CONSERVATION IN THE LIGHT OF MARINE SPATIAL USE

31ST CONFERENCE OF THE EUROPEAN CETACEAN SOCIETY

MIDDELFART, DENMARK

1ST TO 3RD MAY 2017

CONFERENCE PROGRAMME

AARHUS UNIVERSITY
DEPARTMENT OF BIOSCIENCE

DANSK HAVPATTEDYRFORENING

European Cetacean Society

Harbour porpoise near Middelfart. Photo: Jonas Teilmann©

Abstract book of the 31st Annual Conference of the European Cetacean Society

Edited by: Anders Galatius, Andreas Salling, Maria Iversen & Maria Palner

Maps by: Signe Sveegaard

Aarhus University - http://bios.au.dk/en/

European Cetacean Society – www.europeancetaceansociety.eu

CONTENTS

Harbour seal Photo: Anders Galatius©

ACKNOWLEDGEMENTS

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ECS 29 April - 3 May 2017 Middelfart Denmark

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GENERAL INFORMATION

THEME

In these years, the focus on managing the seas in Europe has never been greater or more important. With two new marine directives, the Marine Strategy Framework Directive (MFSD) and the Maritime Spatial Planning Directive (MSPD), the EU is working towards managing almost all aspects of the sea. For the first time, we are now developing clear measurable objective goals for a long list of indicators embracing the entire ecosystem of the seas around Europe. At the same time, maritime spatial planning will be implemented to assign and manage all waters for various human activities. These processes, rules and laws will likely have a huge impact on the future of the marine mammal populations. It is therefore more important than ever that we all take part and provide advice on management decisions, to make sure that marine mammals have both food and habitats with limited human disturbance, to be able to thrive in our waters in the future.

The focus of our invited speakers will be to inspire and discuss what we, as researchers, can do to help conservation efforts in the light of the increasing marine spatial use by humans. We will hear about successes and failures from around the world, from some of the smallest species to the largest marine mammal. In addition, we can proudly present a long list of high quality scientific presentations backing the theme of the conference, but also touching on an ever expanding variety of topics within marine mammalogy.

On behalf of the Conference Organising Committee, I welcome you to celebrate the 30 year anniversary of the European Cetacean Society in Middelfart, Denmark.

