whales to the transect line.79 transects were surveyed totalling 2594,62 km in length. Conventional Distance Sampling (CDS) analysis using the Distance package within R software will be used for abundance estimation. The results of this new survey will be discussed and compared with those of a decade ago, considering evidences for connectivity of sperm whales in Macaronesia from fotoidentification studies, as well as evidences of genetic population structuring for females in the region. This will contribute to resolve if ship strikes might be causing a population level effect in the Canary Islands, or the archipelago might be acting as an attractive sinking habitat for sperm whales.

Poster 59:

Listening to Bottlenose dolphins (*Tursiops truncatus*) using HydroMoths – cost-effective hydrophones as alternatives for cetacean acoustic monitoring

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There is a growing need to monitor cetacean presence to understand possible impacts from anthropogenic activities. Offshore renewable energy (ORE) is on the rise as an important energy source to reach climate goals. As top predators and indicators of marine ecosystem health, it is important to understand how cetaceans will be affected by changes by increased ORE installations. Acoustic monitoring of cetaceans has traditionally been carried out using a range of equipment, including towed and static arrays, determined by the species being monitored, environmental conditions, depth etc. Each of these approaches comes with limitations, including species identification, duration of deployment, handling time and costs. In this study, newly developed, small (7x6x3cm) and affordable (< US $200 per unit) hydrophones, HydroMoths, were tested in the Shannon Estuary SAC in Ireland, an area with a resident population of Bottlenose dolphins that have been studied for over 25 years. Hydrophones were deployed in sets of three, recording at three sampling frequencies (48, 96 and 250kHz) suitable for varied cetacean species, and using a range of duty cycles. The aim was to find suitable configurations for reliable detection of cetacean species such that these cost-effective hydrophones can be used for cetacean monitoring. This study investigates if devices record the target species, the quality of recordings, duty cycles required to differentiate diel patterns of occurrence, and battery life/recording duration for different sampling frequencies suitable for different cetacean species. We present work on the experimental setup and preliminary results of detections.

Poster 60:

Humpback whale songs in the Colombian Pacific and in the Tanzania Indian Ocean: same subpopulation and season but different song pattern

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Humpback whale *Megaptera novaeangliae* is a migratory species that feeds in polar and temperate areas in summer and breeds in tropical areas in winter. This whale inhabits the Colombian Pacific and the Tanzanian Indian Ocean to reproduce and breed. In these areas, it is common to observe whales displaying breeding behaviours and singing. Songs are complex vocalizations made by males for courtship purposes. Humpback whales of Colombia and Tanzania belong to the same Southern Hemisphere subpopulation, but according to their feeding areas in the Antarctica, the Colombian whales belong to Stock-G and the Tanzanian whales to Stock-C. Previous studies on photo-identification and genetic demonstrated that there is a scarce interchange between the different stocks. To determine if there are differences in the songs between Stocks G and C, an analysis of song recordings of 2022 breeding season from Bahía Málaga, Colombian Pacific (October), and Zanzibar, Tanzania Indian Ocean (September), was conducted. After standardizing the songs and characterizing the notes manually in the RavenPro program, 17 different units for Colombian whales and 16 for Tanzanian whales were identified, these were grouped into three main themes. The frequency range of the main signal harmonics ranged from 0.36-2.9 kHz. Differences between the main themes were then identified. In the Colombian song, theme 1 was composed of unit A with differences in time duration; theme 2 by units B-I-J-E; and theme 3 by units F-J-E. While in the Tanzanian song, theme 1 was composed by units C-H-U; theme 2 by L-F; and theme 3 by N-P-B. Our results show that although songs were from the same subpopulation in the same season, songs of both sites differ, confirming the scarce interchange between stocks G and C and hinting that there may be barriers mixing between the Pacific and Indian breeding stocks.

Poster 61:

Large-scale survey data in support of noise impact assessment in the Black Sea

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Sighting data deriving from the ACCOBAMS Survey Initiative (ASI), conducted through the CeNoBS project, enabled the investigation of the habitat preferences for three different cetacean species occurring in the Black Sea waters: the bottlenose dolphins (*Tursiops truncatus*), the common dolphins (*Delphinus delphis*) and the harbour porpoise (*Phocoena phocoena*). Aerial surveys, aiming at assessing the distribution and abundance of cetacean populations, were conducted during summer of 2019 in the marine waters in front of Romania, Bulgaria, Turkey and Ukraine. Thanks to the collaboration of ACCOBAMS, we could use the data obtained from the survey to perform habitat modelling under the scope of the EU-funded QUIETSEAS project. 1,716 sightings could be used: 117 bottlenose dolphins, 715 common dolphins and 884 harbour porpoises. Stepwise Logistic Regression Analysis was used to develop presence/absence predictive models using bathymetric features as covariates. Significant correlations were outlined ($P < 0.05$) supporting the hypothesis that physiographic factors may be employed as predictors of the species presence. The aim of this study was twofold: (i) to develop presence/absence models to estimate the presence probability of the three cetacean species in the Black Sea; (ii) to demonstrate the usefulness of these models in support of the assessment of the impact of specific stressors on marine mammal populations. The case of shipping noise is presented here, demonstrating how model predictions may enable assessing the fraction of the species' potentially usable habitat that could be negatively impacted by shipping noise in the Black Sea. Presence/absence models were found to complement the abundance estimates, enabling the assessment of the habitat vulnerability towards shipping noise pressure, thus contributing to the definition of conservation and management needs, and to meet the needs expressed at the EU level to assess the adverse effects of underwater noise on the marine ecosystem.

Poster 62:

A mitigation approach to reduce dolphin-fishery interaction using acoustic deterrent device on trammel nets in the Northern Tyrrhenian Sea (Tuscany, Italy)

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Dolphin-fishery interaction is a worldwide and long-standing issue affecting both dolphins through bycatches and fishers through catch or gear damages. In the Mediterranean Sea, this conflicting relationship has been documented mainly between small-scale artisanal fishery and common bottlenose dolphins (*Tursiops truncatus*) due to its top predator food chain position, opportunistic feeding behavior, coastal distribution home range, and marked adaptability. To reduce dolphins-fishers interaction, innovative acoustic deterrent devices (DiD01, STM Products S.r.l.) were tested on trammel nets. Fishing areas, net features, catches, damages to catch and gear were collected through onboard logbook at the beginning and at the end of the haul. From March to October 2021, a total of 139 fishing trials using nets with and without pingers, respectively 97 test, and 42 control, were carried in four different areas located in front of the coast of Tuscany. In all areas, Catch Per Unit Effort (CPUE), calculated by using the weight of catches, was not statistically different in test and control nets, while CPUE, calculated by using the number of individuals caught, was statistically significative ($p<0.05$). Among all 59 different species caught, *Sepia officinalis* was the most abundant both in test and control nets, 31.25% and 42.40% respectively. Catch damages caused by dolphins were statistically higher ($p<0.001$) in control than in test nets but also damages from other organisms (i.e. octopus, conger) were higher in control nets ($p<0.05$). In addition, damages to the gear, expressed as holes in the net, were higher in control than in test nets. No dolphin bycatch was recorded during fishing operations. After 8 months of trials, no reduction in numbers and quantities of captures was documented by using DiD01, and fishers were satisfied as this device significantly reduces their interactions with dolphins.

Poster 63:

Click-click, who's there? Acoustically derived size structure of sperm whales in offshore Irish waters

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Understanding the structure of populations is a critical element to the establishment of management and conservation measures. Sperm whales *Physeter macrocephalus* are characterised by a demographic spatial segregation, associated with a conspicuous sexual dimorphism reflected in their vocalisations. These particularities make acoustic techniques very relevant to the study of sperm whale population structure, especially in remote, challenging environments. The reliability of using inter-pulse-intervals (IPIs) extracted within sperm whale clicks to infer body size has long been verified and extensively used. We provide the first size structure estimates of the sperm whale population in an area where assumptions on population structure mainly relied on sparse observations at sea, whaling records and stranding data. Over 10,000 hours of acoustic data collected using both static acoustic recorders and towed hydrophone arrays in Irish offshore waters were processed using a recently developed machine-learning-based tool aimed at automatically extracting inter-pulse-intervals (IPI) from sperm whale recordings. Our analyses revealed that, unlike previously thought, large males do not account for most of the animals recorded in the area. We showed that adult females/juvenile males (lengths of 9-12 m) were predominant, accounting for 49% (n = 788) of the number of individuals recorded (n = 1,595), while the proportions of immature individuals (lengths <9 m) and adult males (lengths >12 m) were well balanced, accounting for 25% (n = 394) and 26% (n = 413) of the recorded whales, respectively. The implications of such findings are crucial to the management of the population and provide an important baseline to monitor changes in population structure, particularly relevant under changing habitat conditions.

Poster 64:

Detection and classification of delphinid vocalisations in Skagerrak waters from autonomous acoustic recorders.

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Delphinids are opportunistically sighted in Skagerrak, the south-eastern hook of the Norwegian Trench between Denmark and Norway. However, very little is known about their distribution and seasonality. Regularly observed species by dedicated visual surveys are killer whales (*Orcinus orca*), long-fined pilot whales (*Globicephala melas*), and white-beaked dolphins (*Lagenorhynchus albirostris*). We conducted the first autonomous Passive Acoustic Monitoring (PAM) project dedicated these species, specifically. In the last decade PAM has become a core monitoring tool of cetaceans, in particular odontocetes. We monitored with four stations on two large stone reefs (Gule Rev and Store Rev) located at 60-70 m depth on the edge of the Norwegian trench, between 4 May and 16 August, 2021. Dataloggers (ST600HF, Ocean Instruments, NZ) were recording 30 minutes per hour at a sample rate of 384 kHz, providing a bandwidth of 192 kHz. Whistles, burst pulses and echolocation clicks from non-porpoise odontocetes were identified in the recordings. Based on acoustic features extracted from the three target species, recorded in adjacent waters with visual confirmation, we were able to create a suite of classifiers in PAMGuard and R to identify times with delphinid activity. Tentatively, we have identified vocalizations in the recordings from white-beaked dolphins and 'blackfish', a group classification for both killer whales and pilot whales. Blackfish were found to be present in the early summer months (end of May through early July). White-beaked dolphins did overlap in time with blackfish, but were more common in the spring months (early May and June). With this study, we show that PAM is a viable method for monitoring delphinid activity in the Skagerrak, and lay the ground work for mapping their distribution and seasonal use of the Northern North Sea in general and the ecologically important southern slopes of the Norwegian Trench in particular.

Poster 65:

Common dolphin and bottlenose dolphin communication influenced by touristic boats in the Algarve, Portugal

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The Algarve located in the south coast of Portugal is known for the occurrence of several species of cetaceans and is one of the main areas to observe these animals in mainland Portugal. Over the last few years there has been a significant increase in the number of dolphin-watching boats in this region, which might lead to short- and long-term impacts on the target species (e.g., common dolphins - *Delphinus delphis*, bottlenose dolphins - *Tursiops truncatus*). Several impacts on the behavior and energy expenditure of cetaceans have been documented, including changes in the vocalization of dolphins (e.g., reduction in the communication range of whistles) and an increased energy cost. In this study, we analyzed the whistle characteristics of common dolphins and bottlenose dolphins in the absence of dolphin-watching tour boats and assessed potential impacts of tour boat presence on the communication of dolphins. Field recordings of dolphin whistles were made from June to September 2022, using a calibrated system. Dolphin behavior and group size were recorded, as well as the number of boats in a 300 m radius. A total of 15h of acoustic recordings were analyzed. Our results indicate that the whistle rate (whistles/min/group size) varied between species and differed depending on the number of dolphin-watching boats. Bottlenose dolphins produced more whistles than common dolphins and overall, the whistle production decreased with an increasing number of dolphin-watching boats for both species. Also, our results showed a significant increase in the start, low and high frequency of whistles in both species when exposed to the presence of one or more dolphin-watching tour boats. These findings indicate that the underwater noise resultant from dolphin-watching tour boats affects the vocalization of dolphins in the Algarve by potentially reducing the communication range of whistles and increasing the energy expenditure of dolphins.

Poster 66:

Monitoring of cetacean diversity in the central Mediterranean Sea using a single static acoustic sensor

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In the Mediterranean Sea, 8 species of cetaceans are considered endemic. Each species has different biology, distribution and ecology, with preferred habitats from pelagic environments to coastal areas. Information on their spatial occurrence in the Strait of Sicily (central Mediterranean Sea) is scarce, where numerous threats affect cetaceans due to the increased human activities (e. g., marine traffic, overfishing, off-shore constructions). The aim of this study was to analyze species diversity in the Strait of Sicily using a single acoustic recorder (SoundTrap ST600) deployed in offshore waters of western Sicilian coast. Acoustic data were acquired from 18 February to 27 April 2022 at 192 kHz sample rate with 50% duty cycle (5 min every 10 min). A total of 9473 recordings (about 1 TB) were acquired. Two different approaches of data analysis were used to detect and classify the sounds emitted by cetaceans. Initially, a manual analysis by spectrogram visualization and listening was applied to a subsample of the dataset (5 min every hour, 1575 files) in order to detect cetacean vocalizations and anthropogenic sounds. Customized algorithms were then applied to all the dataset to detect the echolocation signals of odontocetes (delphinids, sperm whales) and fin whale calls. Results showed vocalizations from different species of dolphins, with higher biosonar activity during nighttime. Moreover, the presence of sperm whales and fin whales suggest that the Strait of Sicily hosts a high diversity of cetaceans and could be a strategic area during their transit between the eastern and western Mediterranean Sea. This study represents an important step towards a better understanding of cetacean distribution in a poorly investigated area of the Mediterranean basin. Passive acoustics resulted a powerful tool to monitor cetacean diversity and to provide data for the establishment of conservation actions.

Poster 67:

Using passive acoustic to better understand dolphins' behaviour around fishing nets in bycatch context

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Bycatch due to fishery interactions is considered as the main threat to common dolphins (*Delphinus delphis*) in European waters. Some solutions are being investigated such as the use of pingers to prevent incidental captures. However, little is known as for the nature of these interactions and more interestingly on the circumstances of captures. This lack of knowledge implies a more challenging implementation of appropriate and effective means for mitigation of small cetaceans. Passive Acoustic Monitoring (PAM) represents a cost-effective and reliable solution to monitor how small cetaceans behave around nets using their acoustic behaviour. The aim of the APOCADO project is to address this question and to provide an insight on interactions between delphinids and fishing nets in the Iroise Sea (Brittany, France). Acoustic data was collected using Soundtraps (ST300 / ST400) directly deployed on the fishing nets. They were recording continuously at a sampling frequency of 144 kHz. Currently, four recording campaigns involving two different fishing vessels and different type of fishing nets have been conducted from May to September, cumulating more than 2400 hours of data. More instruments are to be deployed with more voluntary fishermen, data will be collected until the end of summer 2023. Various whistles, clicks and buzzes are reported throughout the recordings. Whistles are typically associated with communication behaviour whilst clics and buzzes are associated with foraging behaviour. This acoustic presence around the nets is to be compared with other criteria such as the type of net used (gillnet, trammel), the location of the fisheries or the season of the catches. In addition, the data will be correlated with relevant auxiliary data such as tidal coefficients, ambient noise or night-time/daytime periods to draw additional conclusions.

Poster 68:

Playing hide and seek underwater: Evidence of orca (*Orcinus orca*) presence in Icelandic waters through acoustic analysis

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Understanding orca (*Orcinus orca*) movement patterns in relation to prey is important for conservation management. In the North Atlantic, orcas are known to have a close relationship with herring, being regularly sighted feeding in coastal herring grounds. However, the distribution of orcas in offshore waters is less monitored and therefore poorly understood. This study investigated the acoustic presence of orcas across four regions of Iceland to gain knowledge on their seasonal distribution and population origin based on their calls. Six passive acoustic devices were deployed between 2018 and 2022, with four of which in offshore waters. Acoustic recordings were analysed to identify and categorise orca pulsed calls and these calls were compared with published catalogues from Iceland and Norway. The comprehensive comparison, based on 3,876 high-quality calls identified, revealed 760 matches to 29 call types attributed to the Icelandic orca population, providing evidence of orca presence at all monitoring sites. Most orca sounds were detected in the East and Northeast of Iceland during the summer months, suggesting individuals were possibly feeding on the Norwegian spring-spawning herring, which in recent years has returned to this area during the summer months. Herding calls were detected in the South during the winter months, suggesting orcas feed in the region throughout the year and not just in summer, as previously thought. Three calls identified in East Iceland in April were matched to the Norwegian call type catalogue, suggesting that Icelandic waters are visited by orcas from other populations. This study extends the known orca habitat in Iceland to all offshore regions monitored. While most individuals are likely to be a part of the Icelandic population, the detection of Norwegian call types suggests connectivity between Northeast Atlantic orca populations that requires further study.

Poster 69:

Tracking of common dolphins *Delphinus Delphis* using Time Delay of Arrivals' signals recorded by a small hydrophones array

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Passive acoustic monitoring of animals enables to study their behaviour without the use of invasive tagging methods. Recently, there has been interest in 2D/3D tracking of marine mammals using analytical methods based on their acoustic signals, especially for protected species. Among the threats to marine mammals, the most direct one worldwide is fishery by-catch. To try limiting by-catch, repelling acoustic beacons (pinger) can be set on fishing nets. However, mixed results regarding their efficiency have been reported. Recently a new generation of beacon, bio-inspired (DOLPHINFREE project), has been developed to try limiting common dolphins *'Delphinus Delphis'* by-catch in the Bay of Biscay. The beacon emits returning echoes from the echolocation clicks of a common dolphin, from a fishing net, to help dolphins to detect its presence. However, little is known about the precise behaviours of common dolphins in presence/absence of a fishing net, or during acoustic beacon emission. We thus conducted experiments at sea in order to assess wild common dolphins' behaviour in response to these elements. During experiments, we recorded common dolphins' acoustic activities using a small array of 4 hydrophones placed less than one metre apart from each other in a tetrahedron. Using clicks' Time Delays of Arrivals (TDoAs), we are able to localise dolphins when they emit. Our results show that this method is successful in extracting the Angle of Arrival (AoA) of each click, and can provide relative distances estimates. AoA measurements can be used for the diarization of vocalisations, enabling us to discriminate individuals in large dolphins' groups. Ultimately this approach allows the reconstruction of dolphin trajectories to study their behaviour. This proof of concept will be applied to the monitoring of dolphin behaviour during fishing activities of professional gillnetters in order to better assess and understand their interactions.

Poster 70:

Development of a Machine Learning Detector for North Atlantic Humpback Whale Song

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The song of the humpback whale (*Megaptera Novaeangliae*) is one of the most varied vocal displays in the animal kingdom; it consists of complex, hierarchical structures and undergoes constant evolutionary change. Studying humpback whale song recorded using long-term acoustic recording devices requires bioacousticians to review hours of audio recordings, identifying times in which humpback whales are vocalizing. This project aimed to develop a machine learning algorithm able to detect the vocalizations based on pattern recognition using spectrogram images. An existing algorithm (CNN; ResNET50 architecture) to detect humpback whale song produced by Allen et al. [1] in a collaboration between the National Atmospheric and Oceanic Administraion (NOAA) and Google, has achieved satisfactory results for data collected in the geographic area where it was trained (Pacific Ocean), not however on data from the North Atlantic Ocean. In this project the existing NOAA/Google detector was retrained on humpback whale song recordings from the North Atlantic. Different data augmentation techniques were used to artificially increase the variability within the training set with the goal of creating a detector, which is robust towards different noise environments. The resulting model is able to achieve an average precision (AUC-PR) of 0.94 on unit analysis basis (a unit is a single vocalization, under 4 s length) and 0.92 on an hourly basis of detection in the North Atlantic. The framework was built specifically for the detection of North Atlantic humpback whale song in large PAM datasets, can however also be used to retrain the model on other species in other ocean basins.

[1] A. N. Allen, M. Harvey, L. Harrell, A. Jansen, K. P. Merkens, C. C. Wall, J. Cattiau, and E. M. Oleson. A Convolutional Neural Network for Automated Detection of Humpback Whale Song in a Diverse, Long-Term Passive Acoustic Dataset. Frontiers in Marine Science, 8, 2021.

Poster 71:

Baleen whale detection in the Gulf of Corcovado (Chile)

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The Blue Boat Initiative is an anti-whale collision project initiated by the MERI Foundation for the protection of baleen whales in the Gulf of Corcovado. The first buoy, equipped with the LIDO system, has been installed in October 2022 and is currently operational for the detection of whales, in particular blue whales, humpback whales, sei whales, and pacific right whales, through the use of three CNN classifiers (operating on different time-frequency resolutions) trained on typical low frequency calls of these species. The execution time of these classifiers on a 20 second segment are 2.4, 5.3, and 1.5 seconds, operating sequentially, running well within real-time constraints. In addition, an environmental monitoring sensor was connected to the system to measure temperature, conductivity, pressure, oxygen concentration, and chlorophyll A. Classifications and measurements are transmitted in real-time through a 3G connection to a server on land for further distribution of the data and alerting ships in the area around the buoy. Future buoys installed further from land will rely on an Iridium Certus connection for data transfer. Here we present the results of the first operational months during the Chilean summer season.

Poster 72:

First analysis of sperm whale (*Physeter macrocephalus*) vocalizations in the Aeolian Archipelago (Sicily, Italy)

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Deep foraging dives are a significant part of sperm whales (*Physeter macrocephalus*) feeding behaviour, spending approximately 62–72% of their lives underwater. In this study acoustic records (72 spectrograms) from 9 solitary sperm whales (6 males and 3 unidentified sex whales sighted between 2019-2020 in the Aeolian Archipelago (Southern Tyrrhenian Sea, Italy), have been analysed. Acoustic recordings were collected using a simple hydrophone system (Aquarian Audio H2a, sensitivity -180 dB re: 1 V/µPa, state recorder's sound card sampling rate: 48 kHz) deployed from the research boat during the sightings, at a mean depth of 20 m and in good sea state conditions. Acoustic recordings were analyzed using Raven Lite 2.1.0. Totally 98 sequences, with an average duration of 88.03 ± 34s, were detected in summer months: usual clicks (ICI ≥ 0.5s) (71.8%), transition clicks (ICI 0.2-0.5s) (0.4%), and creaks (ICI < 0.2s) (2.0%). While 285 sequences, with an average duration of 59.23 ± 47s, were detected in autumn months: usual clicks (63.41%), transition clicks (2.13%), creaks (0.03%), codas (0.02%) and a single trumpet sequence composed by seven units. The average dive duration was 21.48 ± 11 minutes (min = 7.56 minutes, max = 42.02 minutes), while the average surfacing time was 15.06 ± 4 minutes (min = 9.14 minutes, max = 20.22 minutes). Non-strictly linear correlation between dive duration and number of vocalization sequences and between dive duration and water depth were found. The analysis of the acoustic recordings has shown that sperm whales spent most of their time emitting orientation/searching/foraging click types (usual and transition clicks and creaks) both in summer (74.18%) and autumn (85.02%) months. Furthermore, usual clicks, typically foraging-associated vocalisations, were detected in every dive with some difference between seasons, suggesting that the Aeolian Archipelago is an important feeding ground for Mediterranean sperm whales.

Poster 73:

Influence of vessel noise and light regime on finless porpoise (*Neophocaena asiaeorientalis*) echolocation characteristcs in Seto Inland Sea and Mikawa Bay, Japan

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Small odontocetes produce echolocation clicks to navigate and locate prey, making it an important function for their life. The introduction of anthropogenic sound sources like vessel noise in the dolphins' environment can lead to changes in behavior and shifts in population distribution. However, there are few studies about the impact on vessel noise on the echolocation click characteristics. Our objective was to examine the effects of vessel noise, light regime, and environmental factors on the echolocation click and click train parameters of endangered finless porpoise (*Neophocaena asiaeorientalis*). We conducted passive acoustic monitoring of free ranging finless porpoise at two sites in Japan (Seto Inland Sea and Mikawa Bay) for July-September 2021 and April-July 2022. These two recording sites host genetically and morphologically different local populations of finless porpoises. We selected on-axis echolocation clicks by five hydrophone referencing Villadsgaard et al. (2007) and Kyhn et al. (2009, 2010). The click parameters measured were apparent source level (ASL), peak frequency, center frequency, -3 dB bandwidth, click duration, inter click interval, and number of clicks. ASL and number of clicks were lower with vessel noise at daytime, and higher with vessel noise at night. The center frequency was higher in the presence of vessel noise. -3 dB bandwidth and click duration did not show significant changes with vessel noise. At night, -3 dB bandwidth was wider and the click duration was shorter, which may facilitate in gaining more information at night, thereby compensating for the lack of visual information. The environmental parameters measured, water temperature and synthetic flow velocity, did not affect click and click train parameters. The findings of our study indicate that finless porpoise likely adjust some of their clicks properties to adapt to the surrounding complex environmental conditions, especially the presence of vessel noise and the light regime.

Poster 74:

Biscayan and Azorean common dolphins whistle the same tune

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Common dolphins (*Delphinus delphis*) endure very high bycatch rates in the Bay of Biscay. Whistle repertoires have been used to determine population units of common dolphins. During summer dedicated sailboat surveys in 2013-2014 (Sao Miguel, Azores) and 2020-2021 (Bay of Biscay, BoB), common dolphins were recorded with a system based on a broadband towed hydrophone and a computer software. Whistles were extracted from 24 schools recorded in the Azores and 32 in the BoB, with a total of 133 samples in the Azores and 153 in the BoB, and analysed with a custom Matlab program which extracted FFT contours and provided 14 variables for each whistle (duration, six frequencies, five slopes, number of contour inversions and presence of harmonics). In both regions, dolphin schools had similar sizes, and were observed during various activity phases, including foraging, traveling, resting and socializing. All duration and frequency variables were strikingly similar, and only final and maximal negative slopes were significantly different in both regions (test U, $p < 0.05$). A discriminant model retained slopes variables but had a very poor classification performance (56.6% of global success) and a Wilks Lambda of 0.933: only 54.2% of Biscayan and 59.4% of Azorean whistles were attributed to their provenance region. Furthermore, samples from an independent validation date set of 13 Biscayan whistles were wrongly attributed by the model (to the Azores) in seven cases. Our results indicated that common dolphins of both regions share a very similar whistle repertoire. Although more detailed acoustic analyses could bring contradictory arguments, our study suggested that whistles could not be used to discriminate sub-populations in this part of the Atlantic.

Poster 75:

Potential signature whistles identified in groups of inner Mediterranean sub-population of long-finned pilot whales (*Globicephala melas*)

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The long-finned pilot whale (*Globicephala melas*) is a highly social species with an extremely complex and structurally variable vocal repertoire. Very little is known on the repertoire of the Inner Mediterranean sub-populations (occurring from the eastern Alborán Sea to the Ligurian Sea). Here, the acoustic features of 919 pilot whales' whistles (i.e., tonal, frequency-modulated sounds with a variable/aberrant contour) identified in 30 recordings collected between 2011 and 2020 in the north-western portion of the Pelagos Sanctuary (North-western Mediterranean Sea) are reported. Each whistle was characterized by extracting the maximum, minimum, starting and ending frequency, duration, number of inflection points and overtones, using Raven-Pro software. Then, the presence of potential signature whistles (pSW), a category of whistles used to transmit identity information within the group, was investigated using the SIGnature IDentification (SIGID) method based on the whistles' repetition pattern (at least 5 times in an interval of 1–10 s). About 50% (n=430) of the analyzed whistles was classified as pSW, seemingly belonging to 17 different types (3 of which recorded in different years). Minimum and maximum frequency averaged 2.4±1.2 KHz and 10.2±4 KHz, respectively, with an initial frequency of 2.8±1.6 KHz, a final frequency of 4.5±3.8 Hz, and a duration of 1.1±0.4 seconds. The number of inflections and overtones averaged 1.5±3.3 and 2.5±1.5, respectively. pSWs maximum frequency and duration, and the overtones occurrence, resulted significantly higher than other whistles (Kruskal–Wallis H test, $p<0.05$), allowing discrimination between pSWs and non-signature whistles. Overall, the whistles' maximum frequency, duration, and the number of inflection points seem higher than values reported in other geographical areas (Indian Ocean, Atlantic Ocean, Pacific Ocean), suggesting possible group-specific vocalization patterns (as in other matrilinear social species like killer whale, *Orcinus orca*) and/or effect of anthropogenic disturbance (such as noise).

Poster 76:

Geographic Variation of Bottlenose Dolphin Whistle Characteristics in Galician and Sardinian Waters

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Cetaceans exhibit an exceptional capacity for vocal learning and variation in acoustic parameters even within the same species. The effect of geographical distance on the variation of bottlenose dolphin (*Tursiops truncatus*) whistle parameters has been widely studied. However, many studies have not utilized long-term data sets to reduce the bias of individual, behavioural variation and seasonal variation on acoustic data collected. This study takes advantage of long-term recording periods of confirmed-sighting recordings of bottlenose dolphins gathered over extended periods with expansive whistle collections for two locations: Galicia, Spain (6 years; 1851 minutes; 9613 whistles) and Sardinia, Italy (9 years; 9494 minutes; 1702 whistles). We compared forty-six whistle automatically-detected parameters between the two populations. We found that the whistle features varied significantly between the two populations and that the effect of ambient noise may well influence the whistle parameters. Such studies can continue to inform conservation for the mitigation of maritime noise in cetacean habitats as well as contribute to a rapidly-growing database of cetacean acoustic repertoires.

Poster 77:

Influence of animal spatial distribution on passive acoustic density estimation from single sensors

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Passive acoustic data are increasingly being exploited to estimate cetacean population density. These methods have several advantages when compared to the most commonly used visual surveys, being relatively cheap and applicable on long-term. In this study, bottlenose dolphins (*Tursiops truncatus*) population density is estimated using data collected from a single passive acoustic sensor located in the Sicily Strait over an 8 months period during 2016. A cue-based approach has been applied, in which the number of detected echolocation clicks is converted into animal density considering the click production rate, the proportion of false positive detections and the probability of detection of their clicks. The probability of detection is then predicted as a function of the obtained SNRs. Cue rates are obtained from an auxiliary acoustic dataset based on focal follows of groups of animals for which acoustics is also available. False positives are obtained from the manual analysis of a sample covering the survey period. Finally, the probability of detecting the cues was obtained via sound propagation models. The passive sonar equation is applied to generate signal-to-noise ratios (SNRs) of received clicks. We combine acoustic propagation models to estimate transmission loss with different assumptions regarding the animals' distribution around the sensor. Building from the usual assumption that the distribution is uniform in space, we evaluate how departures to that assumption influence the estimated density. The resulting density estimates are discussed in the light of the different assumptions about animal distribution.

Poster 78:

CLIC PROJECT "Cetacean Listening Investigation for Conservation": preliminary results

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Performing research on marine mammals is always challenging. Several approaches are needed to have a better understanding of cetacean movements. Here we present the CLIC project (Cetacean Listening Investigation for Conservation), for monitoring cetaceans within the Pelagos Sanctuary. The work is carried out in two parallel phases: sea campaigns throughout the year for acoustic and visual data collection in the northern point of Pelagos Sanctuary, offline analysis and comparison with the acoustic data taken by KM3NeT (Cubic Kilometre Neutrino Telescope), underwater telescope for neutrinos that uses hydrophones, deployed in several locations, one is off Toulon, France. The main goals are the assessment on the presence/absence rate, the creation of a catalogue of cetaceans sounds, the comparison between the sperm whales body length estimates done with Inter-Pulse-Intervals and aerial images collected by a drone for the extrapolation of an empirical formula for Mediterranean population. In the season 2022, 38 surveys have been performed, covering 1557,29 nautical miles in 212,6 hours. On 288 listening points, we had 55 positive detections: 41(74.5%) striped dolphin, 12(21.8%) sperm whale and 2(3.7%) Risso's dolphin. On 117 sightings, we had 14(12.0%) fin whale, 11(9.5%) sperm whale, 14(12.0%) Cuvier's beaked whale, 1(0.8%) pilot whale, 1(0.8%) Risso's dolphin, 72(62.4%) striped dolphin, 3(2.5%) bottlenose dolphin, 0 common dolphin. On 11 sperm whales, we get body length of 6 and 2 individuals respectively with IPI and aerial images. Estimates on presence/absence are consistent with current knowledge and striped dolphin, beaked whale, fin whale and sperm whale as most regular species in the area, while Risso's dolphin, pilot whale and common dolphin are rarely seen. Those data will be collected also in the next season and compared with KM3NeT data. These findings will give a better knowledge about occurrence pattern between the northern and the western edges of the Pelagos Sanctuary.

Poster 79:

First attempt to Record minke whale (*Balaenoptera acutorostrata*) in Irish inshore waters

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This is a first attempt to record minke whale vocalisations (*Balaenoptera acutorostrata*) in Irish waters and records of vocalisations to date in the North East Atlantic have until relatively recently been non-existent. The frequency range of minke whale vocalisations is likely to experience increased interference from anthropogenic noise in Irish waters in the coming years from wind farm construction and operation as well as shipping noise. Therefore it is critical to understand the importance of minke acoustics in minke behaviour, where these occur and when in order to properly mitigate any impacts on minke whale populations migrating through and perhaps resident in Irish waters. Drop down drifting hydrophones were used to record minke vocalisations opportunistically in spring off the Beara Peninsula in West Cork, when minke whales were abundant and during observation of the whales. Three pulse trains were recorded from two specific individual animals photographed under the RIB and close to the drifting RIB (Rigid Inflatable Boat); the first two pulse trains from what is believed to be the same individual, also produced clicks with a clear well defined waveform and peak frequency of 10 kHz, demonstrates that minke can and do produce clicks as has been previously suggested. A number of other vocalisations were also recorded and these include upsweeps similar in duration to downsweeps typically of a duration of 0.4 or 0.5 seconds and often in doublets. Longer combinations of these were also recorded up to 1.4 seconds but these may be atypical as these have not previously been described. The purpose of these vocalisations to the whales is not known but it is generally assumed that pulse trains are associated with mating activity.

Poster 80:

Less is more? How the choice of a recording duty cycle could affect monitoring results of passive acoustic studies on cetaceans

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Long-term fixed passive acoustic monitoring of cetacean populations is a logistically and technologically demanding challenge. Sometimes it is necessary to increase battery life or optimize storage capacity by using duty cycle to extend the deployment period. Such recording strategies must therefore be considered in relation to the research questions, studied species and their specific vocal behaviour. This study aims to explore the effects of different temporal subsampling schemes on two specific types of acoustic behaviours. First on the seasonal patterns of three populations of blue whales in the Indian Ocean which produce long, regular songs at low frequencies. Then on the daily patterns of delphinids vocalizing irregularly at high frequencies in the Iroise Sea (Brittany, France). Continuous acoustic data and its corresponding detections were temporarily subsampled via three different duty cycle percentages: 50%, 33%, and 25% with listening periods ranging from 10 seconds to 8 hours. The results show that reducing the percentage of recording time has a negative impact on the accuracy with which the data is represented. For a specific percentage of duty cycle, short listening periods are preferred. The effects of duty cycle are more pronounced when species have low vocal activity or short periods of presence. These results indicate the importance of making conscious decisions in accordance with the target species and their vocal behaviours before choosing an appropriate cycle of use.

Poster 81:

First description of seasonal acoustic occurrence and behaviour of Humpback Whales (*Megaptera novaeangliae*) in Southern Iceland

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Icelandic is a known feeding ground for humpback whales (*Megaptera novaeangliae*). Their presence, that has increased in recent years, is primarily monitored in the North and West/Southwest regions, where they occur all year-round. Here, we contribute to the assessment of Icelandic waters for humpback whales, by investigating their occurrence and sound production in South Iceland. We used an autonomous moored hydrophone, recording from June 2018 to May 2019 in the Vestmannaeyjar archipelago. Recordings were analysed using an automated detector, and sounds identified were classified as social sounds or song. Song delineation was conducted manually and Random Forest and Markov Chain analyses were used to assess the reliability of the song transcription. Furthermore, to assess if song sharing occurred across the North Atlantic, we compared song recordings from Iceland to those recorded off Northern Norway in February 2019, with the Lofoten-Vesterålen (LoVe) Ocean Observatory infrastructure. Song similarity and repertoire sharing were calculated using Random Forest, Levenshtein distance and the Dice's Similarity index. Humpback whales were present in south Iceland for the entire monitoring period, apart for April, suggesting this is an important habitat for the species year-round. Behavioural observations showed that humpback whale occurrence coincides with feeding on herring in summer and possibly herring and capelin in winter. This suggests humpbacks use the area during summer as a feeding ground, and during winter as a migration stopover or overwintering site, as already known in other regions of Iceland. The song comparison between Norway and Iceland showed values of Levenshtein Similarity Index higher than 0.60 (between same phrase types), and an overall Dice's Similarity Index of 58%. This supports some degree of song sharing across the North Atlantic, and highlights the need for further studies on cultural transmission in the North Atlantic.

Poster 82:

Verifying the acoustic presence of southern right whales (*Eubalaena australis*) off Elephant Island, Antarctica

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Passive acoustic monitoring (PAM) methods can be used to monitor underwater vocalizations of cetaceans, providing continuous, long-term and seasonally unbiased data to study distribution patterns and trends. The efficiency of PAM methods depends on the ability to detect and correctly interpret acoustic signals. The upcall is the most commonly detected and prevalent vocalization of the southern right whales' (*Eubalaena australis*) vocal repertoire and is commonly used as a basis for PAM studies on this species. However, previous studies report difficulties to distinguish with certainty between southern right whale upcalls and similar humpback whale (*Megaptera novaeangliae*) vocalizations. Recently, vocalizations similar to southern right whale upcalls were detected off Elephant Island, Antarctica, which represents an important feeding ground also for other baleen whales including humpback whales which are also acoustically present in the data. In this study, these vocalizations were structurally analysed and call characteristics compared to a) confirmed southern right whale vocalizations recorded off Argentina and b) confirmed humpback whale vocalizations recorded in the Atlantic Sector of the Southern Ocean. Based on call features, detected upcalls off Elephant Island could be attributed to southern right whales. Apart from a similar mean duration, southern right whale upcalls had a notably lower frequency range compared to humpback whale vocalizations. Measurements describing slope and bandwidth were identified as the main differences in call characteristics between species. Confirming the acoustic presence of southern right whales in waters off Elephant Island, provides further support that these waters are an important foraging ground for multiple species. With the newly gained knowledge from this study, additional data can be analysed which will provide further insight in temporal occurrence and migratory behaviour of southern right whales in Antarctic waters.

Poster 83:

Functional differences between whistle types in wild populations of bottlenose dolphins (*Tursiops truncatus*)

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In socially complex and acoustically active cetaceans, vocal communication research has mostly been conducted on bottlenose dolphins, specifically on stereotyped whistles (signature whistles). However, little research has focused on non-stereotyped whistles (variant whistles) and whether they are used in different contexts than their counterparts. The aim of this study is to determine whether there is a potential difference in the drivers of these two whistle types in wild dolphin populations, which, to our knowledge, has not yet been explored. Over 15 years of research, 189 hours of acoustic data were collected from two separate wild populations of bottlenose dolphins (Mediterranean Sea and Atlantic Ocean). A total of 1119 one-minute samples were randomly selected and analyzed for the presence of signature whistles and variant whistles. Generalized Linear Mixed Models with binomial distribution were then run for both response variables (presence/absence of signature and variant whistles) with a set of social, temporal and behavioural explanatory variables. Results show that the drivers of the two different whistle types differ. Signature whistles are mainly influenced by the number of individuals in a group and are potentially used for reuniting with particular individuals through their stereotyped individual-based pattern. Variant whistles, on the other hand, are mainly driven by overall group behaviour, potentially indicating their use as context-dependent communication signals. These results indicate that the two whistle types have functional differences and are used in different contexts. Whistle types should therefore be considered separately in future dolphin communication studies.

Poster 84:

The first record of acoustic and visual behaviour of a stressed Bottlenose Dolphin calf in Budva, Montenegro

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Simultaneous visual and acoustic information on bottlenose dolphins (*Tursiops truncatus*) can uncover vital attributes of their life, from behavioural activities, stress levels to social complexity. Bottlenose dolphin calves learn and emit individually unique whistles in their first stages of life. This study reports the first findings of visual and acoustic behaviour of a solitary calf encountered along the coast of Budva, Montenegro on September 24th, 2022. Behavioural events, breathing intervals and acoustic activity of the calf were recorded with a five minute interval to understand the visual and acoustic behaviour.. Whistle contours were overlapped with visual behavioural events. 301 whistles were visually detected in the spectrogram, with 75 being classified as harmonic. Only good quality whistles (41 whistles) were embedded for further analysis. 50% of the emitted whistles exhibited “Concave downsweep” whistle contour. The mean peak frequency of the recorded whistles was 13kHz with a minimum and maximum frequency range of 2 to 24 kHz. These results are similar to bottlenose dolphin whistle characteristics previously studied in Montenegrin waters, however, each frequency measure displays a higher frequency result. The calf emitted a mean minimum whistle frequency of 8.8kHz, and a mean maximum of 20kHz, a smaller range than that identified in earlier studies. Actual minimum frequency recorded was 2.7kHz, over 8kHz higher than previously recorded whistles but the maximum recorded frequency was 24kHz which matches previous studies. Highest frequencies were produced when the calf exhibited behaviours indicative of stress, including pacing, swimming in circles, and behavioural events that were considered a direct response to anthropogenic activity. This study reports a preliminary description of the acoustic production of a lone bottlenose dolphin calf; providing new information on this unique occurrence in hopes of a deeper understanding of calf development and behaviour when faced with stress.

Poster 85:

Assessing the spatial interactions between marine vessels and bottlenose dolphins (*Tursiops truncatus*) in Montenegro, South Adriatic Sea

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Marine traffic is a globally recognised threat to cetacean species, and this is particularly intensified in coastal environments. Studying the interactions between these keystone species and marine traffic provides us invaluable insight into the extremity of the threat, as well as the identification of areas where protection must be implemented. The data deficient waters of Montenegro hold several critical habitats for bottlenose dolphins (*Tursiops truncatus*) as well as prevalent boating due to tourism and fishery activities, reinforcing the necessity of persistent research and conservation efforts. The current study is Montenegro's only dedicated research effort on cetaceans, with the aim to understand the spatial interaction between bottlenose dolphins and marine traffic. Data was collected through 644 land-based surveys with theodolite stations, which were distributed across the coastline of Montenegro. This research was conducted between 2016 and 2021, during this research effort, dolphins were observed during 187 surveys. The potential effect of vessel density and vessel proximity on dolphin presence as well as the area preference of bottlenose dolphins were investigated. Results highlighted that dolphins showed area preference to Boka-Kotorska, and that dolphins remained at sites despite there being increasing vessel density. Furthermore, only <20% of marine vessels observed were within the zone of disturbance (<400m) of focal groups. The results indicate that the coastal waters of Montenegro hold important bottlenose dolphin habitats, with the suggestion that the ecological benefits outweigh the cost of marine traffic disturbance. However, dolphins are consistently displaying instantaneous marine vessel avoidance across the coastline, emphasising their negative reaction towards boating disturbance. Boka-Kotorska is a preferred area of dolphin presence, yet also has the highest marine vessel density, therefore conservation management must be improved and further implemented in this area.

Poser 86:

The Fast and the Furious - Mating behaviour of wild harbour porpoises (*Phocoena phocoena*) in the Western Baltic Sea

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Social behaviour of harbour porpoises in the wild is still understudied and rarely documented on video footage. Due to their short surfacings and difficulties to observe them subsurface documented behaviour is always either interrupted or at least incomplete. In summer 2022 we conducted visual observations with unmanned aerial vehicles (UAVs) in coastal waters at Fyns Hoved (Denmark). More than 1200 flights with a total air time of 288 hours were documented using DJI Mini 2 and Air2s drones. One of the behaviours documented in detail was mating. At least three mating attempts were filmed giving information of the mating behaviour of these cryptic marine mammals. Videos were analysed with a costum made MATLAB software to extract georeferenced tracks from the videos and the flight logs. Mating can be subdivided into four phases:
(1) FOLLOWING: Sea floor-near male pursues a surface-near female in a certain distance in an inconspicuous way for several minutes; female alone or with a calf.
(2) SURFACE: Male surfaces potentially unrecognized and reduces the distance to the female.
(3) STRIKE: A sudden approach of the male to the female with highly increased swimming speed and a strong sideways body contact with potential insemination of the surfacing female by the male ending with a jump over the female, or a refusal to mate by a sudden diving of the female.
(4) FLIGHT / REPEAT: A flight-like distancing of the male from the female in the case of a successful insemination and jumping, or in the case of a denial by the female a further escorting by the male.
We will present video footage of the social behaviour of the harbour porpoise rarely seen. Judging from the footage the contact between adult male and female is very short suggesting a highly randomized gene exchange in wild porpoises.

Poster 87:

Study of Bottlenose dolphins' association with aquaculture and tuna penning activities in Maltese waters

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Bottlenose dolphins are known to inhabit coastal waters and to interact with various anthropogenic activities. Amongst these there are also aquaculture and tuna penning activities which involves the rearing and feeding of fish kept in cages which in turn attract various other species, including fish and bottlenose dolphins. The Maltese Islands have a relatively large number of such cages most of which are situated in shallower waters within the 6km distance from the shore. To understand the extent of association, dependence and risks dolphins face in spending time within the aquaculture and tuna penning areas dedicated land and marine surveys have been running for over one year to assess the seasonal presence and behaviours of bottlenose dolphins in the areas. This project complements the long-term cetacean research project run in the Maltese waters since 1997 to assess cetacean abundance and distribution within and beyond the 25nm fisheries management zone. By focusing on coastal aquaculture and tuna penning activities and identifying the number and the ID of the dolphins interacting with these activities it is possible to understand to what extent the association is strong and spread within the resident bottlenose population in Maltese waters. Additionally the increasing awareness of the public to the presence of bottlenose dolphins close to these activities have exponentially increased the number of leisure vessels, jet skis and ferries travelling to the area especially during the summer months therefore causing an increasing risk that needs urgent conservation management for these legally protected species. The surveys undertaken have therefore documented in detail the number and type of vessels in the area, apart from the aquaculture activities and dolphin behaviours.

Poster 88:

Cultural evolution of close-range killer whale calls

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Resident (fish-eating) killer whales in the North Pacific live in stable matrilineal groups; both males and females stay in the natal group for life. New groups form through a gradual fission of a matriline after matriarch's death. The stable social structure facilitates long-term studies of the evolution of vocal repertoires. Each group has a repertoire of stereotyped calls – a vocal dialect. Calls are transmitted across generations through vocal learning rather than genetically; they slowly change in time due to learning errors, innovations and horizontal transmission – a process known as cultural evolution. Previous studies of killer whale vocal repertoires were mostly focused on long-range killer whale calls, which are highly stereotyped and group-specific. Short-range calls are generally monophonic low-frequency squeak-like sounds with lower source levels than long-range biphonic calls. In contrast to long-range calls, which are used more often in inter-pod contexts, close-range calls are emitted frequently in all behavioral contexts. These differences in structure and usage suggest that close-range and long-range calls can follow different trajectories of cultural evolution. Here we present the analysis of similarity patterns of close-range calls in order to draw insights into their cultural evolution. We found that similarity patterns were different for close-range and long-range calls. Some of the matrilines had similar repertoires of long-range calls but very different repertoires of close-range calls. In some cases, even matrilines from the same acoustic pod had highly distinctive repertoires of close-range calls. On the similarity dendrogram of the long-range call repertoires, matrilines were grouped into well-defined clusters of one to three in each. The repertoires of close-range calls were more homogenous and less clustered with a smoother gradient of repertoire similarities between matrilines. These results suggest that cultural evolution of different call categories can be driven by different processes and occur with different speed.

Poster 89:

Movements of bottlenose dolphins: challenging the existing narratives?

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Understanding movements and connectivity among marine mammal populations means a better understanding of gene flow and potential isolation of populations, which is fundamental in an attempt to delineate units to conserve and help place demographic parameters, such as abundance, fecundity and mortality, in an appropriate population and conservation context. However, even in species we perceive as well studied, our understanding of these processes is incomplete. Common bottlenose dolphins (*Tursiops truncatus*), among the best-studied cetaceans and often 'coastal' in their distribution, are traditionally considered relatively 'resident' and demonstrating strong site fidelity to specific areas. While this is often true, this perception may partly be an artefact of the distribution and 'habitat use' of cetacean researchers, rather than animals themselves, and bottlenose dolphins have been shown to be capable of substantial movements, often in relatively short periods of time. Here, we outline recent advances in our understanding of bottlenose dolphin movements and how this may affect inferences about things such as population structure, population discreteness, spread of behaviours, and conservation management strategies. We provide new data on long-distance (1000 km+) movements, including the world's longest recorded movement in coastal bottlenose dolphins, and provide recommendations for further research. We show that the emerging available data challenge the traditional view held of bottlenose dolphin movement patterns and that they make substantial movements more often than is currently recognised. This shows that we have yet to fully understand the ecology and behaviour of a species we consider well studied.

Poster 90:

Reproductive success of female bottlenose dolphins (*Tursiops truncatus*) in an ultra-oligotrophic marine environment

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The reproductive output of wild bottlenose dolphins *Tursiops truncatus* has been extensively explored worldwide. However, it remains largely undocumented in the Mediterranean Sea. Although it has been identified among different bottlenose dolphin populations, some of the reproductive parameters, such as seasonality of births, weaning period, and interbirth intervals may vary greatly among populations and can be influenced by several variables. Food availability, the current physical environment, risk of predation, social ranking, reproductive status, age of the offspring, and previous maternal experience have all been shown to influence offspring care and survival. Assessing female reproduction is of paramount importance to identify the viability of the population that decreases worldwide and formulate adequate conservation measures. The reproductive pattern of 29 adult bottlenose dolphin females were analyzed using photo identification data collected during boat surveys between 2005-2020 as part of a long-term monitoring study along the Israeli coastline, located in the eastern part of the Levantine Sea. A total of 44,066 km was covered during 1013 surveys. Females were identified based on the proximity of a dependent calf or photograph of the genital area and calves were identified based on visual inspection, approximately half the size of an average adult, with light grey to brownish coloration, but no visible fatal folds. During the study period, 44 calves were sighted and photographed. 13 of the females were observed with different calves over the years, with mean calf interval of 3.92 ± 1.28 years. A database from a >20 year-long stranding monitoring program provides supporting data for birth seasonality estimates. Understanding the reproductive parameters and how they are affected by external factors are crucial to our estimation of the population general health and stability, especially in the eastern Mediterranean Sea, an ultra-oligotrophic region.

Poster 91:

The bottlenose dolphin population in northern Catalan waters (Mediterranean Sea): insights on distribution, behavior, and trawling activity influence.

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The present study summarizes the occurrence and fisheries dependence of common bottlenose dolphins (CBD) (*Tursiops truncatus*) over an extended period of 6 years (2017 to 2022) in the northwestern Mediterranean coast of Catalonia. The study area (2144 km^2) was surveyed from 2017 to 2022 conducting visual and photo-identification surveys on a 6-meter-long RIB. A total of 8903 km of homogeneous effective effort was conducted in the study area. CBD were the most common cetacean detected, with a total of 120 sightings (ER=0.0148 sightings/km). All CBD sightings occurred at depths shallower than 200 meters and group mean size was 9.15 (SD=4.2) individuals and a density of 0.00016 individuals/km^2. Presence of calf was reported in the 44% of the sightings, with a pick of 65% during warm season (june-setember). Most of the sightings (70%) were associated with trawl fishing activities, showing a strong association between CBD and trawlers presence in the area. The analysis of the impact of the trawling activity on the group size did not show a significate result (Kruskal-Wallis n=108; chi-squared = 0.21391, df = 1, p-value = 0.6437) and neither did the fishing ban influence on the distance where groups of dolphins can be found related to the fishing grounds (Mann-Whitney U test: n=120, W = 1506, p-value = 0.1661). During 2022, a behavior study during dolphin-trawler interaction was initiated. More than 300 registers of surface behavior were taken during 42 different CBD sightings, 86% of those being related to foraging. While during towing, the dolphins were dispersed behind the fishing boat in the 90% of the cases, using similar positions on the net. When the fishing vessel started hauling, dolphins gathered and behaved synchronized in the 94% of the records. Other patterns were also described as common (tale flap and jumping).

Poster 92:

Analysis of the disruptive behaviour of Iberian orcas (*Orcinus orca*)

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Orcas (*Orcinus orca*) have been inhabiting the Strait of Gibraltar seasonally for centuries, according to historical data. They were identified as a different subpopulation from the Northeast Atlantic ones according to various studies using different methodologies (e.g., photoID, genetics, isotopes and contaminants). This population was listed as vulnerable by the Spanish Ministry of Environment in 2011, and a conservation plan was approved by the Spanish government in 2017. These orcas were evaluated as Critically Endangered in the IUCN Red List of threatened species in 2019, partly due to the low number of adult individuals, and because they rely heavily on a single prey species, the migrating Atlantic bluefin tuna (*Thunnus thynnus*). Orcas are normally observed actively pursuing tuna to exhaustion in the Strait or even interacting with longline fishing boats, depredating on caught tuna. A disruptive new interaction has been observed since 2020. For no apparent reason the animals touch, push and turn boats by applying pressure with their bodies and heads. The animals have been reported interacting with all types of boats from 5 to 38 metres in length, although they mainly focus on sailing boats from 10 to 17 m. Due to this fact, damages have been occasionally recorded on the stern of the boat (mostly on the rudder and other structures). In total, 460 interactions with or without damage were recorded between July 2020 and December 2022 all along the Atlantic coast of the Iberian Peninsula (from the Strait of Gibraltar to Galicia). Thanks to the collaboration between administrations, scientists and marine stakeholders (fishing and recreational navigation sector) actions and protocols have been designed and implemented in order to avoid as much as possible damaging to boats, harming people and to maintain conservation actions for this endangered subpopulation, as well as their favourable projection at social level.

Poster 93:

Kinematics of foraging behavior of Chilean blue whales (*Balaenoptera musculus chilensis*)

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The northern Chilean Patagonia region is a key feeding ground and a nursery area for blue whales (*Balaenoptera musculus chilensis*) in the southern hemisphere. The foraging behavior of this subspecies has been mainly studied by visual monitoring, acoustic studies, and through anatomical dissections in the past, limiting ecological analyses of the interaction with their prey. In this study, we used bio-logging tags (DTAGs) to measure fine-scale movement kinematics of the whales underwater, and a scientific echosounder to estimate prey density and distribution. During six separate research cruises (2014-2019), 28 blue whales were tagged, generating more than 190h of data and recording hundreds of feeding events. During the years 2016 to 2019, prey density and distribution were simultaneously recorded with tag data. The aims of the study were: (i) to characterize the Chilean blue whales feeding behavior; (ii) to link their behavior to concurrent measurements of prey (euphausiids); (iii) to quantify how diel vertical migration of krill influences their foraging strategies in northern Chilean Patagonia. Here, blue whales exhibited both shallow and deep feeding behaviors in response to changing conditions of light and prey. Whales showed a higher feeding rate during nighttime on shallow and dispersed krill patches rather than feeding on dense and deeper krill aggregations. The results showed less energetically costly maneuvers when foraging near the surface, with lower values of pitch and speed during feeding events. The whales preferred waiting for the migration of krill to shallow waters at night, leading to an increased risk of ship collision during nighttime. These results provide valuable insights into the behavioral ecology of Chilean blue whales to promote specific conservation plans for this subspecies.

Poster 94:

The effects of vessel traffic on the behavioural pattern of common dolphins, in Tagus Estuary (Portugal)

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Over the past few years, several studies have highlighted the impact of human activities on several populations of coastal cetaceans, particularly the potential effects of shipping on the behavioural patterns. In Tagus estuary, Portugal, high levels of maritime traffic, both commercial and recreational vessels, navigate through productive and biologically rich waters year-round. Sightings of short-beaked common dolphin (*Delphinus delphis*) in the estuary have been reported for over two centuries, and appear to have increased during the last years. The reduction in marine traffic, related with the pandemic COVID-19 lockdown, has been pointed out as a possible explanation to the, seemly, increase in *D. delphis* occurrences. However, due to the lack of baseline studies in this region, it is difficult to establish a clear link. Currently, the main drivers of dolphins' visits to the estuary are yet to be understood. This study provides the first insight into the interactions between dolphins and vessels in the Tagus region. To understand the effects of vessel traffic on dolphin' behaviour patterns, land-based observations were carried out from a high vantage point (VTS tower, in Algés). During daylight period (8am-4pm), between March 25 and September 21, 2022, continuous scans of the study area were performed by 2-3 observers, using binoculars and a telescope. Dolphins' behavioural patterns and reactions to vessels (positive, neutral and negative) were assessed using focal-scanning method. Preliminary results (N = 43 events, 30.06 hours of observations) shown a decrease in time spent foraging and travelling when vessels are present, although most of the encounters resulted in neutral responses (78.6% of observations). This study is a first step towards conservation action, since dolphins' activity budgets can provide useful information about biological responses to an impact and may contribute to future guidelines in a blooming dolphin-watching area.

Poster 95:

High-frequency pingers do not increase seal depredation in Baltic Sea fisheries

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The Baltic Proper harbour porpoise population is Critically Endangered, with only a few hundred animals left. The biggest threat to the population is bycatch, for which some mitigation measures exists. One of them are acoustic deterrent devices (i.e., pingers). Due to the small population size, even one bycaught animal per year poses an extinction risk for this population, wherefore it is necessary to apply mitigation measures throughout their distribution range. Although closing static net fisheries in the entire Baltic Proper would ensure complete elimination of bycatch, it is not a realistic approach due to implementation difficulties and the impact on local communities. Alternative gears exist but are insufficient to fully replace static nets. ASCOBANS has recommended that pingers are used as an interim measure while other mitigation techniques are developed, due to concerns of causing displacement of animals from important habitats, and pingers may play an important role in minimizing bycatch of Baltic Proper harbour porpoise outside protected areas. There is hesitation among fishers to use pingers, since they have previously experienced an increase in the already problematic depredation by grey seals through what is known as the dinner-bell effect. Here, we used two types of high-frequency pingers, presumably not audible to seals (50-120 kHz and 70 kHz). These were attached to active static nets in the Baltic Proper and fishers were asked to estimate the catch loss due to seals, with and without pingers. We received data from 646 deployments made between May 2019 and September 2020. Four generalised mixed effect models were developed with relevant variables. The results suggest using pingers does not increase seal depredation on fishing nets. Given these results, we conclude pingers are suitable as an interim measure to minimize bycatch of the Critically Endangered Baltic Proper harbour porpoise population

Poster 96:

Micro, meso and large scale movements of the Galician bottlenose dolphin populations based on the FotoID technique

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Photo identification studies of bottlenose dolphins have been carried out in Galicia (NW Spain) since the 90s. The photographs collected for photo-ID catalogue have been obtained with ship surveys and land-based monitoring from 2000 to 2019 by CEMMA along the Galician coast. Each photograph was classified with quality and distinction criteria, as well as by the number of recognizable marks. For geographic micro and meso scale analysis, six areas are identified along the Galician coast. Dorsal fins detected within each Ría and between adjacent Rías (micro-scale), and along the Galician coast (meso-scale) are analyzed. The photographic bank is compared with those existing in the north of Spain and Biscay Bay (Asturias, Cantabria, Euskadi) and with opportunistic sightings in the Bank of Galicia and coast of Portugal (large-scale). To analyze each movement, a mobility index is used to evaluate them. Between 2003-2022, 395 censuses were carried out, where 754 sightings of 6954 animals were recorded, in which more than a hundred thousand photographs were taken. More than 700 identifiable different dorsal fins were obtained thanks to the Good quality of the photographs. The encounter rate is 0.47 sightings per hour of navigation. A total of the 86 individuals are considered the stable group of dolphins that remains on the coast of Galicia over the years, among which some individuals have been recorded for at least 20 years. Micro-scale movements (less than 100 km) were detected for 45.8% of individuals in the southern area (“Rias Baixas”) and for 10.0% of individuals of the northern area. Meso-scale movements (between 100-200 km) were detected for 20.5% of individuals of both north and south areas. Only 0.8% of the individuals were detected in Large-scale movements (more than 200 km).

Poster 97:

Bottlenose dolphin (*Tursiops truncatus*) habitat partitioning in relation to age-classes in the Western Ligurian Sea

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Recently, there has been an increase in the presence of common bottlenose dolphins (*T. truncatus*) in the western Ligurian Sea (northwestern Mediterranean Sea). In particular, we find more than 66% of groups that contain newborns and/or calves in the area. We aimed to characterise the spatial distribution of the groups in this area and investigate if there are any habitat-use or distributional segregation between adult only, calf and newborn associated groups. Presence-absence data were collected during 273 boat-based surveys between April 2018 and December 2021, resulting in 147 sightings. Through photo-identification techniques, the group size and composition of each sighting was assessed, and classified as an adult only (n=49), groups including calves, (n=62) or newborns (n=35). Each group distribution was modelled separately using an ensemble modelling approach (BIOMOD) that uses linear, non-linear and machine learning techniques to mitigate methodological biases from each model. A suite of eight environmental variables were used to define the likely distribution of each of the three groups in our study area. Results indicate the mean group size of the 3 groups to be significantly different between adult only (mean=3.16, sd=1.99) and groups including calves (mean=14.76, sd=9.46) or newborns (mean=18.80, sd=9.90). The modelling outcomes highlight the importance and relationship of each variable in determining their habitat-use differs among the 3 groups. Specifically, adults were forecasted very close to shore, calf groups showed a wider distribution including both coastal waters and areas closer to the shelf break, while newborn groups were restricted to areas far from the shore. The habitat selection and group size seem to vary according to the unique needs and threats faced by the different age classes. These outcomes are highly valuable to manage this area characterised by a great overlap between bottlenose dolphins and anthropogenic activities due to its peculiar morphology.

Poster 98:

Associations and site fidelity of bottlenose dolphins (*Tursiops truncatus*) in the Strait of Sicily

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Social behaviour in animal populations is a key driver of pathogen and parasite spread, as well as gene and information transmission. Bottlenose dolphins (*Tursiops truncatus*) show complex social behaviours, with fission-fusion societies where group composition varies frequently. This study aims at analysing the association rates and site fidelity of the bottlenose dolphins in the waters off the Agrigento province (Strait of Sicily) during the 2016-2020 period. The half-weight index (HWI) was applied to investigate associations, monthly and yearly occurrence rates (MOR and YOR) were used as estimates of site fidelity. Out of 153 surveys (8020 kms), dolphins were sighted 113 times, with an encounter rate of 0.014. Photo-identification allowed to identify 87 individuals (0.86 recapture rate), of which: 78 adults, 6 juveniles and 3 calves. Analyses were carried out on individuals that were sighted at least 5 times (42 dolphins). The HWI identified 6 clusters and showed a prevalence of low associations (HWI<0.3), with only 9 dyads having strong associations (HWI>5). Average YOR was 0.71 (S.D. 0.23): 29% of dolphins were present in all 5 years (YOR=1), 21% in 4 years (YOR=0.8), 31% in 3 years (YOR=0.6), 17% in 2 years (YOR=0.4), and 1 in 1 year (YOR=0.2). Average MOR was 0.28 (S.D. 0.14): 7% of the dolphins are resident (MOR>0.5), 60% frequent (0.25≤MOR<0.5), 33% sporadic (MOR<0.5). The bottlenose dolphins in Agrigento waters show high encounter, identification, and recapture rates. They have the typical fission-fusion social structure, with low associations and dynamic group composition. Moreover, the high number of reproductive females (21 out of 78 adults) and of registered births (25 in 5 years) seem to indicate Agrigento waters as a calving and nursery area. Currently, these dolphins do not benefit from any protection. Therefore, the preliminary results presented here offer important information for a future management and conservation plan.

Poster 99:

Stable long-term associations between Risso's dolphins of São Miguel, Azores

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Risso's dolphins (*Grampus griseus* Cuvier, 1812) are regularly sighted in the Azores. There is a very well-known population in Pico Island, where identified individuals show a social structure called 'stratified community', in which the pod is based on age and sex classes, and only uniform structures with only males or only females (with calves) are formed. In São Miguel Island, recent photo-ID data suggest the existence of a resident group. In this study, we present the first model for social structure of Risso's dolphins of São Miguel Island, Azores. Photos valid for identification were collected opportunistically from whale-watching vessels between 2010 and 2018. A total of 573 individuals were photo-identified, from which ~29% were sighted more than once, and the maximum number of sightings per individual was 27. These data were used in SOCPROG to analyse the existing association between individuals (association index – AI), and potentially identify stable groups with the hierarchical cluster analyses based on the 'average' linkage method with individuals sighted more than 5 times. Results showed associations better than random, although with a low overall mean AI (AI = 0.13, SD±0.06), likely due to the limited quantity of data available. Several stable associations were identified, including two groups of three individuals and three pairs with AI>0.5, five individuals with AI>0.7 (corresponding to five of the females of the previously identified resident group sighted in seven years of the study period), and three dolphins with AI>0.9 (sighted in four years of the study period). These preliminary results confirm previous data showing stable associations between some Risso's dolphins around São Miguel. The proximity between clusters suggest that more data will greatly benefit the performance of these analyses, likely increasing AI's and unfolding more stable associations with the already defined stable group.

Poster 100:

Effects of ship traffic on the distribution of harbour porpoise (*Phocoena phocoena*)

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Marine habitats are nowadays strongly affected by human activities, while for many species the consequences of these impacts are still unclear. Harbour porpoises (*Phocoena phocoena*) have been reported to be sensitive to ship traffic and other anthropogenic pressures and are consequently of high conservation concern. We studied harbour porpoises in the German Bight (North Sea) using passive acoustic monitoring (PAM) and digital aerial surveys with the aim of assessing effects of ship traffic on the distribution of this species. Data from the automatic identification system of ships (AIS) were intersected with the data of 5 digital aerial surveys and 15 C-POD stations within a study area of 1,906 km² and allowed detailed spatial and temporal analyses. During the study period of 1 year, ship traffic was dominated by fishing vessels and cargo ships, but also wind farm-related ships were frequently recorded. Our study reveals the effects of ship abundance and ship speed of different ship types in a high-density harbour porpoise area. This knowledge can be used to develop effective mitigation measures that could reduce the disturbance of harbour porpoises by ship traffic.

Poster 101:

Reviewed ethograms for cetacean species in the Mediterranean Sea: an updated approach to ethological analysis

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Understanding animal behaviour in the natural environments is critical to describe population dynamics, social structures, and interactions with conspecifics. The ethograms, defined as the standardised description, quantification, and classification of species-specific behaviours, allow the systematic study of activities and the comparison of the results over different locations and periods. However, behavioural studies are particularly complex for highly social species like marine mammals, elusive species with complex social structures. Behavioural nomenclature thus suffers from a general lack of standardisation, and only a few species-specific complete and systematic ethograms currently exist. This work aims to review the studies of behavioural activities of cetaceans observable in nature to compile a series of up-to-date, codified, and standardised ethograms. The study focuses on the Mediterranean Sea, where 5 of 8 resident species are threatened with extinction because of human activities. Behavioural patterns were classified into categories (travelling, resting, feeding, socialising and milling), and split into states and events according to duration or countability. Consistent terminology was set and predefined modifiers were considered for the baseline behaviours. The resulting ethograms, applicable to focal-group and focal-animal sampling methods, will help address the challenges posed by the complexity of cetacean studies. The improved accuracy of behavioural research will benefit the investigation of cetacean populations' health and overall fitness, facilitating the identification of anomalies and disruptions of natural behavioural patterns. Therefore, the compiled ethograms should be considered a crucial tool for cetacean conservation and disseminated and incorporated into methodological guidelines.

Poster 102:

'Solitary' mother-calf bottlenose dolphin pair in long-term residence around the Isle of Man following potential record distance movement from home population

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Following a sighting in September 2019 of a small bottlenose dolphin (*Tursiops truncatus*) pod close to shore with a tiny possibly new-born calf, this pod was seen repeatedly in a shallow bay on the west coast of the Isle of Man (IOM). By the end of January 2020 the other dolphins disappeared and the mother and calf were alone and continued to be seen regularly. After sharing with the marine mammal community, the mother was recognised by University of Aberdeen researchers. Known as Moonlight from the Moray Firth population first seen as a sub-adult in 1996 and known to have had three male calves in 2003, 2010, and 2014. Public engagement with the IOM community resulted in naming the 2019 female calf Starlight. This information confirms the longest cetacean match to IOM waters, and the first known from the Moray Firth. Due to a lack of sightings between Scotland and Isle of Man the exact route is unknown but would be approximately 885km via Northern Ireland or 1780km via Ireland, potentially be the longest record of coastal bottlenose dolphin movement. For three years since the possible birth on 16th September 2019 to 15th September 2022 there have been 455 sightings of bottlenose dolphins in IOM waters, 308 of which are considered to be of Moonlight and Starlight. There is currently no evidence that the pair have left IOM waters since September 2019 or that they have interacted with any other dolphins since January 2020. We can find no evidence in the literature of such a long-term 'solitary' mother-calf pair. 94.8% of these sightings were within 500m of the IOM coastline. With a maximum of 28 and a mean of 3.6 days between sightings the pair display a year-round residency rather than the winter seasonality usually observed for IOM bottlenose dolphins.

Poster 103:

Preliminary findings on the use of caves by Mediterranean monk seals, Ionian Sea, Greece

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Mediterranean monk seals use marine caves with beaches/rocky platforms inside to rest and give birth. Here, we present the preliminary data recorded in three out of fifteen caves monitored with infrared camera traps in the central Ionian Sea, Greece, within the framework of a photo-identification project launched in May 2018. The three caves under consideration are those most used by seals in the central Ionian Sea, identified as important caves already during previous studies (1985-2002). They are located in the northern and the southern parts of Kefalonia island. Although data were systematically collected throughout the year, gaps in data recording still occurred due to extremely bad weather conditions, technical malfunctions of the cameras and logistic reasons. We calculated the days with seal presence as a percentage of all days with active coverage since the first instalment of the monitoring equipment in each of the three caves, i.e. excluding the days of failed recording. The percentage of days with seal presence in the caves were 78,7%, 32% and 30,6% in 552, 1081 and 1023 days of active coverage respectively. The maximum number of seals recorded on a single shot was 10, 8 and 5 animals respectively. Evidently, the cave first in range is much more used than the other two caves. The detection of seal presence largely depends on the beach coverage of the camera's lens: beach size/shape play a significant role here. Thus, the above numbers represent minimum numbers either considering the days of seal presence or the number of individuals present. Seals did haul out in all three caves and in all seasons throughout the time of monitoring but the number of animals and the individuals present varied substantially. Further systematic monitoring is essential for revealing the species´ habitat preferences and their changes in time as also seal movements.

Poster 104:

Influence of marine traffic on the resident common bottlenose dolphins (*Tursiops truncatus*) behaviour in Ria de Arousa, Galicia, Spain

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In recent decades, the marine environment has been exposed to multiple stressors caused by anthropogenic activity. The Ría de Arousa is an area with a high anthropogenic pressure on the marine environment due to fisheries, shipping, tourism and intensive shellfish aquaculture. Living in such an altered environment, the resident population of common bottlenose dolphin (*Tursiops truncatus*) is exposed to a high level of anthropogenic disturbance from marine traffic. As a result, dolphin behaviour is possibly being altered, leading to possible reduced fitness. The effect of marine traffic on cetacean behaviour is widely studied around the world, however not in the Ría de Arousa. The aim of this study is to examine potential changes in behaviour bout and behaviour transitions of bottlenose dolphins caused by the presence of boats in the Ría de Arousa by using Markov chain modelling. Behavioural data was collected from land-based observation platforms year-round from 2019 to 2021. A total of 220 daily observations were carried out and 2340 5-minute behavioural samples were collected with information on dolphin group behaviour and boat presence/absence. The results of this study show that marine traffic affects the behaviour of bottlenose dolphins living in this heavily impacted area. This study highlights the complexity of responses to anthropogenic disturbance in marine animals and permits to access the severity of anthropogenic impact on bottlenose dolphins in busy marine estuarine environment.

Poster 105:

The Great Escape: Long-distance movements of two bottlenose dolphins between the Gulf of Ambracia (eastern Ionian Sea) and Gulf of Trieste (northern Adriatic Sea)

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While bottlenose dolphins (*Tursiops truncatus*) in the Mediterranean Sea often display a high degree of site fidelity, movements across substantial distances can occur and these can be inferred through re-sightings of identified individuals. The semi-enclosed Gulf of Ambracia (Greece) hosts one of the highest bottlenose dolphin densities in the Mediterranean. The local bottlenose dolphin subpopulation shows high levels of year-round site fidelity, constitutes a distinct subpopulation based on genetic and photo-identification data, and is listed as Critically Endangered by the IUCN Red List. Previously, three male dolphins regularly observed in the Gulf of Ambracia were subsequently photo-identified in various parts of the neighbouring Ionian Sea, as far south as the Gulf of Corinth 265 km away, not to be seen in Ambracian waters again. Here, we report long-distance movements by two individuals, encompassing roughly 1,000 km across the Ionian and Adriatic Seas, one of the longest reported movements for this species in the Mediterranean Sea. Two dolphins, a male and a female, first seen in 2003 and 2005, respectively, and repetitively observed in the Gulf of Ambracia until 2008, left the increasingly degraded Ambracian waters and were subsequently photo-identified and regularly observed in the Gulf of Trieste (northern Adriatic Sea) during 2013-2014. Such records indicate some degree of emigration from the Gulf of Ambracia, but no immigration into the Gulf has been recorded to date. The new records presented here also add to the growing body of evidence suggesting that Mediterranean bottlenose dolphins may be more mobile than was previously thought.

Poster 106:

Long-term social structure dynamics of short-finned pilot whales on Madeira Island

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Social networks are normally used to represent the relationship among individuals, which is a static representation of dynamic associations, influenced by spatio-temporal, demographic, environmental and kinship drivers. We studied the social structure of core resident short-finned pilot whales off Madeira, an archipelago in the Northeast Atlantic, delineating their spatial overlapping, temporal evolution, demographic process and site fidelity, between two sub-periods (1997-2013 and 2014-2019). Decades of individual photo-identification work showed that these animals are structured in distinct social clusters. All clusters exhibit highly overlapping spatial ranges, suggesting that their social structure is determined by possible social preferences rather than spatial factors. In general, the likelihood of association between core residents individuals within a cluster decreased over time (halved between 18 and 54 years), which was mostly associated to demographic events. Those clusters were formed by preferred companions, with most individuals showing long-term cluster membership stability. However, clusters can also change dynamically, in fact one of the cluster split in two during the study period. This separation may be due to the increased number of individuals in the original cluster, related with the challenges in maintaining connections between individuals in large groups.

Poster 107:

Male sperm whales' (*Physeter macrocephalus*) foraging activity in the Western Ligurian Sea (North-western Mediterranean Sea)

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During foraging dives, sperm whales produce series of regular clicks interspersed with sequences of rapid–click buzzes called 'creaks', often followed by a few seconds of silence ("creak-pause" event), thought to be indicative of feeding attempts/success. Here, a total of 406 creaks in 163 recordings, collected between 2017 and 2021, were examined to assess the summer foraging activity in the North-western portion of the Pelagos Sanctuary (North-western Mediterranean Sea). Creaks and creak-pause duration, Inter-Click-Interval (ICI) and maximum frequency of the clicks were measured using Raven-Pro software. In addition, the depth at which the creak emission starts was estimated considering a descending swimming speed of 1.2 m/s. A creak rate (creaks/min, CR) was also calculated. These parameters were then associated with the presence of other individuals/species in the area (visually and acoustically assessed) and environmental parameters such as depth and slope, using QGIS software. Creak duration averaged 4.4±3.6 seconds (max=35, median=3.5), with higher values in social contexts (M-W U=5448, $p<0.05$). The mean creak-pause was 8.5±5.1 seconds and the ICI was 0.09±0.04 seconds. The maximum frequency of clicks in a creak was 32.1±7.4 kHz. Both the creak-pause (M-W U=9577, $p<0.01$) and ICI (M-W U=8758.5, $p<0.05$) were lower when other species (e.g., Risso's or striped dolphins) were detected in the area. Creak emission generally started 8 minutes after the fluke-up, at an estimated depth of about 600 m, mainly in the mesopelagic environment. The CR was 0.37±0.09 creaks/min, showing significantly higher values in areas with lower depth (M-W U=1282, $p<0.05$) and slope variability (M-W U=1457, $p<0.05$), both in the continental slope and pelagic environments. These results confirm the importance of both environments as specie's critical habitats. These elements should be considered when managing risks derived from anthropogenic activities such as noise emissions and maritime traffic.

Poster 108:

Temporal analysis of changes in marks of bottlenose dolphins' dorsal fin in the Western Ligurian Sea

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Photo-identification is widely used in the monitoring of coastal populations of common bottlenose dolphins (*Tursiops truncatus*). While this technique allows to recognise individuals by their dorsal fin, their sex can only be confirmed by photographing their genital area or, for females, by constant association with a calf. This study aims to calculate the rate of change of marks on dorsal fins, i.e. number of times changed/ total days passed, and to identify any significant difference in its entity between sexed individuals of a population of bottlenose dolphins in the Western Ligurian Sea. From April 2018 to December 2020, 191 boat-based surveys were conducted in the study area year-round, resulting in 113 sightings and 123 identified, marked individuals. Only high-quality photographs of dolphins sighted more than 2 times were analysed. Of the 57 dolphins analysed, 23 (40.35%) presented changes on their dorsal fins: 8 females (32 % of all females), 5 males (100% of all males), and 10 individuals of unknown sex (37.04 % of all unknown). The average number of days passed between consecutive changes was 172.18 (SD = 190.20) and 81.23 (SD = 95.40), for females and males respectively. Both the minimum and the maximum number of days passed between consecutive changes, respectively 5 and 651, were attributed to female individuals. The rate of change was found to be significantly higher in males (0.003, SD = 0.0027) compared to females (0.0005, SD = 0.0008) (Kruskal-Wallis $p < 0.001$). This difference in rate, which could be related to a higher number of interactions between males, compared to females, can be functional to the development of predictive models on the sex of individuals sighted multiple times. This information, together with a year-round monitoring project, can be helpful in the study of population dynamics and social structures of this bottlenose dolphins population.

Poster 109:

Interspecific interactions between short-beaked common, Atlantic spotted and striped dolphins in the Pico Island, Azores

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The interspecific tendency of association is well-known for many species, including primates, birds and cetaceans. While the exact factors that promote them are still largely uncertain, it is highly probable that one or both species benefit from their association. Three cetacean species share the same habitat in the Azores and have the same feeding habitats, short- beaked common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*) and Atlantic spotted dolphin (*Stenella frontalis*), being occasionally seen together. This project aims to evaluate these associations and determine the main factors influencing these interactions and their benefits. This study collected data in the surrounding waters of Pico Island, Azores, during seven consecutive years (2012-2018), using opportunistic platforms such as whale watching boats, that despite some limitations, have already been proven to be a way of cost-efficient data collection and a source of reliable data for research. A total of 1452 trips that resulted in 1289 sightings of Dd, 317 sightings of Sc, 488 sightings of Sf and a total of 82 interspecific interactions sightings (including at least two of these three target species) were analyzed, studying the behavior, bathymetry, distance to coast and presence of calves for each sighting. Statistical tests were performed to proceed to multiple comparisons between the drivers and the observations with and without interactions, revealing that in the majority of the statistical analysis only the striped dolphin had associations with the interactions, with the common dolphin showing less frequent associations and the spotted dolphin not showing any. The results showed that only the striped dolphin had an association with interaction and the main driver was concluded to be the increase in foraging success, while the common dolphin showed to be driven by social reasons, such as the increase of group size and the Atlantic spotted dolphin did not show any tendency to associate.

Poster 110:

Behavior and natural circadian rhythms of wild bottlenose dolphin (*Tursiops truncatus*) in Galicia (NW Spain)

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Biological rhythms are a natural periodic regularity associated with both external abiotic factors and endogenous control mechanisms that impact the life of organisms. This association enables animals to improve physical and behavioral performance in response to environmental alternations and brings important adaptive gains. Understanding the behavioral variation with respect to circadian cycles of wild bottlenose dolphins (*Tursiops truncatus*) is essential for the protection, management, and conservation of this potentially vulnerable species. The aim of the present study was to understand and determine the behavioral variation of wild bottlenose dolphins during different moments of a day along the Galician coast (NW Spain). Behavioral observations were carried out from February to October 2021 during daylight hours in the Ría de Arousa and surrounding waters onboard BDRI research vessels. Two variables were used in the analysis and a table of contingency was created with: the moment of the day (morning, afternoon, evening, and night) and the behavior of the group of dolphins (feeding, resting, socializing, and traveling). Results show that bottlenose dolphins were mainly observed travelling in the afternoon and resting during the evening. This study provides additional information on behavioral circadian rhythms in bottlenose dolphins, and integrating behavioral studies into conservation strategies is an important step for the protection of wildlife.

Poster 111:

Passive Acoustic Monitoring to discover the hidden nightlife of wild bottlenose dolphins (*Tursiops truncatus*) in Northeast Atlantic waters (NW Spain)

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While dolphins have been widely studied in many parts of the world, their nocturnal activity remains vaguely known due to the technical constraints of nighttime monitoring. New techniques to estimate dolphin detection probability have been developed using the predominance of acoustic communication in these species. This is the principle of Passive Acoustic Monitoring (PAM) that we used to estimate the probability of detection of bottlenose dolphins (*Tursiops truncates*) in the Ría de Arousa, Galicia (NW Spain). Our objectives were to understand how the probability of acoustic detection of dolphins varies with respect to several temporal and environmental variables. This will determine whether habitat occupancy varies over time according to the influence of these parameters, especially at night when visual information cannot be collected. We have collected 3001 hours of data from April to November 2021 using a cetacean click recorder (FPOD, Chelonia Ltd, U.K). Three temporal variables (diel phase, moment of the day and month of the year) and two environmental variables (tidal phase and tidal coefficient) were used for the analysis. The effects of these variables were examined with Generalized Linear Models (GLMs). The best model showed that the probability of detection decreased by 0.66 percent during night-time and increased at the end of the summer with a doubled probability in September compared to April. This study demonstrates the relevance of acoustic monitoring to understand how the detection probability of bottlenose dolphins varies as a function of daylight/circadian rhythms/days and seasons. Especially, our results provide continuous data, allowing us to obtain valuable and reusable information on their nocturnal activity. This variation of the activity would allow us to associate it with other type of monitoring such as visual observations or satellite telemetry, in order to confirm presence trends but also to associate them with behaviors.

Poster 112:

Diving behaviour of fin whales and blue whales and influence of marine traffic

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Marine mammals spend most of their life underwater, but have to come to the surface to breath, which makes the study of their diving behaviour really important to know these animals better. Many cetacean species are threatened by human activities, and one of the most important anthropogenic threats for whales is noise pollution, which can impair their communication and modify their behaviour. As most of noise pollution in oceans is caused by increasing marine traffic, it is important to understand the effects of the ships on the behaviour of marine mammals. The aim of this study was to investigate potential differences into the diving behaviour of two baleen whale species (fin whales *Balaenoptera physalus* and blue whales *Balaenoptera musculus*) and to assess the impact of marine traffic on their dive duration in the North-East Atlantic Ocean. We analysed 8383 dive durations of blue and fin whales collected between September 2017 and October 2022 along the North-western coast of the Iberian Peninsula (Galicia, Spain), an important feeding ground for these two species. A generalized linear mixed model (GLMM) showed that marine traffic density was not linked to baleen whale diving behaviour in their feeding ground. Also, results highlighted a significant difference between the species dive duration, with fin whales diving longer than blue whales. These results are important to have a better understanding of the impact of marine traffic on the respiratory behaviour of baleen whales in Galician waters (Atlantic Ocean), and to improve our knowledge of the diving behaviour of the different species of baleen whales present in this region.

- **Conservation**

Poster 113:

Spatial evaluation of the Natura 2000 network for the protection of species of community interest in the Bay of Biscay

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The global loss of biodiversity due to anthropogenic threats and climate change affects ecosystem functioning and reduces the provision of ecosystem services. Thus, it is urgent to implement networks of ecologically coherent marine protected areas (MPAs). The case of highly mobile species, such as cetaceans and seabirds, is especially challenging due to their extensive habitats in pelagic waters and their migratory behavior for effective conservation. In Europe, the Birds Directive (2009/147/EC) and the Habitats Directive (92/43/EEC) constitute the basis for the designation of protected areas and the convergence between both Directives constitutes the Natura 2000 Network. Within this context, we developed spatial distribution models to assess the abundance and the probability of presence of five species of European community interest, including the bottlenose dolphin *Tursiops truncatus* and the fin whale *Balaenoptera physalus*. We identified their critical marine areas (i.e. areas of higher probability of presence or density) and we evaluated the designated network of MPAs within the Natura 2000 Network in the Bay of Biscay in relation to their conservation. Our results showed that the existing network of MPAs adequately protected species from coastal habitats. However, the existing network of MPAs was not suitable for the protection of species with pelagic distribution. Therefore, the extension of the current Natura 2000 network to pelagic offshore areas, especially in the northwestern area, would guarantee a better coverage of species with more oceanic habitats (i.e. fin whale). Since we did not consider seasonal variation in the MPA assessment, future studies should account for seasonal variability in the distribution of species of community interest to guide their conservation strategies.

Poster 114:

Ship strikes: two cases of fin whales stranded on the South Atlantic Spanish coast

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Ship strikes are considered as one of the major threats for large whales and an increasing problem on a global scale. The Strait of Gibraltar is an area of high vessel traffic, most commonly transited by ferries, fast ferries and cargo ships. Sperm and fin whales are the most vulnerable cetacean species to ship strikes in this area. A ship strike is defined as a forceful impact between any part of a watercraft, most commonly the bow or propeller, and a live cetacean, often resulting in death, major injuries or physical trauma. Diagnosis of ship strikes can be difficult and full necropsies should be carried out as external injuries are not always clearly visible. Between 2011 and 2014, 538 cetaceans, representing 16 species, were found stranded along the Andalusian coast. A complete anatomopathological study was done in 104 out of the 538 to establish the cause of the stranding and/or death. Direct human activity was responsible for approximately 22% of cetacean deaths: ship collisions were determined in 2/104 (2%). Both specimens were juvenile fin whales and were found stranded in the Gulf of Cádiz. They represented the 50% (2/4) of fin whales included in this pathological study and 22% (2/9) from the total fin whales stranded died due to ship collision. Gross findings included: fracture at the left temporomandibular joint (1) and multiple ribs fracture, haematomas and haemorrhages (2). Microscopic findings mainly consisted in oedema and flocculent segmentary degeneration, contraction band necrosis and discoid degeneration of myofibres. The skeletal muscle histopathology method was essential to establish the diagnosis of ship strike as the cause of death in both animals. We highly recommend systematic skeletal muscle sampling as part of the necropsy protocols, especially when a ship strike case is suspected.

Poster 116:

Cetacean excluder devices, a promising mitigation measure for dolphin´s bycatch in pair trawl fisheries

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Several fisheries have been flagged for evidence of high dolphin bycatch rates. Some of the pelagic trawl fisheries operating off western Europe captured short-beaked common dolphins in unsustainable rates. Reducing the incidental bycatch of common dolphins at northwestern Iberian waters is an objective for European Commission to not exceed the maximum removals rate for a sustainable population. To address this issue, France, Portugal and Spain aim to estimate and reduce cetacean bycatch in the ABI within the framework of CetAMBICion project. A case study for the development and application of cetacean exclude devices (CED) focusing on pair trawling in Spanish waters has been carried out during 2022. Several pilot surveys were carried out on board the pair of trawlers operating in northern Spanish waters over winter and spring. Experimental trials on a research vessel were carried in autumn to test the performance of the cetacean excluder device (DESCARSEL research survey). Pilot trials test a cetacean excluder device designed in close collaboration with the fishers and in a cooperative scheme with the main fisheries association in NW Spain. The CED consisted of a net with a grid that allow enter the fishes to the codend while acts as a barrier for dolphins, avoiding their entrance to the codend and directing them to an exit window in the top of the fishing gear, being effective in releasing cetaceans and other big species. It has also been shown to be effective in avoiding the capture of large fish species (rays and sharks). During the tests, evidence of interactions between cetaceans and fishing boats was recorded. The effectiveness of device was evaluated considering both the success rate of dolphin releases and the absence of loss in fish catches. Therefore, each device must be specifically designed for each fishery.

Poster 117:

Depredation impacting the Reunion Island pelagic longline fishery: an interview-based approach to survey fishers' perception

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Depredation is defined as the damage or removal of fish/bait from fishing gear by predators. Using the case of odontocete depredation in the Reunion Island pelagic longline fishery, the aim of this study was to assess how fishers perceive this issue, and to gather information on their itineraries, fishing strategies and measures they implement to mitigate depredation. We conducted 31 face-to-face semi-directed interviews with local fishers in 2017 and 2021 to assess social, economic and spatial perceptions of odontocete depredation. We addressed socio-demography, fishing strategies, observations of odontocetes, depredation patterns and mitigation, and legislation and conservation awareness. Depredation occurs everywhere, especially along the east coast of Madagascar, around Seychelles, Mayotte and the Glorieuses Bank. Depredation levels were reported as higher during the austral summer. According to fishers, various cues can attract odontocetes, such as some specific boat noises, and the concentration of fishing effort in prey-rich areas overlapping with natural feeding grounds of odontocetes. Depredation is considered as a minor issue for small longliners but a major one for larger ones. Finally, fishers showed difficulties to estimate the average depredation rates and income loss they are faced with because the issue occurs too randomly. To prevent depredation, fishers would modify their fishing strategies and reduce the boat noise near the fishing gear. However, when facing depredation, no operational solution was identified as efficient. Most of the interviewed fishers were willing to test any innovative mitigating device if an effective one is made available (e.g. PARADEP (https://paradep.com), a physical depredation mitigation device we are currently trialling). This study allowed us to collect valuable information based upon fishers' knowledge. The local ecological knowledge (LEK) is still underestimated, whereas it provides new insights for the study of depredation. Besides, interviews gave us access to data that are only available within a restricted network.

Poster 118:

Integrated climate, ecological and socioeconomic scenarios for the whale watching sector

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Unprecedented human induced changes to the climate system have already contributed to a variety of observed im- pacts to both ecosystems and populations. Decision-makers demand impact assessments at the regional-to-local scale to be able to plan and define effective climate action measures. Integrated socio-ecological assessments that properly consider system uncertainties require the use of prospective scenarios that project potential climate impacts, while accounting for sectoral exposure and adaptive capacity. Here we provide an integrated assessment of climate change to the whale watching sector by: 1) extending the European Shared Socio-economic Pathways (Eur-SSPs) and developing four whale watching SSP narratives (WW-SSPs) and 2) characterize each key element comprised in the WW-SSPs for the time period 2025–2055. We applied this approach in a case study for the Macaronesia region where we developed scenarios which integrate the socio-economic (WW-SSPs), climate (RCPs) and ecological (species' thermal suitability responses) dimensions of whale watching. These scenarios were used by local stakeholders to identify the level of preparedness of the whale watching sector. When confronted with scenarios that combine this ecological dimension with projected climate changes and the four different socioeconomic narratives, stakeholders assessed the whale watching sector in Macaronesia as being somewhat prepared for a Sustainable World and a Fossil Fuel Development World, but somewhat unprepared for a Rivalry World. No consensus was reached regarding the sector's preparedness level under an Inequality World scenario. Our study demonstrates the importance of considering multiple dimensions when assessing the potential challenges posed by climate change and provides a needed resource to help the whale watching sector in Macaronesia, and elsewhere, in its effort to devise efficient climate action policies and strategies.

Poster 119:

Review and update of Management Units for cetaceans in UK waters

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Management Units for the seven most common cetacean species found in UK waters were defined in 2015 to offer an indication of the spatial scales at which the impacts of plans and projects should be assessed alone, cumulatively and in-combination in terms of Habitats Regulation Assessments, Environment Impact Assessments and European Protected Species. Units have been defined for harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), short-beaked common dolphin (*Delphinus delphis*), white-beaked dolphin (*Lagenorhynchus albirostris*), Atlantic white-sided dolphin (Lagenorhynchus acutus), Risso's dolphin (*Grampus griseus*), and minke whale (*Balaenoptera acutorostrata*). The units have been developed in collaboration with the UK's Statutory Nature Conservation Bodies (SNCBs) and are endorsed as the relevant spatial scales for conservation and management advice within UK waters. The boundaries of the units as far as possible, were based on the presence of known populations, with divisions informed by ecological evidence and/or divisions already used for the management of human activities. Where suitable, boundaries were aligned with appropriate assessment units agreed through International Council for the Exploration of the Sea (ICES) Working Group on Marine Mammal Ecology (WGMME) and/or Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) conservation plans. The evidence base underpinning the units, boundaries, and estimated abundances were to be formally reviewed on a cyclical basis. In 2022, the UK SNCBs successfully completed a review of evidence and updated boundaries to reflect current evidence of population structure where required. The boundaries of the Coastal West Channel MU for coastal bottlenose dolphin have been widened following new photo-identification data that demonstrates the expansion of the semi-resident inshore population's core-range. Emerging evidence of shifts in the core-range of coastal bottlenose dolphin in Scotland, alongside population sub-structuring of Risso's dolphin and white-beaked dolphin may support their consideration in future iterations of the Management Units.

Poster 120:

Preliminary research results on the incidence of plastic marine litter in the Central Mediterranean Sea

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One of the major problematic issues affecting the marine environment is floating litter. This is primarily composed of a wide array of plastics-derived wastes from different sources. Entanglement and ingestion are two of the main impacts caused by floating litter on the marine biome, and marine mammals are among the species most affected. By applying both dedicated scientific surveys and the opportunistic Fixed Line Transect method during the Interreg V-A Italia-Malta SEA MARVEL project, data on the presence and abundance of plastic marine litter has been collected. This research in the central Mediterranean region, including the Maltese waters and Sicilian waters in the Gulf of Catania, and ferry routes between Catania and Malta, Porto Empedocle and Lampedusa, and Trapani and Pantelleria provide an extensive sampled area for understanding the extent and changing distribution of plastic pollution. Methods adopted included both onboard dedicated research vessels and observation on ferry platforms of opportunity, respectively. The latter SEA MARVEL research effort contributed to expanding the framework of an international network using ferries in collaboration with the Italian Institute for Environmental Protection and Research. The dedicated research vessel investigations also collecting data on marine litter were carried out around the Maltese Islands and in the area of the Gulf of Catania in the period 2021-2022. Marine litter was categorised by size and origin and then related to environmental variables and the presence of cetaceans and sea turtles. Preliminary data shows that marine litter is constant along all routes. However, depending on currents and weather conditions, there seems to be some difference between seasons. In addition, on longer straits such as those between the Pelagie islands and Sicily, larger floating rubbish have been sighted repeatedly.