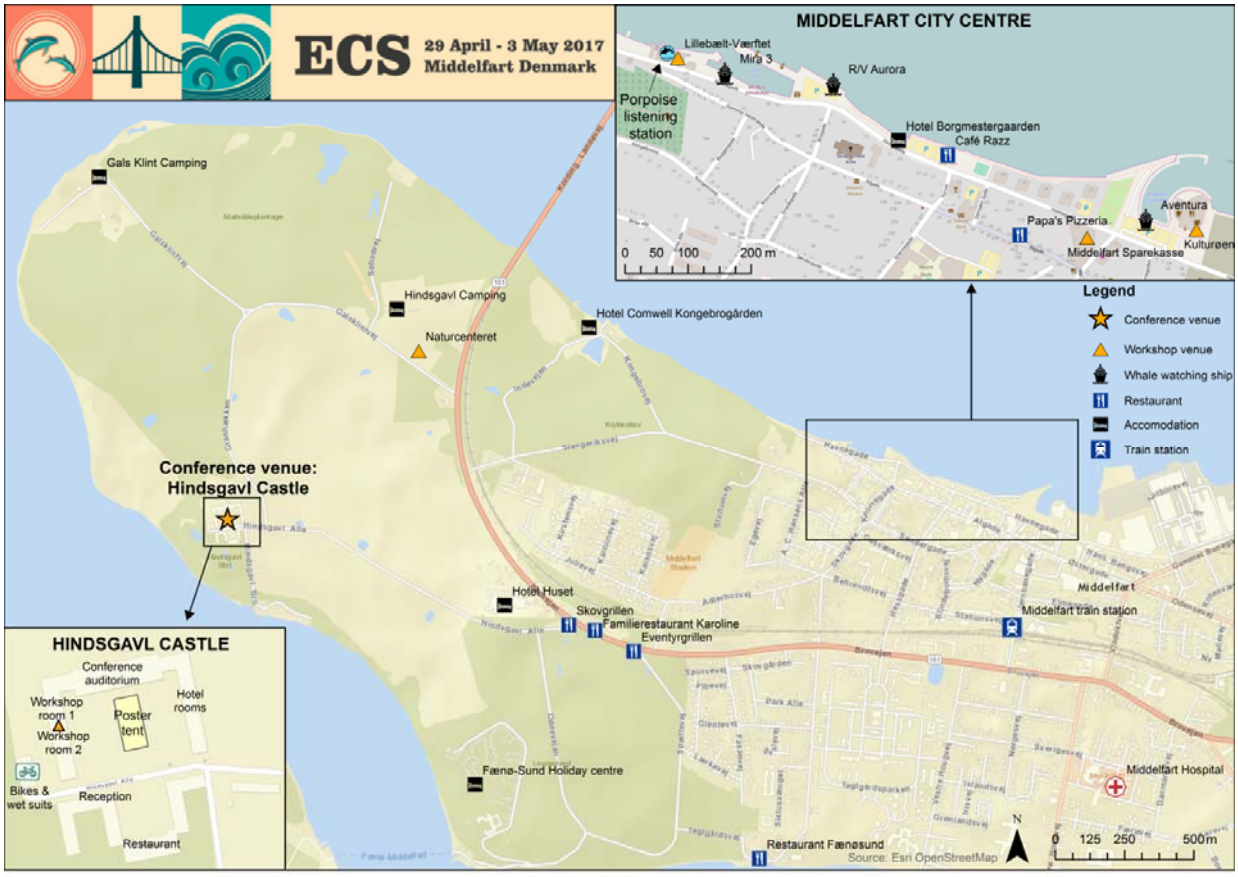
Jonas Teilmann

Chair of the Conference Organising Committee

VENUE

The conference venue for the 31st Annual Conference 2017 is Hindsgavl Castle. Hindsgavl Castle is a historical building situated in some of Denmark's most beautiful nature, close to the water on the peninsula just 4 km from Middelfart centre on Funen. Hindsgavl Castle operates as a modern conference hotel, with top-of-the-line conference facilities.

MAP OF MIDDELFART AND HINDSGAVL PENINSULA WITH RELEVANT LOCATIONS



Most workshops will be held within a short walk from the Icebreaker venue. From Hindsgavl Castle there is a beautiful 3.5 km walk to the Icebreaker. There will be a limited number of free bicycles that can be picked up at the registration desk at Hindsgavl Castle (Sunday 12-18.30).

MIDDELFART - RIGHT IN THE MIDDLE

The Danish landscape is dominated by the long coastlines surrounding the many islands. The beautiful scenery in which this year's conference is set, is expressed by the meandering of the strait of the Little Belt. As the Danish climate is highly influenced by its coastline and the sea, the weather in April and May is generally 7-11°C (based on years 2013-2015) and rain is common during spring.

The meandering waters of the Little Belt pass right by the old castle, setting a fitting frame for the conference. The current main building of Hindsgavl Castle was built in 1784, but the history of Hindsgavl dates back to mid 13th century, where it served as seat for the Lord Lieutenant and occasional housing for the king. The first castle consisted of several buildings situated with open view to the Little Belt, making it possible to oversee the vessel traffic. During the 17th century, Denmark and Sweden were at war and the castle was heavily damaged. After the wars, the castle was never fully renovated and in 1694 a storm brought down part of the castle, crashing it into the Little Belt. The ruined buildings were hereafter sold off by the Crown and demolished. Today, Hindsgavl Castle serves as conference hotel with open access to the old parklands surrounding the castle.

Middelfart is a town located by the narrowest part of the Little Belt, making it the connecting point between Funen and Jutland, the town has around 15,000 citizens. As the town is situated in the centre of Denmark, Copenhagen can be reached by train in two hours and Aarhus in less than one and a half hour. Middelfart and the surrounding area has a lot to offer by itself. If you want outdoor experiences, there are plenty of opportunities, such as bridge walking, where you can walk on the top of the old bridge connecting Funen and Jutland enjoying the view of the Little Belt from above. Great angling and diving spots can also be found along the coastline, or you can choose to hike around the paths of the Hindsgavl peninsula. If you prefer a more cultural approach to discovering the area, there are a variety of choices, from the clay museum in Middelfart through art galleries to Fredericia Theatre. The pedestrian

zone in Middelfart, where many shops are located, starts by the harbour, giving the town a maritime feel showcasing the close relations between most Danish towns and the sea.

The town's historic dependence on the Little Belt has been made explicit by a guild specialising in hunting harbour porpoises which was founded in the 16th century. The guild was dissolved in the late 19th century, as the hunt diminished. But this history shows that the Little Belt has been a harbour porpoise hot spot throughout recorded history.

The Little Belt is the narrowest strait connecting the Kattegat to the Baltic Sea – the larger straits being Øresund and the Great Belt. The narrowest part of Little Belt is just one km across and the depth reaches down to 80 meters just south of Middelfart. As the strait is very narrow, the nutrient rich coastal area combined with the considerable depth enable a large fish stock of both plaice and cod along with many other species. This makes for an excellent hunting ground for harbour porpoises, and on this basis, Middelfart is Denmark's whale watching capital.

USEFUL INFORMATION

IMPORTANT CONTACTS

Emergency number: 112

International phone code for Denmark: +45

Hospital (Middelfart): 118

Local police: +45 64411448

Closest pharmacy: Jernbanegade 2c, Phone: +4564417743, open 9-17:30 on weekdays, Saturday 9-13.

Taxi: +45 64414055

POSTERS

Attachment: Posters must be hung using double-sided tape that will be made available from the conference organizers from Sunday (April 30th) registration onwards.

Putting up and taking down posters: Posters can be hung on Sunday while the registration desk is open (15:00 to 18:30) and on Monday morning. Posters must be taken down after the Poster Session on Wednesday (May 3rd) and before the banquet the same night at 20:00.

Monday 1st: Poster Session 1 (even numbers); Tuesday 2nd Poster Session 2 (odd numbers); Wednesday 3rd: Poster Session 3 (all numbers)

ICEBREAKER

18:00 – 23:00 – Icebreaker - downtown Middelfart

The icebreaker will be held at the first floor at KulturØen (https://www.middelfartbibliotek.dk/bibliotek/kulturoenbib) on the harbour front in downtown Middelfart. The restaurant in the building will serve snacks and drinks. The Icebreaker is kindly supported by our sponsors.

At 18:30 and 20:00 you will have a chance to go on a porpoise safari with one of the three ships docked along the harbour front. Free tickets are available at the Icebreaker. Please pick up your ticket at latest 20 min before departure.

A recently opened permanent listening station for porpoises and noise has been installed close to Middelfart harbour. The station is kindly sponsored by Seiche who will demonstrate the system together with researchers from Aarhus University from 19:00-22:00.

STUDENT PARTY

Tuesday night is student party night. This year's student party will take place at Temabar in Downtown Middelfart. The bar opens at 21 so you can walk directly from Aarhus University's research ship Aurora to the bar in less than two minutes. The entrance fee will be 10 DKK and will buy you access to a newly designed theme bar, which has promised us good prices on drinks and lots of space for all kinds of socializing. So bring all your colleagues, even if they are not students.

Address: Havnegade 13, 5500 Middelfart

DINNER AND DANCING

The conference banquet will be in the main auditorium, 'Laden' at Hindsgavl, followed by dancing. If you have not bought access beforehand, please contact the conference help desk as soon as you can.

LUNCH

Prepaid lunch bags will be available at Hindsgavl. There is also a lunch option at the restaurant at Hindsgavl and restaurants in Middelfart.

CONFERENCE PROGRAMME

Harbour seals Photo: Anders Galatius©

CONFERENCE PROGRAMME

See also the "Activity day by day in Middelfart" under social programme on the homepage

Saturday 29 April

08.00 - 09.00	Booking and return of free bikes at Hindsgavl Castle always possible when info/registration desk is open
09.00 - 18.00	Workshops
10.00 - 13.00	Official opening of the new porpoise listening station next to Middelfart Harbour. Dissection of a bycaught porpoise and opening of the new "Porpoise observation bike trail". Public events next to the old harbour where everyone is welcome.

Workshops

For the location of the workshop rooms please see map. The buildings where the workshops will take place will be identified with the conference logo.