Poster 121:

Fishers as sentinels of the sea in data collection for cetacean conservation

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The Interreg Italia-Malta SEA MARVEL project is providing an opportunity for fishers in the central Mediterranean to operate as sentinels of the sea. When studying the marine environment, it is essential to have as much information and data as possible through the involvement of stakeholders and sea users. In the case of marine mammal monitoring, the vastness of the areas to be monitored may gain from additional sighting reports from fishermen regularly out at sea. The SEA MARVEL (Save, Enhance, Admire Marine Versatile Life) project has set up such a collaboration between researchers and fishers. Apart from collected data in fishing zones in this region, the Nature 2000 sites and their surrounding waters were also included in this citizen science with fishers. The Natura 2000 sites include: AMP Capo Milazzo (Sicily), AMP Isole Ciclopi (Sicily), AMP Isole Pelagie (Sicily), RNO Oasi del Simeto (Sicily), Marine Zone around Gozo (Malta) and Marine Zone close to Ghar Lapsi and Filfa (Malta). With a total of 40 fishers distributed in these areas, sighting data on cetaceans were and continue to be collected. This information complements data from SEA MARVEL dedicated scientific research surveys. Furthermore, thanks to the Sentinel network that has been created, data on marine litter pollution, various vulnerable species but also alien species have been gathered. The importance of involving the fishery sector is not only crucial for data collection but also has a positive effect in terms of raising awareness and educating this category of stakeholders. In fact, the fishers involved are active year-round, increasingly collaborative toward the protection of the marine environment and vulnerable species as cetaceans, apart from collecting any plastic out at sea.

Poster122:

Assessing Natura 2000 sites in the Central Mediterranean for Cetacean Conservation

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Natura 2000 sites are meant to contribute to the safeguard and survival of various marine species including cetaceans. The Interreg Italy-Malta SEA MARVEL project has focused its attention on the presence of dolphins and whales in different conservation areas in the central Mediterranean region including AMP Capo Milazzo (Sicily), AMP Isole Ciclopi (Sicily), AMP Isole Pelagie (Sicily), RNO Oasi del Simeto (Sicily), Marine Zone around Gozo (Malta) and Marine Zone close to Ghar Lapsi and Filfa (Malta). These marine Natura 2000 sites have been studied by dedicated scientific researchers using marine and aerial surveys around the Maltese Islands and using dedicated or opportunity platforms in Sicilian waters and route used by Ferries. The latter include the SEA MARVEL project selected routes between: 1) Catania and Malta, and 2) Porto Empedocle and Lampedusa. Different cetacean species have been sighted including: Fin whales, Risso's dolphins, Striped dolphins, Common dolphins and Bottlenose dolphins. The different species and respective activities observed at different times of the year allow for an updated understanding of the seasonal distributions and conservation requirements for these species in association with the Natura 2000 sites and connecting areas. Integrating with various environmental parameters including bathymetry, distance from shore, diverse additional species recorded, sea surface temperatures and anthropogenic activities aid to provide detailed research results. The latter provide a comprehensive status assessment for useful recommendations to Natura 2000 site managers and environmental protection authorities.

Poster 123:

Marker Project: Evaluation of the impact of whale-watching and the High Quality Whale-Watching® certification in the Mediterranean Sea.

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The whale-watching activities can disturb cetaceans with potential consequences at short-, middle- and long-term on the populations. Regular monitoring of human activities and assessment of their effects on cetacean populations is currently required by the Marine Strategy Framework Directive (MSFD). For that reason, this pilot study aims to provide for the MSFD concrete and standardized assessment tools to monitor the evolution of pressure on cetacean populations from whale-watching activity in the French Mediterranean Sea and evaluate the effectiveness of the High Quality Whale-Watching® (HQWW) certification as a management tool. From 2021-2022, ecological and socioeconomic indicators (including each of which several metrics) were developed and tested. For the evolution of pressure on cetacean populations, we defined 3 ecological indicators – Pressure, Risk, Impact. For the evaluation of the effectiveness of the HQWW certification, we defined 2 ecological indicators - Activity of HQWW operators within the whale-watching activity, Compliance with the commitments of the HQWW certification and 2 socioeconomic indicators - Company demographics, Tourists attendance. For the quality of the visit experience, we identified the main criteria affecting the visitor satisfaction, by distinguishing the sustainability-oriented and consumption-oriented tourists based on certified and non-certified operators clients answers. Over the 2 years, we conducted 65 surveys among certified and not certified operators, 24 visits aboard certified whale-watching trips, 201 clients surveys following a certified whale-watching trip and, 13 clients surveys following a not certified whale-watching trip. With the exception of an insufficient number of responses from clients of the non-certified outlets, the data collected during the test phase allowed the methodology to be validated and the metrics for the identified indicators to be filled in. These results can be used as a reference state in the implementation of the sampling strategy to inform the indicators in the framework of the MSFD measurement and monitoring programs.

Poster 124:

Crime scenes at sea: Deliberate killing of marine mammals in Türkiye (2014-2022)

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Türkiye had a long history of dolphin hunting in the Black Sea until 1983, but currently all marine mammals are protected by national law. Stranded marine mammals with the evidence of deliberate killing, however, are still observed occasionally. Four such cases were reported between 2014 and 2022 on the Turkish coasts. A common dolphin *Delphinus delphis* stranded in Gökçeada Island, northern Aegean Sea, on December 26, 2014 had seven shot holes and birdshots, implying close-range shots. A juvenile female bottlenose dolphin Tursiops truncatus stranded in the Istanbul Strait, on May 26, 2015, was determined to be shot by at least a single fire sidewise. Six bullet holes with smooth edges were identified on the body and one birdshot was found. Another bottlenose dolphin (male) stranded in the Istanbul Strait on June 4, 2017, was evidently shot by a shotgun, as there were more than 100 birdshots found in the head. It seems that he had been shot in the head earlier as shown by many pellets buried in the blubber. The wound healed and he had survived until the second shot, when the hit on the left lower jaw was fatal. A 'wad', a plastic capsule which holds lead birdshots inside when fired, was also found in the wound, suggesting a hit from a very close range. A young monk seal injured by gunshot stranded alive in Gökova Bay, Aegean Sea, but later died on March 18, 2022. Although there was no witness and no direct evidence, investigations should be made to find suspects and deterrence must be increased by posing fines or restricting the license for firearms. Besides, education and awareness raising activities are necessary to fully protect these animals in Turkish waters.

Poster 125:

25 years of research and marine protected area for cetaceans and marine turtles in the Strait of Gibraltar.

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The Strait of Gibraltar is a high productive area that connects the Atlantic Ocean with the Mediterranean Sea. Its oceanographic characteristics make it a unique region that is home to a numerous cetacean species. However, there is also a great number of anthropogenic threats. Therefore, it is significant to be aware of the spatial distribution and ecological requirements of cetacean in order to elaborate conservation measures. In 2022, the Spanish ministry of environment decided to build a marine protected area. Concerning this issue, the present study aims to update data on spatial distribution and abundance (first evaluation using boat-based line transects in the area) of the species present in the Strait of Gibraltar in relation to ecogeographic variables (depth, slope, seabed roughness, sea surface temperature, chlorophyll-a concentration and salinity) and anthropogenic activities. A total of 3980,4 km has been covered during the summer of 2022. This has led to 83 sightings of 7 species of cetaceans. Species, of which spatial distribution was studied, show differences in habitat preference and geographic location. Bottlenose dolphins (*Tursiops truncatus*), long-finned pilot whales (*Globicephala melas*) and sperm whales (*Physeter macrocephalus*) are mainly found in the middle of the strait related to deeper waters. Short-beaked common dolphins (*Delphinus delphis*) and striped dolphins (*Stenella coeruleoalba*) have the largest distribution along the northern waters of the Strait of Gibraltar. Killer whales (*Orcinus orca*) are mostly found in the southwestern waters. Finally, fin whales (*Balaenoptera physalus*) use the northern half of the Strait as a migration corridor from the Mediterranean Sea to the Atlantic Ocean during the summer. These results were then compared to the ones available between 1996 and 2021 from the area. This spatial distribution estimates provide the basic knowledge for the creation of a natural park dedicated to the conservation of cetacean.

Poster 126:

Fisheries and delphinids: a conservation issue at Eastern Spain waters

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Fisheries by-catch remains a threat for many protected species worldwide, including cetaceans. Here we assess the interaction between all active fisheries and delphinid species inhabiting waters of the Valencia region (Eastern Spain). We use historical stranding records (1990-2020) of cetaceans showing fisheries interactions and data from two interview campaigns held in 21 ports of the region. A total of 550 interviews to fishers were conducted during autumn months of 2020 and 2022, to gather information about dolphin by-catch and gear damage produced by dolphins in bottom trawling, artisanal, purse-seine and pelagic longline vessels. During the 2020 campaign bottom trawling vessels reported by-catch of 9 common bottlenose dolphins and 4 striped dolphins. Two years later, bottom trawling vessels reported by-catch of 8 common bottlenose dolphin and 5 striped dolphins. Furthermore, in 2020 campaign, artisanal vessels only reported one unidentified dolphin by-catch event; while in 2022 this fishery reported 4 common bottlenose dolphins bycatch events, probably when they were trying to feed on fish from nets, during the year prior to the interview. Ongoing analyses will compare CPUE of delphinid species between years and with similar studies in the Mediterranean. In the Valencia region, the common bottlenose dolphin continues feeding on catch of trammel nets and gillnets, with fishers reporting an increase of such events in recent years. This interaction results in significant net damage and causes animosity against this species by fishers. Historical regional stranding data revealed that common bottlenose dolphin was the species presenting the highest percentage of individuals showing fisheries interactions (26.72%), being striped dolphin another species interacting (6.46%). Since fisheries-dolphins' interaction is a matter of concern in the region, measures need to be implemented to assure cetacean conservation and fisheries sustainability.

Poster 127:

Enlightening the Path of Knowledge to the Sperm Whales of the East: Initial results on the individual identification, social structure and potential threats in the Eastern Mediterranean Sea of Turkey

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The Mediterranean subpopulation of sperm whales (*Physeter macrocephalus*) are experiencing a negative population trend. Less than 3000 individuals are estimated to be present across the entire basin, hence classified as endangered. In the Eastern Mediterranean Sea, the total population size has been estimated to be less than 300 individuals. Although the Hellenic Trench is known as a sperm whale hotspot, the void in the research effort remains the greatest barrier preventing us from fully understanding the species and the threats in the Eastern Mediterranean. The current project runs the only seasonal research effort, utilizing both visual and acoustic survey techniques within the Eastern Mediterranean Sea of Turkey. Overall, 176 survey days were completed between April 2018 and September 2022. 63 groups of sperm whales were detected across 27 survey days. Sperm whales were acoustically and visually detected in each season, except winter. The spatial distribution of the species detections extends from the Finike Canyon to Adana Canyon. The group size of the sperm whales ranged from solitary individuals to groups of fives. Photo ID analysis allowed 29 individuals to be identified. Solitary individuals (seven encounters), mother-calf pairs (four encounters), social units (three encounters) and subadult groups (three encounters) were recorded. Additionally, a group of bottlenose dolphins (*Tursiops truncatus*) were documented in close interaction with a solitary sperm whale. Spatial mapping revealed a considerable overlap between shipping lanes and underwater impulsive noise sources. Over 50% of photographed individuals feature a nearby ship, with three individuals exhibiting distinct propeller marks. The results presented here, although contributing significantly to the present knowledge, still represent only a limited initial understanding of sperm whales in the Eastern Mediterranean Sea. The near-continuous presence of sperm whales throughout the year, with varying social units, indicates the importance of the territorial waters of Turkey for this endangered species.

Poster 128:

30 years of the Shannon Dolphin Project: A celebration of one of Europe's longest bottlenose dolphin population study

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In May 1993, the IWDG carried out the first survey of bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary, on the west coast of Ireland. This was the start of the Shannon Dolphin Project (SDP) which is now one of the longest running dolphin studies in Europe. The Shannon Dolphin population is the only resident dolphin population in Ireland and is genetically discrete from other populations in Irish waters with low levels of emigration and immigration from the estuary, and high multigenerational site fidelity. The population is thought to be stable over the last 25 years with an abundance estimate in 2022 of 98-133 (95% CI) individuals. The significance of the area was recognised in 2000 with the designation of the Lower River Shannon SAC, although recently the IWDG have recommended a boundary extension of the SAC to the southwest. Photo-identification survey effort increasing throughout the project, culminating in over 175,000 images collected in 2022. These data have been used to determine crucial population parameters including abundance, home range, calving and survival rates, population structure and ranging behaviour. Static acoustic monitoring has been conducted since 2009 to assess year-round distribution, foraging behaviour and effects of anthropogenic noise. The SDP has facilitated many early career researchers to help develop field and data-handling skills. To date, 18 postgraduate students and 46 interns have assisted with the project. The development of the SDP has coincided with accelerating economic and industrial growth in the Shannon Estuary, including a proposed regional hub for offshore renewable energy and an LNG terminal, which increases exposure to cumulative anthropogenic threats including acoustic disturbance, contaminants, and habitat degradation within the SAC. The continuation of the SDP is essential to inform effective localised management plans so that the population can thrive alongside the sustainable use of marine resources.

Poster 129:

Le Vele del Panda Project: an example of how Citizen Science can become a key to conservation for the protection of cetaceans in the Mediterranean Sea

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To protect the eight resident cetacean species of the Mediterranean Sea, a thorough understanding of the health and distribution of their populations is necessary. To date, however, comprehensive and up-to-date information is lacking for different areas of the basin. To address this knowledge gap and support cetacean conservation, WWF Italy, in collaboration with WWF Travel, launched the 'Le Vele del Panda' project in 2020. This effort is based on three main objectives: 1) Citizen Science: public involvement is aimed at raising awareness and encouraging citizens' participation in the data collection activities led by WWF researchers and whale-watching guides. 2) Research: the data on the diversity, abundance, distribution, and behaviour of cetacean species is organised into a platform available to the scientific community. 3) 2030 Agenda: the project concretises WWF Italy's commitment to the Sustainable Development Goals number 4, 14 and 17. Since the beginning of the project, 51 research cruises were conducted, mainly in the Ligurian Sea, the Tuscan, Pontino and Flegreo Archipelagos. The cruises involved more than 450 participants who acted as citizen scientists. A total of 366 sightings have been recorded: 203 of *Stenella coeruleoalba*, 98 of *Tursiops truncatus*, 34 of *Balaenoptera physalus*, 20 of *Ziphius cavirostris*, 7 of *Physeter macrocephalus*, 2 of *Globicephala melas*, 1 of *Delphinus delphis*, 1 of *Grampus griseus*. 'Le Vele del Panda' is an example of how Citizen Science can play a crucial role in cetacean conservation by raising awareness and implementing knowledge about endangered and data deficient species exploring different areas. The project establishes WWF Italy as a relevant facilitator of collaborations for the development of targeted projects for cetaceans' protection.

Poster 130:

Spatiotemporal distribution of suspected bycatch in grey seals in Mecklenburg-Western Pomerania

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The recovery of the Baltic grey seal (*Halichoerus gypus grypus*) population is an achievement of effective marine conservation management. Even though more than 40.000 grey seals were counted in the whole Baltic Sea in 2021, grey seal numbers and the reproduction rate in the Southern Baltic Sea are still comparatively low. Main factor of previous decline like hunting and chemical pollution are nowadays controlled by management plans and specific bans of pollutants. Nevertheless, bycatch is probably the biggest remaining anthropogenic threat. The German Oceanographic Museum and partners established a stranding network in Mecklenburg-Western Pomerania starting in the 1970s, to retrieve all carcasses and perform necropsies including a diagnose of presumed cause of death. Out of 405 registered grey seal carcasses in total from 2015 to 2022, 354 (87 %) could be retrieved and examined. Only one animal was reported as bycatch by a fisherman. Even though, based on macroscopic findings during the necropsy, in 81 cases (23 %) the presumed cause of death was bycatch and thereby the most common. Typical indications are a good health and nutritional status simultaneously with fresh undigested fish in the stomach, remains of fishing gear, net marks or long ventral cut like lesions. The results of this study highlights that bycatch in seals is still an overlooked concern. It will give a closer look inside into the annual, seasonal and geographical distribution and provides further analysis regarding size and age class of presumed bycaught animals, as well as related fishing gear. Since human induced mortality is one major indicator for the Marine Strategy Framework Directive, this study also shows the added value of stranding networks and might help to develop local, targeted conservation and fisheries management measures to reduce anthropogenic mortality in seals.

Poster 131:

How to efficiently protect the new haul-out of grey seals (*Halichoerus grypus*) - guidelines for tourist boat traffic in Poland

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Recolonization of the southern Baltic Sea region by grey seals has been observed since the beginning of the 21st century. In Poland the number of seals observed at the sandbanks forming in the mouth of Vistula River has been increasing each year since 2010. Continuous monitoring of the haul-out allowed to notice the seasonal/yearly regularity of the presence of seals resting on the islets since 2015, and at the same time to diagnose the problem of disturbing animals as one of the most serious threats in the newly forming haul-out. The annual increase in the number of seals and their year-round presence resulted in an increase in tourist interest in this area, and consequently the appearance of the first commercial boats focused on observing seals in their environment. Each year together with the number of seals the number of tourist boats increases. The lack of regulation caused the boats move carelessly, causing frequent disturbance to the animals. Owners of vessels regularly conducting seal cruises have noticed that it is in their interest to take care of the welfare of animals together, guaranteeing the success of tourist surveys. As a result of an agreement with shipowners, it was possible to agree on the preliminary rules for moving around the seal's haul-out by boats. However, the recorded increase in tourist interest in this area and the appearance of new boats every year have forced the drawing up the guidelines for all users. The developed guidelines will allow to regulate tourist traffic to minimize the anthropogenic pressure in the mouth of Vistula River, while securing the safety of animals in the haul-out. This is aimed to lead to stability of seals in this unique available habitat.

Poster 133:

Presentation of the Spanish National Plan for the reduction of the accidental catches in the fishing activity

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The Spanish National Plan for the reduction of the accidental catches in the fishing activity, aims to undertake joint work to assess the problem of accidental captures that could be carried out by the most of 8,000 Spanish fishing vessels, to monitor them and to propose technical solutions to reduce or eliminate, whenever possible, the captures of sensitive species included in the Birds and Habitats directives and protected by national legislation. It consists of eight strategic actions that will help to understand the problem of by-catch and propose solutions in the coming years to make the activity carried out by the Spanish flag fleet much more sustainable.

Poster 134:

The establishment of a regional stranding network on the southwest coast of mainland Portugal (Alentejo): first results and challenges

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Data on cetacean stranding can provide valuable information on the occurrence and distribution of species, their population dynamics, and the threats these animals face. Throughout the years, stranding data has been collected along the coast of mainland Portugal by national entities. In the Alentejo coast (Southwest of mainland Portugal), from Troia to Odeceixe, a regional stranding network was established in April 2021. The present study aims to provide insights regarding the first results of the establishment of the regional stranding network in the detection, examination and analysis of the cause of death for the stranded animals. In this region, a total of 248 cetacean strandings were reported over a period of 13 years (2010-2022). The stranding data were collected by maritime authorities and the Portuguese Institute for Nature Conservation and Forests, from January 2010 to April 2021, and by the regional stranding network, from May 2021 until December 2022. Since the establishment of the regional stranding network, an increase in the number of examined animals has occurred. This provided more information about the cetacean stranded along the Alentejo coast, namely regarding the main causes of death, and the collection of a higher number of samples from each stranding. Also, new strategies to locate strandings have been tested, such as the use of drones, which may lead to an increase in the detection of animals in areas of difficult access. This work highlights the importance of establishing regional stranding networks, for a higher effort in the examination, collection of samples and determination of death causes, which can provide valuable information to the development of future cetacean conservation efforts in regional areas.

Poster 135:

Artisanal fisheries - cetacean interactions in the Canary Islands, an initial overview

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Interactions between cetaceans and fisheries are a worldwide problem which also occurs in the Canary Islands. These islands are characterised by a multi-specific artisanal fishing fleet that plays a major role in the food security of the archipelago, as well as being of economic and cultural value. On the other hand, Canary Islands holds 30 species of cetaceans, making it one of the most biodiverse areas of this group in Europe. All cetaceans are protected under Spanish and European law. The range areas of these species in the archipelago overlap with fishing grounds, sharing in some cases the interest in a common fishing resource. This facilitates the appearance of human-wildlife interactions. These interactions can be positive or negative in nature. Negative interactions may compromise cetacean conservation (eg. bycatch, intentional killing, changes in distribution and diet) and have a social and economic impact (eg. capture loss, fishing gear damage and associated reduction of the CPUE). The aim of this study is to obtain the first global characterization of the interactions between the artisanal fisheries and cetacean species in Canary Islands waters, in order to detect hotspots of incidence. A total of 210 interviews were conducted in 25 fishermen's guilds in all the islands to assess the typology, intensity, losses and damages, mitigation measures employed and fishermen's perception. These interviews revealed both positive (collaboration) and negative (depredation, gear loss/damage, bycatch) interactions. The most frequently involved fisheries were the tuna fishery and longline fishery. The most frequently involved species were *Pseudorca crassidens*, *Orcinus orca*, *Balaenoptera* sp. and small-medium size oceanic dolphins. The intensity and typology of interactions varied between and within islands. A better understanding of the interactions and correct management tools can improve the coexistence and sustainability of this economic activity.

Poster 136:

The Scottish Entanglement Alliance: A collaborative search for solutions

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The Scottish entanglement Alliance (SEA, www.scottishentanglement.org) is a collaboration between six organisations, established in 2018 to assess the distribution, scale and impacts of cetacean, shark and turtle entanglements in the largely unregulated Scottish inshore creel fishery. In the initial stages of this project 159 creel fishers were interviewed to gather information regarding their experiences of entanglement and views on ways to reduce this threat. Twenty fishermen also participated in a two-day disentanglement training course where a range of possible mitigation strategies including creel limits, improved regulation and marine spatial planning, and use of alternative gears were debated. The spatial distribution of fishing effort and cetacean presence were overlaid to estimate a 'risk of entanglement measure (REM)', and the welfare implications of both acute and chronic entanglements to individual animals continue to be reviewed. Data collected by SEA has informed a paper recently accepted to Endangered Species Research, which estimates the annual number of humpback and minke whale entanglements in Scottish waters, and trials led by SEA partners to assess the practicalities of introducing sinking groundlines to the fishery are currently underway. These trials were initiated after data gathered from interviewed fishers suggested that over 80% of entanglements involving minke whales and 50% of those involving humpback whales occur in floating groundlines. The SEA project has found that as fishing effort has increased in recent years, so has the incidence and range of species impacted by entanglement. Underreporting of these incidents remains a concern however the collaborative nature of the project has earned the respect of fishers, and moving forward continued engagement to improve reporting, and identify practical and effective mitigation strategies will be vital to protect our marine megafauna and the future sustainability and prosperity of the Scottish creel sector, and may be of value to other unregulated fisheries globally.

Poster 138:

The Important Marine Mammal Area network: new updates on the growing tool for assisting global conservation efforts to protect marine mammal habitats

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The Important Marine Mammal Area (IMMA) programme was launched in 2016 by the IUCN Marine Mammal Protected Areas Task Force as a response to the conservation crisis in the protection of marine mammals and wider global ocean biodiversity. IMMAs identify discrete portions of habitat, important for one or more marine mammal species, which have the potential to be delineated and managed for conservation. Scientific experts identify IMMAs during regional workshops, on the basis of satisfying one or more of eight criteria covering critical aspects of marine mammal biology, ecology and population structure. Candidate IMMAs undergo independent peer-review prior to acceptance, and are then disseminated via a searchable database and dedicated online e-Atlas. Between 2016-2022, nine expert workshops - engaging more than 300 experts - have resulted in the identification of 209 IMMAs located in over 100 countries or territories, across two thirds of the world ocean. IMMAs identified to date provide important habitats for 78 of the 133 recognized marine mammal species. Around 32% of IMMAs in the network were identified on the basis of habitat for marine mammal species that are threatened on the IUCN Red List. Approximately 51% of IMMA surface areas occur within Exclusive Economic Zone waters, while 49% fall within areas beyond national jurisdiction. IMMAs are increasingly utilized in environmental impact assessments, marine-planning exercises, maritime traffic routing, as well as international, national, and regional conservation, policy and management initiatives. These include those governed through the Convention on Migratory Species and Convention on Biological Diversity, as well as the design and management of Marine Protected Areas (MPAs) and the development of MPA networks. The Task Force is working toward completing a global network of IMMAs that will contribute to the scientific information needed to fulfil the current collective goal of protecting 30% of the ocean by 2030.

Poster 139:

The ghost labyrinth: quantifying illegal Fish Aggregating Devices (FADs) in the Southern Tyrrhenian Sea cetacean corridor

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Over 300,000 cetaceans die each year worldwide, after becoming entangled in active and ghost fishing gear. Particularly, both direct and indirect impacts of illegal, unreported and unregulated fisheries (IUUF) are of major concern. IUUF generate marine litter from the loss or disposal of fishing devices and these derelict gears may represent a direct threat for marine mammals. Fish aggregating devices (FADs) consist of deep water mooring with large surface expressions designed to attract different commercial fish species. However, FADs are well-known to be cause of entanglement for marine megafauna. Anchored (to the seafloor) FADs pose a serious problem, since marine mammals can become entangled in the mooring lines. Such event can limit animal ability to swim and feed, and ultimately cause significant injuries, undue stress and/or death. Additionally, FADs presence might alter feeding behavior, as marine mammals can benefit from an unnatural amount of accumulated food sources. The southern Tyrrhenian Sea (STS, Mediterranean Sea) represent an important area for marine mammals, being a corridor along with latitudinal movements of different marine mammal populations occur. Nevertheless, static (anchored) FADs fishery - despite being widespread in southern Italy - it is not adequately monitored in the area. This study reports, maps and quantify the presence of illegally abandoned FADs in the STS. Data presented were collected during Sea Shepherd dedicated campaigns carried out in summer and fall throughout 2021 and 2022. More than a thousand illegal FADs were found during around 120 days of search effort. Results will include information on FADs characterization, distribution and deployment patterns and their overall impact as marine litter. This preliminary study means to shed light on understudied and likely underestimated threats posed by FADs to the STS ecosystem and - more broadly - to the endangered marine mammal populations in the Mediterranean Sea.

Poster 140:

The Gulf of Catania: an eligible zone for a Specially Protected Area

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This study explores the characteristics of the Mediterranean Sea with a specific focus on the cetacean species hosted by the Gulf of Catania. After a general discussion of the study area, the paper characterizes these priority marine species, considered both bioindicators and top predators. In addition, some juridical instruments for the protection of existing marine areas and species in the Euro-Mediterranean region have been examined. The research has been realized in the framework of the "Dolphin watching and Conservation in the Gulf of Catania" programme carried out by the Marecamp Association in Sicily since 2014. To monitor cetaceans, the fixed transect method was used. Considering an extract of the databases referring to the 2021 summer season, the species most frequently observed were Tursiops truncatus and Stenella coeruleoalba. Results show that in the study area these species are well represented both in terms of number of individuals and composition of groups (adults, juveniles, and calves). In particular, the sightings took place both near the coastal Marine Protected Area "Isole Ciclopi" and offshore, with different frequencies related to the ecology of the two species. The presence of calves demonstrates that the area is used not only to play, feed, socialize, but also to reproduce and initiate to group life. Moreover. The “recapture” of different individuals through photo-identification allowed to prove their constant residence in the area; scars on their body permitted also to demonstrate their negative interactions with human activities. Considering the Gulf of Catania a very anthropized area with a high biodiversity potential, it would be appropriate to allow an expansion of the MPA “Isole Ciclopi” starting from the more coastal area of retrieval "Grotte di Aci Castello" and extending offshore than the current zoning with the aim of defending this ecosystem in a more concrete way.

Poster 141:

UK fishing gear strategy and targets required to reduce waste and cetacean bycatch

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Abandoned, Lost or otherwise Discarded Fishing Gear (ALDFG), estimated at over 11,000 tonnes per year, accounts for about a third of marine litter found in European seas. Along with active gear, ALDFG poses a threat to cetaceans through ingestion and entanglement. Although the true impact of ALDFG on cetaceans remains poorly understood, there is the wide-spread consensus that they are a serious threat and welfare issue for this taxon. European directives require proper management of ALDFG and End-Of-Life (EOL) fishing gear, including their separate collection, transport, and treatment. Accordingly, Member States are required to set collection and treatment targets. Having left the EU, the UK currently has no strategy in place to effectively tackle EOL and ALDFG gear and only has one facility that recycles some trawl nets. Approximately 60,000 tonnes of fishing gear are estimated to be in use across the UK, generating annual waste gear of 4,500 tonnes. The diversity of materials used in fishing gears make it difficult to recycle EOL gear as a single unit. Whilst metals and nylon are easy to separate and valuable on secondary materials markets, other components are not. This creates a challenging problem exacerbated by the lack of space for waste management in small ports and harbours. As a result, potentially recyclable EOL fishing gear is going to landfill or is incinerated. Based on a review of available information, we present a series of actions to tackle the issue of EOL and ALDFG in the UK. The development of a comprehensive strategy with ambitious targets to effectively tackle EOL and ALDFG in line with global and regional efforts is crucial, given the transboundary nature of this issue, to ensure less wasteful use of resources and benefitting cetaceans, associated ecological services, industry and generating a circular economy.

Poster 142:

“Cetaceans - an indicator of the state of the Black Sea environment"

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Cetaceans are at the top of the food chain in the Black Sea and as the largest predators their populations can be a good indicator of the overall condition of the marine environment. Three species representative of odontocetes (dolphins and porpoise) occur in the Black Sea –Black Sea Common Dolphin (*Delphinus delphis ssp. ponticus*), Black Sea Bottlenose Dolphin (*Tursiops truncatus ssp. ponticus*) and Black Sea Harbor Porpoise (*Phocoena phocoena ssp. relicta*). The currunt study is attempt to gather data for presence and accumulation of five elements (heavy metal) in tissues of the three species of cetaceans in Black sea - lead (Pb), cadmium (Cd), zinc (Zn), copper (Cu), mercury (Hg). Marine mammals are an extreme link in the trophic structure in the Black Sea and therefore, the potential impact of pollutants on their health is of concern. To have a more complete picture of the state of the sea ecosystem and the potential pathways, heavy metals are also investigate in a few fish species and marine water.

Poster 143:

One team, one dream: sustainability of whale and dolphin watching in the Strait of Gibraltar

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Whale and dolphin watching (WW) is the world's largest cetacean-related economic activity. Its growth in the Strait of Gibraltar calls for adequate management for achieving social, economic and ecological sustainability. This study aims to gain a multi-stakeholder perspective of WW activity, and assess the socio-economic profile of WW customers, their economic contribution to the local community, and their level of satisfaction with WW. In Tarifa (Spain) and Gibraltar (UK), we invited key stakeholders (e.g., WW customers and operators, researchers, NGOs, and policymakers) to fill out 637 questionnaires and we conducted a direct assessment of the WW trips, from 2017 to 2019. The type of data was analysed either qualitatively or quantitatively. Results suggest that: (1) local WW operators only partially follow WW legislation; (2) a large majority of whale watchers had a high education level and purchasing power, and many were national tourists who showed signs of loyalty to WW and support for conservation; (3) 51% of the expenses made by WW customers (total expenditure of €855,604 in 2 trimesters) directly benefited the local economy of Tarifa; (3) WW customers better value operators when cetaceans are indifferent to or approach vessels, and the education provided before and during the WW trip improve their satisfaction; (4) interviewed stakeholders recognize the scientific, recreational and educational values of WW. Our recommendations for sustainable management of the WW include structuring educational programmes, launching a national publicity campaign directed at whale watchers, implementing administrative facilities for WW companies, improving the monitoring of WW activities (e.g. from the land and analysing AIS data) and the enforcement of WW legislation (e.g. patrolling, control de maximum number and revoking of licenses). Further, the designation of Marine Protected Areas, a regional shipping plan, and an integrated management approach could benefit the WW industry and improve its sustainability.

Poster 144:

An unusually high number of cetacean strandings in the Black Sea, 2022 - is it the consequence of war?

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Three cetacean endemic subspecies inhabit the Black Sea: harbour porpoise Phocoena phocoena relicta, common dolphin Delphinus delphis ponticus and bottlenose dolphin Tursiops truncatus ponticus, with threatened populations, and are the subject of 11 Important Marine Mammal Areas (IMMAs). Bycatch is the main cause of regular P. phocoena strandings in April-July, while infection outbreaks occasionally have caused mass mortality in the past. Russia's war against Ukraine is putting the entire Black Sea basin under a huge threat. An increase in strandings was reported between late February and August 2022, coinciding with the military activities at sea. In total, 914 cases were recorded in January-October 2022 in Bulgaria (277), Romania (204), Türkiye (297), Georgia (12), Ukraine (124); among them 35 were live strandings (Bulgaria, 4; Romania, 7; Türkiye, 8; Ukraine, 16). P.p. relicta was the most affected species in general. In Türkiye, however, unlike in other years, it was D.d. ponticus, . This at least twice surpasses the average stranding rate in 2019-21 by country. The peak of strandings fell in May-June, while in Türkiye (Black Sea and Istanbul Strait) an additional unique peak occurred in late February-March. D.d. ponticus in March showed bycatch signs; also, unusually high P.p. relicta bycatch was found in Bulgaria in April. In Ukraine no bycatch signs were seen. Gross dissections were performed when appropriate and collected samples will be subsequently analyzed to ascertain the likely cause of death. For now, none of the hypotheses including infection outbreak, acoustic trauma due to blasts or ship activities, displacement and stress, or habitat degradation caused by military action or a combination of these factors can be ruled out completely. However, in all the scenarios Russia’s war posed a threat to cetacean conservation and welfare, especially at the Balaklava and Western Black Sea IMMAs, with unknown long-term consequences.

Poster 145:

Scientific bottlenose dolphin research: guiding conservation in Calabrian Southern Ionian Sea

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Cetaceans are impacted by different anthropogenic pressures and particularly Tursiops truncatus suffer from multiple pressures due to its preference in coastal waters. As this vulnerable species is protected under the European Habitat Directive and various other conventions and agreements, it requires MPAs (such as SACs -Special Areas of Conservation) for their protection. Bottlenose dolphin research carried out in the stretch of the Calabrian Ionian Sea, between Brancaleone and Botricello, was started on April 2019 and it was necessary as there was still a gap in knowledge in this region on the presence and distribution of cetacean species. Theyear-round study since 2019was possible through the regional operational program 2014-2020, funded by EU FESR – FSE for the Calabria Region. This study is continuing, and cetacean surveys have been conducted in 2020, 2021 and 2022, too. The project involved a multi-action approach including scientific field research to study the distribution and the habitat used by the dolphins; a citizen science approach; removal of the marine litter in the SAC Fondali di Stalettì, to reduce the negative impact these could have on the health of the bottlenose dolphins. Additional efforts are also being made to detect plastic and ghost net, using ROVs. In these four years of research, in the study area four species of cetaceans were sighted: *Stenella coeruleoalba*, *Grampus griseus*[1], *Tursiops truncatus* and *Delphinus delphis*. The study contributes towards effective conservation managementefforts for the cetaceans in a geographic area that was under-investigated despite presence of this species. Sustained research and regulatory measures to control vessel traffic, dolphin watching without sustainable certification and tourist pressuresare urgently needed.

[1] Menniti M. A., Vella A., 2022. First sighting of Risso's dolphins (*Grampus griseus*) during scientific research in the Calabrian Southern Ionian Sea (Central Eastern Mediterranean). NESciences, 2022, 7(3): 248-259.

Poster 146:

Gear use, recovery and disposal in the Scottish inshore creel fishery

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Recent work conducted by both the Scottish Entanglement Alliance (www.scottishentanglement.org) and St Andrews University revealed concerns regarding the amount of fishing gear associated with the Scottish inshore creel fishery, an unregulated sector known to pose an entanglement risk to cetaceans. To investigate these concerns further, an anonymous online survey aimed at commercial creel fishermen was launched in late 2021. The survey aimed to gather information on the amount of gear deployed in inshore waters; the frequency, amounts and causes of gear loss; the frequency with which abandoned, lost, or discarded fishing gear (ALDFG) is encountered during normal fishing operations; the extent to which fishing gear is deliberately dumped at sea; and fishers' concerns regarding the future management and sustainability of their sector. From the 208 usable responses received, results suggest that gear loss is a common occurrence around the Scottish coastline, largely due to poor weather, conflict with other commercial vessels (both fishing and non-fishing), and contact with marine debris. While attempts to recover gear are common, often only a fraction of that lost is found again. Nearly half of respondents reported encountering ALDFG at least once a month and while the majority said that they take this ashore to dispose of, one quarter stated they leave this at sea. Nearly a quarter of respondents also admitted to disposing of their own gear at sea. Responses to open-ended questions within the survey called for better regulation and policing of the sector, limits on gear use, better marine spatial planning, and improved recycling facilities for end-of-life gear, to safeguard the future sustainability of the sector and minimise environmental impact. Further work in this area is planned in the coming months and full results will be available in time for the conference.

Poster 147:

Cetaceans of the Galapagos Archipelago: species in constant change, and the importance to standardize long-term citizen science contributions

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The Galapagos Archipelago has been described as one of the richest areas for cetacean species diversity in the Tropical Eastern Pacific. Information on species diversity and the presence of cetaceans have been recorded since whalers arrived at the islands in the 1800s. Due to the highly productive conditions around the islands, the Galapagos has been identified as a key location to increase our understanding of whale and dolphin ecology under changing conditions. Since 2010 the Cetacea Galapagos Program (CGP), a research initiative on whales and dolphins in the Galapagos managed by the University of San Francisco Quito and the Galapagos National Park, has been collating citizen science data from users of the marine reserve. The main objective was to evaluate long-term species diversity, habitat use, demography, movement patterns, and possible threats or changes in cetacean populations due to climate variability or diverse anthropogenic factors. We analyzed these citizen science contributions to track temporal and spatial fluctuations in species diversity and habitat usage. Through this, we identified resident species such as bottlenose dolphins as the most commonly sighted species, and a small pod of orcas resighted through photo identification. Conversely, we have seen an increase in sightings of blue whales being present year-round in the archipelago and other migratory species like humpback whales with a seasonality on the islands. We have noticed the necessity to standardize the methodologies and apply new technologies for less common species. Identifying future research priorities to help contribute to Galapagos Marine Park management.

Caribbean Cetacean Society: Going beyond island frontiers for cetacean conservation in the Lesser Antilles

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All Caribbean islands depend on the marine ecosystem for their livelihood. Its waters, rich and diverse, contain more than thirty species of cetaceans which play an essential role in the ecological balance of the ecosystem. The goal of the Caribbean Cetacean Society (CCS) is to protect these animals, pillars of the blue economy. The CCS is going beyond the island's frontiers (with different cultures, languages and regulations) for cetacean conservation in the Lesser Antilles through international cooperation, research, capacity building and education actions. The project “Ti Whale An Nou”, meaning “our own little whales” in a Creole mix, is the largest research program in the Caribbean. It includes six scientific missions of 15 days, between Anguilla and Grenada, to study cetaceans every year. During these sailboat expeditions, cetacean observations, photo-identifications and passive acoustic data through a towed hydrophone array were collected. Here, we present some results of the data gathered during the 2021 and 2022 expeditions, where 21 different species were visually identified in more than 400 observations. First, distribution models with uncertainty maps are presented. The species were grouped into six categories by similar detectability characteristics and their associated effort was estimated. Then, environmental covariates were added to the spatial model. Second, we analyse the threats they are facing. Based on a photo-id analysis, more than half of the cetaceans observed in 2021 had scars of possible anthropogenic origin: (propellers, nets, collisions, etc). This study fills the data gaps highlighted by the latest marine mammals action plan of the Caribbean, establishing a basis for appropriate and effective conservation measures within each territory.

Poster 149:

Transnational mapping of cetacean bycatch risk in the Bay of Biscay and the Atlantic Iberian coast, in the scope of the CetAMBICion project

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The co-occurrence of protected marine species and fishing activities can result in the bycatch of protected species such as marine mammals, sea birds, sea turtles and diadromous fish. Under several European legislations (most notably the Habitats Directive, the Birds Directive, the Marine Strategy Framework Directive and the Common Fisheries Policy), EU Member States are required to implement regulatory and technical measures to minimise this source of mortality. We present an approach to map the bycatch risk of various marine species protected by European Directives, based on their sensitivity to different fishing gear types and their exposure in space and time to gear-specific fishing effort. This analysis takes advantage of a newly-built R script that standardizes and automates the numerous spatiotemporal intersections between modelled density distribution maps and seasonal fishing effort layers derived from VMS data. In the scope of the EU-funded CetAMBICion project (www.cetambicion-project.eu), this approach is applied to a broad transnational area encompassing French, Spanish and Portuguese EEZs in the NE Atlantic. Gear-specific fishing effort maps built from national fisheries data are thereby contrasted with density surfaces for 8 marine mammal species modelled specifically for this area. The resulting risk maps highlight the geographical sectors where species are vulnerable to the different fleets and allows an integrated response to marine mammal bycatch in the Bay of Biscay and along the Atlantic Iberian coast.

Poster 150:

The French MSFD marine mammal monitoring programme for 2022-2028

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In France, the first MSFD monitoring cycle started in 2015 for 6 years, producing data that were used for the 2018 and 2024 Good Ecological Status (GES) evaluations. A critical evaluation of the 2015-2021 marine mammal monitoring programme was performed in 2020, leading OFB to propose an updated monitoring programme for 2022-2028. It was reported by France to the EU in December 2021 and adopted beginning of 2022 by the local authorities in the four marine sub-regions of the French EEZ. This monitoring programme has the same structure as the previous one, but includes new monitoring features in order to complete for the GES criteria for species and/or marine sub-regions that could not be evaluated previously. Some are only candidate monitoring features and will become operational if GES indicators can be developed for the 2030 GES evaluation. The French marine mammal monitoring programme is made of the following 5 sub-programmes: 1. Coastal cetacean populations: photo-identification of coastal groups of bottlenose dolphins in the Atlantic and the Mediterranean; PAM network to monitor porpoise in the Eastern Channel and the North Sea 2. Seal populations: visual counts, photo-identification and telemetry in the main haul out sites (Hauts-de-France, Normandy, Brittany) 3. Offshore populations: aerial surveys (SAMM, SCANS, ASI) every 6 years in winter and summer; 6 annual surveys on scientific vessels (2 in the Channel, 2 in the Atlantic, 2 in the Mediterranean); ferry surveys in the Mediterranean 4. Strandings: French National Stranding network, monitoring the 2000+ annual strandings on the French shores; improved monitoring of contamination, causes of death and health parameters 5. Interactions with human activities: monitoring of bycatch, collisions, noise pollution (in relation with offshore wind farms), disturbance (in relation with whale watching)… This monitoring programme started to be implemented in 2022 and will consolidate in the following years.

Poster 151:

Policy change leads to reduction in use of acoustic deterrent devices on the west coast of Scotland

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Acoustic deterrent devices (ADDs) have been used to minimise pinniped depredation at aquaculture sites across Scotland since the mid-1980s. ADDs emit loud, mid-to high-frequency sounds (0.5 to 40 kHz) into the marine environment that can disturb non-target species, including European Protected Species (EPS), such as harbour porpoises. The west coast of Scotland, where most fish farms are located, provides critical habitat for many protected species of cetacean. Following a change in policy by the Scottish Government in 2021, the use of ADDs at marine aquaculture sites now requires an EPS license or consents from Marine Scotland (MS) with proof that planned ADD deployment will not disturb marine mammals. Prior to this ADD use in Scotland was unregulated and largely undocumented. This study quantified changes in the detection of ADDs over 20 years, utilising acoustic data collected by more than 1000 citizen scientists during cetacean line-transect surveys from Hebridean Whale and Dolphin Trust's (HWDTs) research vessel. Between 2006 and 2022, a total of 30,273 listening events were recorded and ADD presence was detected in 2,348 (7.76%) of these events. There was a steady increase in ADD detections from 2006 (0.05%) to 2020 (11.7%), with the highest number of detections in 2017 (13.74%). Maps of ADD detections at listening events demonstrate the substantial geographic expansion across the west coast of Scotland and highlight that many areas were ensonified by ADDs. A significant decline in the detection of ADDs was recorded in 2021 (3%) and 2022 (0%). There were no detections during HWDT surveys following the clarification of licensing regulations by MS. Increased monitoring and enforcement are vital to continue the cessation of ADD use within protected areas for EPS. HWDT's long-term monitoring will be an essential tool in quantifying the impacts of underwater noise as the aquaculture industry adapts to new legislation.

Poster 152:

Tour-operators as key tool to improve information on data deficient cetacean species

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Even though the majority of cetacean species are well-documented worldwide, there are still information gaps of some species. Using whale-watching tour operators, as an opportunistic platform, we have the goal to obtain baseline data from false killer whales (*Pseudorca crassidens*), a poorly known odontocete species, in the Azores archipelago (Portugal). We aim to describe this species in the area, their main behaviours, and its relationship with another cetacean species. A total of 45 encounters of false killer whales were detected from April to October between 2012 and 2016. The mean size of the groups was 31.36 ± 5.93 (± SE) animals per sighting. During the study period 59 individuals were photo-identified and 13 animals were re-sighted. From these, 69% were matched almost twice in different years. In two cases, animals were recaptured in five different occasions between 2012, 2015 and 2016. Common bottlenose dolphins were almost sighted 40% of the times with our target species. Our results show the importance of opportunistic platforms to provide useful information on population data deficient species, namely on false killer whales.

Poster 153:

A team dedicated to the quietude of cetaceans in Reunion: an action that adapts to an evolving context and emerging threats

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Whale-watching has rapidly developed in Reunion Island, since 2008, due to an increasing number of humpback whale sightings during the austral winter breeding season, with a peak in 2018, and a large demand for interactions with cetaceans. The activity is now well established and offers tours throughout the year, targeting also coastal dolphin populations. Since 2017, a team "Quietude" was committed to monitoring and educating whale watchers to ensure compliance with the local regulations. Monitoring human-animal interactions occurred mainly during the whale seasons in 2017 and 2018 but was carried out year-round since 2019. A total of 1238 hours were spent at sea collecting data on cetaceans and the activities around this megafauna. Other actions include the development of a label, federating whale-watching stakeholders, and creating information, and educative tools to promote a sustainable whale-watching and to raise awareness of new threats. Whale-watching vessel presence rate ranged from 84% to 76% between 2017 and 2022 and reached 91% in 2020. When whale-watching vessels were present, avoidance responses of whales increased from 14.9% to 22.2% between 2017 and 2018, and decreased from 20.4% to 5.9% in the 2019-2022 period. Regarding spinner dolphin, 86.6% of dolphin-watchers were compliant to the regulations between February 2018 and May 2020. Avoidance responses were higher in cases of non-compliance. Analyzing whale-watching monitoring have supported the implementation of a local binding decree since 2019. The presence of "Quietude" in whale-watching areas for the last six years has allowed to progressively reduce the daily pressure on the targeted animals, and to improve the communication between stakeholders. The team adapts its actions to emerging issues and find news relevant indicators for monitoring. This six years' feedback demonstrates that a dedicated team makes research and direct field conservation efforts compatible, complementary, and fundamental to ensure the conservation of cetaceans.