09:30 - 17:30	**ECS student workshop - Passive acoustic monitoring and introduction to PAMGuard** *Venue: Lillebælt-Værftet (9:30 - 15:30) and Kulturøen (15:30 - 17:30)*
10:00 - 16:00	**How to achieve a European Joint Cetacean Protocol?** *Venue: Naturcenter Hindsgavl*
09:00 - 17:00	**Best practice workshop: Fostering inter-regional cooperation in underwater noise monitoring and impact assessment in waters around Europe, within the context of the European Marine Strategy Framework Directive** *Venue: Hindsgavl (Room 1)*
09:00 - 17:00	**Citizen science as a basis for management decisions and nature conservation** *Venue: Middelfart Sparekasse (Room 1)*
09:00 - 17:00	**The Marine Mammal Nexus - How can we as marine mammal scientists make a better contribution towards addressing global environmental problems** *Venue: Middelfart Sparekasse (Room 2)*

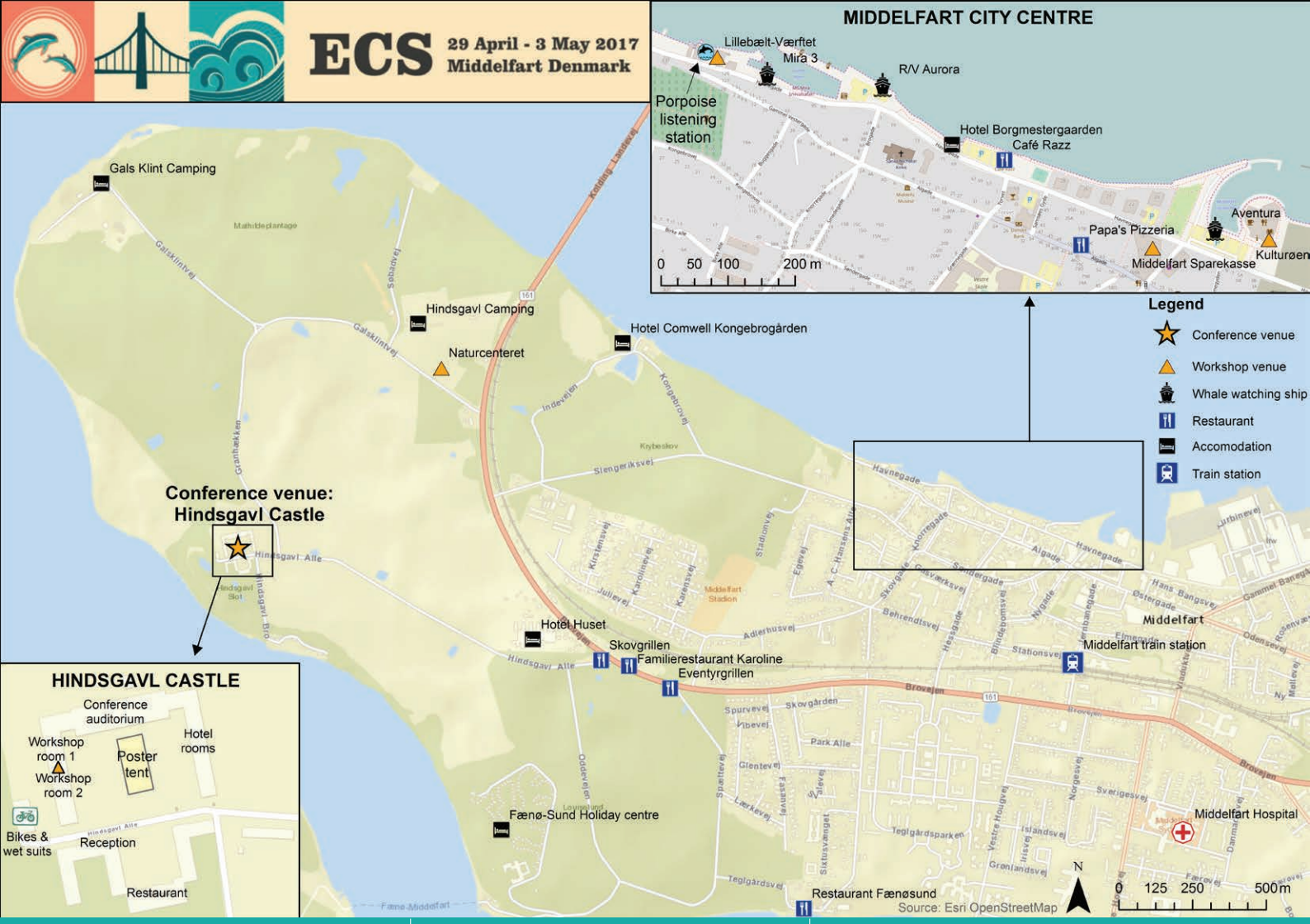
Sunday 30 April

08.00 - 09.00	Booking and return of free bikes at Hindsgavl Castle
12.00 - 18.30	Registration at Hindsgavl Castle / Booking and return of free bike
18.00 - 23.00	Icebreaker (Kulturøen - downtown Middelfart). Porpoise safari with Aarhus University vessel Aurora and two certified safari boats (Aventura and Mira). Trips last one hour and all boats depart at 18:30 and 20:00. Free tickets available at icebreaker. The new public "Ear in the Sea" listening station, sponsored by Seiche, will be open 19:00-22:00 next to Gl. Havn (Old Harbour).

Workshops

For the location of the workshop rooms please see map. The buildings where the workshops will take place will be identified with the conference logo.

08:20 - 17:20	**Static Acoustic Monitoring (SAM) of toothed whales using echolocation clicks: Loggers, Experience, Advances and Challenges** *Venue: Naturcenter Hindsgavl*
09:30 - 17:00	**Approaches to assessing & managing impacts from marine industry on harbour porpoise Special Areas of Conservation** *Venue: Lillebælt-Værftet*
09:00 - 17:30	**Predator-prey interactions between grey seals and other marine mammals** *Venue: Middelfart Sparekasse (Room 1)*