Poster 154:

Three decades of harbor porpoise reproduction at the German coast

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The harbor porpoise (*Phocoena phocoena*) is one of the three top predators at the German coast. They are affected by different anthropogenic influences such as chemical pollutions, fisheries, shipping and offshore-constructions. Those effects can lead to depletion of populations due to changes in reproduction success. Like most other mammals, harbor porpoises undergo distinct phases towards sexual maturity, which makes them especially vulnerable to anthropogenic impacts. To gain an overview about the reproduction capacity of stranded or bycaught female neonate, juvenile and adult harbor porpoises were collected between 1992 and 2022 and macroscopically investigated. For the detection of different reproductive parameters the uteri and ovaries from 363 harbor porpoises were examined and Corpus luteum (CL), Corpus albicans (CA), tertiary follicle, scars and pregnancy recorded. As part of this study, the volume of CL and CA were determined, as well as the correlation between corpora and age/age group of the porpoises. Another focus lay on the differences of the waters (North and Baltic Sea). In addition, the occurrence of sexually mature parameters was monitored throughout the year to see if there was a seasonal pattern. The highest number corpora were found in the age group “adult” and a significant correlation between corpora and age was found for age four ($p=0.04$). Likewise, significant more corpora could be found in the left ovary ($p<0.05$). This study gives an overview of the last three decades of reproductive capacity of stranded and by-caught harbor porpoises collected at the German coast. Adaptations and changes within the population can be visualized with this large data set.

Poster 155:

Successful management of a wandering wild walrus in western Europe

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In March 2021 a juvenile male walrus (*Odobenus rosmarinus*) 'Wally' was sighted in Ireland before visiting the town of Tenby, Wales, UK. Here he exhibited habituated-type behaviours including hauling out on boats and sleeping on the lifeboat slipway. Deterrent measures (air horns and hosepipes) were utilised when the lifeboat launched, but these became less effective over time. From mid-May 'Wally' travelled through southwest England, France and ultimately Bilbao, Spain. He returned to the UK in mid-June when he attempted to board an occupied yacht in the Isles of Scilly. This is an archipelago of over 180 islands (five inhabited) off Cornwall, England. British Divers Marine Life Rescue were contacted for advice and suggested fending him off with oars, which worked. 'Wally' subsequently took up residence in the largest harbour, St Mary's, regularly hauling on boats and causing damage, turning some local community opinion against his presence and threats were made to his life. Urgent stakeholder meetings were planned that implemented a range of deterrent measures led by BDMLR, Seal Research Trust and Isles of Scilly Wildlife Trust. Expert advice from Alaska helped develop a mitigation management plan and risk assessment. A key action to keeping 'Wally' safe was building a floating platform specifically for him, which successfully prevented further property damage. Public and international media attention was intense and much effort was made to manage people to reduce his rest being disturbed. He was then able to leave and visited several sites along the south coast of Ireland throughout August where he continued boat-hauling behaviour. Here management was successfully led by Seal Rescue Ireland with support from BDMLR and SRT based on prior experience. 'Wally' was last photo ID'd in Iceland in September and he is presumed to have returned to his normal species range.

Poster 156:

First insights on differential bycatch risk of bottlenose dolphins (*Tursiops truncatus*) off the southern Iberian coast

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The competition between fisheries and bottlenose dolphins (*Tursiops truncatus*) is well documented worldwide. Nevertheless, off the mainland Portuguese coast studies have focused mostly on the negative impact of the species towards coastal artisanal fisheries, through economic loss from catch and gear damage while the level of bycatch or other injury fatalities has never been approached. Using cetacean strandings' data collected along the southern Portuguese coast (Algarve) between 2010-2017 and 2020-2022, when a specialized team performed necropsies, fisheries bycatch corresponded to 54% of the causes of death amongst the stranded individuals (n = 35; decomposition state ≤ 3 - moderate decomposition). The bycatch was mostly associated with bottom set fisheries. Bottlenose dolphins with evidence of fisheries interactions (FI) (n = 19) or having no evidence of human interaction (NHI) (n= 16) were evaluated to assess factors of possible bycatch risk factor (i.e. sex, maturity, season and time period). Due to the small sample size, contingency tables were used to analyze the differences. Analysis indicated that bycatch evidence oscillated throughout the years, no evidence was found in some months (i.e. July, September and October) and higher evidence is observed in the first half of the year (approx. 70 % of the individuals). Bycatch risk for sex differences was only possible to determine for 29 individuals and was observed in most maturity stages in males (calves, subadults and adults) and in adult females only. However, a higher bycatch risk was detected in adult males. These preliminary results are a first insight on bycatch evidence of bottlenose dolphins in Southern Iberia and highlight the need for additional dedicated studies to determine the impact of coastal fisheries on the species and contribute to the implementation of future conservation measures.

Poster 157:

Improving minimum standards of the Marine Mammal Observers used during offshore activities

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Marine mammal observers (MMO) have been deployed since the late 1990s to mitigate the potential impacts of loud sounds produced during offshore activities via regulatory marine mammal guidelines. The UK's Joint Nature Conservation Committee (JNCC) guidelines were the first to be issued and many countries have since adopted them for use in their own waters or used them as a model to develop their own. Aspects of these guidelines have been criticised based on increasing scientific knowledge and recognition of what might constitute best practice, however, little has changed over the last 25 years. Some key shortcomings include: failure to mitigate for acoustic disturbance, untested assumptions about injury prevention, observation protocols that often result in a low likelihood of detecting marine mammals, and the lack of experience required to qualify and work as a MMO. JNCC approved MMO training courses last generally one day and provide the most basic information with negligible ground truthing of the observers' skills at detecting or identifying marine mammals. In periods of high observer demand, inexperienced and non-dedicated MMOs are sometimes responsible for monitoring and mitigation. Conflicts of interest, censorship and undue influence from the companies hiring the observers can affect the MMO selection process. All these factors affect the likelihood of animals being detected, and therefore represent a risk for the effective mitigation and conservation of individual cetaceans and local populations. We propose the creation of a committee within the European Cetacean Society (ECS) to develop minimum region-wide standards for MMOs and an approval of expertise. The aim would be to minimise the potential negative impacts of disturbance and injury on marine mammals through the use of improved and objective training and selection criteria to increase the competence level of MMOs used during offshore activities.

Poster 158:

Evaluation of parameters determining rehabilitation success of harbour porpoises (*Phocoena phocoena*) to assist in adequate decision-making during stranding events

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Harbour porpoises (*Phocoena phocoena*) are an abundant species inhabiting the North Sea and frequently strand on the Dutch coasts. Alive stranded animals are reported to SOS Dolfijn, who are legally authorized to to offer professional help to small cetaceans. In 2022, SOS Dolfijn opened a new rehabilitation centre at Hoenderdaell estate, after leaving the premises of the Dolfinarium in 2017. In case of stranding, SOS Dolfijn has three options: relocate the animal back to sea, immediate euthanasia on site, or rehabilitation. To assist in this decision-making process, we investigated the probability of successful rehabilitation based on different key variables. Previously collected data (from 1967-2017) on harbour porpoises (n=208) that had entered rehabilitation were examined by performing a multivariate binomial logistic regression on a selected number of possible predictive parameters. As a pilot, a limited number of 4 predictors (sex, age, BMI, and presence of external wounds) were included in determining the probability of a successful rehabilitation process. From the 4 selected parameters that were statistically analyzed, BMI ($p<0.001$) and age class ($p<0.001$) were found to be predictive factors for succeeding in the rehabilitation process. Keeping other variables constant, the odds that an animal successfully rehabilitated is about 6 times higher for juveniles [OR=5.73; 95% CI: 2.41 to 14.84] compared to animals classed as non-juveniles (being neonates or adults). In addition, for every unit (+1.0) increase in BMI, the odds of a successful rehabilitation increase by a factor of 1.5 [OR=1.52; 95% CI: 1.31 to 1.80]. Similar results were found for animals that have been successfully released into the wild, but the odds for juveniles were slightly lower: 5 times [OR= 4.80; 95% CI= 1.94-13.28]. As a next step, it would be helpful to add more parameters such as the grade and origin of the injuries, standing season, or contracted diseases.

Poster 159:

"Care4Seals": a citizen science project for the conservation of the endangered Mediterranean monk seal (*Monachus monachus*)

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Conservation is an interdisciplinary field involving science and society. In order to address conservation issues, Citizen Science projects represent a valid tool integrating social (citizens) and scientific (researchers) perspectives. "Care4Seals" is a multi-collaborative citizen science project born from Gruppo Foca Monaca APS in collaboration with the University of Milan-Bicocca. The double goal of Care4Seals is to provide insights into the endangered Mediterranean monk seal (*Monachus monachus*) distribution in an understudied area and to increase conservation sensitivity in local communities at the same time, necessary to build human-seals coexistence. The monk seal distribution is studied using environmental DNA to detect the species' presence in a non-invasive manner within "SpotTheMonk", an initiative supported by the University of Milan-Bicocca. The monitoring campaign "Care4Seals" ran from September to December 2022 in the Southern Adriatic and Northern Ionian Sea, involving up to 10 teams of volunteers collecting samples simultaneously every three weeks. Citizen science volunteers were recruited during summer 2022 by Gruppo Foca Monaca APS. Participants regularly frequent the sea for recreational or working reasons, thus being exposed to areas potentially visited by monk seals. "Care4Seals" network not only allows the collection of large-scale almost-contemporary samples, but it also promotes species conservation among the local community. In September, volunteers were trained and equipped to collect, filter, and store environmental DNA samples for lab analysis. The expected outcomes of the projects are to better understand the monk seal distribution in the area and improve people's conservation knowledge, attitudes, and behaviours at an individual and community scale.

Poster 160:

Combinig citizen science and land-based surveys as a tool for research cetaceans and sustainable use of the marine resources in a special area of conservation

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Long-term data series for cetaceans are difficult and expensive to obtain. Citizen science can provide this data gathering public in scientific information. Surveying cetaceans from land has advantages as it is cheap and allows to record sightings, duration, and reaction to anthropogenic impact as vessel, without influencing the behaviour of the animals. Although, this method has limitations for the recognisance of the animals, it is a powerful tool to spread the knowledge in view of the need of conservation across the local communities. The project PRCEO has been carried out since 2021 in Special Area of Conservation (ZEC Estrecho Oriental) located in the Eastern part of the Strait of Gibraltar. Common dolphins, bottlenose dolphins, striped dolphins and loggerhead turtles are considered local species, while fin whales are seen seasonally during their migration towards the Atlantic Ocean very close to the coast. The study has been developed from a land-based fix station located in La Línea de la Concepción. Morning and afternoons shifts were covered by teams formed by a minimum of 1 scientist observer and 1 volunteer citizen trained previously and supervised by the scientist. Effort time, species, estimate number of individuals, behaviour, weather conditions, heading as well as, the risk of collision with vessels. From May to October a total of 66 sightings of fin whales, 187 sightings of common dolphins and 12 of bottlenose dolphin were counted on 2021 versus 41 sightings of fin whales, 82 of common dolphin and 13 of bottlenose dolphin on 2022. Citizen science combined with land-based monitoring are powerful tools to study cetacean populations, not only for the great scientific information or for expanding knowledge and creating awareness but also for the sustainable use of the marine resources.

Poster 161:

UK retailer supply chain policies influence plastic use to protect marine species & habitats

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The use of agricultural plastics, terrestrially, within fisheries and aquaculture, contribute to marine plastic pollution. Terrestrial agriplastic leakage into the marine environment occurs through macro-plastic waste mismanagement and microplastic run-off. Fisheries and aquaculture contribute to plastic pollution through the use of plastic fisheries products used for transportation to buoys, fish aggregation devices, nets, ropes, lines, traps and enclosures, as well as general waste. Plastics used in agriculture, including fisheries, is estimated to be 3.5% of total global plastic production. Despite only making up a small proportion of total production, their impacts on the marine environment are thought to be severe. For instance, fisheries and aquaculture production contribute roughly 2.1 million tonnes per year of abandoned, discarded and lost fishing gear (ALDFG), with nearly 2% of all fishing gear is lost to the ocean annually. Gillnets and longlines have an operational life between 1-3 years, needing regular replacement. Whilst active and also once lost, gear can entangle, harm and kill marine species. Fishing gear is rarely retrieved and when it is, it typically goes to landfill. Since 2018, the largest 10 UK retailers completed questionnaires identifying the level of engagement and policy requirements on plastics, including with agriculture and fisheries supply chains. The most common measures retailers take to prevent plastic pollution in their supply chain are identified, as are changes in policies over time. On the theme of 'Our Oceans, Our Future', eliminating and preventing the use of plastic pollution in the retailer supply chain will have the mutual benefits of preventing plastic pollution and bycatch and subsequent suffering of marine species and habitat damage, including through ALDFG. Action will be most effective if a system wide perspective is taken and all retailers employ robust policies regarding plastics across their supply chains. Recommendations to this end are made.

Poster 162:

Cetacean habitat under pressure: the case of the bottlenose dolphin in the Gulf of Lion

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A campaign was carried out during the whole month of September 2021, over the entire continental shelf of the Gulf of Lion in order to characterize the anthropic environment of the bottlenose dolphin habitat. A line transect method was applied during 1,302 km resulting in 971 boats and 13 sightings of bottlenose dolphins (95 individuals). Recreational activities represent 87.9% of all boats (of which 69.4% are leisure boats and 18.5% recreational fishermen) and professional fishing represents 7.6%. Large commercial vessels are rare (<5%). The bottlenose dolphin is observed throughout the Gulf of Lion with a relative abundance of 0.07 ind.km-1. On a grid of 6NMx6NM cells, leisure boating is characterized by a coastal distribution, close to large marinas with a Maximum Relative Abundance (MRA in number of item.km-1per cell) of 12 boats. Recreational fishing is essentially located around the coastal edge of the Gulf, with a MRA of 2 boats. For professional fisheries, trawlers are present rather extensively with a gradient from the coast to the open sea and from East to West (MRA=0.6 boats), whereas passive gear (long-line, gillnet, pot) boats, are widely distributed throughout the Gulf (MRA=0.2 boats). Finally, large commercial vessels are mostly near large commercial harbours, Marseille and Sète. As the entire Gulf is the habitat of the bottlenose dolphin, the cooccurences between dolphins and the different type of activities were analysed through Kernel Density Estimation and GIS with boats relocated from angle and distance measurements. Indeed, leisure activities overlap 16% of the area frequented by the bottlenose dolphin, professional fishing activities 86% and large commercial vessels 29%. Overall, 92% of the surface frequented by the bottlenose dolphin in the Gulf of Lion is used by various human activities. This study helps greatly for Marine Spatial Planning and Risk Exposure mapping for bottlenose dolphins.

Poster 163:

Benefits of having a regional stranding network: the case study of RAAlg, the Algarve Stranding Network in Southern mainland Portugal

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Cetacean strandings´ data can provide insights into the long-term dynamics of populations, and threats they face. Having access to strandings and their in-depth study, depends on the availability of functional authorized entities, funding and human, space and equipment logistics. This work investigated cetacean strandings collected along the southern Portuguese coast (Algarve) between 2000 and 2022, comparing outputs in periods when a regional stranding network (RAAlg) operated and periods when the network was not functional. Analysis showed that the relative frequency of strandings in the periods when the regional stranding network operated (11 years; 2010-2017 and 2020-2022) was threefold higher compared with periods when the network was inactive (12 years; 2000-2009 and 2018-2019). Of the 947 cetaceans stranded, about 29% were recorded in the period where the regional stranding network was inactive, while 71% were recorded in periods when the network was active. Moreover, RAAlg allowed detailed necropsies, from which causes of death could be determined to carcasses up to moderate decomposition (n=331). Interactions with fisheries was the main cause of death for the whole sample and the four main stranded species (common dolphin, striped dolphin, bottlenose dolphin and minke whale), respectively 45 %, 52%, 31 %, 60 %, and 58% of the analyzed individuals. Increases in cetacean strandings in southern Portugal in recent periods may be related with increased survey effort and RAAlg´s activity. However, fisheries interactions, especially with coastal gears (gill and trammel nets, purse seine) for delphinids and other not specified gears for whales are in significant part responsible for mortality patterns and worthy of more detailed investigation. These results highlight the ecological significance of strandings data from long term databases as a valuable monitoring strategy, and the importance of having specialized/trained teams available to collect the data in a systematic and standardized way.

Poster 164:

Marine debris ingestion in five cetacean species stranded along the Italian coast

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The ingestion of marine debris is one of the most noxious threats on marine organisms and its impact, ranging from sub-lethal effects to mortality, is documented in several cetacean species worldwide. However, few non-homogeneous data are available for the Mediterranean Sea, one of the most polluted areas for marine debris worldwide. This study aims at evaluating the occurrence of marine debris in stranded cetacean species by adopting a multidisciplinary and standardized protocol to analyze the multiple stress that cetaceans are facing together with marine debris ingestion. The gastrointestinal tract (GIT) of 40 cetaceans (3 *Ziphius cavirostris*, 1 *Globicephala melas*, 14 *Tursiops truncatus*, 21 *Stenella coeruleoalba* and 1 *Balaenoptera physalus*) stranded from 2017 to 2022, along the Italian coast, were examined for macro and microlitter, diet and pathology. With the adopted methodology, 790 debris items were properly isolated from 32 out of 40 specimens (80%). Artificial polymer material was the only macrocategory of debris found and it was mainly isolated from the intestine rather than in the stomach. Polyethylene and polypropylene microplastic (<5mm) were the most ingested debris in the five species. Fragments were the predominant shape in Cuvier's beaked whale, whereas thread-like particles, in particular fibers, were the most abundant in the other species analyzed. The use of a standardized protocol, in compliance with the Marine Strategy Framework Directive protocols, confirms the importance of analyzing both portions of the GIT to correctly assess the presence of ingested marine debris and allowed comparison among different species of cetacean that may be prone to different rates of ingestion due to feeding strategy and habitat. Furthermore, the protocol and the results support the promotion of cetaceans as indicators of marine debris in governance programs such as MSFD in EU and Barcelona Convention in Mediterranean Sea.

Poster 165:

Floating macro-litter composition, distribution, and overlap with bottlenose dolphins (*Tursiops truncatus*) along the Western Sicilian coast (Italy)

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Coastal habitats are one of the most degraded and threatened ecosystems. One of the principal stressors for marine fauna is marine litter and the Mediterranean Sea is one of the most polluted basins. Macro litter can impact marine fauna due to entanglement or ingestion, which could reduce animals' fitness and survival. Cetaceans usually become entangled around their neck, flippers, and flukes. In this study, the Kernel density estimation method was applied to investigate the distribution of bottlenose dolphins (*Tursiops truncatus*) and of floating macro-litter (FML). In order to isolate areas that correspond to a given percentage of the total cumulative distribution (Percent Volume Contour (PVC), 95 and 50 PVC were produced. The 50PVC was used to define the boundaries of the core area. Subsequently, the core areas for the dolphins and for FML were superimposed in order to perform a risk spatial analysis. Data were collected in the coastal waters of the Agrigento province during 90 surveys (5201 Km) in the summer seasons 2019-2021. The survey resulted in 76 sightings of bottlenose dolphins and 629 FML items detected, 90% of which were plastics. Both dolphins and FML resulted distributed along the whole studied area. The greatest dolphin density (50PVC) is located between 4 and 10 km from the coast in an area of 61 km2. FML is concentrated (50PVC) in the range of 2-12 km from the shoreline, covering 103 km2. The area of highest risk for dolphins, i.e. where dolphins and FML core areas overlap, extends for 59 km2 between 3 and 10 Km from the coast. Dolphins in these waters mainly use zones that are the most polluted by plastic, underlining the need to enact specific management measures in these waters of the Sicilian Strait and preserve the species.

Poster 166:

The Gulf Of Dolphins: a multi-stakeholder project at the service of the bottlenose dolphins conservation

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The fish-farm in Golfo Aranci (Sardinia) is an attractor for bottlenose dolphin (*Tursiops truncatus*). Their presence in the Gulf is so frequent that, over the years, locals have activated an economy based on dolphin watching. In Italy, dolphin and whale watching activities outside Marine Protected Areas and the Pelagos Sanctuary are not regulated. In this context, "The Gulf of Dolphins" was born: a project to transform dolphin watching into a sustainable activity. A network of sustainable dolphin watching operators has been created through their training and the creation of a sustainability certification, which includes enforcing a code of conduct during boat trips. They have thus become guardians of the dolphins in the gulf. An infographics translated into 5 languages allows to raise awareness among tourists. Operators noticed a very frequent presence of calves, taking an active part in the scientific monitoring, understanding if the species used these waters as a nursery area. The data have been collected by students, extensively trained and embarked on the platforms of opportunity (boats of operators of the network) during tourist excursions. Each sampling was recorded via GPS in summer seasons 2019-2022, and during sightings dolphins were photo-identified. For each identified individual, its association with a calf was evaluated, and its residency (RR) was calculated. They were divided in 2 categories: sighted with and without calves. During 367 surveys, 2458 NM were traveled and 295 pods were sighted, 107 dolphins were identified, 73 of which were calf-associated. The calculation of the RR was statistically significant in the two-tailed Mann–Whitney U test ($z=-1.027$ with $p<0.05$). Results show dolphins preference for the surroundings of the fish-farm, as confirmed by previous studies. Therefore, it is possible to affirm the effective use of the bay as a nursery.

Poster 167:

Survival in the Mediterranean Sea: the sperm whale Atlante

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Sperm whales are animals of endurance. This predator inhabits all world's oceans and enclosed basins such as the Mediterranean Sea. Worldwide this species has been exploited during whaling time and the population has been reduced to about 250,000 individuals. Although the Mediterranean subpopulation has not been hunted by whalers, in the last decades its conservation status has become "Endangered" due to several anthropogenic pressures: plastic ingestion, entanglements and ship collisions. Among these threats, the marks of a ship strike can be easily recognized on the body of dead and alive whales. Here is reported the case of a sperm whale named Atlante, with clear signs of an interaction with a propeller that has removed up to 25-30% of its fluke. This animal has been sighted for the first time in October 2021 in the northern area of the Pelagos Sanctuary and in May and July 2022 respectively in the Ischia and Ventotene IMMA and again in the Ligurian Sea, recording a displacement of 660 nautical miles in 292 days. Due to the body length estimates, assessed with Inter-Pulse-Intervals and aerial images, and the presence of other individuals in each sighting, Atlante has been classified as a juvenile. In all sightings, the animal performed typical feeding dives of about 40 min and the aerial images didn't reveal any weight loss. These findings suggest that despite the injury, this animal can feed regularly and undertake long movements within the western basin. The marks on the fluke reveal that ship strike is a real danger to this species in the Mediterranean Sea. Sharing Atlante's fluke and records with the scientific community is fundamental to keeping track on this animal. Further data will be valuable for a better knowledge of how this species can survive and live after this trauma.

Poster 168:

Dolphins don't care about politics: the challenges of studying cetaceans in a politically sensitive area

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The eastern Levantine Sea is one of the most under studied areas in the Mediterranean Sea and data on the distribution of cetaceans in the area is limited. The Israeli coastline, located in the eastern most part of the Mediterranean, has been declared as an Important Marine Mammal Area since 2017 due to regular occurrence of common dolphins, *Delphinus delphis*, and common bottlenose dolphin, *Tursiops truncatus*. This study uses sixteen years of boat-based observational data to assess the abundance and social structure of the bottlenose dolphin population in Israel. Between 2005-2020, 44,066 km were covered during 1013 surveys. Bottlenose dolphins were sighted and photographed in 199 of these surveys with a mean group size of 5.1 to a total of 288 mature individuals. Site fidelity appeared weak with low yearly and monthly sighting rates: 0.16 ± 0.15 (range = 0.06 - 0.93) and 0.032 ± 0.037 (range = 0.01 - 0.23), respectively. Robust Design mark recapture models estimated the population to be stable throughout the study period with a mean of 67 ± 25.15 mature individuals present in the area at any given time. Among these individuals, 42 were repeatedly sighted in the area and were part of a fluid fission fusion social structure, with frequently changing group compositions and weak short-term associations. These results support the idea that the local bottlenose dolphin population is part of a larger meta-population whose range is wider than the 196 km coastline of Israel and extends through the waters of neighboring countries such as Lebanon, Syria, Gaza and Egypt, and perhaps even further. To fully understand its dynamics, we need to break through the political boundaries of the area, an important step for future conservation. In our presentation, we try to tackle this sensitive issue by discussing existing solutions and suggesting new ideas.

Poster 169:

Pinger trials to reduce bycatch in Bulgarian Black Sea turbot fishery

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Incidental bycatch in fishing gear, mainly in bottom gillnets targeting turbot, is a major mortality factor for the Black Sea harbour porpoise (*Phocoena phocoena relicta*), an endemic subspecies listed as Endangered in the IUCN Red List. Acoustic deterrent devices or pingers are globally widely used to mitigate bycatch. In 2019-2022, trials with three different models of pingers (Future Oceans 10 kHz; Future Oceans 70 kHz; and PAL 10 kHz) were conducted in Bulgaria during standard turbot fishing operations. 85 hauls were covered by the study. Data was collected by independent onboard observers (66% of all hauls) and through self-reporting by fishermen (34%). In 62% of all hauls, we recorded bycatch. A total of 250 cetaceans were bycaught: 235 harbour porpoises, 12 bottlenose dolphins and 3 common dolphins. Soaking time varied between seasons: 14-31 days in spring and 7-26 days in summer. Bycatch rate varied significantly between the years (Kruskall-Wallis, $H=9.411$, $p<0.05$). Statistical analysis (nonparametric Mann-Whitney U test) showed that there is not significant difference in bycatch rates between spring and summer seasons ($U=755$, $p>0.05$). No significant difference in bycatch rates between active and control nets (2 hauls per trial) were observed in trials involving Future Oceans 10 kHz (18 trials) and 70 kHz (6 trials) pingers (t-test, $p>0.05$). A significant reduction in cetaceans' bycatch of 86% was however recorded during the 6 trials conducted with 10kHz-PALs (t-test, $p<0.05$) in 2020 and 2021. We therefore recommended PAL as a successful bycatch mitigation device to Bulgarian authorities and to the General Fisheries Commission of the Mediterranean (GFCM). GFCM initiated further confirmation trials in Black Sea waters of Bulgaria, Romania and Turkey.

Towards effective management of marine mammals in MPAs: the Marine Mammals Management Toolkit

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With climate change predicted to aggravate the detrimental effects that shipping, bycatch and pollution are having on marine mammal populations, the need for the development and implementation of effective management plans for the conservation of these species is at its highest. Marine protected areas (MPAs) have been essential in conserving and managing marine mammal populations, however their success is often hindered by lack of resources, capacity and/or knowledge. To tackle these threats, fill knowledge gaps and empower MPA managers, the Marine Mammal Twinning, as part of the EU-funded Ocean Governance project, created the Marine Mammals Management Toolkit. Aimed at aiding MPA managers to effectively take into account marine mammals into MPA management plans, the Toolkit comprises Factsheets, Good Practices, a Self-Assessment Tool (SAT) and a Community of Practice (CoP). The SAT, through a series of graded questions, enables MPA managers to monitor and understand the status and effectiveness of the MPA's management plan with respect to marine mammals. The use of the SAT and the wider Toolkit is then supported by the CoP, a network of MPA practitioners working with marine mammals, which promotes knowledge sharing, capacity building and transboundary cooperation. With the toolkit already being successfully applied in management plans in multiple MPAs across the globe, the 34th European Cetacean Society conference will provide an important platform to increase the reach and uptake of the Toolkit, and welcome MPA managers into a global network of marine mammal MPA practitioners. With more governments committing to the "30x30" Agenda, the danger of "paper" parks is at its highest. Thus, this tool is crucial for ensuring that MPAs are equipped, and managers have the capacity to conserve marine mammals effectively, preserve critical habitats, mitigate threats, and protect biodiversity.

Poster 171:

Mediterranean Gate Sanctuary for the protection of cetaceans

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Three Important Marine Mammal Areas (IMMAs) in the Alboran Sea have recently been identified through different workshops based on scientific evidence and expert opinion. This highlights the great importance of this area of the Mediterranean for this group of species where several cetacean species can be seen regularly. In this work, we carried out a systematic prioritisation using the prioritzr package in R to establish which are the priority areas within these IMMAs that will help the delimitation of new marine protected areas for the conservation of cetaceans. Two important areas emerged from the analysis, one are situated between the "Sur de Almería-Seco de los Olivos [ESZZ16003]" site of community importance (SCI) and the "Espacio Marino de Alborán [ESZZ16005]" SCI, and a second area close to the already defined "Estrecho Oriental [ES6120032]" SCI. In conclusion, we propose the creation of the Mediterranean Gate Sanctuary (English) / *Santuario Puerta del Mediterráneo* (Spanish) / *Sanctuaire Porte Méditerranée* (French) / الأ ب ت وسط م ر ي ةال محم اب ب بحر ال ي ض (Moroccan) in the whole Alboran Sea where a spatial-explicit approach (i.e. increasing protected areas elucidated in this analysis) will be combined with a basin-wide threat-based approach to achieve a compromise between cetacean conservation and exploitation of marine resources in the Alboran Sea. Spatially explicit information on cetacean abundance in the southern part of the basin is a high priority for comprehensive basin-wide planning.

Poster 172:

Joint Cetacean Data Programme: developing a cetacean data community for the benefit of cetacean science

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The theme of the conference: 'our oceans, our future', highlights the need for a collective approach for sustainable management of our ocean. The Joint Cetacean Data Programme (JCDP) is at the core of this approach, by creating a community of data sharing and collaborative action in understanding and protecting cetacean species. Collecting cetacean data at sea is time consuming, resource heavy and expensive. But is an essential part of understanding these species. A considerable number of surveys collecting effort-related data on cetacean species are conducted in the Northeast Atlantic. On their own these surveys can answer many questions, but spatial and temporal gaps remain. By collating these data together, we can build a more comprehensive picture of the ecology, abundance and distribution of these cryptic, widely distributed species. However, collating multiple datasets comes with challenges; differing survey protocols, data formatting and access complicat the process. The JCDP offers a solution by providing an online data portal which facilities access and wider use of these data, freely available resources for standardising vessel and aerial survey data, and metadata catalogue to improve discoverability of data. The JCDP has been developed as an international, cross sector collaboration, and is governed by a dedicated ICES working group to support and develop this shared resource for cetacean science. The JCDP provides multiple benefits for data contributors and users from across sectors. By bringing together data from international coordinated surveys to regional monitoring, citizen science programmes and industry monitoring surveys, we can fill current knowledge gaps in our understanding of cetacean seasonal distribution, changes in abundance and long-term shifts. The JCPD provides a free long-term solution to data storage and archiving, easy access to cetacean survey data from across the Northeast Atlantic and adds value to hard-won data by ensuring future use beyond the original purpose.

Poster 173:

Can pearls protect porpoises? Application of acoustic reflectors in gillnets to reduce bycatch of harbour porpoises and other odontocetes while keeping fish catches high

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The incidental catch in fishing gear, especially in gillnets, is one of the main threats to marine mammals around the world, including harbour porpoises (*Phocoena phocoena*). Consequently, there is an urgent need for the mitigation of bycatch to protect marine mammals while maintaining fisheries. Our study aims to develop and test fishing techniques that reduce the bycatch of porpoises in gillnets, but ensure profitable catches of targeted fish species. Since porpoises use echolocation for orientation, one way to achieve this might be to increase the acoustic detectability of gillnets. By attaching small acrylic glass spheres to a gillnet as those pearls were found to have a strong echo. By making the netting acoustically "more visible", the bycatch of harbour porpoises might be reduced in the so-called "pearl net" as the animals should recognize the netting as an impenetrable object. To investigate the pearl net´s effects on fish catches, catches of target species like plaice (*Pleuronectes platessa*), but also other species were compared between pearl net and a conventional flatfish gillnet net. The positive results of these trials show that, in case bycatches of harbour porpoise can be reduced significantly, the pearl net could be a fair compromise between fisheries interests and marine conservation goals not only in the Baltic Sea but also worldwide. Investigating the bycatch reduction of harbour porpoises by using the pearl net compared to a standard gillnet in a large-scale experiment will be the next step.

Poster 174:

The benefits of long-term data collection on cetaceans in Skjálfandi Bay, Northeast Iceland in collaboration with whale watching

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In 2001, long-term photo-identification, sighting location and animal behaviour data collection began in Skjálfandi Bay, Northeast Iceland by the Húsavík Whale Museum, and then, in 2007, the University of Iceland's Húsavík Research Centre in collaboration with local whale watching companies. Data is primarily collected by student interns, originally using paper logs and handheld GPSs, and now using the SpotterPro app on Ipads. Over the past 20 years this collaboration between the science and tourism sector has led to the creation of a database that contains over 1000 individually identifiable humpback whales (*Megaptera novaeangliae*), as well as more than 300 white-beaked dolphins (*Lagenorhynchus albirostris*) over the past 10 years, and more than 50 minke whales (*Balaenoptera acutorostrata*) over the past 8 years. The internship program hosts an average of 20 students per year, allowing them to earn credit and use the long-term data for their bachelor or master's degrees as required. In addition to this database supporting 5-10 student research projects per year of different sizes and scopes, the data collected has also contributed to scientific findings such the migration routes of the animals, the abundance and population trends of each species in the bay, and the prevalence of entanglement in fishing gear, showing the great value of long-term, collaborative, and low-cost data collection.

Poster 175:

Cetaceans and artisan fishery in a humpback whale breeding area off the coast of Esmeraldas, Ecuador

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From May to September, humpback whales (*Megaptera novaeangliae*) mate and breed off the coast of Ecuador in warm, shallow areas of the Bajos de Atacames off Esmeraldas characterized by scattered rock formations on soft substrate and highly frequented by artisanal and semi-industrial fisheries. Loss of fishing gear is poorly documented off Ecuador, but artisanal and industrial fisheries have increased all along the coast with an estimated 33 humpback whales entangled each year. Subtidal monitoring of benthic ecosystems off Esmeraldas in 2006 and 2020/ 2021 revealed that 90% of the 32 survey sites were damaged by lost or abandoned fishing gear. With long term data sets on the abundance, distribution and strandings of humpback whales and occurrence of other cetaceans we analyze the impacts of derelict fishing gear on humpback whales and the cetacean community. Artisanal fisheries bycatch was assessed in 2013 on board local fishing vessels and interviews with local fishers held in 2021 provided reasons for gear loss. In the past 20 years in the study area, artisanal fisheries increased to about 1550 fishers operating from 601 small scale fishing vessels by 2021. According to interviews, fishers state that 11% of the loss of fishing gear is caused by interactions with marine mammals. Onboard surveys conducted in 2013 revealed cetacean gear impacts on every second trip with 4 fatal events of dolphin bycatch. Off Esmeraldas from 2000 to 2021, 8 species were involved in a total of 33 strandings with humpback whales accounting for 43% of the reports. Relative abundance of humpback whales increased from 2000 to 2019, but sightings of other cetacean species was scarce and a shift in species was observed. Our data gives evidence for the need of efficient fisheries management including the control of artisanal fishing gear particularly a ban on nondegradable fishing nets.

Poster 176:

Conservation efforts to protect marine mammals in the southern Baltic Sea

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Population of seals in the southern Baltic Sea has been growing in recent years but still remains below Favourable Reference Level. According to the SAMBAH project, there are fewer than 500 harbour porpoise individuals left in the Baltic Proper. Thus conservation efforts have been carried out within a series of consequent projects carried out by WWF Poland since 2009. The current, fourth project: Protection of marine mammals and seabirds – continuation [POIS.02.04.00-00-0042/18], carried out from 1.04.2020 till 31.08.2023, aims to protect marine mammals: harbour porpoise, grey seal, ringed seal and harbour seal, as well as five seabird species (ringed plover, little tern, sandwich tern, common tern and oystercatcher) against anthropogenic threats and pressures. This is to be achieved through i.a.: rehabilitation of wounded or ill animals, minimizing the interaction between mammals / seabirds and fisheries (particularly important for the critically endangered population of harbour porpoise in the Baltic Sea), collecting scientific data on marine mammals and seabirds, their habitats and pressures they face, as well as monitoring migration routes of seals. All along the Polish coastline (over 500 kilometers) 200 volunteers organized within Blue Patrol help actively ensure that animals receive appropriate treatment when necessary. They also give advice to the public on how to behave while sharing the beach with wild fauna. A set of discussion fora is carried out with aim to exchange knowledge and experience about marine conservation activities. Some guidelines on the above mentioned issues are being prepared throughout the project, too. Comprehensive informational and educational activities are also carried out to gain support for the idea of protection of marine biodiversity. WWF Poland implements this project in cooperation with University of Gdańsk (Hel Marine Station) and Waterbird Research Group KULING.

Poster 177:

A magnifying glass on cetaceans and their environmental DNA

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The detection of genetic material left by organisms in the environment (eDNA) has rapidly grown as a tool for monitoring marine communities. The possibility to simultaneously identify multiple taxa within a single seawater sample, allows both to detect the presence of cetaceans and to study the biological communities associated to their presence. This is the aim of the project LIFE- CONCEPTU MARIS, currently the most extensive project using eDNA to monitor marine mammals in Mediterranean offshore waters. Although the eDNA approach can be extremely informative for assessing the health conditions of marine ecosystems, recent metabarcoding studies indicate that species detection may be biased towards more abundant taxa (e.g. bony fish), to the detriment of the rarer ones (e.g. marine mammals). In this study we aimed to develop a protocol to increase the number of reads associated to cetacean species. To do so, a multi-primer approach was tested, flanking the use of universal vertebrate primers to that of two novel primers sets specific for marine mammals both targeting homologous regions (12S-rRNA and 16S-rRNA). The test was performed on marine eDNA samples collected over a wide area of the Maldivian archipelago proving the ideal scenario for validating the new assay considering its diversity in cetofauna. Across the environmental samples, we identified over 250 taxa; cetacean species were detected both when sample collections were simultaneous to cetacean sightings and when no cetaceans were spotted during sampling. When the identified species were classified on the basis of their trophic level, we could appreciate that low trophic species were predominant within the atoll, while in pelagic waters predators were prevalent, confirming the reliability of the eDNA to resolve local communities at sampled sites. In conclusion, the newly developed markers and the use of combined multiple primers pairs seem promising in increasing the simultaneous detection of cetaceans.

Poster 178:

Influence of environmental conditions on the occurrence, spatial use, and health of bottlenose dolphins in northcentral Gulf of Mexico

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Mobile Bay (Alabama, USA) is one of the largest delta in the northern Gulf of Mexico, and drains the 4th largest freshwater discharge that strongly affect the estuarine ecosystem stability of this area. A poorly studied resident bottlenose dolphin (*Tursiops truncatus*) population inhabits these waters, where drastic variations of the environmental conditions (e.g. salinity, water temperature and dissolved oxygen) affect their spatial use, health and survival. To define how dolphins are impacted by these environmental variations, particularly the drastic seasonal and annual change in the salinity, we conducted capture-mark-recapture photo-identification surveys of dolphins in two major embayments in Alabama. We documented group size of dolphins and composition, collected environmental attributes and assessed the body condition of individuals (e.g. presence of skin lesions) during winter and summer. Dolphins were mainly observed in higher salinity waters (> 15 PSU) but they were also frequently observed in extremely low salinity waters (< 5 PSU). Salinity and dissolved oxygen seem to explain group size variations, occurrence, and the spatial distribution of dolphins. Bottlenose dolphin is also the most reported stranded cetacean in Alabama waters. Subadults were found stranded more often than other size classes and mostly in the spring (March to May), while females and fetuses stranded most frequently during calving season (January to April). When exposed to freshwater for an extended period of time, bottlenose dolphins developed skin lesions (e.g. combinations of pale, proliferative skin with multifocal to coalescing erosions and ulcerations). Forty-one percent of stranded animals were observed with freshwater lesions on their skin, especially in subadults and adults, with the highest occurrence following periods of lowest salinity and highest discharge within the study area.

Poster 179:

Analysis of the population structure of the Rough-Toothed Dolphin (*Steno bredanensis)* in the Canary Archipelago

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The rough-toothed dolphin (*Steno bredanensis*) is distributed in warm and tropical oceanic waters around the world. In some basins there are populations closely associated with oceanic archipelagos as Canary Islands. Scarce information are available on basic aspects of biology and ecology of the species. The rough-toothed dolphin is listed as Least Concern (LC) by the IUCN. In 2008 was record the first massive acute mortality case in Europe due to brevetoxin. The objective of this study was to analyze the population structure, habitat use and association patterns of the species through analysis of photo-identification from 366 sightings realized between 1995 and 2019 in the Canary Islands. This area is the only region within the european ambit where this species can be observed regularly a long the year, with higher frequency between the months of March and August. Group size ranged from 1 to 150 animals, with a mean of 19.2 individuals (n=332, range:1-85) for groups of less than 100 individuals. We have observed the presence of calf and neonate into the schools between the months of June and October. We photographically identified 725 individuals on the right side and 726 on the left side. This study revealed long-term residence (up to 8 years) in the region, a variable site fidelity to the área, which varies with the groups and islands, and the movement of individuals between islands.

Poster 180:

Can global warming cause a northward shift in the distribution of *Balaenoptera edeni* in the North Atlantic? Insights from opportunistic data

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Human-induced global warming may have serious impacts on ecosystems, including marine species. One way to understand these alterations is through the study of cetaceans as they may be considered sentinels of the ocean. The Azores archipelago is home to a great diversity of cetaceans, and whale watching activities have become one of the most important tourist attractiveness of the region. This study looks for changes in the occurrence patterns of a tropical whale (Bryde's whale, *Balaenoptera edeni*) in Azorean waters. To tackle this issue, 12 years of opportunistic cetacean occurrence data provided by different whale-watching companies under the MONICET project were used. An encounter rate was calculated to compare interannual variations in the temporal distribution of the species, weighting the number of sightings by a relative measure of effort. Generalized Additive Models (GAMs) were used to analyse habitat suitability of Bryde's whales in the Azores in relation to sea surface temperature (SST), an indicator of global warming. Our results reflect a more frequent occurrence of the species in the Azores archipelago between July and October, particularly increasing since 2017. The obtained model explains 44,8% of the Bryde's whale distribution in the archipelago, showing the most suitable SST conditions at around 23ºC. Sea surface temperatures are expected to continue to rise in the coming years, affecting the distribution of many species, as the case observed with Bryde's whales in the North Atlantic, which has already shifted northwards in the Atlantic Ocean. E xpanding our knowledge of the distribution patterns of oceanic species is essential to better understand the conservation implications and assess potential levels of threat.

Poster 181:

The use of land-based surveys to monitor small cetaceans in the south coast of Portugal

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The south coast of Portugal is an important area for several species of cetaceans, while also being a famous location for dolphin watching activities. In the past years, both boat-based surveys and platforms of opportunity have been used to study cetaceans in this region. Here we present a pioneer study using land-based surveys to monitor the presence and behaviour of small cetaceans in this region. Land-based surveys were conducted from a fixed point (Ponta da Baleeira) in Albufeira, at approximately 28.5m of altitude. Surveys were conducted from April to November of 2022, with sea state conditions of Beaufort 0–3, visibility (≥1 km), and no precipitation. During the surveys, ≥2 observers were scanning the water with binoculars and one person collected data. For each sighting, data on group composition, behaviour and cohesion were recorded as well as distance from the coast and vessel number/type. The sampling effort amounted to 223h over 85 days, resulting in 18 sightings of cetaceans. The most sighted species was the bottlenose dolphin (*Tursiops truncatus* - 83.3%), followed by unidentified odontocetes (11.1%) and common dolphin (*Delphinus delphis* - 5.6%). Bottlenose dolphins presented the highest encounter rate (0,07) and the month with most sightings of this species was October. Mean group size was 10.1 ± 7.6 (range 2 – 22, n=15) and the predominant behaviour observed was travelling (48.8%), followed by socialising (16.9%). Groups were found at an average distance of 3.2km from shore and 52% of sightings had ≥1 touristic boats present. This study highlights that the bottlenose dolphin is the species most often observed close to the coast in Southern Portugal. As this region faces high touristic pressure, a long-term monitoring program is required to understand the impacts of touristic activities on the behaviour and ecology of occurring cetaceans, and to establish proper conservation measures.

Poster 182:

Social structure of bottlenose dolphins (*Tursiops truncatus* Montagu, 1821) off Lampedusa Island (Strait of Sicily, Italy).

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Social structure is an important attribute of marine mammal social system. This study was conducted to investigate the social structure of the local population of the common bottlenose dolphin (*Tursiops truncatus*) off Lampedusa Island. Data were collected from 2013 to 2020, during 124 boat-based surveys of direct visual detection. A total of 73 well-marked individuals were photo-identified based on natural permanent marks on their dorsal fins, 59% of which were re-sighted over the years. Groups (n=117) averaged 4.5 individuals, with a mode of 2. We applied social network analysis to understand association patterns and community division. Only individuals observed on at least 3 occasions (n = 34) were selected to ensure a reliable representation of the data. Evidence for structure within the network was delineated from the estimate of social differentiation (S = 0.72) and data were representative of the true social system (correlation coefficient r = 0.4). However, the Half-Weight Index (HWI) averaged 0.07 (± 0.03), including mainly weak bonds and few strong bonds (3%). Highly significant differences were found in mean and maximum association indices within the five clusters evidenced (Mantel test: t = 12.4; p = 0), in which 94% of maximum association rates were greater than 0.4. The sociogram reveals a well-connected network with strong associations that reach up to 0.67. Temporal analysis of associations showed stable relationships over the study period. Bottlenose dolphins that inhabit Lampedusa Island waters show social structure characteristics similar to other populations: a well-differentiated fission–fusion society with variable grouping patterns and stable relationships. Multiple biological factors such as behavior, feeding and habitat preference should be examined to ascertain the extent to which individuals associate with others.

Poster 183:

Trophic niches of cetaceans of the Azores using stable isotopes

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Niche partitioning of time, space or resources is a key mechanism allowing the coexistence of sympatric competitors, especially guilds of predators. In the Azores, 28 species of cetaceans occur both seasonally and year-round. One can wonder how such diverse species share the local resources. However, the trophic ecology of cetaceans is largely unknown due to the difficulty of sampling, especially in oceanic archipelagos like the Azores, where strandings are very rare and stomach content data are scarce. As an alternative, we used carbon (δ13C) and nitrogen (δ15N) stable isotope ratios, which have proven to be a powerful tool for the identification of trophic niches and potential diets. Here, we analysed a total of 407 samples from 12 species of cetaceans occurring in the Azores. We determined Standard Ellipse Areas and overlapping probabilities between species and applied a hierarchical clustering analysis to identify species with similar trophic niches. Results showed that the cetacean community occupies a wide range of δ15N values (range=7.78-15.26‰), thus suggesting they feed on diverse trophic levels. Values of δ13C ranged from -20.43‰ to -15.09‰, suggesting the use of varying habitats among the species. The clustering analysis revealed that species can be classified into 3 functional groups. The niches of these 3 groups are relatively well segregated but there was a high overlap between species within groups. The greatest overlap was between the common dolphin and the striped dolphin (35.2%), followed by the sperm whales and bottlenose dolphins (34.2%). This study provides the first step to understand the trophic structure of the cetacean community in the Azores, and on the mechanisms promoting the coexistence of such a diversity of predators.

Poster 184:

Data access restrictions: the potential of currently unavailable marine mammal data

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The use of digital video aerial surveys (DAS) for marine megafauna is well established. HiDef Aerial Surveying Ltd. ('HiDef') have conducted such surveys for over a decade with derived density and abundance data fed directly into offshore renewable energy Environmental Impact Assessment (EIA). With large areas of the seabed currently leased for offshore wind development there is potentially a vast amount of available marine mammal data. Currently, data sharing is largely at developer discretion, with access restrictions resulting in external parties being unlikely to see these data beyond summaries presented during impact assessment. Here, we identified potentially available marine mammal DAS data collected in the UK and Ireland between 2009 and 2022. The total number of marine mammal observations was estimated at 50,866 individuals over 2,080 hours with cetaceans being the most commonly recorded group (40,173 observations). Harbour porpoise (*Phocoena phocoena*) and common dolphin (*Delphinus delphis*) were the most numerous (30,187 and 8,440 observations respectively). As an area of the marine environment currently undergoing extremely high levels of anthropogenic development, the North Sea was selected to be investigated further. Within this region, five marine mammal species were identified, of which harbour porpoise and grey seal were the most commonly recorded. Some progress has been made towards the development of data repositories, although the commercial sensitivities around these data are a barrier to full functionality. In Scotland, offshore wind licensing conditions for some developments have stated raw data are to become publicly available, however with no fixed timescales or recognised database, regulation and enforcement is challenging. These commercial data typically span multiple years and seasons which contrasts with many cetacean monitoring datasets which are biased towards the summer. Therefore, ensuring availability and accessibility of these data would be invaluable, especially when considering the highly mobile and transient nature of marine mammals.

Poster 185:

Short-term variability of the striped dolphin (*Stenella coeruleoalba*) suitable habitat in the Adriatic and Ionian Seas

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In the LIFE Project ConCepTu Maris framework, the striped dolphin (*Stenella coeruleoalba*) distribution was analysed to investigate the extension of suitable habitats (ESH) within the Adriatic and Ionian Seas and its variability across years and seasons. From December 2014, sightings data were collected by experienced MMOs belonging to FLT-Network, monitoring dolphin presence from the ferries' command deck along the Ancona-Patra transect. The gathered effort tracks and sightings were spatially organised using QGIS, geomorphological characteristics, climate variables, and maritime traffic density. Maxent allowed modelling species distribution employing presence-only data of each year and season (AUC values ranging from 0.912 to 0.954). Since during the COVID-19 pandemic, only some of the seasons allowed monitoring activity to be carried out to compare the habitat suitability of different years, just the ones with all seasons sampled were considered (2015-2019). Differently, all available data from 2014 to 2021 were employed to compare habitat suitability among seasons. MaxEnt suitable output maps were reclassified in binary suitable-unsuitable predictions under the Equal training sensitivity and specificity logistic threshold after having tested the "Minimum training presence logistic threshold" and the "Maximum training sensitivity plus specificity logistic threshold". The outputs binary suitable-unsuitable predictions raster were converted into polygon layers, including the highest suitable class only, to count ESH in km2 for each year and season. Results show differences in ESH among years and seasons that are not even in the two basins. Notably, in the Adriatic Sea, ESH increases during the spring and decreases during the autumn; in the Ionian Sea, it is maximum during the fall. The analysis of the shift of suitable habitat's centroids shows a similar pattern, North-West movement during the spring and South-East movement during the autumn, highlighting the challenge of protecting a dynamic species in a dynamic environment.

Poster 186:

25 years of research on killer whales in the Strait of Gibraltar. A review

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Even though killer whales (*Orcinus orca*) are known to inhabit a wide variety of different habitats, from the poles to tropical seas, their conservation status is still labeled "Data Deficient" on the IUCN Red List because of taxonomic uncertainty. Due to their non-interbreeding ecotype structure, small regional populations must be individually assessed when speaking about threatened status. In fact, Iberian orcas were proven to be genetically different from other near populations, such are the North Sea waters around Great Britain, Iceland, and Norway populations. In addition, a significant decline in the Iberian population has been observed along the years reaching the critically endangered status by the IUCN. Which, added to the recently increasing complains about the killer whales' interactions with different kinds of vessels and the increasing whale watching pressure raises the need to develop new management and conservation programs for the species. In response to this, CIRCE has been carrying out a monitoring program in the Strait of Gibraltar and Gulf of Cadiz for the species since 1996 to disentangle the number of individuals, social structure, and dynamics of the Iberian killer whales. For more than 25 years, a total of 65923 photos have been taken, and a total of 45239 km sampled. Using photo-identification 70 individuals belonging to 6 different pods. In this study, population abundance, distribution range, and potential threats of this population based on a long-term data collection of the period 2016-2022 are presented and compared to the period 1996-2015. Our main findings indicate that the Iberian orca population is potentially threatened and should be addressed as an endangered species. The knowledge gathered within this study is essential to establish new conservation measures for the Iberian orca population and implement more accurate management plans in the short term.

Poster 187:

Correlation of Sea Surface Temperature and Bottom Water Temperature with the presence of Sperm Whales (*Physeter macrocephalus*) and Cuvier's beaked whales (*Ziphius cavirostris*) in the NE Aegean Sea, Greece

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The Mediterranean populations of sperm whales (*Physeter macrocephalus*) and Cuvier's beaked whales (*Ziphius cavirostris*) are facing increasing anthropogenic threats. Improving knowledge on the distribution, abundance and habitat preferences of these cetaceans is essential for mitigating the impacting factors in this highly exploited region. Whilst abundance and site fidelity within the Mediterranean have previously been explored for these species, little is known about their distribution and habitat preferences within the Aegean Sea. This study investigates the potential correlation between sea surface temperature (SST), sea bottom temperature (SBT) and depth with the presence of sperm whales and Cuvier's beaked whales. Presence/absence sighting data of *Physeter macrocephalus* and *Ziphius cavirostris* between January 2017 and August 2022 was collected during 290 standardised boat-based surveys. A Generalised Additive Model (GAM) was used to examine the correlation between the presence/absence of the species and the biogeochemical variables: depth (EMODnet Portal), sea bottom temperature (Copernicus Portal) and sea surface temperature (Copernicus Portal). Prior to analysis, the environmental variables were tested for collinearity using variance inflation factors (VIF, threshold = 2.5). The independent variables were investigated with a non-linear regression (GAM). Results suggested that the presence of both species analysed in this study were strongly influenced by depth ($p < 0.01$) and SBT ($p < 0.01$). Further exploration showed that the fluctuation of SST was too weak to fit in the model (min SST = 20.03, max SST = 21.89). The most important covariates linked with the presence of deep-diving cetaceans were sea bottom temperature and depth, which is potentially associated with higher prey densities in colder and deeper waters. More extensive research of biogeochemical variables is required to improve the understanding of the distribution of these species in the Aegean Sea, hence contributing to their conservation.

Poster 188:

Exploring the habitat preferences and niche segregation of two teutophagous cetaceans in the Azores islands

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In a context of global change, understanding the ecological requirements of a transient tropical species in a highly dynamic environment is essential to study the potential impact of a distribution shift on a local marine community. Short-finned pilot whales (*Globicephala macrorhynchus*) visit the Azores islands mostly during the summer and autumn months, whereas Risso's dolphins (*Grampus griseus*) occur year-round in the archipelago. Both species are deep diving delphinids with potential overlap in their trophic niche. This study focuses on the habitat preferences and niche segregation of short-finned pilot whales and Risso's dolphins off São Miguel Island. For this purpose, we explored 11 years of whale watching data gathered in the MONICET platform (from 2009 to 2019). Generalised Additive Models (GAMs) analysing a set of environmental variables were applied to presence/absence data for each species, using sightings of non-target species as background for pseudo-absences. For pilot whales, model results indicate a positive effect on their occurrence of depths greater than 700 m, sea surface temperatures (SST) between 19 and 23ºC and low sea level anomalies (SLA). The best fitted model for Risso's dolphins also retained depth and SST as predictor variables (along with slope and distance to the coast), although it had an overall weak performance. For a direct comparison between the two species, we designed an additional GAM using Risso's dolphin sightings as presences and pilot whale sightings as pseudo-absences. Significant differences were found regarding depth, SST and distance to the coast, highlighting a greater preference of Risso's dolphins for shallower inshore areas and temperatures warmer than 22ºC, which suggests a certain degree of differentiation in their habitat use. According to our results, potential changes in the occurrence of pilot whales due to global warming may impact the local cetacean community and the overall deep-sea ecosystem.

Poster 189:

Sealed with a Poo: Preliminary eDNA Analyses of Mediterranean Monk Seal Faeces

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Environmental DNA (eDNA) sampling is a non-invasive research method that may be used to discover additional information about wild animals, such as if they are afflicted with a certain illness or dietary preferences. A specimen of Mediterranean monk seal *Monachus monachus* faeces was collected from a cave at Gökçeada Island, Türkiye, in the Northern Aegean Sea during a camera-trap surveillance study in 2018. The metagenomics analyses of the *M. monachus* faeces was made by amplifying the CO1 gene for the total DNA extracted from the sample. The sequencing was made in the Illumina Miseq platform, using 300 bp pair-end reads. The results confirmed that the faeces indeed belonged to a monk seal. In addition, the data showed the presence of *Diphyllobothrium* sp. and the fungus *Geotrichum candidum*. In addition, two unidentified OTUs (Operational Taxonomic Units) of gram-negative bacteria, one OTU of a tapeworm, and one OTU of a fungus/mold were identified. Gram (-) negative species of the culturable bacterial isolates were determined as dominant in the preliminary bacteriological studies of the sample. *Diphyllobothrium* sp. is among the parasites previously reported in the Mediterranean monk seal. Due to its non-invasive nature, eDNA studies ensure the safety of both the researchers and the animals during field studies and do not cause stress for the animals. Therefore, they have a great potential to complement other monitoring efforts, for not only abundance and distribution and diet but also the health status of such endangered populations. This study is the first one using eDNA in faeces to collect information about the health status of the Mediterranean monk seal.

Poster 190:

Long-term changes in the trophic position of dolphins in waters of Galicia (Northwest of Spain)

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Recent changes in climate and local hydrography have induced decadal shifts in plankton and fish assemblages in the highly dynamic coastal upwelling system of Galicia (Northwest of Spain). These changes in the composition and structure of the pelagic food web may have affected upper trophic levels. This study aims to understand whether and how top predators have responded to these changes in the food web by investigating long-term changes in the ratio of nitrogen stable isotopes (δ15N) and in the trophic position (TP) of two species of dolphins inhabiting Galician waters. Skin tissue samples from 121 common dolphins (*Delphinus delphis*) and 62 striped dolphins (*Stenella coeruleoalba*) that stranded along Galician shores between 2004 and 2019 were selected to perform bulk and compound-specific analyses of nitrogen stable isotopes. Results of Generalized Additive Models using bulk δ15N as a proxy for TP showed a significant increase in the trophic level of common dolphins over the 18-year period, which was mainly driven by the increasing trophic level of females. In addition, males had higher δ15N than females. No significant changes were observed in striped dolphins, in either sex. Future steps include using a subset of samples to perform amino acid compound-specific isotopic analyses in order to compute TP, and to determine whether the trends observed from results using bulk δ15N are driven by a change in the diet of dolphins and/or a change in the isotopic baseline of the pelagic food web. Results from this study will provide a better understanding of how top predators react to ecosystem changes, in particular by identifying the main factors driving this response. This will ultimately inform current and future ecosystem management policies in a context of rapid climate change due to natural and anthropogenic forcing.

Poster 191:

The nutritional and trace metal dynamics in the multidimensional niche of a delphinid

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There is need to jointly explore the nutritional and chemical links of pollutants, to understand the ecotoxicological effects on different life history stages. We combine stomach content analyses nutritional composition of prey, the Multidimensional Niche Framework (MNNF) with Bayesian multivariate ellipses, trace metal analysis and nicheROVER to explore the nutritional and trace metal niche dynamics across sex, age, and sexual maturity status in common dolphins (*Delphinus delphis*) from New Zealand. Prey composition niche breadths (SEAc) revealed broader niche breadth in immature compared to mature individuals. Such differences are likely attributable to foraging behaviours, physiological responses, and tailored nutritional needs for each maturity phase. Immature and mature dolphins shared four prey species (grey mullet, pilchard, jack mackerel, arrow squid), consumed at different proportions, accounting for 94.0% and 96.8% of the wet mass contributions to their respective diets. MNNF revealed mature dolphins had broader Hg and Se niches characterized by the higher concentrations in livers and kidneys and a low overlap with the niches from their immature conspecifics. The low overlap niche overlap estimated by SIBER and nicheROVER models between maturity stages groups likely provides insight on the pathways and resources (foraging behaviour, prey, and habitat) from which metals are incorporated. We highlight the importance of a multidisciplinary approach to evidence how the interactions between the nutrients and metals shape the multidimensional nutritional niche that common dolphins occupied during two distinct life history stages (i.e., immaturity and maturity). Our combined nutritional and trace metal assessments unravelled the underlying intricacies on how the nutritional requirements and foraging strategies are important to predict the trace metal intake and potential physiological consequences from consumed prey.

Poster 192:

Stability and fluidity of short-finned pilot whale social groups of known sex off Madeira Island

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Comparative studies of animal societies have shown that social organization, social structure, mating system, and care system can vary widely among mammalian species or populations. For pilot whales, the matrilineal social system has been described and it is widely recognized that females grow to maturity in their natal group. However, the understanding of male stability and natal pod philopatry is poorly understood. Off Madeira Island (Eastern North Atlantic), biopsies from free-ranging short-finned pilot whales (*Globicephala macrorhynchus*) allowed identifying 52 sexed individuals through genetic analysis. This information was combined with long-term photographic-identification data, collected between 2003 and 2020, and has allowed to infer on this population's matrilineal social structure, and to investigate male natal pod philopatry. Social analyses included hierarchical cluster analyses and standardized lagged association rates. The resulting dendrogram divided the sexed individuals into 8 pods of mixed sexes and a mantel test suggested no significant differences in association strength within or between sexes ($p>0.4$). Two pods contained only female individuals, while no pods contained only males. The social analyses indicate that most individuals were frequently sighted with particular companions. Strong dyadic associations were suggested in 33.33% of the individuals, as they displayed a maximum association index of >0.80. The association rate between individuals decreased with time but never crossed the null association rate indicating the presence of stable associations over a more extended period. This study confirms that short-finned pilot whales in Madeira exhibit long-lasting and stable groups of mixed sexes and supports the hypothesis that pilot whale social groups are primarily matrilineal.

Poster 193:

A multimethod approach to analyse the dietary composition of the Baltic grey seal (*Halichoerus grypus*) in the southern Baltic

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Baltic grey seals (*Halichoerus grypus*) returned to the Southern Baltic in the early 2000s, and in 2021 more than 40,000 were counted in the Baltic Sea, with about 10 % of the population found in the southern Baltic. As top predators, grey seals compete to some extent with coastal fisheries for the same resource. Estimation of total consumption of key fish species by grey seals is hampered by the low natural abundance of some species such as northern pike (*Esox lucius*) as well as high mobility of seals moving among inner and outer coastal waters where the fish communities differ. Moreover, grey seals are known to feed on soft tissue of large-bodied species such as pike or marine mammals. Therefore, hard parts of those species may not be detectable with morphological analyses. We anticipated a better understanding of the grey seal diet composition with genetic analyses. In this study, morphological and genetic methods are combined to estimate the diet composition of Baltic grey seals. Samples were collected during necropsies within the marine mammal stranding network of the German Oceanographic Museum in Mecklenburg-Western Pomerania (Germany). In total, 96 intestine- and 27 stomach-content samples were taken. DNA was extracted and the mitochondrial 16S rRNA gene was targeted for DNA metabarcoding using a combination of existing primers and newly designed primers that cover the expected local diet of grey seals. For comparison, 13 whole intestines and all 27 stomachs will be analysed morphologically as well. First results indicate that hard part recovery of fish parts in the intestinal tract seems to be weak. DNA extraction success from 62 samples to date does not appear to depend on the state of decomposition, although DNA concentration varies among samples. We aim to provide a new molecular tool to exemplify predator-prey interactions.

Poster 194:

Does the "medical" smell of gray whales persist from season to season in the Senyavin Strait?

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Gray whales feed mainly on benthic organisms, but geographical differences in their diet are poorly understood. Some eastern gray whales that come to feed off the coast of Chukotka have an unusual medical odour, which may be due to their diet. One of the objectives of whale research in the Senyavin Strait was to determine how long the acquired smell lasts. In order to do this, we attempted to detect the smell of as many whales as possible, taking their photographs for further identification. During the observation period of one month, we managed to smell an exhalation odour of the wales 59 times. We were able to determine at least 9 of the so-called stinky whales, and at least 24 non-stinky whales. Analysing results and comparing them with last year data, we determined four categories: 1) whales whose smell we did not determine in the past, but in 2022 they had a medical smell, 2) whales who had no medical smell neither last nor this year, 3) one whale who had a medical smell both in 2021 and 2022, 4) two whales that had a medical smell in 2021, but lost it in 2022. This suggests, at least, that the whales are able to lose the smell, so the presence of this smell is not a genetic feature of some whales and may be caused by other factors, such as diet. Considering that some of the whales in Senyavin Strait displayed a tendency to feed in one certain selected locality throughout the period of observation, it is quite possible that the presence of a medicinal odour depends on an individual whale's dietary preferences.

Postert 195:

Trophic position and isotopic niches of odontocetes in a remote oceanic archipelago in the Eastern North Atlantic

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Cetaceans are high trophic level predators, for which detailed information regarding habitat requirements and functional position in oceanic food webs is still scarce. In Madeira Archipelago (NE Atlantic), 29 species of cetaceans have been identified and are present year-round, seasonally, or occasionally, and may rely on similar food resources. Here, we investigated the trophic position and trophic niche size, and potential interspecific differences in resource or habitat use of six species of odontocetes. To that, we used carbon (δ13C: 13C/12C) and nitrogen (δ15N: 15N/14N) stable isotopes from the skin of free-ranging adult individuals collected within the same time frame. The results showed significant interspecific differences, with sperm whales (n=7), short-finned pilot whales (n=32), and false killer whales (n=8) occupying a higher trophic position than common bottlenose dolphins (n=38), Atlantic spotted dolphins (n=33) and short-beaked common dolphins (n=47). There were no significant differences between the sexes, except for the false killer whales (n females=4, n males=4), in which females presented a higher trophic position. The higher δ13C and δ15N values found in sperm whales, short-finned pilot whales, and false killer whales suggest differences in resource or habitat use, or both, relative to the other studied species. The largest isotopic niches were presented by short-finned pilot whales, bottlenose dolphins, and Atlantic spotted dolphins, which could be related to intraspecific variability in diet or the presence of different ecotypes within species. This study provides the first overall assessment of the trophic ecology of several species of cetaceans in this area of the Atlantic.

Poster 196:

Photo-identification of fin whales in inshore Irish waters: building a catalogue to support citizen science

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The fin whale (*Balaenoptera physalus*) is one of the most abundant mysticetes in Irish coastal waters, particularly inshore along the south and southwest coasts. Their regular occurrence is of international significance, and the Celtic Sea area of the Irish South coast provides important feeding habitats. Whooley et al. (2011) analysed fin whale images collected between 2003 and 2008 and showed a high inter-annual resighting rate of 18% with mean residency times of 33 days with a maximum of 165 days. The Irish Whale and Dolphin Group (IWDG) solicit images from citizen scientists obtained on opportunistic platforms such as commercial whale watching and private boats, as well as from dedicated photo-ID research through the Whale Track Ireland project. In the current study, images were analysed from a 20-year period (2003 -2022). Individual fin whales were identified through permanent features including lesions on the dorsal fin, chevron/blaze patterning and scarring. A minimum of 53 individuals were identified, each allocated a unique reference with associated sighting histories. Of the animals re-sighted over multiple years, 65% were resighted ≥ three years. The Irish Fin Whale Catalogue is available online on www.iwdg.ie to facilitate matching and sharing with organisations within and outside Ireland. Currently, no international matches have been discovered and we hope that by encouraging collaboration we can increase our knowledge of the movements and ecology of fin whales in the North Atlantic. Increased development is projected in Irish waters, including a significant expansion of marine renewable energy, with a forecasted 80% of energy supplied by offshore wind by 2030. Ireland has also committed to designating 30% of its territorial waters as Marine Protected Areas by 2030. More data is urgently required to inform effective management plans to ensure the conservation of large whale species such as fin whales.

Poster 197:

Investigating the role of prey depletion in cetacean distributions and population dynamics

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A key driver in determining the distribution and demography of cetaceans is the dispersion of their prey, in terms of availability, abundance and quality. A Working Group on Resource Depletion has been established within ASCOBANS to review current knowledge and develop recommendations for research and action. It includes members with expertise in veterinary and fishery science, cetacean biology, ecology and conservation. The group has eight terms of reference - reviewing and collating recent information on resource depletion and its impacts, prey distribution and abundance, health and condition indicators, small cetacean diet, spatio-temporal trends in small cetacean species, emerging technologies, integrating information from multiple data sources, and making recommendations for possible mitigation measures to aid conservation. As a first step, the group has summarised information on the diets of all small cetacean species regularly occurring in the ASCOBANS Agreement Area, and explored the parameters required to assess cetacean health and condition at both an individual and population level. The need to better understand prey choice in terms of prey availability and caloric content is highlighted along with the development of indicators of food shortage through necropsies of dead animals and photographic assessments of body condition in live animals. Future research, monitoring and conservation needs include refining the definition of prey depletion, developing prey depletion reference points, and articulating associated conservation objectives. We also need a better understanding of the relationships between cetacean physiology, energetics, body condition, health and diet, and of the population and ecosystem level consequences of prey depletion (e.g. based on the use of ecosystem models). Improved monitoring of prey and cetacean distribution and abundance at relevant spatiotemporal scales would facilitate estimation and mapping of resource depletion risk.

Poster 198:

New insights into sperm whale social units presence in the western Ligurian Sea (NW Mediterranean Sea)

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In sperm whale populations adult males are known to segregate from social units of females and immatures as they reach sexual maturity. This social pattern has been described also in the western Mediterranean, with males occurring in more northern waters, while social groups generally remain at lower latitudes. Since 1990 sperm whales have been reported with increasing frequency in the western portion of the Pelagos Sanctuary (north-western Mediterranean Sea) during summer. In this study photo-identification images, collected during surveys carried out from 1990 to 2022 in the north-western Ligurian Sea, were analyzed with the aim to confirm the occurrence of females in the area. The presence of dorsal fin calluses was adopted as the primary identification criterion of gender. Group composition was assessed considering field estimates of the size, afterward confirmed through photo-id images. In over three decades of monitoring, 570 sperm whale sightings were collected. In 97% of the sightings, mainly sub-adult/adult males performing foraging activity were encountered in average group sizes of 1.4±0.5 (1990-2005) and 1.5±0.3 (2006-2022) individuals. Since 2017, four groups of females and calves were encountered during six different sightings, with two groups sighted twice. Their average group size was 8.3±4.9 individuals (min: 2 - max: 16). Eleven females showing calluses and seven calves were identified. The number of calves ranged from one to three per sighting. Re-sightings of females occurred only within the same season. Sightings were made over an average depth of 2,000 meters in an area affected by intense maritime traffic. Concerns are rising about the threats (such as the risk of collision with vessels) these vulnerable individuals are subjected to. Therefore, further effort is needed to verify the persistence of the social units with females and immatures in the area and to confirm if a shift in sperm whale distribution is occurring.

Poster 199:

Sperm whale (*Physeter macrocephalus*) commercial whaling catches in Norway reveal historic range and life history information

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The sperm whale is the largest toothed whale and displays a wide range in habitat preferences from equatorial tropical areas where the breeding grounds exist north to the foraging grounds as far north as the sea ice pack edge at high latitudes in the North Atlantic and Arctic Oceans. Norwegian waters represent an important male sperm whale foraging area with an extensive continental shelf edge pocketed with submarine canyon systems along the western Norwegian coast up to the Svalbard archipelago. This species was targeted by commercial whaling in Norway from 1925 – 1971. 1,550 whales were landed at 5 land stations along the western and northern Norway during the whaling season from March – November. Catch numbers peaked in July at 379 but similarly high catch rates were noted for June (n = 376) and August (n = 319). Most of the whales were caught in northern Norway at the Skeljnan whaling station near Tromsø and following World War II from 1948 – 1971 (n = 1,088, 69.8% of total catches) along the continental shelf edge. This region overlaps with Bleik Canyon and Andenes on Andøya Island where a year-round whale watching industry has operated since 1987. Most whales were caught in water >1,000 m depth. Sperm whale catches increased in frequency when baleen whales (in particular fin whales (*Balaenoptera physalus*)) were caught lower numbers which may have prompted effort in more suitable grounds for sperm whales. Catch rates were lower off western Norway where the continental shelf's distance from shore was greatest. 1,242 sperm whales with reportedly accurate length measurements were noted. Total lengths ranged from 11.58 - 17.37 m with a median length of 14.94 m. 140 whales (11.3% of catches) were >16 m. The use of historic whaling data helps to provide an insight into this species life history.

Poster 200:

Impact of climate change on marine mammals around the UK (MCCIP Review 2022)

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As part of the Marine Climate Change Impacts Partnership (MCCIP), the JNCC carried out a review of current scientific understanding on the impacts of climate change on marine mammals relevant to the coastal and marine environment around the UK and Ireland. This review builds from previous MCCIP reports and collates the most recent evidence to provide an update on scientific understanding of the impact of climate change on marine mammals around the UK. The UK is well-placed to monitor and observe changes in both resident and transient marine mammal populations due to its position between warmer subtropical waters and colder Arctic waters which places both cold and warm water species at the edges of their thermal tolerances. The evidence reviewed continues to suggest that the predominant impacts of climate change on marine mammals are geographic range shifts, reduction in suitable habitats, food web alterations and increased prevalence of disease in marine mammal populations. However, with the diverse range of anthropogenic pressures presently acting on marine mammals in UK waters (e.g., offshore infrastructure development, commercial fisheries, tourism) and the difficulty in determining causation from correlation with many observed changes in marine mammal populations, it remains challenging to separate climate change induced pressures from wider cumulative pressures. More long-term species monitoring, and a better understanding of cumulative impacts and bottom-up effects are needed to improve confidence in understanding of what is already happening to marine mammals because of climate change, and what could happen in the future. The review has involved collaboration and coordination across multiple UK government organisations and external scientific experts for collation of evidence and review. The review contributes to the MCCIP report cards, providing a publicly available evidence base of the impacts of climate change for a range of topics in the marine environment.

Poster 201:

Stories of the Sea(l): Grey seal stomachs tell us more about fisheries interactions and prey consumption in Southern Baltic Sea

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Since the early 2000s grey seals (*Halichoerus grypus*) return into German Baltic waters thereby re-establishing the conflict between fisheries and the once common top predator. By morphologically analysing the hard parts in more than 110 grey seal stomachs of stranded and bycaught animals along the coast of Mecklenburg-Western Pomerania we analysed seasonal trends and prey size preferences in the seals' diet, documented net remains and other debris. A wide prey spectrum with more than 20 species was documented. Based on the size of otoliths and chewing pads prey size and bio mass intake were estimated. The most common species were herring (*Clupea harengus*) and cod (*Gardus morhua*), both represented >30 % of the estimated biomass. Roach (*Rutilus rutilus*) was found in >10 % of the stomachs and represented >20 % of the calculated biomass. Therefore, this fresh water species was of high importance for grey seal diet, which is a new finding. The neozoan round goby (*Neogobius melanostomus)* was found in juvenile seals several times. Even unsuspected prey species like the long-tailed duck (*Clangula hyemalis*) and the Eurpoean river lamprey (*Lampetra fluviatilis*) were documented. Through typical lesions in carcasses harbour seals (*Phoca vitulina*) and harbour porpoise (*Phocoena phocoena*) could be identified as grey seal prey in this region for the first time. A considerable part (10 %) of the analysed stomachs was empty. In 29 stomachs nematode infestations were documented. In 15 stomachs (14 %) whole or parts of undigested fish were found, indicating an acute cause of death, like by-catch. Fresh fish without heads might indicate that grey seals fed on fish in gill nets. In two stomachs parts of gill nets were found. Beyond that, four stomachs contained other marine debris. Our findings show that stomach content analysis is one major tool to address urgent conservation research questions.

Poster 202:

Twenty years of temporal trend assessment for regulatory trace elements in common dolphins and harbour porpoises from French Atlantic waters

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Cetaceans are long-lived species often located at high trophic positions where they bioaccumulate toxic trace elements (TEs, among other chemicals) through the food web. On an evolutionary time scale, this natural exposure to TE implies that cetaceans may, have developed mechanisms to control and/or mitigate any toxic effects of TEs. Consequently, cetaceans are heralded as sentinel species to assess the chemical contamination of the marine ecosystems. In this context, temporal trends of mercury (Hg), cadmium (Cd) and lead (Pb) concentrations were studied with dynamic linear models through the analysis of 264 individuals belonging to two cetacean species, the common dolphin (Delphinus delphis) and the harbour porpoise (Phocoena phocoena), from two different Management Units (MUs) in the north-eastern Atlantic for the latter species. These individuals stranded along the French Atlantic coasts between 2000 and 2019. Trends were estimated while taking into account age- (or length), sex- and stable isotope ratios of carbon (δ13C) and nitrogen (δ15N; both proxies of the animal's feeding ecology). Results showed that Pb concentrations decreased over time in both species and MUs, according with the lead petrol regulation after the 2000s. A long-term increase of total Hg and Cd concentrations was observed in both species but was statistically significant only in common dolphins. The models applied also reflected an important effect of confounding factors. Lastly, the Se:Hg molar ratios of these species were calculated and suggested a low risk for Hg toxicity over time. This temporal trend assessment provides information about the rates of change of TEs concentrations in these marine sentinel organisms and has been proposed as a national indicator under the European Marine Strategy Framework directive in France.

Poster 203:

Environmental DNA as a cetacean monitoring tool in the Northern Coast of Continental Portugal

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In recent decades, environmental DNA (eDNA) has emerged as a utopian monitoring tool in the marine conservation landscape, for its potential to collect data on presence and abundance of biological communities with insufficient knowledge and/or difficult access. In the ATLANTIDA Project, this tool is being optimized with the ultimate goal of detecting and identifying cetacean species on the northern coast of continental Portugal without relying on visual monitoring. To this end, a molecular biology-based methodology is being developed and tested in positive control samples, consisting of a mixture of DNA extracted directly from muscle tissue or gums of cetaceans with eDNA samples collected in ATLANTIDA dedicated at-sea surveys. Firstly, in silico analysis using metagenomic data was performed to assess the pair of primers directed to mitochondrial DNA presenting the highest variability and, consequently, a higher probability of distinction among the target species. For that purpose, different sets of primers previously described in the bibliography were analysed and unique single nucleotide polymorphisms between the species of interest were counted. After the selection of the most suitable primer set, several optimization tests have been conducted, through conventional PCR, in order to identify the most efficient DNA amplification protocol for the gene of interest. From these tests, we were able to identify the ideal annealing temperature, the best TAQ polymerase enzyme, and the detection of cetacean DNA up to very low concentrations (~5ng/µL) was achieved, with salt water not inhibiting the reaction. In environmental samples, we were still not able to detect cetacean DNA, probably because of its concentration below our detection limit in the samples tested. In conclusion, although the effectiveness of resorting to eDNA for cetacean monitoring programs remains unclear, these results represent a step forward towards that goal.

Poster 204:

Photo-identification catalogue for Mediterranean monk seals - a functional methodology

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Within the framework of a photo-identification project in the central Ionian Sea, Greece, starting in 2018, camera traps in marine caves are used for establishing actual numbers of the endangered Mediterranean monk seal. A catalogue of individual seals has been developed following a procedure with strict criteria to avoid over- or underestimation. Seal identification is based on natural marks following and updating previous methodologies: patterns of fur coloration, ventral patch or its lateral remains and presence of scars. Animals are categorized in pups, juveniles, subadults and adults, along with their gender if detectable. The period from installation to retrieval of a camera is defined as a session. Each session´s data are registered in an excel file with date, time, absence/presence and number of animals for each picture, as also the classification of each animal as a completely, partially or not identified seal. A completely identified animal is a seal for which both sides, back, and belly are recorded within the session, and it is classified with a unique code. A partially identified animal´s morphological features allow to diversify it from completely identified seals but one or more of the above-mentioned records is lacking. It is classified with a temporary code. Not identified seals are listed under the generic code UK. Characteristic pictures of completely or partially identified seals are included in sheets forming a Session Catalogue of individuals. In subsequent sessions and/or re-examining the previous ones, a seal partially or not identified can be re-classified. Only completely identified subadults and adults, with information on recaptures through sessions, are included in a Main Catalogue, thus representing the absolute minimum number of potentially reproductive seals composing the population. Long-term monitoring is essential for evaluating population numbers and other ecological parameters.

Poster 205:

First Photo-ID catalogue of gregarious oceanic dolphins in the Northern coast of Continental Portugal: *Delphinus delphis* and *Tursiops truncates*

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Photo-identification (photo-ID) is a non-invasive method for assessing population dynamics and spatio-temporal distribution of cetaceans. It is generally used for coastal species with relatively low group sizes and distinctive marks on their dorsal fins, such as cuts and nicks/notches. Nevertheless, there are limited photo-ID studies examining gregarious species found in large groups and oceanic environments. Here, we developed a photo-ID protocol and started the first catalogue recording the poorly-marked common dolphins (*Delphinus delphis*) and bottlenose dolphins (*Tursiops truncatus*) from waters off the coast of Northern Continental Portugal. Photos were collected between June 2021 and September 2022 in the course of 22 at-sea campaigns dedicated to cetacean monitoring under the scope of ATLANTIDA Project. The monitoring efforts resulted in 46 photographed sightings of *D. delphis* with a total number of 1840 processed photos, and 3 photographed sightings with 429 processed photos for *T. truncatus*. We developed a processing protocol, adapted to the photographic data available for the region, by closely examining picture quality (PQ) on a scale from 1 (low) to 4 (high) and dorsal fin distinctiveness of individuals. After processing the photos, we recorded 220 individuals (PQ >1) of common dolphins of which only 59 were distinctively marked individuals (DMIs) and can be used for assessing population structure. For bottlenose dolphins, although with only 3 encounters, our photo processing revealed that these species are more marked, having 16 DMIs out of 23 individuals determined from PQ > 1 photos. So far, our catalogue has one match of *D. delphis*, showing that the same individual was encountered in March 2022 and August 2022. This result reinforces the need to expand the photo-ID catalogue throughout the seasons for a better insight into the population structure and dynamics of dolphins inhabiting the Northern waters of Continental Portugal.

Poster 206:

Trace elements in fin whales off Western Iceland

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Heavy metals, widely amplified by human activity, can produce toxic effects on organisms when they reach high concentrations. In this study, we analysed the concentrations of Cu, Cr, Ni, Pb, Cd, Se, Mn, Fe, Zn and Hg in the muscle of 97 fin whales (*Balaenoptera physalus*) caught off western Iceland in the 1986, 2009, 2010, 2013, 2014 and 2015 whaling seasons. We investigated the effect that sampling period (1986 vs 2009-2015) had on the concentrations of the various elements. For many heavy metals (all except: Cr and Fe) the concentrations in the samples from 1986 were significantly higher than those from 2009-2015. Cd was the element that showed the greatest drop, reducing by more than 90% compared to the first period. Cd, Pb and Hg are heavy metals that, due to their toxicity, have seen their use increasingly regulated and their reduction in the whale tissues (90%, 50% and 36% respectively) reflects a decrease in the anthropogenic use of these metals along the North Atlantic basin. On the contrary, Fe was the only metal that increased by 3% its concentrations between the two periods. Funding: MICINN / 10.13039/501100011033.

Poster 207:

Towards the definition of the Humpback Whales population units in Tanzania - revealing the unknown from the data deficient regions

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Humpback whales (*Megaptera novaeangliae*) are one of the most widely studied cetacean species worldwide, yet there remain areas of data deficiency, including Tanzania. It is known that between June and December, the waters of Tanzania hold important breeding and nursing grounds for humpback whales. The existing data gaps prevent an accurate understanding of the identification of regional whale assemblages, subpopulation boundaries and connectivity. The current study employs visual techniques during boat surveys with stratified effort to develop a photo-identification catalogue that is shared with regional and global datasets. Boat surveys have been conducted in the Unguja and Mtwara region since 2017. Overall, 43 days (174:45 min) were surveyed of which the species were encountered 24 days (105:41 min). In total, 24 focal groups were followed, resulting in 92 photographically identified individuals. One individual was re-sighted in Tanzania waters in between years, and one whale was re-captured within one season. To understand the movement in between subpopulations, the "Happy Whale" platform has been used to compare identified individuals of Tanzania with the global dataset, which transpired a single individual captured off Zanzibar in 2022 to be also catalogued and sighted twice outside of the West Indian Ocean region, which represents a long-distance match between two different breeding grounds. The low re-sighting rates within and in between seasons, together with the documented unique cross boundary match, indicate the complexity of migration routes and populations' dynamic. These initial results shed light on our understanding of the site-fidelity, residency time and the movement range of humpback whales within Tanzanian waters and underpin the necessity of further research on the habitats that hold considerable gaps of knowledge.

Poster 208:

Multiple collapses in ecological niche size reflect historic trophic alterations in the Black Sea ecosystem

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Marine ecosystems are threatened by the legacy of (over)exploitation and ecosystem degradation. The Black Sea is no exception and is disproportionately affected by anthropogenic influences due to its isolated nature and small size. Despite a long history of marine exploitation, eutrophication, and bioinvasions, there has been little work done comparing the preindustrial and modern Black Sea ecosystems. To examine the impacts of modern and historic anthropogenic changes, we use stable isotope analysis (C and N) as a proxy for the dietary/ecological niche of archaeological and contemporary Black Sea cetacean (ancient=79; modern=51) and fish samples (ancient=14; modern=40). The archaeological cetacean and fish data show isotopic similarity with high pairwise percentages (over 60%); suggesting all four predator species (*Tursiops truncatus*, *Phocoena phocoena*, *Delphinus delphis*, and *Scophthalmus maximus*) may have been part of a single dietary niche. While modern samples appear isotopically similar to the ancient samples, comparisons between isotopic niche size in the modern and ancient cetaceans and turbot show a four-fold reduction over time, reflective of a fundamental shift in the food-web likely resulting from general degradation of the Black Sea marine ecosystem. Our analysis provides ecologically relevant timescales pertinent to understanding trends and changes vital for conservation efforts key to modern ecological problems in degraded marine systems.

Poster 209:

Photoidentification of the Common Dolphin (*Delphinus delphis*) in the Bay of Algeciras (Southern Spain). Preliminary study

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The identification of small cetaceans using photographs is a widely used non-invasive technique that uses physical characteristics, such as nicks and/or notches on the dorsal fin, which are unique to each animal and stable over time. Photo-identification catalogues of common dolphins are scarce because this species is not usually very well marked and, if it has markings, they are usually very small, making identification difficult. However, common dolphins inhabiting the Bay of Algeciras (southern Spain) show numerous markings as a consequence of the activities carried out in the area, mainly due to their interaction with fishing and recreational boats. In addition, Algeciras Bay is home to a resident population of this species, which facilitates the photo-identification of individuals. From a total of 36,220 photographs obtained during the study period (March 2017 - March 2018) in 272 sightings, numerous images have been obtained of animals (of more than 400 individuals) with markings on the anterior and posterior edge of the dorsal fin (in many cases on both sides), as well as on its distal end and some individuals with partial or total mutilation of the dorsal fin. The use of dorsal fin pigmentation patterns has been adopted as a secondary photo-identification character for those animals that appear poorly or not at all marked, as it has been observed that this spotting in adult animals is symmetrical and invariable over long periods of time. The aim of this preliminary catalogue is to count what proportion of the population is lacerated, to classify the number of lacerations according to their possible causes and to draw up a conservation plan for this species in the area.

Poster 210:

Investigating dolphin connectivity in south-east Queensland, Australia

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Dolphin studies in south-east Queensland (SEQ) are sparse, with efforts primarily focused in Hervey Bay (HB) and Moreton Bay (MB), two coastal embayment's and designated marine parks located 150km apart. Despite limited study, 14 dolphin species have predicted ranges in SEQ waters; however, the unprotected waters between HB and MB (i.e., along the Sunshine Coast) are data deficient as no dolphin studies have ever been conducted in the area. The basis of this range information is from population modelling derived from habitat suitability, not from confirmed studies. Therefore, it remains unknown what dolphin species inhabit these waters and whether the two embayment's are home to distinct populations of dolphins or if spatial overlap and gene flow occur via the unprotected waters between the two marine parks. Data will be collected from a combination of wildlife stranding's data and via land- (via theodolite) and boat-based surveys to investigate which dolphin species are present, their current distribution, and movement throughout SEQ. The questions I will answer are: i) what dolphin species utilise the waters between HB and MB, and ii) are these resident or transient individuals? Stranding's data indicates that at least 7 delphinid species inhabit SEQ waters which is further confirmed by the initial sightings results; finding 2 resident species inhabiting the Sunshine Coast waters: the Indo-Pacific bottlenose (*Tursiops aduncus*) and Common bottlenose (*Tursiops truncatus*) and less frequent sightings of Australian humpback dolphins (*Sousa sahulensis*). These results indicate there is some level of connectivity across SEQ, and confirms the species presence in the Sunshine Coast. It also highlights the need for further result into population genetics to fully understand the genetic connectivity of the different delphinid species in the region.

Poster 211:

Investigating taxa- and species-specificity in fatty acid calibration coefficients and their implications for quantitative fatty acid signature analysis (QFASA) in cetaceans

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Elucidating cetacean diet is critical for evaluating vulnerability and response to anthropogenic disturbances that increasingly disrupt prey access. Quantitative fatty acid signature analysis (QFASA) provides detailed, weeks-long diet estimates, using the fact that predators incorporate prey FAs into their blubber with only minor structural changes accounted for by calibration coefficients (CCs). CCs also impede QFASA's broader use, however. Deriving CCs requires blubber from managed-care animals with known diets, and limited access to such marine mammals restricts CC development. Furthermore, taxa- and species-specific differences in diet, tissue structure, and metabolism may cause CC variation, diminishing CC interchangeability. The only existing cetacean-specific CCs are derived from killer whales (KW); all other cetacean studies have applied mink-derived CCs with only partial success. We derived the first bottlenose dolphin (*Tursiops truncatus*) CCs and investigated CC interchangeability by comparing the dolphins' known diets to QFASA estimates made with the dolphin (n=2, D1 and D2), KW (n=4), and mink (n=15) CCs. Dolphins, KW, and mink had different diets (D1 = capelin and herring; D2 = capelin, herring, squid, and mullet; KW = capelin, herring, mackerel, and salmon; mink = herring). Dolphin CCs yielded the most accurate diet estimates, with 5.9% and 23.1% total error for D1 and D2's estimates, respectively, when applying CCs derived from the other dolphin. Mink CCs yielded lower-error estimates (15.3% and 29.2%) than KW CCs (21.5% and 43.4%). Though further research is needed, we suggest diet complexity influences CC interchangeability and QFASA estimates more than physiological differences, as demonstrated by the higher error of estimates for D2 and/or using KW CCs. Mink and KW CCs' partial successes indicate non-species-specific CCs provide somewhat accurate estimates, as in previous studies. However, our findings emphasize that species-specific CCs are key for high-accuracy diet estimates, and thus our dolphin CCs expand QFASA's applicability in cetaceans.

Poster 212:

Diet of sperm whales in the Azores: first results from a faecal DNA metabarcoding approach

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Diet and foraging ecology study of wild/free-ranging animals can be challenging, especially, when it concerns a champion of deep dives, the sperm whale. During the whaling period in the Azores, sperm whale diet was studied analysing the stomach content of the hunted animals. Nowadays, a number of molecular analysis methods allows the non-invasive identification of their preys, in particular cephalopods, the primary source of food for this cetacean. This study aims to investigate the sperm whale diet by DNA metabarcoding on their feces, and indirectly also to assess the biodiversity of deep-ocean cephalopods. Whale watching activities being an important industry in the Azores, to maximize the number of faecal samples collected, a collaborative network was creating involving touristic companies and their biologists under a citizen science approach. From June 2019 to September 2022, 16 samples of sperm whales' feces were collected in the Azores. Here, we present the first results obtained by DNA metabarcoding using 18SCeph primers. The differences from previous studies, which were mostly based on stomach contents analysis, may reflect the unstable population dynamics of oceanic cephalopods. Alternatively, they may reflect deeper changes in the ecology of these animals.

Poster 213:

Stable isotope ecology and interspecific dietary competition among dolphin species in the Northeast Atlantic

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Warming ocean temperatures since ~1980 are altering marine species distributions around Britain. Dolphins are mobile apex marine predators. Three decades of strandings and sightings data indicate warm-water adapted dolphin species (short-beaked common and striped) have expanded their ranges northward and become increasingly abundant in British waters. This has prompted recent and increasing degrees of geographical range overlap with cold-water adapted Atlantic white-sided and white-beaked dolphins. Foraging success is critical to both individual animal health and overall population resilience. However, the degree of dietary overlap and plasticity among these species in the Northeast Atlantic is unknown. Here we characterise current (2015-2021) interspecific dietary competition among six medium-sized delphinid species (short-beaked common, striped, Atlantic white-sided, white-beaked, Risso's, and bottlenose) co-occurring in Northeast Atlantic waters using skin stable carbon and nitrogen isotopes (δ13C and δ15N) combined with published knowledge on stomach contents and prey δ13C and δ15N. Comparison of dolphin isotopic feeding niche (as quantified by SIBER - Stable Isotope Bayesian Ellipses in R) found that short-beaked common dolphins are generalists and could compete for prey with Atlantic white-sided and white-beaked dolphins, as a significant portion of their diets comprise the same pelagic schooling and gadid fish. These priority prey species are also important takes for fishery industries in British waters. The two cold-water dolphin species exploit non-overlapping isotopic niches. Potential interspecific competition for prey among dolphin species previously separated by latitude and thermal gradients should be considered when assessing possible stressors faced by cold-adapted dolphin populations in the Northeast Atlantic.