09:00 - 17:00	**5th workshop on „Communicating marine mammal science to the general public"** *Venue: Middelfart Sparekasse (Room 2)*
09:00 - 14:00	**Marine litter: an emerging cause of concern for marine mammals** *Venue: Kulturøen*
09:00 - 17:30	**Inputs to the ACCOBAMS ongoing effort to map human threats on cetaceans in the Mediterranean and Black Seas** *Venue: Middelfart Sparekasse (Room 3)*
09:00 - 17:00	**Effects of PCB exposure in killer whales and other threatened toothed whale species of the North Atlantic** *Venue: Hindsgavl Castle (Room 1)*
13:00 - 16:00	**Wildlife Computers Cetacean Tag Workshop** *Venue: Hindsgavl Castle (Room 2)*



Venue	Adress	Events
Hindsgavl Castle	Hindsgavl Alle 7, 5500 Middel-fart	Conference venue, Video night, Banquet, Hotel
Kulturøen	Havnegade 6, 5500 Middelfart	Workshop, Icebreaker
Lillebælt-Værftet	Havnegade 98, 5500 Middelfart	Workshop
Middelfart Sparekasse	Havnegade 21, 5500 Middelfart	Workshop
Naturcenteret	Galsklintvej 2, 5500 Middelfart	Workshop
Porpoise listening station	Havnegade 98, 5500 Middelfart	Porpoise listening station
Aventura	New harbour	Whale watching boat, Icebreaker
Mira 3	Old harbour	Whale watching boat, Icebreaker
R/V Aurora	Old harbour	Aarhus University research vessel, Ice-breaker
Middelfart Hospital	Østre Hougvej 55, 5500 Middel-fart	Hospital
Café Razz	Havnegade 40, 5500 Middelfart	Restaurant
Eventyrgrillen	Brovejen 341, 5500 Middelfart	Restaurant
Familierestaurant Karoline	Brovejen 386, 5500 Middelfart	Restaurant
Marina Café & Grill	Østre Hougvej 118, 5500 Mid-delfart	Restaurant
Papa's Pizzeria	Algade 57, 5500 Middelfart	Restaurant
Restaurant Fænøsund	Teglgårdsvej 100, 5500 Middel-fart	Restaurant
Skovgrillen	Brovejen 353, 5500 Middelfart	Restaurant
Fænø-Sund Holiday centre	Oddevejen 8, 5500 Middelfart	Hotel
Gals Klint Camping	Galsklintvej 11, 5500 Middelfart	Hotel
Hindsgavl Camping	Søbadvej 10, 5500 Middelfart	Hotel
Hotel Borgmestergaarden	Havnegade 69, 5500 Middelfart	Hotel
Hotel Comwell Kongebro-gården	Kongebrovej 63, 5500 Middel-fart	Hotel
Hotel Huset	Hindsgavl Alle 2, 5500 Middel-fart	Hotel
Middelfart train station	Stationsvej 36, 5500 Middelfart	Train