Poster 214:

Proteome profiling reveals opportunities to investigate biomarkers of health in blubber biopsies from free-ranging baleen whales

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Objective and widely applicable tools to assess cetacean health are vital for population monitoring and to inform conservation initiatives. Novel blubber biomarkers of physiological state and reproduction are examples of such tools that could be used to assess overall health. Proteins extracted from cetacean blubber likely originate from both the circulation, and various cell types within the tissue itself, and their expression is responsive to signals originating from other organs. Blubber proteins therefore capture information, at the cellular level, on which physiological stressors are experienced by individuals at the time of sampling. For the first time, we assess the feasibility of applying shotgun proteomics to blubber biopsy samples collected from free-ranging baleen whales. Blubber biopsy samples were collected from minke whales (Balaenoptera acutorostrata) (n = 10) in the Gulf of St Lawrence, Canada. Total protein was extracted using a RIPA cell lysis and extraction buffer based protocol. Extracted proteins were separated using 1D Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis, and identified using nanoflow Liquid Chromatography Electrospray Ionisation in tandem with Mass Spectrometry. We then mapped proteins to known biological pathways and determined whether they were significantly enriched based on the proteome profile. We created a pathway enrichment map, based on protein interaction networks, to gain further insight into the range and overlap in tissue-level biological processes. Among the most significantly enriched biological pathways were those involved in immune system function: specifically, the complement cascade, neutrophil degranulation, platelet activation, signalling and aggregation. Pathways associated with interleukin signalling and cellular responses to chemical and heat stress were also enriched, in addition to post-translational protein modifications, protein metabolism, and amino acid metabolism. Using a suite of such protein biomarkers has the potential to help us better assess the physiological state, and thus the health of live individuals through remote blubber biopsy sampling.

Poster 215:

Insights into the foraging Ecology of Azores Cetaceans: results of the MISTIC SEAS III project

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Gaining knowledge on the foraging ecology of top predators is relevant to obtain indicators for the Descriptor 4 (Food-webs) within the Marine Strategy Framework Directive (MSFD). These indicators are obtained through food-web models where local data are essential to obtain faithful results. During the MISTIC SEAS III project, a total of 24 stomachs from at least seven species were analysed: three pelagic dolphins (*Delphinus delphis*, *Stenella coeureoalba*, *Stenella frontalis*), and four deep diver species (*Kogia breviceps*, *Physeter macrocephalus*, *Mesoplodon densirostris* and *Ziphius cavirostris*). Pelagic dolphins were found to feed both on fish (48.6-78.6%FO) and cephalopods (21.4-46.0%FO). Regarding the deep divers, they were found to be teutophagous feeders apart from *M.densirostris* who only fed on mesopelagic fish. Most of the fish found in pelagic dolphins consisted of mesopelagic/bathypelagic (66.7%) and pelagic fish such as mackerel and horse mackerel (31.5%). More than 95% of cephalopods occurred in all cetaceans' stomachs were pelagic species which might occur at deep waters but also in surface waters. It is relevant to find out that cetaceans occurring in the Azores archipelagos might feed on different type of prey than in other areas, like more continental waters. The results of this information show the relevance of using local data in food-web models in the Macaronesia to obtain faithful indicators.

Poster 216:

Examining spraint of the Eurasian otter (*Lutra lutra*) as a potential method for biomonitoring marine debris

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Marine pollution has been widely recognised as a major anthropogenic threat among the scientific community. With plastic known for being the main contaminant in the marine environment, in more recent years microplastics have gained interest as upcoming persistent pollutants. However the available research regarding the presence of plastic debris within the trophic web structure remains limited. The Eurasian otter (*Lutra lutra*) is known to be a sentinel species as it sits on top of the food chain, at a worldwide scale. The potential usage of marine mammals as bio-indicators for plastic pollution has been highlighted in previous research. Therefore, here we aim to promote spraint analysis as a non-invasive method for bio-monitoring plastic debris, offering insight into marine pollution throughout the food-web. In this study, 279 samples (each containing up to 6 otter spraints) were collected in O Grove (Spain) within the years 2018-2022 and analyzed for the presence of plastic and other type of debris. Parameters such as abundance, type, size, color and date were assessed, allowing for the examination of potential trends. Overall, 38.7% of the samples contained marine debris (n= 108). A total of 166 marine debris was found with plastic making up 94% of them. Fibers were the most predominant type found (50%), with transparent being the most popular color (38.2%). A significant increase of 71.4% in the abundance of debris within samples was noted across the years. Samples recovered in autumn had significantly higher concentrations of debris than the rest of the seasons. Although there are limitations to otter spraint analysis for bio-monitoring due to their broad habitat niche, which affects their opportunistic diet, this study provides an example of how this method could be deployed at a regional level for continuous monitoring of marine debris.

Poster 217:

Niche partitioning among marine mammals inhabiting a large estuary as revealed by stable isotopes of C, N, S and O

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Detailed knowledge on habitat use of marine mammals is critical to understand their role in an ecosystem. The stable isotope ratio of carbon (δ13C) and nitrogen (δ15N) have been widely used to study the trophic ecology of marine mammals, but the stable isotope ratio of other chemical elements, such as sulphur (δ34S) and oxygen (δ18O), can provide complementary information and better inform about habitat use in areas with strong salinity and redox gradients. The Río de La Plata estuary represents the largest freshwater runoff in the southwestern Atlantic Ocean, and supports a rich community of marine mammals. Here, we analysed δ34S values in bone tissue from seven marine mammal species inhabiting the estuary and the adjacent Atlantic Ocean, in order to amplify previous isotopic data (δ13C, δ15N and δ18O) and compare their resolution as habitat tracers. As expected, δ34S and δ18O offered relevant insights into the characterization of the habitat used by marine mammals, and allowed a better delineation of habitat partitioning between them. Bottlenose dolphins, South American sea lions and fur seals seem to be frequent users of the less saline areas of the estuary, whereas Burmeister´s porpoises, Franciscana dolphins and false orcas seem to prefer the saltier marine waters closer to the bottom. Fraser´s dolphins were the only inhabitants of true offshore waters. Thus, combining the stable isotope ratios of four chemical elements offers a good understanding of habitat partitioning between the marine mammals inhabiting estuarine ecosystems.

Poster 218:

Krill and penguins dominate the diet of young and sub-adult male Antarctic fur seals (*Arctocephalus gazella*) year-round

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Detailed knowledge of marine mammal diet is critical to understand their ecological roles, but only indirect approaches can be used to study that of most marine mammal species, because of their elusive at-sea behavior. The summer diet of the Antarctic fur seal (*Arctocephalus gazella*) has been studied extensively through scat analysis, but little is known about their winter diet, when they spend most of the time at sea. Furthermore, the relative contribution of penguins and fish to the summer diet of Antarctic fur seals inhabiting the Antarctic Peninsula is poorly known, because of the bias in the preservation of hard remains in scats. Here, scat analysis is combined with fecal virome analysis and stable isotope analysis of blood and whisker sections to better understand the seasonal and inter-annual changes in the diet of young and sub-adult Antarctic fur seal males from the South Shetland Islands. The three methods identified Antarctic krill (*Euphausia superba*) as the staple food of young and sub-adult Antarctic fur seal males year-round. Although fish occurred in half of the summer scats analyzed, the stable isotope analysis of blood revealed penguins as the second major prey for male Antarctic fur seals in summer. The analysis of the fecal virome, a qualitative approach, also supported this hypothesis. The stable isotope analysis of whisker sections revealed a kill-based diet also during the winter months, with penguins as secondary prey and a negligible contribution of fish to the assimilated diet. These results suggest that traditional scat analysis, based on the frequency of occurrence of hard remains, largely overestimates the contribution of fish and underestimates that of penguins to the diet of male Antarctic fur seals. Furthermore, these results reveal that male Antarctic fur seals prey on penguins not only in land during the summer months, but also at-sea year-round.

Poster 219:

New Insight into Eastern North Atlantic Sperm Whale Population Structure through Stable Isotope Analysis

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Sperm whales are cosmopolitan odontocetes that experienced strong pressure from the whaling industry in the past. Very little is known about their current population trends and conservation status in different parts of the world's oceans. A significant gap is an insufficient understanding of sperm whale population structure. To gain insight into sperm whale population structure in the eastern North Atlantic, we compared δ13C and δ15N values in growth layers of sperm whale teeth obtained from Iceland (n = 30), Denmark (n = 3) and Northwest Spain (n = 5). The growth layer corresponding to age 3 was selected to obtain isotopic values from the period when animals are still at their breeding grounds. No significant differences were found between the δ13C values of individuals from the three regions. However, the δ15N values of individuals from Northwest Spain were significantly higher than those of individuals from Denmark ($p = 0.006$) and Iceland ($p = 0.005$), while no significant differences were found between individuals from the latter two areas ($p = 0.627$). Although the International Whaling Commission recognizes only one sperm whale stock in the North Atlantic, our results suggest the existence of population structure within the eastern North Atlantic with different breeding grounds for the sperm whales from Northwest Spain and those from Denmark and Iceland. Additional research with larger sample sizes and using other indicators may help reach more solid conclusions for the effective conservation of this vulnerable species.

- **Genetics/Evolution**

Poster 220:

Population Genetics of the Bottlenose Dolphin (*Tursiops truncatus*) Based on Mitochondrial DNA

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The spatial distribution of genetic variation between and within populations is a central focus of conservation biology. Molecular methods allow inferences of population structure and provide valuable insights that can assist in the conservation and correct management of wild species. This knowledge is beneficial for marine organisms, as they are often difficult to study and define populations. Bottlenose dolphins (*Tursiops truncatus*) are one of the best known and studied cetaceans. They are observed in temperate and tropical marine waters around the world, they are separated into two ecotypes: inshore and offshore. Species and population-level differentiation in bottlenose dolphins (genus *Tursiops*) in particular are considered to be influenced by environmental heterogeneity. To verify whether environmental factors are influencing the population structure of this species, we analyzed the MtDNA control region, which is the most commonly applied molecular marker in genetic studies of cetacean taxonomy and is the only marker with sufficient data available in many populations, subspecies and species. All haplotype sequences available from GenBank were downloaded, which had information on the number of individuals per haplotype. From this, we carried out analyzes to verify the levels of structure and population dynamics, and structuring was verified between different regions around the world. The next steps are to start seascape genetics analyzes to understand which environmental factors may be influencing the population dynamics of this species. Bottlenose dolphins are top predators that play a key role in the food chain in the ecosystems they inhabit. Studying their population dynamics and how they relate to the abiotic factors of the habitats in which they are inserted is essential for carrying out a correct management of these populations, even more so from the perspective of the climate changes that are taking place.

Poster 221:

Bottlenose dolphins in the Black and Mediterranean Seas share diverse cranial morphotypes

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Common bottlenose dolphins *Tursiops truncatus* show genetic, ecological, behavioural and morphological differences across their range. Morphological variation includes differences as in body size as in cranial size and shape, and the marginal Black Sea population has even been defined as a separate subspecies *T. t. ponticus*. Here we test its morphological heterogeneity in comparison with populations in the Mediterranean and North Atlantic. Six regional samples of cranially mature dolphins (n=121) have been analyzed from the Black and Mediterranean Seas and the Northeastern Atlantic. Twelve cranial measurements were made; the PCA and MANOVA were used for analysis. The results of the PCA show that the historical Black sea sample (1948) is homogenous and isolated from others, while the modern Black Sea sample overlaps with Mediterranean ones. The Levantine sample partially overlaps with all the others. Adriatic and Western Mediterranean samples are indistinct, and the Bay of Biscay sample broadly overlaps with them. However, MANOVA shows significant pairwise differences between all the regions, except Adriatic vs. Western Mediterranean. We conclude that the Black Sea samples are distinct from the other regions but not fully differentiated from Mediterranean ones, as suggested before. Two morphotypes are seen in the Black and Mediterranean seas: individuals with relatively short and wide rostra and with relatively long and narrow rostra. Both morphotypes were found in the Levantine Basin and the Black Sea, whereas West Mediterranean dolphins were the most heterogeneous in morphology, supporting previous genetic studies.

Poster 222:

Preliminary insights on the genetics of the Inner Mediterranean Sea long-finned pilot whale (*Globicephala melas*)

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Long-finned pilot whales (*Globicephala melas*) global genetic diversity across the Northern and Southern Hemispheres is considered low. Based on a 345 base pair fragment of the mitochondrial DNA control region (mtDNA-CR), 17 haplotypes were identified worldwide. Only two of these were recorded in the Mediterranean Sea. According to the IUCN Red List, Mediterranean pilot whales are divided into two subpopulations: the Inner Mediterranean (occurring from the eastern Alborán to the Ligurian Seas and listed as Endangered) and the Strait of Gibraltar (Critically Endangered) subpopulations. Significant mitochondrial DNA differentiation was found between the two subpopulations, although some gene flow may still occur. To refine genetic diversity estimates of the Inner Mediterranean subpopulation and add new data to those few available, 40 tissue samples, collected during summer season in the Ligurian Sea between 2001 and 2008, were subjected to mtDNA-CR amplification and sequencing. A Maximum Likelihood phylogenetic analysis was run with an obtained sequence and the available haplotypes previously recorded for this species. The overall genetic mean distance value revealed a significant differentiation between our sequence and the aforementioned haplotypes ($p<0.05$; Tamura-Nei Model=0.0247). Preliminary results suggest the existence of a potential new haplotype from the Inner Mediterranean pilot whale subpopulation; ongoing analyses with a higher number of mtDNA-CR sequences should confirm this hypothesis. The investigation into the genetic diversity of this subpopulation represents an important element to better explore the phylogeography of this species. Further results could contribute to the definition of appropriate conservation strategies needed for a subpopulation in suspect decline.

Poster 223:

The aftermath of whaling past: impending genetic extinction of the eastern North Atlantic humpback whale breeding population

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Commercial whaling from the mid-19th century to the early 20th century dramatically reduced the humpback whales in the North Atlantic (NA). Post-whaling protection appears to have facilitated recovery of the breeding population in the western NA, but not the population in the eastern NA, including Cabo Verde. The underlying cause for this disparity remains unknown. The most recent abundance estimate of the eastern NA breeding population was ~300, indicating little, if any, post-whaling recovery. In contrast, the western NA breeding population has reached an estimated abundance at ~12,000 individuals as of the early 1990s. Gabualdi et al. (unpublished) employed microsatellites to infer that only ~20% of the Cabo Verde breeding population had pure eastern NA ancestry, while the remaining ~80% were either immigrants from the western NA breeding population or descendants thereof. Considering the very different recovery rates in the western and eastern NA breeding populations, we expect a further increase in effective west-to-east breeding ground migration. This introgression of western NA genomes into the eastern NA breeding population will eventually result in the replacement and extinction of the eastern NA breeding population; a legacy of the long ranging impacts of whaling. We employed Approximate Bayesian Computation (ABC) to assess the posterior probabilities of different post-whaling scenarios in order to elucidate the population dynamics and estimate rates of recovery and migration. Our model selection was based upon data from 19 microsatellite loci and mtDNA control region sequences in 245 samples. The ABC model selection suggested a whaling-bottleneck scenario generating source-sink dynamics, and a conclusion that the eastern NA breeding population will eventually be supplanted by immigrants from the western NA breeding population. Our results underline the importance of management plans where genetic diversity is considered along with population abundance.

Poster 224:

Supraoccipital length as an alternative to condylobasal length for relativizing skull morphometric characters in the family *Delphinidae*

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Condylobasal length (CBL) is a skull measurement related to body growth in dolphins, which is used to transform absolute values into relative values in skull morphometric characters. However, in the osteological collections of museums, not all skulls are complete, since one area that is deteriorated and mistreated is the rostrum. Therefore, we have decided to look for another skull measurement that is related to CBL and that could replace it and thus be able to use a greater number of specimens from these collections. We took 69 cranial morphometric measurements on 536 skulls of 12 species (*Cephalorhynchus commersonii*, *Delphinus delphis*, *Grampus griseus*, *Lagenorhynchus albirostris*, *Leucopleurus acutus*, *Peponocephala electra*, *Sagmatias australis*, *Stenella attenuata*, *S. coeruleoalba*, *S. longirostris*, *Steno bredanensis* and *Tursiops truncatus*) of the family Delphinidae. The correlations between CBL and the rest of the measurements were analyzed by statistical analysis. The highest significant correlation we obtained was between condylobasal length (CBL) and supraoccipital length (SOL), except in *Leucopleurus acutus*, *Sagmatias australis* and *Steno bredanensis*. Supraoccipital length (SOL) is defined as the distance between the superior margin of the supraoccipital and the opisthion (midpoint of the superior border of the foramen magnum). We propose to use SOL as an alternative to CBL to transform absolute to relative data in 9 species of the family *Delphinidae*. SOL is an easily measurable cranial morphometric character and, being part of the cranial case, it is usually better preserved than the rostrum.

Poster 225:

Gathering data on Mediterranean monk seal past presence in Italy

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The Mediterranean monk seal is one of the first pinniped species studied by humankind. However, several aspects of its biology, ecology, and distribution have yet to be unveiled. With the present research, data on Mediterranean monk seal (*Monachus monachus*) individuals captured in the past along the Italian coasts were analysed. The data were recovered by collecting samples, with the related metadata, of specimens preserved in museums (skeletons, bone remains, and stuffed animals), conducting a thorough bibliographical survey, and comparing the information. Most of the captures mainly refer to the period between the 19th and the first half of the 20th century, from the following Italian regions: Sardinia, Sicily, Apulia, Tuscany, Lazio, Liguria, and to a lesser extent Campania and Calabria. Limited data were also collected from the coasts of other Italian regions. The latter, however, represent accounts of even rarer occasional encounters. All these captures may have contributed to the numerical decrease of a species already heavily exploited since the times of the Roman Empire, confirming the results of previous genetic studies. The majority of the consulted literature unanimously reports the presence of the species in specific localities along the Italian coasts while confirming its rarity, already at those times. The overall analysis of the data showed that tiny nuclei of Mediterranean monk seals were still present in the last centuries along the Italian coasts. However, although births still took place, these populations were already reduced in numbers and scattered along the coast. Further studies should be conducted to better understand the ecological role played by the species in the Central Mediterranean. These results could provide suitable insights for conservation and monitoring, on the increasing sightings reported from the Italian coast in recent years.

Poster 226:

Spatiotemporal occurrence and prehistoric exploitation of small odontocetes in the Holocene Baltic Sea

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Small toothed whales (Odontocetes) are often recovered from archaeological sites of the Baltic Sea region. There is no complete record of their prehistoric occurrence and relative abundance, preventing a full understanding of their natural history and response to human impacts and environmental change through time. Here, we document and analyse the occurrence and relative abundance of the harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*) and white-beaked dolphin (*Lagenorhynchus albirostris*) based on almost 700 subfossil remains from more than 170 archaeological sites in the Baltic Sea region. Our results suggest that small toothed whales have been part of the Baltic Sea ecosystem and utilized by prehistoric cultures for at least 7000 years. The harbour porpoise dominates the faunal assemblage, comprising 77 % of all finds and being omnipresent in the subfossil record spanning a time period of over 9000-year BP. In contrast, the occurrence of white-beaked, common and bottlenose dolphins peak in the warm Ertebølle and Neolithic periods (7000-5000 BP). The distribution of harbour porpoise subfossils corresponds with contemporary satellite tracking and acoustic monitoring data, suggesting that the prehistoric populations have kept their range ever since settling in the Baltic Sea. To improve conservation efforts for the harbour porpoises and small dolphins, further studies into the interplay between their occurrence, genetic composition, human impact, and environmental change are needed.

Poster 227:

When the going gets tough- reliable methods for eDNA, aDNA and cetacean blow analysis

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An increasing amount of non-traditional sampling for genetic and genomic studies of cetaceans and their environments have been developed to maximize limited opportunities to conduct research and inform conservation. Within the past ten years, development of molecular techniques has largely improved; trivial amounts of DNA can be recovered from sources once considered hard to work with. Despite leaps made in the last decade, some samples are still unreliable, including exhalations of free-swimming animals. Many published methods have low success rates and are arduous to replicate, which is a major roadblock for labs collecting unconventional samples. In this study, we present a new method to recover genetic material from various challenging sources, including teeth, water, and cetacean blow. This method, originally developed for forensic-level applications, requires miniscule amounts of material. All analyses are conducted in a level III clean room, compromising a series of chambers that facilitate isolation for different steps of the process (e.g., drilling, extraction, PCR). We compared the standard silica-based ancient DNA (aDNA) method with the new method and found the latter had a higher success rate in recovering enough DNA for both genetic (e.g., mtDNA) and genomic applications, including metagenomic and microbiome analysis. PrepFiler by Thermo Scientific, requires only 40mg of bone/tooth powder and 40µl of a cetacean blow sample, allowing precious or low volume samples to now be analyzed. For both extraction methods, a positive and negative control are added for insurance and to check for contamination. For the blow samples, a cell count of the positive control and breath samples will be done by flow cytometry to determine if a sample is usable for eDNA analysis. This new method standardizes an extraction method that can be used on challenging samples found in wildlife research and conservation.

Poster 228:

Evaluation of eDNA primers for coastal UK marine mammal species

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Monitoring of marine mammals using conventional visual or acoustic methods is associated with high costs. On the other hand, environmental DNA (eDNA) is a cost-effective method for monitoring marine species, and its application to monitoring marine mammals is receiving increasing attention. eDNA is DNA that has been shed by an organism into its environment, for example from skin, mucus, faeces and urine. The eDNA is amplified using assays targeting specific DNA sequences. When amplification occurs using species-specific primers, eDNA can be used to detect the presence of a single species. Whereas the use of universal primers allow amplification of a fragment of a gene of interest simultaneously from whole communities, which is followed by high throughput sequencing (sequencing multiple DNA molecules in parallel), allowing multiple species detection in a process called metabarcoding. Recent studies have led to the publishing of species-specific assays, and universal primers for metabarcoding of marine vertebrate communities. Here we evaluate the use of different primers for monitoring three common UK coastal species; grey seal (*Halichoerus grypus*), harbour seal (*Phoca vitulina*), and harbour porpoise (*Phocoena phocoena*). Novel eDNA sampling methods allowed collection of samples at both coastal and estuarine locations. Water samples were filtered in situ using an automated large volume eDNA sampling device, the Applied Genomics inDepth eDNA sampler, over two tidal cycles (25 hours). These samples were complemented by positive controls. Recently published primers (MarVer1, MarVer3, Ceto2) were compared with conventional primers for the detection of marine mammals (MiMammal and MiFish), in order to understand the effectiveness of open-source metabarcoding primer sets. These metabarcoding methods were supplemented by species specific assays to evaluate the most effective eDNA analysis method. The findings of this study give an understanding of the primer efficiency when conducting studies for eDNA studies of UK coastal marine mammal species.

Poster 229:

Lead in bones of pinnipeds shows Galapagos archipelago as a relatively pristine spot

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Lead, which is a toxic trace element, is released to the marine environment mainly through anthropogenic activities (e.g., industry), but also by wind-blown dust from arid regions or other natural sources. Here, the concentrations of lead in bone samples of four pinniped species (Galapagos sea lion *Zalophus wollebaeki*, monk seal *Monachus monachus*, American fur seal *Arctocephalus australis* and South American sea lion *Otaria flavescens*) collected from three marine areas (Galapagos Islands, Mauritania and Uruguay) were analysed to investigate potential geographic differences. Results indicated lower levels of lead in the species from Galapagos Islands than in those from Mauritania and Uruguay, indicating that Galapagos Islands are a pristine spot for lead in comparison with the other two areas, which are affected by the inputs of lead from the desert dust and the local industry, respectively. The current study supports the use of pinnipeds as bioindicators of marine pollution and the validity of bone to analyse lead concentrations in biota and, by extension, in the environment. The study was funded by the Fundació Barcelona Zoo (Spain) through the Research and Conservation Programme – PRIC (309998).

Poster 230:

New results on striped dolphins feeding habits in the Pelagos Sanctuary: could crustaceans be non-anecdotal?

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Cetacean diets have been studied with direct or indirect methods for several decades, and are important to assess the animals' ecological habits (which may evolve) and to implement protection measures. Although considered generalist feeders, striped dolphins (*Stenella coeruleoalba*) are often described as heavily relying on cephalopods and bony fishes. Most of the literature on this topic state that the crustaceans are either absent or negligible in their diet. Data on this matter being scarce in the French Mediterranean Sea, GREC and PNPC-Pelagos France launched a new study in 2022, which already delivered some interesting findings. A first pool of 20 stomachs, coming from striped dolphins processed by the French Strandings Network after their stranding on the French continental coasts of the Pelagos Sanctuary area in 2020-2021, were rinsed using a standard procedure and a 200µm mesh sieve. Repletion was graded, parasites and plastic wastes were looked for, and the stomach contents were macroscopically examined. The hard parts that could be used for prey identification (chitinous, fleshy or bony remains) were sorted; preliminary results include identification to, at least, the phylum level. 90% (18/20) of the stomachs contained some food remains, the two empty ones being from newborn animals. On the 18 non-empty stomachs, 39% (7/18) contained three prey phyla (fishes, cephalopods and crustaceans), 50% contained two prey phyla, and the remaining 2 stomachs contained only one prey phylum. Being present in 89% (16/18) of non-empty stomachs, cephalopods were the most frequent phylum, but it was interesting to observe that crustaceans were found in 61% (11/18) of non-empty stomachs, which is a proportion far greater than what is usually described in the literature. A more detailed analysis (finer identification, ponderal quantification) will enable a better assessment of the Crustaceans importance in the diet of these dolphins.

Poster 231:

Digestive parasitofauna of a Sowerby's beaked whale (*Mesoplodon bidens*) stranded on the Galician coast

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Although they often go unnoticed, parasites are very interesting animals, both in themselves and for their relationship with their host. It is this relationship that allows us to discover a lot about the parasite, but also about its host. This becomes even more important when dealing with animals as elusive as the Sowerby's beaked whale (*Mesoplodon bidens*; Sowerby, 1804). So, when a juvenile male of this species ended up ashore in Xove (Northwestern Spain), the 20th of October 2022, we took the chance to do the necropsy and examine the organs in search of parasites. No ectoparasites were present on the carcass. Samples of blood, muscle, the liver, the intestines, and the lungs were collected, but in this study, we present the preliminary results obtained after the exam of the digestive tract. In the dissection of the liver, we found that the bile ducts were calcified and a total of 31 adult digenea trematodes were recovered. In the intestines we collected 20 nematodes, 6 acanthocephalans and 3 tapeworms of the Family Tetrabothriidae that were attached to the intestinal mucosa. Fecal samples were analyzed by the sedimentation and sucrose flotation techniques. The flotation turned out negative, but in the sedimentation fluke eggs were observed. These are preliminary results, so further study is needed to complete the exam of the different organs and to fully identify the parasites, as well as their effect on the host.

Poster 232:

Herpesvirus-associated genital lesions in two short-beaked common dolphins (*Delphinus delphis*) stranded in Península Valdés, Argentina

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Herpesviral infections have been identified in several cetaceans worldwide, with scarce data from South America east coast. This study reports the first identification of a Gammaherpesvirus in genital lesions from short-beaked common dolphins that died during a mass stranding event in Golfo Nuevo, Península Valdes, Argentina. In March 2018, 68 dolphins stranded alive, 21 were returned alive to the sea, while 47 animals died and were recovered for a complete post-mortem examination. Two adult males showed small proliferative lesions on the genital slit. Samples of lesions were collected in 10% neutral-buffered formalin, routinely processed, embedded in paraffin, sectioned at 5 µm, and stained with hematoxylin and eosin for histologic examination. For molecular study, samples from each lesion were macerated in lysis buffer to perform DNA/RNA extraction using DNA Tissue Kit S (QuickGene, Kurabo, Japan) according to the manufacturer's instructions. Herpesvirus DNA was detected by conventional nested PCR using degenerate primers (VanDevanter et al. 1996). Histologically, there was moderate epithelial hyperplasia of the mucosa, ballooning degeneration, margination of chromatin, and nuclear pyknosis, with mild, diffuse lymphoplasmacytic infiltration in the submucosa. No viral inclusion bodies were observed. Sequencing and BLAST analysis of PCR products indicated that, in both samples, the amplified HV sequences clustered with gammaherpesvirus sequences, sharing the highest nucleotide identities with sequences detected in Delphinus delphis from Portugal. Our result expands the cetacean herpesvirus geographical range.

Poster 233:

Study of otoliths in the stomach contents of the Atlantic Spotted Dolphin (*Stenella frontalis*) in the Canary Archipelago

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In this study, we analyzed fish otoliths found in the stomach contents of Atlantic spotted dolphins (*Stenella frontalis*) stranded in the Canary Islands between 1994 and 2015. The main objective of this work was to: 1) identify and quantify the prey (fish) preyed by dolphins based on the morphological characteristics of the otoliths in order to know the trophic preference of the species in the archipelago, and 2) evaluate abundance and diversity of prey species over a period of 21 years. Twenty-five stomach contents were analyzed, of which 17 had otoliths. The otoliths were classified according to their morphological characteristics with the aid of a binocular lens and various sources were used for the identification of the taxon (identification guides, articles, web resources, etc.). A total of 2.233 otoliths were analyzed and identified and 221 remained unidentified. The cause of the latter can be explained by the taxonomic complexity of certain fish taxa (especially deep-sea) and semi-digested and/or broken otoliths. Twenty-three prey species belonging to the families *Carangidae*, *Gadidae*, *Apogonidae*, *Mictophidae*, *Osmeridae* and *Gonostomatidae* were identified. The occurrence, number frequency and diversity index were calculated. Observations at sea indicated that this species fed on prey in the upper part of the water column, but this study has revealed a high (and unexpected) frequency of mesopelagic fish in stomach contents. The most frequent species was *Hygophum taanigi* (32%) belonging to *Myctophidae* family. As part of this project, a reference collection of fish otoliths from the Canary Islands was created, integrated into the Biological Collection Reference of Cetaceans of the Macaronesian (CBRCM) of the SECAC.

Poster 234:

A blainville´s beaked whale stranded in the Canary Islands due to an attack of orcas with a review of the strandings of the species in the archipelago

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Blainville's beaked whale (*Mesoplodon densirostris*) is a deep diving cetacean belong to the *Ziphidae* family, listed as "Least Concern" (LC) by the IUCN and a target species for SECAC monitoring programs to improve the scarce knowledge concerning its biology. On 4 April 2021, a sexually mature female Blainville's beaked whale stranded at La Guirra, Antigua, Fuerteventura Island, on a stretch of coastline integrated into the AMP Site of Community Importance (LIC) "Marine Space of the East and South of Lanzarote and Fuerteventura". The animal stranded with no caudal peduncle and presented post-mortem shark bites, as well cutaneous tooth rake marks produced by killer whales (*Orcinus orca*). A systematic necropsy was conducted by the IUSA Institute and a biological study was carried out by SECAC. The provisional diagnosis of death was compatible with intra-interspecific traumatic interactions. This individual was part of a small population of Blainville's beaked whales resident in the water of Fuerteventura and had been photographically identified (with the code Mde 008) 18 years earlier as part of a SECAC beaked whale monitoring program. This specimen shows a characteristic deformity of the rostrum, specifically the left lower jaw suffered an old trauma that, apparently, did not affect its survival. Animal shows a good physical conditions and the stomach analysis revealed an abundant stomach contents with remains of fish, crustaceans and cephalopods, confirming a normal feeding. Between 1983 and 2022, 17 specimens of Blainville's beaked whales have stranded a long the coasts of the Canary Islands. This case exemplifies the value of integrative science through the combination of information from different approaches such as monitoring programs at sea and stranding networks (from the health to the biological perspective) to improve the knowledge and the management of these species and the AMP.

Poster 235:

From Galician waters to cetacean stomachs, a feeding story told by preys

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Cetaceans play an important role in maintaining the health and stability of marine ecosystems. To understand the trophic relationships of these top predators in waters off the Northwest Iberian Peninsula, and to determine their possible competition with fisheries, the stomach contents of 751 common dolphins (*Delphinus delphis*), 60 striped dolphins (*Stenella coeruleoalba*), 124 bottlenose dolphins (*Tursiops truncatus*), and 72 harbour porpoises (*Phocoena phocoena*) stranded on the Galician coast between 1990-2018 (almost 30 years) were analysed. Results indicated that their diets are mainly piscivorous (after identified 90 different taxa: 68 fish and 22 cephalopods), being the blue whiting (*Micromesistius poutassou*) and the European hake (*Merluccius merluccius*) the most important preys (in occurrence, number, and biomass) throughout all the years studied and for the four cetacean species. The long time series available allowed to detect interannual variation in the diet of both common dolphins and harbour porpoises by means of Generalised Additive Models (GAMs), observing an increase in the presence of European hake and a decrease of sardines (*Sardina pilchardus*) in the stomachs through time. Seasonal variation in the diets of the common and striped dolphins were also observed, with a higher consumption of blue whiting during the summer (May-September). Significant differences were found in the diet of the two bottlenose dolphin ecotypes present in Galicia, the coastal ecotype contains a higher percentage of demersal preys in the stomachs, while the oceanic ecotype contains more pelagic preys, confirming the habitat separation between the two. Results also confirmed an ontogenic variability in the diet of harbour porpoises, with juvenile animals showing a higher presence of coastal preys in the diet (e.g., pouting – *Trisopterus luscus*). There is an overlap between the diet of these four cetacean species and the fisheries' target species in the area, indicating competition for some resources.

Poster 236:

The application of a post-mortem diagnostic framework to determine cetacean fishery-interaction index

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Within the Life DELFI project (LIFE18 NAT/IT/000942), a review of literature and cases on cetacean post-mortem findings associated with fishery interaction helped to develop a framework to harmonize the evidence-based diagnostic investigation. The document is organized into multiple tiers and categories based on the expertise of the examiner, the fishing gear, and the decomposition code of the carcass. The framework was validated in several contexts and on different cetacean species. In 2021, the Italian and Croatian stranding networks officially adopted this framework. Considering the Italian cases on which it was possible to conduct a necropsy (93), the fishery interaction index shows that evidence of fishery interaction was recorded on 18% (17) of the carcasses. Within the fishery interaction categories, by-catch is confirmed as the main category recorded (70%). Considering the Croatian cases (3), the fishery interaction index shows that evidence of fishery interaction was recorded on the totality of the carcasses. Within the fishery interaction categories, by-catch is confirmed as the only category recorded. In both Italy and Croatia, *T. truncatus* represents the most recorded species (95%), involving mainly adult males. In regards to the seasonality, no particular temporal distribution of any of the fishery interaction categories is present. While in regards to the distribution, evidence of set-net interaction (by-catch, larynx entanglement, and ingestion) is more recorded in the Adriatic Sea, and evidence of active-fishing gear interaction (by-catch) is more recorded in the Tyrrhenian Sea. Compared to previous years, the analysis of the cases of 2021 showed how this tool was useful in implementing the assessment of the fishery interaction evidence with more precise diagnostic evaluations. This preliminary data represents a baseline for the assessment of fishery interaction in the next years and the monitoring of the results of the conservation strategies developed within the Life DELFI project.

Poster 237:

Evaluation of the number and size of blubber adipocytes as a method to establish body condition in striped dolphins (*Stenella coeruleoalba*)

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Climate change and anthropogenic impacts on the ocean can alter the body condition of cetaceans. Body condition has a direct impact on the individual's survival, reproduction rate, and calf survival rate. Recent studies have shown that body mass/body length^2 is a good index to characterize body condition. However, body mass is difficult to estimate at sea. Large efforts have been made to estimate the body condition of cetaceans at sea, although there is no agreement about the best method to do so. Blubber is an important energy storage in cetaceans that is frequently sampled in the form of biopsies for various purposes. The aim of this study was to assess whether the number and size of adipocytes estimated in the total blubber and within each layer (i.e., superficial, middle, and deep) would be good indirect methods to estimate body condition in free-range striped dolphins through biopsies. For this purpose, we studied the dorsal blubber, the most frequent sampling location in biopsies, in stranded striped dolphins as an experimental model to validate the technique. We photographed the blubber at 10x in an optical microscope and we counted and measured the adipocytes with ImageJ software. Later, we studied statistically the relation between number and size of adipocytes with body length, mass, condition (mas/length^2), perimeter, and thickness of the dorsal blubber. Finally, we studied the correlation between the number and size of adipocytes. A significant relationship was observed between body condition (mas/length2) and the number of adipocytes present in the total blubber (R2 = 0.320, P = 0.035) and in the middle layer (R2 = 0.375, P = 0.020). These results suggest that the number of adipocytes present in the blubber could be a good objective method for the evaluation of body condition in free-range striped dolphins through biopsies.

Poster 238:

Design and application of a real time molecular polymerase chain reaction (PCR) for the detection of Erysipelothrix rhusiopathiae in cetaceans

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Erysipelothrix rhusiopathiae is a facultative, non-spore-forming, non-acid-fast, small, Gram-positive rod-shaped bacteria with zoonotic potential. It has been isolated from a wide variety of mammals, birds, reptiles, fish, and insects from which it could be a pathogenic or a commensal microorganism. *E. rhusiopathiae* is ubiquitous and can persist for a long period of time in the environment, including marine locations; although secretions of infected animals (feces, urine, and/or respiratory discharges) and the skin mucus of contaminated fish are thought to be the main sources of infection through dermal abrasions or ingestion. Since the first description in porpoise in 1956, *E. rhusiopathiae* infection is considered one of the most serious infectious diseases of cetaceans. Cutaneous and septicemic forms of *E. rhusiopathiae* have been described in several cetacean species worldwide, with a predominantly acute course of the disease and commonly fatal. Gross changes to affected organs are often subtle or non-specific and included pulmonary edema, hemorrhage, congestion and/or serosanguineous effusion of various organs. Bacterial emboli, typically associated with systemic congestion, edema, hemorrhages, and fibrinocellular thrombi, were commonly observed on histopathology. These bacteria are frequently intravascular, either extracellular or intramonocytic/macrophagic. Although blood culture is the gold standard of diagnosis, molecular polymerase chain reaction (PCR) significantly improves the accuracy and shortens the duration for speciation. A SYBR® Green real-time PCR for rapid and specific detection of *E. rhusiopathiae* was developed based on the DNA polymerase IV gene (GenBank Acc. No.: KX274429). The PCR was successfully applied to test several cases of *E. rhusiopathiae* infection in stranded cetaceans in the Canary Islands previously confirmed by histopathology, immunohistochemistry and culture and bacterial identification (API Coryne system).

Poster 239:

Monitoring of hormones in blubber of Balaenoptera physalus from Catalan coasts

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In conservation practices, assessing cetaceans' population structure and reproductive status is crucial. When dealing with large cetaceans, non-invasive sampling, focusing on blubber biopsies, is a principal methodology. Present work reports about the analysis of sexual hormones in 39 blubber samples from Spanish fin whales (*Balaenoptera physalus*) to evaluate the usefulness of this tissue for sex and reproductive status determination. Biopsy samples were obtained in 2019 and 2021 with a crossbow type Barnett 150 pounds during EDMAKTUB's Fin Whale Project 2021 along the Catalan Coast, Northeast Spain, a recently described feeding ground. Samples (0.05 g minimum) were extracted with ethanol, and extracts were reconstituted with 0.5 ml of 5% ethanol and analyzed with commercially available ELISA kits for testosterone (T), progesterone (P4), and estradiol (E2). Genetic analyses were performed to determine the sex of each whale. A P4/T and E2/T ratio was calculated, as these parameters are commonly used for sex determination. The results were compared with those of some recent studies to analyze in females what the reproductive status might be, and in males, whether dominant ones were related to elevated Testosterone levels. No statistical difference was found between males and females in any of the hormones due to the high standard deviation observed in males for all hormones considered. A good correspondence between genetic and hormonal sex determination was found, although some mismatches were found. Compared with known reported levels indicative of pregnancy and lactation in fin and humpback whales and dominance in male humpbacks, a few females seem to be pregnant, as from E2 and P4 levels. Testosterone levels are high in all whales, being them females or males. Obtained results indicate how blubber could be helpful in sex and physiological status determination for conservation purposes.

Poster 240:

Budd-Chiari-like pathology in dolphins

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Nearly two decades ago, pathologic examination results suggested that acoustic factors, such as mid-frequency active naval military sonar (MFAS) could be the cause of acute decompression-like sickness in stranded beaked whales. Acute systemic gas embolism in these whales was reported together with enigmatic cystic liver lesions (CLL), characterized by intrahepatic encapsulated gasflled cysts, tentatively interpreted as “gas-bubble” lesions in various other cetacean species. Here we provide a pathologic reinterpretation of CLL in odontocetes. Among 1,200 cetaceans necropsied, CLL were only observed in four striped dolphins (*Stenella coeruleoalba*), with a low prevalence (2%, N= 179). Together, our data strongly suggest that CLL are the result of the combination of a preexisting or concomitant hepatic vascular disorder superimposed and exacerbated by gas bubbles, and clearly difer from acute systemic gas embolism in stranded beaked whales that is linked to MFAS. Budd-Chiari-like syndrome in dolphins is hypothesized based on the present pathologic fndings. Nonetheless, further researched is warranted to determine precise etiopathogenesis(es) and contributing factors for CLL in cetaceans.

Poster 241:

Strengthening the health surveillance of marine mammals in the waters of metropolitan France by monitoring strandings

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Monitoring the health status of marine mammals is a priority theme that France aims to develop with the other European members, in the context of European agreements and directives such as the Marine Strategy Framework Directive. For nearly ten years, France has been recording an average of 2,000 strandings per year, monitored by the French National stranding network managed by the observatory Pelagis. Since 1972, this network has successively evolved from spatial and temporal faunistic description to, the detection of major causes of mortality. It now aims to carry out epidemiological studies on a population scale. Thus, a strategy to strengthen the monitoring of marine mammals' health status based on stranding data has been developed. This strategy will allow for a more accurate detection of anthropogenic and natural cause of death. Moreover, it will allow the monitoring of time trends and geographical differences of diseases associated with conservation and public health issues while ensuring the early detection of emerging or zoonotic diseases of importance. Thus, this strategy is in line with the "One Health" approach which implies an integrated vision of public, animal and environmental health. It is composed of four surveillance modalities: (1) general event-based surveillance (GES); (2) programmed surveillance (PS); (3) specific event-based surveillance (SES); (4) and syndromic surveillance (SyS). This work describes the global strategy as well as these surveillance modalities, the levels of examinations and the associated sampling protocols and finally, the method of standardisation of the data collected. The objective is to present the strategy developed at the French level in order to integrate it into a future strategy shared at the regional level, necessary for a better evaluation of the health status of these mobile marine species.

Poster 242:

First report of vaginal stone in the common dolphin from the Black Sea coast of Türkiye

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Vaginal stones or calculi have been reported in mammals like Guinea pigs, moles, bats, primates, humans, and several cetacean species, especially delphinid species. They have been found in common dolphins from the Atlantic and Pacific Oceans as well as the Black Sea. In the Black Sea, the reports go back to the 1940s, however, the causes and effects on the population still need to be studied. On 18 June 2022, a common dolphin (*Delphinus delphis*) stranded alive in Istanbul and died after 3 hours. A healed scar at the base of the right lower jaw, upper jaw shifted to left, new tooth cavities formed in the right lower jaw, emaciation, thin and congested blubber, cystic kidneys, and a vaginal stone were the main gross findings in the necropsy of the 160 cm long female individual. It was cylindrical in shape, 151.8mm in length, with 49.1mm max height, 55.3mm max width, 355.3g weight, and 1.6 g/cm3 density. The main histopathological findings were severe glomerular changes and tubulointerstitial nephritis, haemorrhages, cysts, hyalin casts in the kidneys, liver steatosis with severe congestion, diffuse capsular and interstitial fibrosis and severe pigmentation in the spleen, and haemorrhage in the lungs. Vaginal stone formation and cachexia have been mentioned together in previous studies. Considering the mandibular shift and cachexia, changes in kidney and liver can be associated with emaciation. Mineral analysis of the stone is still ongoing. There are different hypotheses on the causes of stone formation, such as bacterial infections, concentration changes and stasis of urine and deposition of minerals around foetal remains. Although there are previously reported cases in the Black Sea, this is the first case from the Turkish coasts. Bycaught and stranded animals, thus, should be examined in detail to understand calculi formation and their possible effects on reproductivity of the animal.

Poster 243:

Diet of the harbour porpoise (*Phocoena phocoena*) in Swedish waters using macroscopic techniques and eDNA analysis

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The harbour porpoise (*Phocoena phocoena*) is distributed throughout the Northern hemisphere's cold temperate and subarctic waters and is the only cetacean native to Swedish waters. Stranded and bycaught harbour porpoises are collected by the National Veterinary Institute (SVA) and the Swedish Museum of Natural History (SMNH), as part of the National Health and Disease Surveillance Program. Currently little is known about the diet of the harbour porpoise and how it might fluctuate seasonally, temporally and geographically, or if individuals selectively feed on specific species of prey. Here, we describe the stomach contents from 137 harbour porpoises that were found along the west and southern coasts of Sweden. Macroscopic and eDNA (environmental DNA) analyses were used to describe the diet of harbour porpoises found within Swedish waters between years 2006 and 2022. Hard parts (e.g., otoliths and fish bones) were collected from the stomach contents and used for species determination and size approximation of prey. Cephalopod beaks, whole crustaceans and exoskeletons were occasionally found, but not determined down to species level due to level of digestion. Additionally, the liquified stomach content was analyzed for fish DNA fragments to provide a more complete picture of harbour porpoise prey composition. Preliminary results indicate that harbour porpoises from Swedish waters feed on several different types of prey, the most common species being Herring (*Clupea harengus*), Transparent goby (*Aphia minuta*) and Sprat (*Sprattus sprattus*). With this study, we hope to further describe and fill current knowledge gaps on harbour porpoise diet. Increased understanding of porpoise diet will improve future conservation and management efforts of harbour porpoise populations, including the critically endangered Baltic proper population that is included in this study.

Poster 244:

Anatomopathological findings on harbour porpoises (*Phocoena phocoena*) stranded in Galician coast, NW, Spain

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The coast of Galicia constitutes one of the areas with the greatest biodiversity in the North Atlantic Ocean.The local population of harbour porpoise (*Phocoena phocoena*) belongs to the meridionalis ecotype,proposed as a new subspecies with their own genetic identity.According to ICES this population constitutes a Management Unit. It is classified as "Endangered" by the Spanish legislation. Recent studies on dynamics of Iberian harbour porpoise indicate a possible short term collapse within the next 20 years. In order to determine the pathological findings and the possible cause of death of this sensitive population in Galician waters, stranded harbour porpoises has been studied for more than thirty years (1990-2021). In this period, 144 were necropsied following standardized protocols. In order to have a wide view of the sanitary condition of the population, individuals of both sexes and all the physical development categories were included. Macoscopically, bycatch related lesions were detected in 38,3% (55/144) of the studied animals (i.e., skin cuts and impressions producing by fishing nets, amputations, tracheal edema, emphysematous lungs, multifocal haemorrhages, fresh prey in stomach, lymph on thoracic duct, intavascular bubbles on blood and lymphatic vessels). Parasitic bronchopneumonia with intralesional nematodes was a common finding. In addition, some individuals presentes lesions related with live stranding (i.e. skin abrasions, acute skeletal and myocardial muscular fibre degeneration), and interspecific traumatic event (i.e., rake marks, hematomas). Due to advance decomposition status of individuals, only samples of 15 individuals were suitable to carry out histopathological studies. Histopathological analyses were carried out in blind trial. Microscopic examination of the samples allow us to confirm macroscopical findings, the presence of other pathological process, and to better understand the sanitary status of the individuals. Specifically in cases suspicious of bycatch, histological examination was crucial to exclude other possible pathology responsible of the stranding.

Poster 245:

Stranded cetaceans provide an evidence of ongoing interactions with fisheries in Galician waters

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Bycatch is the most reported anthropogenic threat for cetaceans worldwide. Although some observer programmes could suggest a sustainable situation regarding interaction with cetacean species in European waters, some estimates based on strandings highlight a very concerning situation, at least for common dolphin (*Delphinus delphis*) and harbour porpoise (*Phocoena phocoena*). Galicia is located at the Northwest of Spain, and holds one of the major fishery fleets of Europe, with up to 4,000 boats. Of them, 93% practice minor or artisanal fishery, which officially reports low interaction rates. However, almost 500 boats use extractive fishing nets, such as trawls and longlines. With almost 1,500 km of coast, Galician is the scenario of more than 220 cetacean strandings yearly. The aim of this study is to approach the prevalence of bycatch in different cetacean species due to external evidences on stranded cetaceans. For that, we retrospectively review the stranding reports and photographs of stranded cetaceans with conservation codes 1-3 in the last thirty-two years [1990-2021]. Thus, 2,367 cetaceans of 12 species were included, an average of 74 individuals per year. At least, 41.4% of the studied cetaceans presented lesions compatible with bycatch (i.e., skin cuts, net impressions, amputations of the dorsal fin, caudal flukes or peduncle). Regarding species, we found evidences of fishery interactions on 50.6% of studied common dolphins, 39.0% of Risso's dolphins (*Grampus griseus*), 38.2% harbour porpoises, and 26.9% of the bottlenose dolphins (*Tursiops truncatus*). These numbers could be higher, as external lesions are not always present in bycaught cases. At least, 14 minke whales (*Balaenoptera acutorostrata*), 2 humpback whales (*Megaptera novaeangliae*), 1 Blainville's beaked whale (*Mesoplodon densirostris*), and 1 True's beaked whale (*Mesoplodon mirus*) presented evidences of chronic entanglements. In conclusion, long-term series of strandings data indicates the persistence of these fatal encounters in Galician waters.

Poster 246:

Modeling transference levels of Anisakis parasites from main prey species to common dolphin in the Northeast Atlantic Ocean

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Anisakis nematodes are parasites that infect cetaceans worldwide, but can accidentally infect humans and are a growing cause of human health concern. They infect fish and squid as paratenic hosts, and are transferred to cetaceans when they consume infected prey. Once in the cetacean stomach, they can penetrate the mucosa where they grow until reaching maturity, having pathological effects such as ulceration. Anisakis eggs are dispersed by cetaceans, thus closing their life cycle. However, parasite flows from prey to individual cetaceans and populations have not been quantified. In this study, we used a dataset spanning 20 years on common dolphin diet in Galicia, as well as an epidemiological survey of commercial fisheries from 2013-2015 in the area, coupled by means of generalized additive models (GAM) predicting Anisakis abundance based on fish length. We estimate that around 70 Anisakis/day or around 26000 Anisakis/year are being transferred on average to common dolphins in the Atlantic waters of the Iberian peninsula from their main prey species (species making up ~87% of their diet), with blue whiting being an especially important source, followed by hake, sardine and mackerel. Extrapolating these numbers to the population level suggests a yearly transfer of over 4000 million Anisakis from fish to common dolphins. While results are congruent with previously reported high prevalence of infection in stranded delphinids from the NEA and the Mediterranean, it is also apparent that numbers found in individual dolphin stomachs represent only a small proportion of the numbers ingested, suggesting substantial throughput. Further investigation of the trophic transfer of Anisakis is important to understand infection levels in marine biota and risks to human consumers of marine fish.

Poster 247:

Arthropod parasites of marine mammals: convergent physical solutions for living on aquatic hosts

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Arthropod parasites of marine mammals show functional adaptions to the aquatic lifestyle of their hosts. Crustacean whale lice and insect seal lice are ectoparasites, while respiratory mites parasitize the nasal passages of seals. *Echinophthirius* (*E.*) *horridus*, the seal louse and the heartworm *Acanthocheilonema* (*A.*) *spirocauda* comprise a unique parasite assembly conveyed to the marine environment. *E. horridus* is believed to serve as vector for heartworm filariae of harbour seals (*Phoca vitulina*). Prevalence of *A. spirocauda* and *E. horridus* in harbour seals (n = 655) between 2014 and 2022 was analysed using a unique sample set collected within a stranding network along the German coast to reflect epidemiology and transmission pathways. In-vitro culture and histology of parasites and associated lesions, as well as Confocal Laser Scanning Microscopy, nanoCT and attachment force measurements were performed to characterise physical solutions for life on marine hosts. Heartworm *A. spirocauda* infections were found in 11% (n = 70), showing a significant increase from previous decades. Seal lice were found in 4% (n = 26) of harbour seals. Seal lice and nasal mites were cultured for weeks with larval specimens undergoing moults. Histology revealed new aspects of the morphological adaptations for attachment to skin, associated lesions and larval nematode stages in the hemocoel of seal lice, supporting seal lice as intermediate host of *A. spirocauda*. CLSM indicated sclerotized structures and nanoCT aided in 3D reconstruction of skeleton-musculature, while force measurements highlighted the forces these unique marine insect parasites generate to attach to their aquatic host. The increased prevalence of the heartworm *A. spirocauda* over the study period probably reflects growing seal populations and higher densities on haul-outs, thereby facilitating transmission by lice vectors. The interdisciplinary tool box employed in this study allows for better understanding life history traits and functional morphology of highly specialized parasites of marine mammals.

Poster 248:

Prevalence of skin lesions in wild bottlenose dolphins (*Tursiops truncatus*) in the NW Mediterranean Sea determined through photo-identification analysis

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Photo-ID is a common and widely used technique for studying wild cetaceans with several advantages, such as being cost-effective and non-invasive. Additionally, photographs in which the surface of the skin is clearly visible can give insight into the health of wild cetacean populations. The present study utilized photo-ID data from 2018-2019 collected in the western Ligurian Sea (northwestern Mediterranean Sea) to estimate the prevalence of skin lesions in wild common bottlenose dolphins (*Tursiops truncatus*). A total of 106 boat-based surveys were conducted in the two-year study period. 620 high quality photographs from 47 sightings of bottlenose dolphins were evaluated for the presence of skin lesions and characterized based on ten categories previously described in the literature. Prevalence of lesions was reported overall, for each lesion type, and based on known population demographics (sex and age class). A 63% prevalence of skin lesions was found in 62 dolphins and the most prevalent lesion types were White Spots (56%) and Dark Fringe (51%). Males had a higher prevalence (100%, n = 7) for skin lesions than females (42%, n = 19), and juvenile animals showed the highest prevalence among age classes (75%, n = 8). Results indicate a prevalence of skin lesions within the range reported by other studies around the world, but relatively high in comparison to a similar study in the Mediterranean Sea. Research on skin lesions in the Mediterranean is currently limited, and the present study, to our knowledge, is the first to describe skin lesions in bottlenose dolphins in the Ligurian Sea. Long-term monitoring of known individuals within a population through photo-ID can reveal changes in prevalence, progression/resolution of lesions, and even the emergence of new lesion types. This technique represents a valuable tool for the conservation and health status monitoring of resident and migrant dolphin populations.

Poster 249:

Mass strandings of cetaceans on the Atlantic coast of the Iberian Peninsula and Macaronesian archipelagos

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Most of the cetacean strandings are individual and dead specimens. However, occasionally, the strandings can be massive and some specimens are still alive. This study reviews the mass strandings events on the Atlantic coast of the Iberian Peninsula and the Macaronesian archipelagos (Canary Islands, Azores and Madeira), based on records of the local stranding networks, specialized bibliography and published references from the mid 18th century to date. Except for the stranding of a pair mother-calf, a stranding event is classified as a mass stranding when it involve 2 or more specimens. These strandings were classified by region and type typical when occurring in the same place and date, and atypical when occurring at different places and/or dates with a common cause. A total of 67 massive strandings were recorded, of which 50 were classified as typical and 17 as atypical. Atypical mass strandings of large divers like *Ziphius cavirostris*, *Hiperoodon ampullatus*, *Mesoplodon europaeus*, *M. mirus* and *M. densirostris* (n=9) stand out. 59.7% of the cases were recorded between 1990 and 2022 (n=40), and 40.3% (n=27) were recorded from the mid 18th century to 1989. Altogether, 2762 individuals were recorded, 49.6% (n=1371) of them survived. A total of 15 species of odontocetes were recorded, some of them considered as resident or frequent in the studied area (for example *Delphinus delphis*, *Tursiops truncatus*, *Grampus griseus*, *Stenella coeruleoalba*, *Physeter macrocephalus* and *Globicephala macrorhynchus*); others are uncommon (like *Kogia breviceps*, *Steno bredanensis* and *S. longirostris*), and others are only known from mass strandings (*G. macrorhynchus* and *Pseudorca crassidens* in the north of the Iberian Peninsula).

Poster 250:

Analysis of causes of death in necropsied common dolphins in Cornwall, UK (2018-2022) illustrates the continued threat of bycatch for this species

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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 each year along the county's near 700km coastline. Between January 2018 and December 2022, 522 common dolphins were found stranded in Cornwall and reported to the Cornwall Wildlife Trust Marine Strandings Network. Of these, 121 individuals were necropsied, consisting of 64 adults or subadults, 53 juveniles and four neonates. The most common cause of death was bycatch, accounting for 40% (n=49) of all necropsies. This is consistent with Cornwall being the hotspot for bycatch in this species in the UK, with 64% of all cases of bycatch diagnosed in UK stranded and necropsied common dolphins between 1990 and 2019 being recorded in the county. A further 25% (n=30) were cases of infectious disease, 12 of which were cases of parasitic, bacterial and/or mycotic bronchopneumonia. 11% (n=13) of cases were classified as live stranding, where the only pathological changes found on necropsy were lesions that could be attributed to the stranding event itself. There were also nine cases of starvation, nine cases of non-bycatch related trauma (including two cases of boat strike), seven miscellaneous causes of death and, in four cases, the cause of death could not be established. Necropsies of common dolphins carried out in Cornwall make a substantial contribution to our knowledge of the threats faced by this species in UK waters and the wider region.

Poster 251:

Auditory cortex of *Tursiops truncatus*: alterations with age

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The auditory cortex of delphinids is often regarded as their most critical cortical area, on which these animals so heavily rely to perceive their environment and forage. There is partial evidence that dolphins are born with the capacity to produce and receive sounds, which they likely develop through adulthood and potentially lose in old age. There is relatively little data describing the cortical architecture in cetaceans and even less so comparing species or age classes. We set out to compare the cortical neurons found in very young, adult and old age to try and find measurable differences pertaining putatively to the cortical development and cellular arrangement. As we expected the magnitude of the changes were relatively minute since the cortex is mostly mature at birth in cetaceans, but by analyzing thousands of cells per specimen and per layer, we were able to find discrete differences. There was a clear change from calves to older animals, where cells got noticeably larger (area, diameter, perimeter and axes lengths). Layers 3, 5 and 6 showed a clear loss in density from calves to adults, to older animals. By looking at cells by shape, we were able to determine that there was a very significant change in the size of rounder cells from calves (smaller) to adults to olds (larger): the difference in size of round cells across age classes was most noticeable in the first layer, suggesting the involvement of interneurons and glia in these differences. While reference data in terrestrial animals is lacking, these changes suggest that alterations do occur during the lifetime of delphinids, sparking the question of the mechanisms underlying neural aging which could explain them.

Poster 252:

Combination of scoliosis-kyphosis-lordosis deformities and infectious processes observed in a wild adult bottlenose dolphin with by-catch evidence

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In February 2022, the Galician stranding network was notified of a dead bottlenose dolphin with a striking malformation in the peduncle. It was thought to be RA15-14, an individual with this peculiar morphology and known to local scientists since 2015. This identification was confirmed by the dorsal fin marks and the photo identification catalogue of the species in Galicia (NW Spain). Its sex was also confirmed for the first time: it was a female, with a total length of 256 cm. During the external examination, signs of by-catch were observed. Necropsy was carried out and samples were collected for radiological, histopathological, virological, parasitological, and bacteriological studies. The histopathology revealed the existence of parasitic pneumonia, leukocytosis and disseminated intravascular coagulation in several organs, and lymph node lesions, which together would indicate an infectious or septic process. Hypercontraction, hyperacidophilia, and segmental necrosis were observed in the musculature of the peduncle and in the heart. Regarding parasites, pulmonary nematodes and cyamids -the latter located in the fold formed in the dorsal part of the peduncle due to the malformation- were also recorded. Computed tomography images were analyzed to determine the malformations of the spine. Scoliosis, kyphosis, lordosis, and vertebral fusion were observed in the segment of the spine between the third lumbar and the third caudal vertebra; atlanto-occipital fusion was also observed. Anyway, the monitoring of the animals carried out for years allowed to verify that the malformation did not affect her growth and social integration into the group. Although ovaries showed corpus albicans indicative of reproductive activity, it is not known if she could have been pregnant and, if so, whether the malformation would allow her to complete the pregnancy or have a normal delivery.

Poster 253:

Brucella sp. antibody titers in Mediterranean striped dolphins: low predictive value of cELISA for diagnosis of neurobrucellosis

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Since 2012, eight cases of neurobrucellosis by Brucella ceti have been diagnosed in stranded striped dolphins (*Stenella coeruleoalba*) on the Catalan coast. Seven of them stranded alive but died shortly or were euthanised. At necropsy, some animals showed no gross brain lesions, while others displayed leptomeningeal haemorrhages, leptomeningeal opacity, cerebrospinal fluid turbidity, or brain haemorrhages. Histological lesions were found in the brain, as a non-suppurative meningoencephalitis, often with choroiditis and radiculitis. Serological tests for Brucellosis used in ruminants and swine may help to identify infected cetaceans, but further standardization is needed. We tested 57 serum samples, collected from striped dolphins by cardiac puncture at post-mortem examination, to evaluate the usefulness of a multispecies c-ELISA (INgezim® Brucella Compac 2.0) for detecting dolphins with neurobrucellosis. The test uses a single dilution for small ruminant (1:5) or bovine (1:10) samples, and a percentage of inhibition (PI) >40% (compared to a reference serum) as positive threshold. For each cetacean sample we tested 6 two-fold serial dilutions, from 1:5 to 1:160. In dolphins with neurobrucellosis, 7 out of 8 cases had still a PI of >97% at the dilution 1:160, and the remaining case had a PI of 39% already at the dilution 1:40. However, further 12 striped dolphins had a positive c-ELISA result at the dilution 1:160, seven of them with a PI >95%. Bacteriologic investigation for *Brucella* was negative in these 12 cases. From them, 4 had CeMV infection, 2 had polioencephalomalacia of unknown origin, 4 were accidental captures, and 2 had encephalitis of unknown origin. Our results show that most (7/8) neurobrucellosis cases are positive in the c-ELISA (1:160) but with low specificity. If these 12 dolphins were latently infected or false positive results is unknown. A strong humoral response to *Brucella sp*. appears to not be protective against disease progression.

Poster 254:

Temporal trends and influence of biological variables on bisphenol and phthalate concentrations in Mediterranean striped dolphins (*Stenella coeruleoalba*)

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Bisphenols (BP) and phthalates (PAE) are ubiquitous chemical compounds that are added to confer proprieties such as softness, flexibility, resistance, etc, to plastic products of daily use, such as water bottles, PVC products and food packaging. Most of those plasticizers have been detected in the environment and in the tissues of living organisms, and associated to toxicological effects such as endocrine disruption. Long lived mammals and top predators such as odontocete cetaceans are especially vulnerable to pollutants that may bioaccumulate and biomagnify along the trophic web. However, the occurrence of these relatively new pollutants has been scarcely studied in cetacean tissues and little is known about their relation with biological variables or their trends over time. Here, we investigate the presence, concentration, relations with sex and maturation stage, and temporal variations, of 23 BP/PAE compounds in the muscle of 30 striped dolphins (*Stenella coeruleoalba*) stranded along the Catalan coast (NW Mediterranean) between 1990 and 2018. Results showed little influence of sex and maturation stage on compound concentrations, with only the overall PAE compound concentration being significantly higher in samples from males than in those from females, and DMP concentrations significantly higher in immature than in mature dolphins. Possible shifts in the production and use of specific compounds were reflected by BPE, DEP, and DMP concentrations, which were lower, and BPFL concentrations, which were higher, respectively, in samples taken between 2014-2018 than in those taken during the 1990s.

Poster 255:

Blow microbiota of free-ranging short-finned pilot whales: comparison of two 16S rRNA primers for studies of blow prokaryotic communities

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Respiratory disease is one of the main causes of death in cetaceans. Characterizing the microbial communities harbored in the exhaled breath condensate (EBC), or blow, has been proposed as a suitable methodology to assess cetacean health. However, still few studies in the literature focus on the respiratory microbiota of free-ranging animals. In the present study the short-finned pilot whales (*Globicephala macrorhynchus*) were used as a model species to: 1) develop a sampling/analysis protocol for the characterization of the microbial diversity in the EBC of free-ranging cetaceans; 2) perform a comprehensive comparison of two 16S rRNA gene primers set (regarding amplification and taxa coverage) able to describe the microbial communities of their respiratory tracts; 3) highlight possible potential pathogens in the animal's airway microbiota. For this purpose, a total of 12 pilot whale EBC samples were collected during at-sea campaigns in Madeiran waters, in the autumn 2018. Environmental DNA was extracted from the samples and then sequenced using the Illumina MiSeq platform to amplify V3-V4 and V4-V5 hypervariable regions of the 16S rRNA gene. DADA2 bioinformatic pipeline was used to process sequences and analyze the diversity and taxonomic profiles of blow prokaryotic communities. Results showed that, independently of the primer set used, all the sampled animals share Actinobacteria, Bacteroidetes, Firmicutes, and Proteobacteria phyla in their blow composition. The V4-V5 dataset showed higher microbial richness (rare biosphere and potentially pathogenic taxa), whereas V3-V4 captured more diversity. This research contributes to bringing new knowledge on the characterization of the respiratory-associated microbial communities, towards a non-invasive tool for monitoring the physiological state of the airways in cetaceans. However, the methodology still requires research effort and development / optimization of techniques to further advance the implementation of such monitoring tool.

Poster 256:

Biometric study of small cetaceans in Galicia (NW Spain)

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The morphological study of cetaceans provides information on growth rates, sexual dimorphism, or even differences between populations. This study aims to determine if there are differences and similarities between fin areas (dorsal fin, flippers, flukes and all these together) of four species: common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*), bottlenose dolphin (*Tursiops truncatus*) and harbour porpoise (*Phocoena phocoena*). In addition, within each species it is intended to determine if there is a relationship between total length (TL) and fin areas and if there is some sexual dimorphism. Differences between fin areas of these species and similarities between TL and fin areas were analyzed using multivariate analysis, Tukey's test, indices and correlations. Sexual dimorphism was analyzed by comparing available data through various statistical analyses: descriptive statistics, simple and stratified sampling, exploratory analysis, and multivariate analysis. Dorsal fins and flukes of *D. delphis* and *S. coeruleoalba* did not present statistical differences between them, being considered a single group. In *D. delphis* and *S. coeruleoalba*, TL is not well correlated with none of the fin areas, presenting variable fins morphology depending on age. In *T. truncatus* and *P. phocoena* there is a high correlation between TL and area of the dorsal fin, flukes and the sum of all fins, so they either maintain a proportionality or the data available is not representative in terms of age. Adult males of *D. delphis* and *T. truncatus* were significantly larger than adult females, while in *P. phocoena*, adult females were the ones that presented the largest size; indicating in the three species a clear sexual dimorphism in the TL. The measurement of the tip of rostrum to mid-point of genital slit represents a sexual dimorphic character in all species studied. Other representative biometric was the tip of rostrum to mid-point of umbilicus.

Poster 257:

Ultrastructural analysis of the organ of Corti in harbour seals (*Phoca vitulina*)

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Harbour seals (*Phoca vitulina*) are highly dependent on sound for their life-long activities in both terrestrial and aquatic environments. Currently, characterization of the different structures of the ear has allowed us a limited understanding of this sense in this species. Features in the anatomy of the important structure for sound perception, the organ of Corti, are still unknown. This study aims at presenting a morphometric (linear and geometric) description of the inner ear sensory cells in the harbour seal. Ears from five seals (four neonates and one adult) from human care at the Vancouver Aquarium, Canada and the University of Santa Cruz, USA were used. Equidistant measurements were taken (locations every 10% +/- 2%) in the organ of Corti using scanning electron microscopy. Estimation of cell density per 100 µm/location was also performed. The spiral shape of the cochlea showed an average length of 28.4 mm. Sensory cells showed significant changes in linear morphometry associated with their location in the organ of Corti by six relevant parameters. Geometric morphometrics analyses (PCA, k- medoids clusters) supported these associations by grouping the changes in cell configuration (57 landmarks in 12 representative cells) according to their location in the organ of Corti. These descriptive and quantitative findings will provide a baseline for morphology and morphometry of the sensory cells of the organ of Corti in harbour seals, which will allow comparing between normal and pathological features.

Poster 258:

Fatal infection of influenza A virus in a harbor porpoise (*Phocoena phocoena*)

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Influenza A viruses (IAV) naturally occur in wild waterbirds and can infect domestic poultry and other bird and animal species. Europe, Africa, Asia and North America are experiencing unprecedented mortalities in wild and domestic birds because of the highly pathogenic avian influenza virus (HPAI) H5N1 clade 2.3.4.4b., HPAI subtype H5N1 has dominated infections in wild birds in Sweden since December 2021, with occasional spillover into wild mammals. In contrast to numerous reports of IAV infections in seals, reports in cetaceans are scarce. In June 2022, an immature male harbor porpoise presenting clinical signs suggestive of neurological disease was observed in shallow waters off the Swedish west coast and drowned shortly thereafter. Necropsy was performed at the National Veterinary Institute (SVA), Uppsala, Sweden, within the marine mammal disease surveillance program. No significant macroscopical lesions were found. Stranded porpoises in Sweden are screened routinely (PCR) for cetacean morbilliviruses (CeMV) and IAV. HPAI- H5N1 clade 2.3.4.4b was found in several organs, with the highest viral loads in the brain. The virus contained no genetic motif of mammalian adaptation besides those already described for the H5 clade 2.3.4.4. It was closely related to strains recovered from wild birds from the same area, supporting spillover from wild birds. Histopathological changes in the brain were consistent with non-purulent meningoencephalitis, and viral antigens could be seen as associated pathological lesions using immunohistochemistry. These results confirm that meningoencephalitis associated with IAV infection is the cause of abnormal behaviour and subsequent drowning. Infection of IAV in a harbor porpoise represents an expansion of the viral host range, and this case highlights the potential risk of virus spillover to mammalian hosts even without adaptation.

Poster 259:

Determination of water balance in *Orcinus orca* and *Tursiops truncatus* using oxygen isotopes

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Defining how marine vertebrates maintain their water balance without consuming continental freshwater offers insight into the adaptation of tetrapods to a fully aquatic lifestyle in a hyperosmotic environment. The contribution of four potential source of water has been identified for these organisms: surrounding salt water, dietary free water, inhaled water vapor and metabolic water. We have measured the 18O/16O oxygen isotope composition of blood plasma, urine, food and basin water from thirteen captive specimens belonging to two odontocetes species (four Killer whales *Orcinus orca* and nine Common bottlenose dolphins *Tursiops truncatus*). This was done in order to investigate the contribution of each oxygen sources to their body water isotopic signature. Coupled with a box-model, the oxygen isotope composition of body fluids reveals that dietary free water and metabolic water contribute to more than 90 % of the total water inputs, with the remaining 10 % consisting of inhaled water vapor and surrounding water accidentally ingested or absorbed through the skin. Moreover, metabolic water contribution appears to be more important in *O. orca* than in *T. truncatus* due to a higher metabolic water production associated with a more lipid-rich diet. Beyond physiological and conservation biology implications, these results question the use of the oxygen isotope composition of cetaceans' body fluids and skeletal elements as an environmental proxy of the oxygen isotope composition of present and past oceanic waters.

Poster 260:

Host size and microhabitat suitability as potential drivers of body size and sexual dimorphism of whale lice

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Whale lice (*Cyamidae*, 28 spp.) are amphipod ectoparasites specific to cetaceans that feed on skin and are transmitted by bodily contact. Although there is a wide range of sizes, and sexual differences in size, among cyamid species, the drivers of such variability are poorly understood. We explored whether the overall size, and sexual dimorphism in size, of cyamids could be positively associated with the size and suitability (in terms of microhabitat availability) of their cetacean hosts. We gathered all available published data on body length for each sex of all cyamid species and their cetacean hosts; the latter were further classified into four categories based on microhabitat availability, from '1'(cetaceans with smooth skin, providing just natural orifices as a shelter from water flow) to '4' (cetaceans with numerous ventral grooves and callosities, which provide much additional shelter). Furthermore, we measured the length and area of 120 specimens from 3 cyamid species (20 of each sex) of different size: Syncyamus aequus from striped dolphins (small size), Isocyamus delphinii from long-finned pilot whales (intermediate size), and Cyamus boopis from a humpback whale (large size). We found that both cetacean body length and suitability were strong, significant predictors of cyamid length. Furthermore, sexual dimorphism in body size was accentuated with increasing cyamid overall length. A detailed comparison of the 3 selected species corroborated the same results. Females of cyamid species infecting large cetaceans with many sheltering places could have evolved larger body sizes (thus increasing their reproductive output) due to the low risk of being wiped out. The resulting increase of population density would have led to stronger intrasexual competition in males, resulting in male-biased sexual size dimorphism. Our findings suggest that cyamid size is limited by the size and number of available microhabitats on cetaceans, thus being a potential factor shaping specificity.

Poster 261:

Differential Prevalence of "melanistic" Common Dolphins across four European regions as obtained by small boat visual survey

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Although being relatively homogeneous within cetacean species, pigmentation patterns may greatly vary among conspecifics. It has been known for a few decades that some *Delphinus delphis* individuals may show an anomalous pigmentation: in the most frequent case, the yellow patch that produces the usual hourglass-like pattern on the flanks is missing, leading to a very dark appearance. Such individuals have been described from several areas around the globe (notably Eastern Pacific, North-Eastern Atlantic and South-Western Pacific oceans), but the phenomenon is difficult to quantify, which prevents comparison between areas. Here we study the occurrence of this abnormal dark pattern using at-sea visual data obtained by Groupe de Recherche sur les Cétacés with an 11-meter-long sailboat and a consistent methodology, that provided several hundreds of common dolphins visual sightings with or without anomalously pigmented animals. In order to be usable in this study, we considered that a sighting should have three properties: duration longer than 3 minutes, minimal distance between the dolphins and the boat shorter than 50 meters, good environmental conditions (daylight, sea state inferior to Beaufort 3). Once filtered, the dataset consists of 185 sightings obtained from 1992 to 2022 in four European areas: Mediterranean Sea, Western Iberia, Azores and Bay of Biscay. Presence of dark pigmented common dolphins was noted in 13 sightings (0% (0/42) in the Mediterranean, 8% (1/12) in Western Iberia, 7% (6/83) in the Azores and 13% (6/48) in the Bay of Biscay). The geographical distribution of these individuals (relative homogeneity of the prevalence in the North-Eastern Atlantic, opposed to the apparent absence of this pigmentation pattern in the Mediterranean) might be a sign of differential genetic flows between areas. These observations highlight the usefulness of consistent boat-based cetologic fieldwork.

Poster 262:

Significant multi-decadal changes in the intestinal helminth fauna of Mediterranean striped dolphins, *Stenella coeruleoalba*: what do they reveal?

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In 1990 and 2007 the western Mediterranean population of striped dolphins experienced two mass mortality events caused by cetacean morbillivirus. In addition, this population apparently shifted, over the last two decades, from a diet dominated by oceanic prey towards one based mainly on neritic, demersal prey. In this study we analyse whether, and how, these factors could have impacted the infection levels of intestinal helminths. We examined the intestinal parasites of 225 striped dolphins stranded along the Spanish Mediterranean coast between 1987 and 2016, and used Generalized Additive Models (GAMs) to monitor long-term changes in their abundance. Three tetrabothriid cestode species were found, i.e. *Tetrabothrius forsteri* (prevalence = 93.8%), *Strobilocephalus triangularis* (15.6%) and, much more rarely, *Trigonocotyle globicephalae* (5.8%). The two first species exhibit high specificity for striped dolphins in the study area and might share a similar life-cycle. However, in the case of T. forsteri, no significant changes in abundance were observed during the studied period, whereas the abundance of S. triangularis significantly dropped during the period 1997-2002. This temporary decrease could be related to a time-lagged effect of the mortality event of 1990 on the host population, suggesting a stronger impact on the specific parasite with lower prevalence. A fourth helminth species, the acanthocephalan *Bolbosoma vasculosum* (prevalence = 15.6%), was only found as juvenile, and its infections were virtually restricted to 1990. Why this parasite was seldom detected afterwards is puzzling because the dolphins' dietary shift could not be so abrupt as to halt potential contacts with *B. vasculosum*. To our knowledge, this study represents the first investigation of multi-decadal changes in cetacean parasites and illustrates their potential as indicators of ecosystem changes.

Poster 263:

Plastic ingestion and phthalate ester loads in different tissues of a stranded Fin whale (*Balaenoptera physalus*): a case study in the Mediterranenan Sea

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Plastic ingestion in cetaceans is a well-understood phenomenon both in the Mediterranean Sea and globally, although the evaluation of microplastic in these species, particularly in mysticetes, remains poorly studied due to difficulties in sampling and analytical procedures and the lack of standardized methods. Nevertheless, the large number of synthetic items floating in their feeding ground, secondary ingestion by contaminated prey and the potential release and accumulation of contaminants from ingested plastic pose a serious threat to these organisms. Accordingly, plastic ingestion and phthalate levels in eight biological tissues were evaluated in a stranded fin whale found in Sorrento in 2021 (Thyrrenin Sea, Italy). No items were found in the stomach, while a total of 37 plastic particles were isolated from approximately 20 kg of intestinal content collected by analysing one-third of the whale's intestinal tract. Microplastic (<5 mm) resulted in the most abundant size classes (78%), represented mainly by fragments, films, and filaments chemically composed of polyethylene and polypropylene. Only one macroplastic (3%), represented by a fishing line, was isolated and characterized. Phthalate compounds were detected in all biological tissues analysed with the highest concentrations in the heart (889.87 ng/g w.w.), kidney (767.32 ng/g w.w) and lung (665.02 ng/g w.w.). Differences in the accumulation fingerprint were highlighted with high molecular compounds (DEHP and DCHP) mostly present in the kidney and heart and low molecular compounds in the lung, liver, and blubber (DIBP, DBP and DEP). These data highlight for the first time the ingestion of synthetic particles in the Mediterranean fin whale shed the light on the potential relationship between the presence of plastic and the leaching of phthalates. Further analysis is needed to better investigate the different accumulation patterns among biological tissues analysed stressing their metabolic pathways, as well as the potential toxicological effects on this endangered species.

Poster 264:

Histological analyses of the stomach of an odontocete, the harbor porpoise (*Phocoena phocoena* L.)

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Whales have a stomach, consisting of different compartments due to their phylogeny. Odontocetes have the forestomach, main stomach, connecting channel and pyloric stomach. Each compartment has a unique histology and therefore a different task during the digestion process. We present a new analysis and comparison of the histology of the different compartments with a discussion on their specific physiological functions and constraints. Chemical and mechanic digestion of the hard and soft parts of prey takes place in the the 1) forestomach. The thick longitudinal muscle layer, which is twice as thick here as in the other compartments, suggests that a very strong motoric movement can be induced during the digestion process. The thick keratinized mucosa protects the underlaying epithelia layers from injuries which can occur when hard parts are moved inside this compartment. However, the lamina propria of the forestomach lacks any glandular cells. Chief cells, endocrine cells and parietal cells which secrete hydrochloric acid and mucosa, containing digestion enzymes, are only found from 2) the main stomach on. Glandular cells are highly packed in this lamina propria. Since hard parts are only found in the forestomach this means that acid and enzymes are secreted in the main stomach and transported via a reflux into the forestomach where the first chemical digestion takes place. The chyme than is transported back into the main stomach and further into the connection channel. The connection channel and the fourth compartment the pyloric stomach have a similar histology. The lamina propria of both compartments contains only mucosa secreting glands endocrine cells and chief cells which are loosely packed suggesting a further chemical digestion of the chyme. Thereafter the resorption process begins inside the intestine.

Poster 265:

The curious case of the harbour porpoises born in winter

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The known calving seasonalities in the different harbour porpoise populations are concentrated from May to September, with differences among them. However, in Galicia (NW Spain) it has been observed that in recent decades this seasonality has been changing. The porpoise recorded in the area is the Afro-Iberian harbour porpoise, considered an endangered species by Spanish legislation. Each year more information about its biology and natural history is being learned, and small differences with other populations can be observed. One of the lesser-known aspects of the local population is the fetal development and the possible seasonality of births. In the last 32 years of study only 6 fetuses have been recorded, the largest being one with a total length of 89 cm. On the other hand, there is much more data on newborns, the smallest with a total length of 78 cm. In order to try to delimit a birthing season, and considering the smaller calf and the larger fetus, the records of individuals already born with a length between 78 cm and 95 cm (n=19) recorded by the stranded network were analyzed. In the period 1991-2000 (n=4) the individuals were found in March, June, July and August; between 2001 and 2010 (n=3) all were concentrated in May; and between 2011 and 2022 (n=12) 1 was recorded in December, 4 in January, 6 in February and 1 in March. Despite the reduced number of data, a calving seasonality is observed, more pronounced with the years, and it has been moving towards the winter months. The birthing seasonality could also be inferred studying the peak in testicular weight variation in adult males (n=16), that is set in January-February. Considering a gestation period of 11 months, newborns would be recorded in winter, too. This is a very different seasonality compared with other populations.

Poster 266:

What a ball of nets in a bottlenose dolphin, *Tursiops truncatus* stomach can tell?

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Bottlenose dolphins, *Tursiops truncatus*, are known to interact with several fisheries globally, exploiting opportunistic strategies that allow them to obtain food easily, such as preying on gears. Here, we document the findings from the analysis of the stomach contents from a stranded adult (Length = 301 cm) male bottlenose dolphin in Southern mainland Portugal (Algarve). Examination of the animal revealed a good nutritional condition state and the absence of the right caudal lobe, that had already healed and scarred, most likely caused by an old anthropogenic interaction. Furthermore, its stomach contents contained several cephalopod beaks and a ball of different pieces of bottom set-nets weighing about 3 kg. The ball of nets was washed, the pieces separated, counted and meshes measured. 266 pieces of 12 different mesh sizes were found. Based on the existing national mesh classes established for gill nets (<50mm, 60-79mm), gill/trammel net (80-99 mm) and trammel nets (100-120 mm), and their most likely target species, this bottlenose favored interacting with gill nets that operate closer to the coast, with meshes between 60-79 mm, which accounted for 65 % (n= 172 pieces) of the whole sample. Moreover, the metiers operating with these mesh sizes are locally known to target red mullets, Mullus sp, cuttlefish, Sepia officinalis, and sparids. The second most found mesh size segment (20%; n= 53) was the 50-59 mm, which targets bastard sole, Microchirus azevia, followed by 9% (n= 23), 6% (n= 17) and less than 1% (n =1) of mesh sizes 80-99 mm, 100-120 mm and 25 mm, respectively. This work provides a valuable insight on the feeding ecology and preferences of a swimming impaired bottlenose dolphin associated to its possible developed “dependent/exclusive” depredatory behavior in gill nets operating near the coast and predicts long-term consequences of accumulation of non-digestible nets in stomachs.

Poster 267:

First epidemiological investigation of tattoo-like skin lesions among bottlenose dolphins (*Tursiops truncatus*) in the Ría de Arousa, Spain

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Studying epidemiological aspects of pathogenic skin lesions in cetaceans contribute to the knowledge of the population health status and to future investigations of possible anthropogenic and environmental stressors. In this study, we analyzed tattoo-like skin lesions in prevalence, number and size in resident, coastal bottlenose dolphins contributing to important baseline data. Data was collected from 145 daily boat based surveys in 2017 and 2018 in the Ría de Arousa (NW Spain). Photographs were taken to identify the dolphins and then skin lesion analysis was carried out in a total of 100 sexed individuals (10 409 images). Prevalence, number and lesion-sizes were compared and correlated between sexes, seasons and years. Tattoo-like skin lesions of symptomatic individuals that had been sighted in more than one season were examined in terms of progressing stages as well as their minimum persistence time. Overall prevalence of tattoo-like skin lesions in the population was similar in both years. Season was not significant, but males showed higher prevalence than females. Progressing lesions showed round or irregular light grey or whitish marks when healed, but lesions also reoccurred after healing. Males might be more vulnerable to tattoo-skin disease than females, possibly due to increased susceptibility to environmental stressors and a different immune response. Ongoing monitoring should also include analysis of prevalence within age-classes, as well as analysis of possible linkages of the disease with anthropogenic and environmental factors.

Poster 268:

Radiological study of the harbour porpoise pectoral fin (*Phocoena phocoena*) in Galicia (NW Spain)

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Harbour porpoises from the Iberian Peninsula and North Africa have been proposed to be classified as a new subspecies, *P. phocoena meridionalis*. The population is low and the species was catalogued as endangered in 2020. To improve the anatomical knowledge of the proposed subspecies, samples of either one or both pectoral fins were collected by the regional stranding network from dead stranded animals found along the Galician coast (NW Spain). Since 2010, the flippers from 45 animals were collected and examined in mediolateral projection by using an X-ray equipment. Radiological data about bone growth were correlated with individuals of known age and the same total body length. Regarding the osteological structure of the harbour porpoise flipper, the digit region displayed variability among individuals concerning the number of phalanges in each finger, but maintaining hyperphalangy in the second nd third digits. The most common phalangeal formula was I1 II6 III6 IV3 V1/2. Variations in the conformation of the carpus were also found, as well as asymmetry between left and right flippers. No differences were found in the osteological pattern between males and females, but growth plates closed earlier in males than in females. Open growth plates were noted in smaller sized individuals. In conclusion, the osteological structure of the pectoral fin in harbour porpoises from Galician waters is similar to the ones studied in other species of odontocetes, but shows individual variations. Radiology is a relatively cheap, non-invasive method to study bone structure in cetaceans, and can be used to estimate the age of live and dead individuals when correlating the total body length and the presence/absence of growth plates.

Poster 269:

Anisakis spp. as biomarkers of residency of short-finned pilot whales, Globicephala macrorhynchus in the Iberian Atlantic coast

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Short-finned pilot whales, *Globicephala macrorhynchus* (SFPWs), inhabit temperate and tropical waters worldwide. In the Atlantic Ocean there are regular sightings up to 40ºN, but also sporadic records at 43ºN-45ºN, especially in recent decades. However, whether the SFPWs are transient or resident above 40ºN is unknown. Here, we use gastric nematodes of genus *Anisakis* as biomarkers to reconstruct the geographical mobility of a SFPW pod prior to its mass stranding in Asturias, Northwest Spain (43º28'27''N, 5º10'35''W) in September 2020. A total of 972 worms were collected from 6 of the 8 SFPWs analysed, and were morphologically identified as *A. simplex* (s.l.) with the following population structure: L3s (4.5%), L4s (56.9%), subadults (12.1%; sex ratio: 0.297) and adults (26.4%; sex ratio: 0.553). These figures closely resemble those reported for *A. simplex* (s.l.) infecting harbour porpoises in the Northeast Atlantic. The analysis of the cox2 gene from 30 worms revealed the presence of *A. simplex* (s.s.) (93.3%) and *A. pegreffii* (6.7%), mirroring proportions of 52 additional specimens identified by morphological diagnosis (88.5% and 11.5%, respectively). A third species reported in SFPWs and other delphinids up to 35ºN-40ºN, i.e., *A. typica*, was not detected in our sample by morphological or molecular methods. The predominant species found, i.e., *A. simplex* (s.s.), is the most cryophilic of the genus, occurring above 35ºN, whereas *A. pegreffii* is eurytopic, with a septentrional record around 43ºN (Galician waters, NW Spain). According to the above evidence, and considering the life span of *Anisakis* spp. in cetaceans, we can infer that the SFPWs of this study had probably resided at latitudes above 40ºN at least during 3-4 months preceding the stranding. The finding raises the question as to whether the latitudinal distribution of SFPWs is experiencing a climate-driven expansion, such as it has been observed in other cetaceans worldwide.

Poster 270:

Occurrence of tattoo skin lesions in bottlenose dolphins (*Tursiops truncatus*) related to exceptional climatic events in the Western Ligurian Sea

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The common bottlenose dolphin represents an excellent bioindicator due to its coastal habitat, high sociality behaviours and the capacity, as apex predator, to accumulate environmental contaminants. In this study, we investigated the occurrence of tattoo skin lesions in the bottlenose dolphin population inhabiting the Western Ligurian Sea (Northwestern Mediterranean Sea) related to two important flood events in 2020 and 2021. Data were grouped in two sampling periods 2018-2019 (I, pre-floods) and 2021-2022 (II, post-floods) and dolphins were divided by sex and age class to evaluate for any differences. Presence of tattoo lesions was examined in 2,015 (4.4% of the total photos collected) high-quality pictures. Of the 137 identified dolphins, 31 showed tattoo lesions at least once in the study period, with a range of 1-5 lesions per animal. Seven animals showed complete recovery across the four years, while one animal recovered from lesions between 2019 and 2021 but presented again in 2022. Sex but not age was significant, with males exhibiting lesions more than females ($p < 0.05$). Minimum prevalence of tattoos for the whole study period, periods I and II, was 22.6%, 14% and 20% respectively. Considering only residents dolphins re-sighted every year (14), there was a significant increase in both the annual incidence rate: 0.21 (2018), 0.14 (2019), 0.43 (2021), 0.64 (2022) and pre/post-flood period incidence rate: 0.29 (I) and 0.79 (II), with 11 new cases detected from 2021-202. Our findings suggest a possible relationship between the two exceptional flood events and incidence of tattoo lesions. Increased freshwater input and contaminants from run-off may impact dolphins' health. We suggest future analyses to correlate salinity and environmental variables to the occurrence of tattoo skin lesions. As in other parts of the world, tattoos may be good indicators of coastal environmental health and of extreme climatic events.

Poster 271:

A family affair: from neutral markers to the bacterial microbiomes of a short-finned pilot whale (*Globicephala macrorhynchus*) mass stranding event

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In species that form close-knit social groups, an individual's ecology and behavior tends to be similar to other group members. Presumably, external threats to survival are similar, and in highly related or familial groups, all may be genetically predisposed to the same health risks or diseases. Short-finned pilot whales, (*Globicephala macrorhynchus*), found worldwide from tropical to temperate waters, are highly gregarious cetaceans that form kin-based matrilineal societies comprised of multiple generations of related individuals. Species that form long-term social bonds are prone to mass stranding, and short-finned pilot whales are notorious for these events. In this study, we used genetic and genomic techniques to investigate kinship, immune function, and skin microbiome composition from individuals in a mass-stranding event on Florida's east coast in 2012. We extracted tissue samples from n=18 individuals using DNeasy Blood and Tissue kit (QIAGEN), and a single haplotype was identified from a 400bp sequence of mitochondrial DNA (mtDNA) d-loop. Samples genotyped at n=13 microsatellite loci revealed close kin. To investigate adaptive immune function, we sequenced n=12 samples for exon 2 DQA, a class II gene of the Major Histocompatibility Complex (MHC) and found polymorphisms in nonsynonymous sites previously detected in other cetacean species. To evaluate individual skin microbiome composition, the 1,500bp 16S rRNA gene was sequenced on Oxford Nanopore minION platform for n=8 samples. A few bacteria phyla dominated but increased individual variation can be seen at the species level, likely reflecting different responses to the environment. In this study, we demonstrate the utility of retroactively extracting archived frozen tissue samples to investigate adaptive genetic diversity twinned with bacterial microbiome detection in a closely related group to understand how individuals interact with conspecifics and the environment, exploring the roles of group similarities and individual differences in the health, fitness, and viability of a social species.

Poster 272:

Categorizing and defining externally detected deformities in free-ranging cetaceansAna

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Externally detected deformities are important features that may support identification of free-ranging cetaceans, especially in poorly-marked individuals; and they may be used as indicators of health conditions. Nevertheless, to use the assessment of deformities as a monitoring tool, it is necessary to have a standardized language in order to employ comparative analysis among studies, at the spatial and temporal levels, and across species. The present work provides a definition of deformity, as well as a categorization of externally detected deformities in wild individuals. We compiled an extensive state-of-the-art baseline, categorized deformities, and developed consensus definitions for each category and sub-category. We compiled 253 research papers reporting deformities in cetaceans across the globe, in 50 countries (~26% worldwide geographical representation) for 80 species (~82% representation of the Cetacea species). A deformity was defined as "a condition, congenital or acquired during the course of the individual's life, irrespective of the source, in which all or part of the body differs from the shape, colour, or appearance that is naturally expected/typical/characteristic for the species". Six general categories were determined: "Anatomical malformation" (11 sub-categories), "Skin lesion" (29 sub-categories), "Anomalous pigmentation" (4 sub-categories), "Physical impact" (14 sub-categories), "Emaciation", and "Epibionts" (7 taxa). Besides reporting and describing the deformities, it is also important to identify location of occurrence, species and prevalence, possible cause(s), and impacts on the short- and long-term. The documentation of cetacean deformities is a promising monitoring methodology, non-invasive and easily applicable, that can provide support to photo-ID studies and important indicators of cetacean and ecosystem health. Especially with the increase of open science, the use of common language is fundamental to compare data among studies, and efficiently support cetacean management and conservation at national, transnational, regional and international levels.

Poster 273:

Assessing temporal patterns in nutritional condition in harbour porpoises in the southern North Sea

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Studying the health of harbour porpoises (*Phocoena phocoena*) in the wild is a challenging task, thus animals that were bycaught in fisheries or stranded ashore are a valuable source of information on a range of parameters, including nutritional status. Harbour porpoises are protected under several (inter)national policies and the Netherlands has the obligation to maintain a healthy population. The impending changes in the climate could have cascading consequences on harbour porpoise health in the southern North Sea, and there is an urgent need to monitor the impacts of climate change on harbour porpoises. One of the ways to determine the effect of climate change is to study changes in nutritional condition of harbour porpoises. Porpoises have high energy demands and are therefore vulnerable to changes in food quality and quantity, making nutritional condition a useful indicator of health for these animals. The aims of this study were firstly to determine if nutritional condition can be used as an indicator to assess the health of a porpoise and to assess the temporal trends in nutritional condition of harbour porpoises of different biological characteristics, and secondly, to explore how these relate to fluctuations in sea surface temperature (SST). Data was collected from harbour porpoises that stranded on the Dutch coast and collected for post-mortem investigations at Utrecht University from 2008 until 2021. Nutritional condition was calculated using measurements of weight, length and blubber thickness. We found differences in nutritional condition between female and male porpoises and, which varied between years. The assessment of nutritional condition in harbour porpoises provides vital knowledge to monitor potential effects of climate change, such as changes in SST, on porpoise health. Expanding our analyses spatially will provide additional insights into these findings and allows assessment at a spatial scale that is ecologically relevant.

Poster 274:

Brucella ceti infection in cetaceans from Italian Seas: associated lesions and epidemiological data

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Brucella ceti infections have been increasingly reported in cetaceans over the past few years, although a limited characterization of Mediterranean Brucella spp. isolates has been previously reported. In this study, we focused on 23 cases of B. ceti infection occurred in striped dolphins stranded along the Italian coastline from 2012 to 2021, investigated by the network of Istituti Zooprofilattici Sperimentali laboratories, coordinated by the National Reference Centre for Diagnostic Investigations on Stranded Marine Mammals (C.Re.Di.Ma.). We performed pathological, microbiological, biomolecular and serological investigations, and a complete genomic sequencing and comparative genomic analysis. Pathological changes consistent with B. ceti infection were detected in the central nervous system of 19 animals, showing non-suppurative meningoencephalitis; 6 of which showed B. ceti-associated pathological findings also in other tissues. Co-infections with other relevant pathogens, mainly involving Dolphin Morbillivirus (DMV), were detected in 13 cases, and in 6 of which the cause of stranding has been related to a severe cerebral impairment associated. We classified the 23 isolates into two sequence types, ST26, prevalent, and ST49. Whole genome SNP analysis showed that strains from Italy clustered into 5 genetically distinct clades. Plotting these clades onto the geographic map suggests a link between their phylogenic and topographical distribution (Adriatic Sea, Ionian Sea, Ligurian Sea, Sardinian Sea, Tyrrhenian Sea) alongside a potential indication of separation of the circulating striped dolphin populations. These results represent an exhaustive characterization of B. ceti isolated from Italian waters and show the usefulness of WGS in understanding the evolution of this emerging pathogen. The severity of B. ceti-associated lesions reported, confirms his role as a primary neurotropic pathogen in striped dolphins. In conclusion, this study shed light on one of cetaceans emerging pathogens that, together with other biological agents, climate changes and human activities, is threatening the survival of these species globally.

Poster 275:

Unveiling evidence of natural and anthropogenic skin marks on baleen whales (Northwestern Iberian Peninsula coast)

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The use of photographs to assess the health of free-ranging cetaceans has been increasingly used over the last years. To explore the potential threats on baleen whales feeding along the Northwestern coast of Spain (Galicia), we used a non-invasive method through the analysis of photographs to assess markings of natural and anthropogenic origin on three baleen whale species over a period of 5 years (2017-2021). Epidermal lesions, coloration anomalies and ectoparasites were detected in blue (*Balaenoptera musculus*), fin (*Balaenoptera physalus*) and minke whales (*Balaenoptera acutorostrata*). Altogether, 36 types of skin marks were documented. The most prevalent skin lesions were black marks on blue whales (95.2%), blisters and white marks on fin whales (74.2%), and blisters on minke whales (76.2%). Our results showed that skin marks were more abundant and prevalent on blue whales, however, more severe on fin whales. Minke whales appeared to be the most vulnerable species facing anthropogenic threats. Herpes, black and white marks were the lesions that contributed the most for the variability of skin marks on whales, however none of those are particularly related to a specific species or body condition. These findings therefore further show that skin marks can be used to unveil the potential natural and anthropogenic threats to whales' health.

Poster 276:

Body condition and allometry of free-ranging short-finned pilot whales in the North Atlantic

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Anthropogenic disturbance on animals can affect the nutritional health of individuals. The morphometrics, allometrics and body condition of individuals can be used to assess and monitor the health of cetacean populations. We examined the body shape, allometric relationships and body condition of free-ranging short-finned pilot whales (*Globicephala macrorhynchus*) in three locations across the North Atlantic: Tenerife, the Canaries; Terceira, the Azores; and Dominica, the Lesser Antilles. Using unmanned aerial vehicles, the body length (BL) and width (along the body axis) were measured from photographs of the dorsal side, while body height (dorso-ventral distance) was measured of the lateral side. 77 whales were measured (mean±SD), including nine calves (BL 2.37m±0.118), 31 juveniles (2.90m±0.183) and 37 adults (3.72m±0.440). The body shape was similar among reproductive classes, with the widest point being anterior of the dorsal fin (at 30-35% BL from the rostrum). The cross-sectional body shape of the whales was flattened in the lateral plane, which increased towards the peduncle and fluke. The rostrum-blowhole distance and fluke width increased linearly with BL. The estimated body volume of pilot whales ranged between 0.15-0.32m3 (mean=0.23m3, SD=0.046) for calves, 0.25-0.64m3 (mean=0.39m3, SD=0.090) for juveniles and 0.46-1.13m3 (mean=0.72m3, SD=0.205) for adults. The body condition (residual of log-volume vs. log-length) ranged from -34.8 to +52.4%% (mean=0.0087, SD=0.137). There was no difference in body condition among reproductive classes (LM: F2,74=0.155, P=0.856) or locations (LM: F2,74=0.188, P=0.829). The results contribute to the long-term monitoring of the health status of these populations and the better understanding of their vulnerability to potential anthropogenic stressors with implication in management conservation of the short-finned pilot whales across the North Atlantic.

Poster 277:

Polychlorinated biphenyls are associated with reduced testes weights in harbour porpoises (*Phocoena phocoena*)

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Polychlorinated biphenyls (PCBs) are highly toxic and persistent aquatic pollutants that are known to bioaccumulate in a variety of marine mammals. They have been associated with reduced recruitment rates and population declines in multiple species. Evidence to date documents effects of PCB exposures on female reproduction, but few studies have investigated whether PCB exposure impacts male fertility. Using blubber tissue samples of 99 adult and 168 juvenile UK-stranded harbour porpoises (*Phocoena phocoena*) collected between 1991 and 2017, here we show that PCBs exposures are associated with reduced testes weights in adults with good body condition. In animals with poor body condition, however, the impact of PCBs on testes weights was reduced, conceivably due to testes weights being limited by nutritional stress. This is the first study to investigate the relationship between PCB contaminant burden and testes weights in cetaceans and represents a substantial advance in our understanding of the relationship between PCB exposures and male reproductive biology in cetaceans. As testes weight is a strong indicator of male fertility in seasonally breeding mammals, we suggest the inclusion of such effects in population level impact assessments involving PCB exposures. Given the re-emergent PCB threat our findings are globally significant, with potentially serious implications for long-lived mammals. We show that more effective PCB controls could have a substantial impact on the reproductive health of coastal cetacean species and that management actions may need to be escalated to ensure adequate protection of the most vulnerable cetacean populations.

Poster 304:

Persistent Organic Pollutants in harbour porpoises (*Phocoena phocoena*) stranded in the Portuguese coast

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The harbour porpoise (*Phocoena phocoena*) population in the Iberian Peninsula is small and genetically isolated. Although porpoises are mostly affected by fisheries bycatch, additional anthropogenic pressures, such as pollutants, may be affecting the population. We evaluated 21 persistent organic pollutants (POPs) in blubber samples from 42 porpoises (23 males and 19 females) collected by the stranding network in the north coast of Portugal between 2005 and 2013, and later stored at the Marine Animal Tissue Bank (ECOMARE). Samples were analysed by GC-ECD and GC–MS. Overall, the mean POP concentration levels were ranked as follows: ∑PCBs > ∑DDTs > ∑drines > ∑HCH. The most concerning concentrations were detected for ∑PCBs (ICES 7) in mature males (9.64 ± 3.05 µg/g, lipid weight) and 4,4´- DDE (2.58 ± 0.60 µg/g, lw) also in mature males. Considering the whole sample, three porpoises (7%) exceeded the ∑PCB toxic threshold defined for health and reproductive effects on marine mammals. PCB 138, PCB 153 and PCB 180 were the predominant PCB congeners (representing 91,4% of the detected ∑PCB), which is in accordance with recent studies of persistent organic pollutants in cetaceans. In general, we found p,p'-DDE/∑DDT > 0,6 indicating an earlier (not recent) higher environmental DDT availability. This preliminary evaluation corroborates that traditional POP concentrations remain high in small cetaceans and supports the need for a conservation strategy for this species.

Poster 305:

Gastrointestinal vascularization of the bottlenose dolphin (*Tursiops truncatus*)

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Odontocetes base most of their diet on fish, and their digestive system is in an intermediate state where the polygastric complex resembles that of their terrestrial relatives (the cow, the sheep, the giraffe) while on the other hand, the entero-colic tract mirrors that of terrestrial carnivores. Nevertheless, the odontocete intestine is an unvaried tube lacking a caecum and thus the division between small and large intestine (and their subdivisions) appears difficult if not impossible. The methodology to overcome this issue lies in the intestinal vascularization pattern, in particular in the course and ramification of the celiac artery (CA), the cranial and caudal mesenteric arteries (CrMA and CdMA). We analysed a series of pictures and dissections on ten bottlenose dolphins (Tursiops truncatus) and performed a polyurethane foam cast in one adult bottlenose dolphin. From the cast we also measured the arteries' thickness to clarify the monopodial or dichotomous branching. Our results discern the presence of multiple duodenal arteries detached from the CA, which probably caused the distancing of the pancreas from its original supplying arteries. The CrMA, apart from multiple jejunal arteries, gives origin to a thin ileocolic artery (ICA) and thin CdMA, which was never found directly detached from the aorta. The ICA detached the ileal and anti-ileal mesenteric branches, and the right and middle colic arteries. From the CdMA originated the left colic and cranial rectal arteries. Diameter measurements showed a mixed monopodial and dichotomous scheme. The arterial pattern suggested an elongation of the duodenum together with a shortening, while still present, of the colic tract. This might be related to the crucial need to directly digest entire prey and avoid the classical gas-producing colic fermentations. The origin of the CdMA on the CrMA might instead be related to the loss of the pelvic girdle.

- **Modelling**

Poster 278:

The identification of cetacean aggregation areas based on species distribution models

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The geographical distribution of a species reflects its ecology and evolutionary history and is determined by both abiotic and biotic factors that operate at different temporal and spatial scales. Species distribution models are powerful tools that allow projecting habitat suitability for a species and its potential distribution. The overlay of the potential distributions of a group of species facilitates the identification of their aggregation areas. Twenty-one resident cetaceans inhabit the Gulf of Mexico (GM). The objective of this study was to identify their aggregation areas. We implement the maximum entropy algorithm (MAXENT) to model the potential distribution of 11 species: the sperm whale (*Physeter macrocephalus*), the dwarf sperm whale (*Kogia sima*), the short-finned pilot whale (*Globicephala macrorhynchus*), the Risso's dolphin (*Grampus griseus*), the rough-tooth dolphin (*Steno bredanensis*), the pantropical spotted dolphin (*Stenella attenuata*), the Atlantic spotted dolphin (*S. frontalis*), the Clymene dolphin (*S. clymene*), striped dolphin (*S. coeruleoalba*), the spinner dolphin (*S. longirostris*), and the bottlenose dolphin (*Tursiops truncatus*). As result, we found a spatial partition in the distribution of the GM cetaceans based on depth: 1) species that distribute on the continental shelf (<200 m depth), 2) species associated with the continental slope (200 to 3000 m depth) and 3) oceanic species (> 3,000 m depth). Aggregation areas were defined as those regions where the potential distribution of at least seven species overlapped. According to this definition, the northern and western continental slope regions were identified as potential cetacean hotspots of cetaceans.

Poster 279:

Micronekton as a new environmental variable for Atlantic Spotted Dolphin (*Stenella frontalis*) in Azores

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Due to global warming, many species will change their distribution to maintain their ecological niche. Predicting these changes in advance will allow the species protection to be evaluated and managed more precisely. As an indicator of ocean change, also called ocean sentinel, we selected the Atlantic spotted dolphin (*Stenella fontalis*), a tropical dolphin species sighted every year in Azores during summer and autumn. Its habitat preferences were calculated using Generalized Additive Models applied to occurrence data recorded between 2009 and 2019 on the MONICET platform (an opportunistic dataset submitted by the local whale watching companies). Along the 11 years of study, we recorded 2532 sightings of S. frontalis at the islands of Faial, Pico, Terceira and São Miguel. The best obtained model explains 23,9% of deviance and includes the variables previously reported as significant for the species, sea surface temperature (SST), distance to coast and depth and additionally, includes the micronekton concentration and the slope. About the micronekton, represents nekton with less than 15 cm in length (for example potential prey of *S. frontalis*) and was extracted from SEAPODYM dynamical population model. The addition of micronekton improved model results, showing a stronger preference at concentrations higher than 1,5 g/m^2. In the light of the results obtained and knowing how global warming is affecting, we expect that habitat suitability for *S. frontalis* in the Azores will increase in the nearby future.

Poster 280:

Where and when? Monthly habitat suitability prediction of two teutophagous cetaceans in the Azores

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Ecological requirements act as key factors that determine cetacean distribution patterns. Within the current climate change situation, the distribution of two teutophagous species in the Azores, the Risso's dolphin (*Grampus griseus*) and the short-finned pilot whale (*Globicephala macrorhynchus*), could experience a distribution shift due to unmatched requirements and habitat conditions. This study aimed to determine the habitat preferences and predict the distribution of both species over the year. To achieve this, we used cetacean occurrence data collected opportunistically by whale watching companies of the Azores and reported to MONICET over a twelve year period (2009 - 2020). We applied presence-background species distribution models using Maxent, employing a set of static and dynamic environmental variables, and obtaining a prediction map for each month of the year. Distance to the coastline was one of the most relevant environmental variables. The results showed different predicted suitabilities for each species, both temporally and spatially. Higher overlap in habitat suitability was found during summer and autumn months, as pilot whales visit the Azores archipelago in this period. However, Risso's dolphins seemed to select areas closer to the coast than pilot whales. These results suggest niche segregation, although with higher levels of overlap during summer. This could suggest that interspecific competition between this species may be higher in those months. In conclusion, research in current habitat use and distribution is necessary to forecast future scenarios with climate change and to discuss appropriate conservation issues.

Poster 281:

Opportunistic data: use it or lose it?

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Data collection is a challenge, especially when dealing with highly mobile species, as is the case of cetaceans, and surveying dynamic open ocean areas, which comes with several logistic constrains. Therefore, it is of extreme relevance to be able to use all available data to study the distribution and habitat of cetacean. The CETUS Project is a cetacean monitoring programme that uses platforms of opportunity to survey long line-transect routes in the eastern North Atlantic. The CETUS dataset contains data on cetacean occurrence collected both during dedicated monitoring effort and opportunistically (with interrupted monitoring effort). Here, we aim to compare opportunistic and dedicated data for the assessment of cetacean diversity, distribution and habitat. Due to the large amount of data collected over an 11-year period (2012-2022), we were able to compile sufficient opportunistic records to characterize the cetacean community in the area, but only for the most frequently sighted species. For frequent, easily detected and identified species (e.g., common dolphin, *Delphinus delphis*), the results for spatial distribution patterns and habitat range are similar when using dedicated and opportunistic data. On the other hand, for species that are less frequent, elusive and difficult to identify (e.g., Cuvier´s beaked whale, *Ziphius cavirostris*), there were important differences. For some of these species, there were several regions where the only available data on occurrence were collected opportunistically, and inclusion of such data would thus increase assessed distribution and habitat range. The results obtained evidence that there is high value of opportunistically collected data, and the rarer the species, the more relevant such data is. Ultimately, if possible, opportunistic occurrence data should be used in the analytical process and not lost.

Poster 282:

Investigating the environmental drivers of *T. truncatus* acoustic presence in Ría de Arousa, Spain

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Out of all types of energy, acoustic energy propagates in water the most efficiently making it the optimal way to transfer information. This fact is widely taken advantage of by members of the Delphinidae family who use whistles for communication. The bottlenose dolphin (*Tursiops truncatus*) is a well-studied species in the Ría de Arousa (NW Spain), as there is a resident population inhabiting the area. As T.truncatus is an elusive species that spends the majority of time underwater, the use of Passive Acoustic Monitoring (PAM) could fill potential gaps in the current knowledge of their presence in a given area. Continuous PAM recordings were used in conjunction with environmental data to determine the drivers of acoustic presence of T.truncatus in the ria, between June 2018 and December 2019. The data were obtained through an oceanographic platform located in the inner part of the ria. The main investigated parameters included sea temperature, sea salinity and time of day (day/night). Hydrophone recordings were examined using PAMGuard for analysing the presence of bottlenose dolphin whistles. Whistles were classified as either present or absent per each hour of recording. Throughout the study period, presence was detected in 369 hours (3.49%), with the highest detection proportions in spring and summer. Logistic regression was used to analyse the potential relationships, with results of the generalised linear model showing a significant effect of sea surface salinity and temperature on whistle presence. Time of day was also found to be significantly related to whistle detection. Whistles were detected more often at higher values of sea surface temperature and salinity, indicating a seasonal influence on sound production since these variables are also related to time of year. The seasonal and diel patterns of detection could be related to prey availability, as well as behavioural changes throughout the year.

Poster 283:

Drivers of pelagic bottlenose dolphin (*Tursiops truncatus*) habitat use in Galician waters (Northwestern Spain)

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To create protection measures for a species, it is necessary to know its distribution. Through the study of environmental variables that determine the presence of a species, it is possible to obtain information on their distribution. Among the species that need to be protected are bottlenose dolphins. Although this species is widely studied around the world, there is a lack of information on the pelagic ecotype. This study aims to better understand the drivers of pelagic bottlenose dolphin distribution and group size in Northwestern Spain. A total of 119 days of data, collected between February 2017 and October 2021, were used to conduct this study. This represents 980 hours of fieldwork and 11,374 km traveled, as well as 77 groups of bottlenose dolphins sighted. Using GAMs, the relationship between eco-geographic variables and the presence-absence of pelagic bottlenose dolphins was explored. The results show that the variables that most influence the presence of pelagic bottlenose dolphins are sea surface temperature, depth, and the concentration of chlorophyll-a in seawater 60 days before the sighting. The variables that influence group size are the same, in addition to the distance to the 100m bathymetric line. Pelagic bottlenose dolphin presence and group size seem to be influenced by variables related to the presence and availability of their prey. This study contributes to a better understanding of the distribution of pelagic bottlenose dolphins, to lead to the development of adapted management and protection measures.

Poster 284:

Predicting bottlenose dolphin habitat preference based on satellite-derived environmental data

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Environmental variables directly affect the physiological liveable range of a species or indirectly influence prey distribution, which then acts as a driver for the species' presence. Knowing the drivers that indicate cetacean habitat preference leads to a better understanding of their fine-scale distribution and provides motivation for conservation areas. The objective of this study is to provide insight into the effects environmental changes have on higher levels of the trophic food web. Specifically, if environmental variables collected from satellite data can be linked to the presence of bottlenose dolphins (*Tursiops truncatus*) in a coastal environment subject to anthropogenic activities. The study area (the Ría de Arousa, NW Spain) has a known resident population of bottlenose dolphins living within a highly productive estuarine system. Presence-absence data of bottlenose dolphins was collected from 2015 to 2017 on board a research vessel in the study area. Several variables including sea surface salinity, sea surface temperature, chlorophyll-a, zooplankton concentration, surface partial pressure of carbon dioxide, dissolved inorganic carbon and pH were extracted from Copernicus Marine: open access satellite data. Eleven environmental variables were linked to bottlenose dolphin presence-absence using QGIS software. Results of a Generalized Linear Model indicate a high-fidelity model that proposes bottlenose dolphin presence is closely linked to chlorophyll-a concentration, sea surface salinity and the concentration of dissolved inorganic carbon in seawater. Bottlenose dolphin occurrence was associated with higher levels of chlorophyll-a, higher levels of dissolved inorganic carbon and lower sea surface salinity levels. Thus, the presence of this species is focused on freshwater inputs and high primary productivity sites; in the future, these could be specific areas targeted for conservation measures. This study shows that satellite data can be used to understand bottlenose dolphin presence and that environmental variables play a key role in dolphin habitat use.

Poster 285:

Cetaceans' distribution and habitat modelling in the NE Atlantic OceanAna-

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Cetaceans play a major role in the conservation of marine ecosystems as keystone, umbrella, biodiversity indicators, and flagship species. Nonetheless, their conservation is affected by the limited data on their occurrence and distribution patterns. Iberian Atlantic waters are highly productive and rich in marine resources. Species recorded most often along the southern Portuguese coast are *Delphinus delphis*, *Tursiops truncatus*, *Balaenoptera acutorostrata*, and *Balaenoptera physalus*. Despite regular occurrences, the knowledge of these species is limited, and even more in others more rarely sighted as *Stenella coeruleoalba*, *Balaenoptera borealis*, and *Orcinus orca*, due to the complex demands required by the collection of biological data. The aim of this study is to define cetacean distribution and habitat preferences within the Eastern North Atlantic, in the south coast of Portugal. The main objectives are to: 1. Provide data on the most recorded cetacean species in the Algarve region; 2. Identify the spatial and temporal patterns of cetacean distribution; 3. Perform ecological niche modeling techniques to characterize habitat preferences and produce habitat suitability maps; 4. Address future research questions, conservation measures, and cultural and economic implications. The data will be collected from dolphin-watching boats, and from high-vantage scoping points, as well as from open-access data platforms such as Global Biodiversity Information Facility (GBIF), iNaturalist, and Ocean Biodiversity Information System (OBIS). Furthermore, satellite data will be used in order to model the habitat suitability of the studied species. It is expected that the obtained results might help identify potential cetacean hotspots in the southern coastal waters of Portugal mainland, and thus, protecting these areas and the surrounding waters is a key action for maintaining the biodiversity, as well as the cultural and economic benefits of the area.

Poster 286:

Matching visual and acoustic detections to estimate detection probability for small cetaceans in the ACCOBAMS Survey Initiative

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Estimating the detection probability of small cetaceans is difficult because they do not surface or vocalise continuously and can be imperceptible to the observer or hydrophone. Often animals seen at the surface have lower vocalisation rates, whereas submerged individuals may be more vocally active. To correctly quantify abundance using distance sampling methodologies, we need to estimate detection probability. Mark-Recapture Distance Sampling (MRDS) methods deal with missed detections by estimating the detection probability on the transect line g(0);two platforms can be used to 'mark' animals and subsequently identify duplicate detections ('recaptures'). Our study used vessel-based visual and acoustic (based on click identification) data collected simultaneously during the ACCOBAMS Survey Initiative in 2018 onboard the R/V Song Of The Whale. We identified duplicate detections between visual and acoustic platforms using a decision tree based on time and distance thresholds to estimate g(0) for small cetaceans. A total of 34 duplicate detections were identified from 122 and 124 detections identified by the visual and acoustic platform respectively. The g(0) was estimated as 0.48 (CV=24.3%) for both platforms combined, as 0.27 (CV=20.2%) for the visual platform only and as 0.30 (CV=26.8%) for the acoustic platform only. Our results illustrate that passive acoustic monitoring can be deployed as an independent platform in MRDS to estimate detection probability. The main limitations lie in the difficulty of estimating group size and identifying species from acoustic detections. Our estimation of g(0) was much lower than 1, nowhere near the perfect detection commonly assumed for estimating abundance. Without correction for imperfect detection, total abundance would be underestimated by a factor of two when using both acoustic and visual data, and more than three when using either dataset alone. This highlights the importance of using double-platforms in surveys to estimate detection probability to improve abundance estimates and conservation efforts.

- **Techniques**

Poster 287:

Creating training data sets for the automatic identification of wildlife sounds: a narwhal example

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The increasing capacity for automated data collection generating a large amount of data and to be analysed has been driving the search for automatic methods for data processing. The bioacoustics field has been facing this problem. We are now able to obtain acoustic data for long periods leading potentially to millions of observations. Traditionally, sound identification has been done manually. That is becoming unfeasible for applications with anything but overall short recording times. There is a pressing need to develop automatic, or at the very least, semi-automatic, methods to process the data for sounds of interest. Based on a project aimed at estimation sound production rates for passive acoustic density estimation, we present a method for automatic identification of narwhal clicks and buzzes. We consider first a high-pass filter, to remove some of the background noise, and then obtain and identify peaks from the waveform with characteristics consistent with the echolocation clicks. This leads to the identification of the most probable times clicks or a buzz were produced. Times with no sounds of interest are then obtained manually to complete a training data set. This will be used to train a neural network to identify the clicks in additional tags. Methods are illustrated using data from DTAGs attached to narwhals (3 in 2017 and 2 in 2018, tagged near Tremblay Sound, northern Baffin Island, Nunavut, Canada). The training dataset spans 5 tags and includes around 93 minutes. Our results show that this simple method easily identifies most of the clicks, identifying around 15900 buzzes and clicks. This opens the door for training more potent deep learning methods.

Poster 288:

New research platform offers unprecedented opportunities for studying Northern bottlenose whales in the Arctic

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The northern bottlenose whale (*Hyperoodon ampullatus*, NBW) is a poorly studied species of beaked whale found in the northern North Atlantic. It is listed as "Data Deficient" on the IUCN Red List of Threatened Species, and as populations are recovering from historical whaling operations, more biological knowledge on distribution, population structure and behaviour and ecology is needed. Here, we present a description of new data collected from frequent encounters with NBW that occurred during offshore trawl surveys in the Davis Strait. During 7 weeks of fieldwork onboard the RV Tarajoq in Canadian and Greenland waters, we documented more than 20 close encounters with groups of up to 20 NBW within 5-10 meters of the vessel. We collected 2 biopsies samples, 19 eDNA samples, and more than 3000 pictures for a growing photo-ID catalogue for the area. NBW were also, for the first time, photographed feeding on Greenland halibut underwater which we presume escaped from the trawl. According to fishermen in the region, interactions between NBW and fishing operations is common and frequent, which may increase risks for entanglement or injury of NBW in this area. The RV Tarajoq conducts annual surveys for Greenland halibut in the area and is well-positioned to carry out further sampling and satellite tagging in these difficult-to-access waters. Here, we present initial results from photo-ID analysis of individual NBWs seen during the 2022 surveys, which will be used in combination with photos collected in the region in previous years to make a preliminary assessment of population size. In combination with ongoing genetic monitoring, data collected on this opportunistic research platform can provide powerful insights on the behaviour and population structure of NBW, which is important for any future conservation efforts of this species in the Arctic.

Poster 289:

The application of an unmanned aerial vehicle in the assessment of habitat use by grey seals in Mewia Łacha nature reserve in Polish waters

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An increase in the abundance of grey seals, *Halichoerus grypus* in the Baltic Sea at beginning of the 1990. led to recolonization of the southern part of its coast by that species. Mewia Łacha nature reserve at the Vistula mouth with sandbars located in this area are the only terrestrial habitat of that species in the region of the Polish coast, inhabiting of which commenced in late 2000s. Due to uniqueness of the area, it has been constantly monitored with a stationary camera survey since 2010, which allowed to collect information on the quality of habitat and the extent to which this area is used by the seals on seasonal and annual basis. Data acquired through on-line observations provide knowledge on the impact of human activity on animal behaviour. Changing distance between camera stand and sandbars, which are very impermanent and susceptible to weather conditions, makes precise assessment of the grey seal abundance extremely difficult. Due to above mentioned impediment, in 2022 new method of survey was introduced which relies on data collection through regular use of an unmanned aerial vehicle. The use of a drone allowed to precisely count present seals as well as determine surface area and changing shape of sandbar habitat. In 2022, monthly survey carried out with the use of DJI Phantom 4 model drone showed the occurrence of seals in that area in all studied months. The highest number of seals was recorded in June, and the lowest in December. The application of the drone in surveying of the seals in their habitat, with no access from land, allows to preform precise counts of seals at the same time minimizing the disturbance. The use of a drone should be recommended in the research of the seasonal and spatial use of newly formed habitats.

Poster 290:

Gollum: our tresaure is now open. Common creative licence to the data collected by CIRCE since 1996

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Between 1996 and 2022 CIRCE has developed research programs in the waters of the Alboran Sea, Strait of Gibraltar and Gulf of Cadiz. These programs have been based on monitoring programs from boats, from the coast, satellite tagging, and skin and fat biopsies. In total, more than 130,000 km of effort have been covered, and around 7,000 sightings of cetaceans, including fin whales (*Balaenoptera physalus*), sperm whales (*Physeter macrocephalus*), killer whales (*Ocinus orca*), long finned pilot whales (*Globicephala melas*), bottlenose dolphins (*Tursiops truncatus*), common dolphins (*Delphinus delphis*), stripped dolphins (*Stenella coeruleoalba*), harbour porpoise (*phocoena phocoena*), Cuviers beaked whales (*Ziphius cavirostris*), Risso's dolphin (*Grampus griseus*) have been made. Moreover, more 500 cetacean kin samples, with information on isotopes, contaminants, and genetics have been collected. During the sampling, more than 700,000 photographs for photo-identification have been taken, with 5 photographic catalogues with 25 years of life histories carried out to date, of sperm whales, bottlenose dolphins, pilot whales, killer whales and pilot whales. The samplings have also resulted in “information on information” anthropic activities and more than 60,000 of seabirds’ observations. More than 80 research papers, and 10 PH’d resulted from these data. In 2020 CIRCE decided to give creative common licence to the data, as many more research results can results from these data. Gollum is a set of cetacean research protocols followed by CIRCE since 1996, and a Progress SQL based database implemented to access and use the data. In this presentation the data available, condition of utilisation, and connexions available to download the data will be presented.

Poster 291:

Using behavioural observations, drones and collaboration to help free an entrapped sperm whale from an enclosed voe in Shetland, Scotland

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In March 2022, an adult sperm whale was seen close inshore in Whiteness Voe, Shetland, Scotland. It subsequently stranded and then spent 9 days in the upper reaches of the enclosed voe. Over this time the whale was monitored both by land and via drone. Through these techniques, injuries obtained from the stranding could be assessed, and breathing rates and behaviour were recorded. Once it was deemed to be a healthy individual just in the wrong place, discussion begun about possible rescue options. The rescue planning involved a huge collaboration between multiple agencies and individuals. Local knowledge of the bathometry and tidal conditions was essential for timing the rescue event and for getting boats in position. On the day of the rescue, drones were used to continually monitor the whale whilst boats from Scottish Seafarms were used to herd the animal out to deeper water. Communication between land observers, sea skippers and drone operators ensured actions required were timeous and the whale's welfare was at the forefront of every decision. The herding operation followed the same pace as that of the whale - with several breaks when the whale rested, following a similar pattern as had been observed on previous days. The whale was last seen heading out into deeper water before entering a deep dive and disappearing to the west of Shetland. This successful operation would not have been possible without the information gained from continual behavioural observations and the collaboration and support of the entire Shetland community.

Poster 292:

Investigating laterality and spatial associations in common dolphin mother-calf pairs using an unmanned aerial vehicle

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In different mammal taxa, mother-offspring interactions are lateralized due to a right-hemispheric advantage in social processing. For cetacean mother-calf dyads, spatial relationships that confer predator protection and hydrodynamic benefits to the calf are of additional importance. Here we investigate spatial associations of common dolphin (*Delphinus delphis*) mother-calf pairs in southern Portugal using an unmanned aerial vehicle (UAV). Footage was analyzed post-hoc in 30-second intervals, documenting calf positioning and laterality relative to the mother (infant: underneath; echelon: left/right-side). The frequency of each position relative to group size, location within the group, and number of social events was evaluated through descriptive analyses. Additionally, differences according to month, group cohesion, and calf proportion were assessed. A total of 1768 calf positions were analyzed, with most calves in echelon (58.52%: 29.40% right; 29.12% left) and 41.48% in infant position. For small groups (2-10 individuals), right-echelon was more frequently observed (39.89%) than left-echelon (17.98%) and for intermediate group sizes (21-30 individuals) this was reversed (left-echelon: 31.32%; right-echelon: 23.85%). When mother-calf pairs were in the back-edge, back-center and front-edge of the group, calves were mostly in infant position (47.77%, 42.75%, 46.61% respectively), whereas in the front-edge, left-echelon was most frequent (50.92%) and infant position least frequent (21.98%). When no social events occurred, calves were more often in right-echelon (34.49%) than in left-echelon (21.25%) and with the highest numbers of social events, the opposite was observed (left-echelon: 34.05%; right-echelon: 25.95%). Early evidence suggests that month and group cohesion may influence calf positioning and laterality, and calf proportion potentially impacts infant position. Statistical analysis using multinomial logistic regressions is ongoing. Our results highlight the importance of both calf positions for common dolphins and indicate a potential lateralization of mother-infant interactions. We demonstrate that using UAVs to study spatial relationships in cetaceans offers profound insights from a novel perspective.

Poster 294:

while AtSea, we prefer an open platform data collection

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Large-scale surveys of cetaceans has always been a great challenge, especially in high seas. Since 1990 several research bodies have started using ferries as platforms of observation along fixed transects. Several networks have since then been established in Europe/Mediterranean (Northeast Atlantic, Macaronesian Sea, Central-western Mediterranean Sea) and protocols have become more systematic with multidisciplinary data collection. Data harmonization between networks remains one issue to be improved. For this reason, within the IMPEL (European Union Network for the Implementation and Enforcement of Environmental Law) research project Marine Transborder Transect, several members joined together developing a road map for a proper data stewardship from data collection to use of data for legislative requirements (e.g. HD, MSFD). First milestone was the development of a recording tool for data collection atSea. The desired results were to deliver a digital helper for Cetacean observers carrying out their shifts on ferries and large ships. The output files had to be ready to flow into existing databases with no manipulation. To achieve the results the developer adopted ODK: simple forms, hierarchically structured, with large buttons and automatic collection of data taken from the device (position, time, etc.). ODK - open data collect (https://getodk.org/) is an open-source tool for developing data collection forms that works in any offline condition and syncs when back online. The development is made by preparing structured spreadsheets that define the data to be collected. The extremely long life expectancy of the underlying software, with little needed maintenance, is a key factor of this project. After about one year of field testing a frame of 6 topics, from navigation to Cetacean observations, with over 70 forms in a hierarchical structure is ready to serve a community of over 14 research bodies.

Poster 295:

Using vessel-located thermal cameras to detect fin whales on the Catalan coast, north-western Mediterranean

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Ship strikes are becoming an increasing and widespread issue for large marine mammal populations, being the most significant threat for fin whales in the Mediterranean Sea. Most of these fatalities are unknown events, as most of the whale species sink when they die. To reduce the collision risk, different methodologies have been implemented. Thermal cameras have been tried recently to automatically detect cetaceans, mainly whales. Even though some organisations have successfully done this automatic detection, there is still no standardised method. Since 2014, the Fin Whale Project has been carried out on the Catalan Coast feeding ground in spring. In 2022 a total of 47 surveys were performed in which 110 fin whale sightings were recorded. From May to mid-June this year, an M364C LR FLIR thermal camera was installed at the top of the mast of a sailing catamaran, 21 meters above mean sea level, aiming to get a new perspective on how to implement thermal cameras to decrease the risk of collision for whales in high-risk areas. This technology was implemented in 14 days of fin whale sightings, recording more than 35 hours along 38 sightings, being able to detect whales up to 1km, depending on the meteorological and oceanographic conditions. The images obtained are being used to train a machine-learning model that aims to identify the whales' blows and bodies and mark their direction. The animal's position and direction are mapped together with a probable appearance area for each ship-whale encounter in the monitored zone, covering a 120-degree angle at the vessel's bow. A smaller 60-degree risk zone is also drawn, indicating the high collision risk area. By implementing this model in merchant's vessels, we might reduce ship strikes and have a better idea of the number of ship-whale encounters.

Poster 296:

Whale Track: Expanding community-based cetacean monitoring on the west coast of Scotland using a smartphone app

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The waters of western Scotland are a hotspot for many protected cetacean species. However, the conservation status of cetaceans in UK waters is 'unknown', so long-term species monitoring is vital to achieve Good Environmental Status (GES). Whale Track is a community-based species monitoring project, supported by a smartphone application. Here we present the first 5 years of data from Whale Track (2017–2021) to demonstrate the value of utilizing a smartphone application to expand the quality and quantity of cetacean monitoring which communities undertake. Over 3,000 people registered to use the Whale Track app, and half of those registered users (51%, n=1,540) submitted records for 18 cetacean species, totalling 21,713 sightings of 138,963 animals. Of this data 44% of sightings were collected during 1,914 effort-based excursion surveys. Harbour porpoises were the most sighted species accounting for 44.5% of sightings (n=9,672), whereas Common dolphins were the most numerous species, 62.3% of total animals (n=86,573). The number of registered users and number of unique reporters increased year on year, whilst overall, survey effort, number of sightings and the geographic coverage of the sightings increased over the 5 years of the project. The effects of pandemic restrictions were evident with fewer sightings reported and reduced geographic coverage. Notably, the number of reporters remained stable in 2020. However, in 2021, there was a rapid recovery post pandemic of unique reporters, number of sightings and geographic coverage, which all exceeded pre-pandemic levels. Whale Track is enabling communities to increase the level of year-round species monitoring, engaging more local stakeholders in monitoring efforts to document the presence and detect long-term changes for cetaceans. Such efforts can inform the implementation of management measures for new Marine Protected Areas (MPAs), designated in 2020, supporting the delivery of the Scottish MPA Monitoring Strategy, and achieving GES for UK cetaceans.

Poster 297:

Use of photogrammetric techniques and binoculars with rangefinder to estimate radial distances in megafauna ship surveys

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In distance sampling cetacean ship surveys, the two parameters needed to calculate the perpendicular distance between a sighting position and the transect line are the angle and the radial distance. The most common methods for estimating radial distances are the use of marked sticks and reticulated binoculars. Both methods are based on counting the number of reticules between the horizon and the animal or group of animals detected. In rough sea conditions, it is difficult to keep stable the upper edge of the stick or the reticulated scale of the binoculars, so estimated radial distances are usually biased. During the SCANS-II project, a new method was developed to estimate radial distances based in photogrammetric techniques. This method count the number of pixels between the horizon and the animal or group of animals from a snapshot of the video footage recorded at the precise instant when the sighting is detected. In this work, two alternative methods to estimate radial distances have been tested: the photogrammetric method, adapted to megafauna protocol used in the Spanish and French multipurpose ship surveys, and the use of rangefinder binoculars. Regressions were fitted between the estimated and real distances to a fixed buoy whose distance was precisely calculated by the GPS position. Both methods showed a high precision for estimating distances, with p-values less than 0.01 and R 0.993 and 0.990 respectively.

Poster 298:

Unmanned Aerial Systems: how does altimetry noise affect morphometric measurements? A case study on Mediterranean whales

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Unoccupied aerial systems (UAS), and particularly small vertical take-off and landing (VTOL) UAS, are finding several applications in marine mammal research. VTOLs are increasingly used to collect photogrammetry data in order to gather animal morphometric information. Photogrammetric measures use geometrics to estimate parameters - like animal width and total length - based on a scaling reference. Nevertheless, this method provides estimated measurements rather than direct ones, and are subject to different sources of error. The imprecision of the altimetry sensor is one of them. Therefore, calibration objects (located close to sea level) can be measured at some point of the photogrammetric flight to correct barometric altimeter errors during postprocessing. However, the altimetry error must be constant throughout the flight in order to allow reliable postprocessing compensation. The present work aims to gather information on possible altimetry error bias. Therefore, the main goals of this study are i) to analyze altitude error consistency during a typical VTOL flight, and ii) to assess the resulting bias on whale total length estimations. We analyzed data from 20 VTOL flights - carried out in the NW Mediterranean Sea – aimed to collect morphometric information from different cetacean species. Particularly, analysis will be performed on photogrammetry data from a sample of fin, sperm, and Cuvier's beaked whale individuals, allowing for an estimation of their lengths based on different data and normalization treatments. This study will contribute to the knowledge on the uses and limits of commercial UAS in photogrammetry and the role of altimetry sensors and normalization in the accuracy of morphometric estimations.

Poster 299:

Low-cost biotelemetry tracker for cetacean monitoring

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Biologging and biotelemetry are of great importance in cetacean movement ecology studies. While biologging methods are mostly used for assessing cetacean large- or fine-scale patterns, they remain laborious and costly in both obtaining access to data (in case of satellite tags) and retrieving the tags after detachment (in case of short-term suction-cup tags). Ubiquitous computing, Internet of Things (IoT) and open radio communication protocols such as Long-Range (LoRa) provide opportunities for creation of robust, low-cost sensors to study cetacean movement ecology and their behavioral patterns. In this work, we present progress in the development of a low-cost biotelemetry device for monitoring cetacean movement. We design a telecommunication system based on IoT and LoRa, obtaining a battery autonomy of 66 days when using GNSS (long-term tag) and 5 days when adding pressure and Inertial Measurement Units (IMUs) sensors (short-term tag). We present a custom-made location estimation pipeline which in seconds allows us to interpret the raw satellite signals for decoding the position of the tag at the sea surface. We performed in-situ validation by means of tracking vehicles, vessels and snorkelers, obtaining a median average error of 100m distance. We provide a roadmap discussing faced challenges, paving the way towards the application of the proposed system on cetaceans.

Poster 300:

Satellite tracking of rehabilitated Grey Seal pups (*Halichoerus grypus*) in the Baltic Sea: determination of survival and adaptation

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Aquatic telemetry technology is rapidly developing the ability to observe marine mammal behaviour and distribution in their natural environment. A multitude of data loggers and sensors provide a broad observational framework for acquiring detailed information, therefore marine mammals tracking opens up opportunities for unprecedented ecological insights. The doctoral studies research aims to determine Baltic grey seal pups (*Halichoerus grypus*) survival and adaptation in their natural environment after rehabilitation, and provide recommendations for the protection of the species in the Baltic sea. For this work, over a period of three years 30 rehabilitated seals will be released with satellite transmitters non-invasively attached to their fur, gathering the seal‘s locations, dive depth and water temperature. Also, it will be the first step of assessing the usefulness of satellite transmitters for rehabilitated seals monitoring in the Baltic sea. 8 rehabilitated seals have already been released on September 2022 and are currently being tracked. According to the gathered data, animal movements will be linked with their physiology and habitat and presented as preliminary results.

Poster 301:

On-board cameras to monitor marine mammals bycatch? Example with the OBSCAMe project in the Bay of Biscay

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OBSCAMe is a French scientific program based on Remote Electronic Monitoring (REM) system in order to better understrand the interactions between gillnetters and marine mammals in the Bay of Biscay. This project is coordinated by the French biodiversity agency, in partnership with the French fishermen's representative organizations, scientists and the political supervision of the ministries in charge of the environment and fisheries, with the financial support of the European Maritime and Fisheries Fund (EMFF). Initiated in 2021, the project initially started with 5 volunteer vessels (first phase). This phase allowed to validate the feasibility of REM on French gillnetters in the Bay of Biscay, concerning the phenomenon of marine mammals bycatch (e.g. image quality, species identification, etc.). Today, 20 vessels (from 7 to 25 meters in length) are volunteers and participate in the OBSCAMe project. The REM system is composed of several elements including a central unit and a camera that records images of the net being hauled along the hull of the vessel. The videos are then analysed on land by a team. Incidental catches of marine mammals are identified and valuable information is collected (GPS position, type of, net soak time, etc.). 98 bycaught marine mammals have been identified so far (mainly common dolphins and harbour porpoises) and REM shows some interesting first contributions. The data will soon be analysed by scientists and will contribute to thinking on measures to reduce marine mammals bycatch events in the Bay of Biscay. In 2023, the OBSCAMe project will expand and REM is likely to be used also to assess the effectiveness of mitigation measures and to better understand bycatch of others protected species (birds, turtles, etc.) in the Bay of Biscay by gillnetters.

Poster 302:

What the F-POD? Investigating the performance of the F-POD V C-POD for ecological monitoring of harbour porpoise (*Phocoena phocoena*)

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Passive acoustic monitoring (PAM) is a cost-effective method for monitoring cetacean populations over time compared to other techniques such as aerial and ship-based surveys or photo-ID. The C-POD (Cetacean POrpoise Detector) has been an integral tool in many monitoring programmes globally for more than a decade, providing standardised metrics of occurrence that can be compared across time and space. However, the development of the new F-POD (Full waveform capture Pod) devices with increased sensitivity, improved train detection, and reduced false positive rates represents an important methodological change in the collection of data, particularly when being introduced into existing monitoring programmes and time-series as C-PODs are phased out. Here, we compare the performance of the C-POD with that of its successor, the F-POD, co-deployed in a field setting between April 2021 and July 2022. While similar trends in detection were found for both devices across the recording period, we found the C-POD detected only 58% of the detection positive minutes (DPM), recorded by the F-POD. Differences in detection rates were not consistent through time, making it difficult to apply a correction factor or directly compare results obtained from the two PODs, with important implications for long-term monitoring. Generalised additive models (GAMs) were used to investigate the relationship between environmental variables and harbour porpoise (*Phocoena phocoena*) acoustic detections on both PODs. No differences were found in environmental correlates of porpoise occurrence, but the C-POD failed to detect sufficient foraging buzzes to identify temporal patterns in feeding behaviour shown by the F-POD. Our results suggest that the switch to F-PODs will have little effect on determining broad scale seasonal patterns of occurrence, but may improve our understanding of finer-scale behaviours such as foraging. We highlight how care must be taken interpreting F-POD results as indicative of increased occurrence when used in time-series analysis.

Poster 303:

Database and WEB-Gis platform to manage large datasets of marine megafauna in the open seas: an essential tool to help EU environmental policies

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Environmental policies set several indexes to evaluate trends in abundance, distribution, and habitat availability, used to identify species conservation status at different scales. Analysis effectiveness rely on large datasets, encompassing the spatial and temporal scale needed to assess natural and/or human induced variability. Such large datasets are rare for the open seas, an area that is time/cost demanding when it comes to dedicated surveys. Management of large amount of FAIR data (Findable, Accessible, Interoperable and Reusable) is challenging; nevertheless, open science is a policy priority for the EU 2020-2024, and is needed to enhance knowledge on cetaceans and their environment. Since 2007, dedicated large-scale systematic surveys are conducted in the Mediterranean basin by a Network of Research bodies (Fixed Line Transect Mediterranean Network) using ferries as multidisciplinary research platform. The full dataset encompasses 2755 surveys in Western and Central-Mediterranean, and Adriatic Subregions, accounting for almost 500.000km of effort and highest number of sighting records: 6181 for striped dolphin, 3376 for fin whale, 1018 bottlenose dolphin, more than 200 for both sperm and Cuvier's beaked whales, 189 for common dolphin, 128 for Risso's and 75 for long finned pilot whales. A dedicated SQL-based database with a Web-GIS user-friendly interface was set up to: guarantee dataset harmonization, fasten database search and data extraction, guarantee interoperability with different GIS-platform and external databases. The system hosting the infrastructure is the National Biodiversity Network and it is OGC and INSPIRE compliant, and Open-API compliant for interoperability. Dedicated tools to visualize summary statistics and basic reports are accessible to all users, while more specific functions are open to data-providers and managers. After a two-step validation process, all data from 2007-2021 period were stored in the common Geo-Database and will be periodically update with data coming from the ongoing monitoring activities.