Monday 1 May

8.00 - 8.45	Registration / Booking and return of free bike always possible when info desk is open
8.45 - 9.30	**Official opening: 30 years' anniversary of the ECS, founded in Denmark in 1987.** Chair of ECS, Mario Acquarone, Chair of the local organisers and the Mayor of Middelfart, Steen Ole Dahlstrøm will open the conference. Founding board members Peter Evans and Carl Kinze will give an anniversary talk on the history of the ECS.
9.30-10. 15	**Keynote speaker - Lars Bejder: Making science matter - the zipper effect , Chair: Mario Acquarone**

10.15-11.10	**First session, Chair: Anders Galatius** **EVOLUTION & DEVELOPMENT**
10.15-10.25	*This year the session chair begins each session by introducing the subject and presenting 5-10 posters relevant to the subject of the session.*
10.25-10.40	**Lee A Miller -** Evolution of narrow band-high frequency biosonar and hearing in odontocetes
10.40-10.55	**Benjamin Ramassamy** - A new specimen of beaked whale from the Gram Formation (Denmark): implications to the evolution of suction feeding in Ziphiidae
10.55-11.10	**Magnus Wahlberg** - Ontogeny of sound production in new-born, free-ranging harbour porpoise (Phocoena phocoena) calves

11.10-11.50 **Coffee break / poster viewing**

11.50-13.00	**Second session , Chair: Jonas Teilmann** **MANAGEMENT & CONSERVATION**
11.50-12.00	*This year the session chair begins each session by introducing the subject and presenting 5-10 posters relevant to the subject of the session.*
12.00-12.15	**Denise Risch** - Large-scale underwater noise pollution from Acoustic Deterrent Devices (ADDs) on the west coast of Scotland
12.15-12.30	**Alice Lapijover** - Are cetacean bycatches lost in translation?
12.30-12.45	**Anita Gilles** - New opportunities in dynamic species management for the harbour porpoise
12.45-13.00	**Ansgar Diederichs** - Assessing disturbance of harbour porpoises by pile driving during construction of the first seven commercial North Sea offshore wind farms in Germany

13.00-14.00 **Lunch break / poster viewing**

14.00-15.00	**Third session, Chair: Joan Gonzalvo** **DISTRIBUTION & ABUNDANCE**
14.00-14.10	*This year the session chair begins each session by introducing the subject and presenting 5-10 posters relevant to the subject of the session.*
14.10-14.25	**Yann Planque** - Comparing horizontal and vertical approaches for the identification of harbour and grey seals' foraging areas
14.25-14.40	**Kaitlin Frasier** - Cetacean population monitoring integrating visual and acoustic observations
14.40-14.55	**Phil Hammond** - Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys
14:55-15:10	**Deanna Leonard** - Late summer distribution of bowhead whales in relation to environmental variables in the Canadian Beaufort Sea

15.10-15.50	**Speed talks, Chair: Lee A Miller** **BEHAVIOUR & ECOLOGY**
15.10-15.15	**Charles McGibney** - Do model drones disturb seals?
15.15-15.20	**William Kay** - Sex-dependent environmental drivers of grey seal pup dispersal and predicted spatio-temporal overlap risk with marine energy installations
15.20-15.25	**Elizabeth Zwamborn** - Long-term social units of long-finned pilot whales do not show group-specific repertoires of repeated calls
15.25-15.30	**Mridula Srinivasan** - To mix or not to mix: testing for randomness in mixed-species cetacean groups
15.30-15.35	**Belén G Ovide** - Using behavior and acoustic data from multi-sensor tags to assess responses of humpback whales (Megaptera novaeangliae) to whale watching boat noise in Skjálfandi Bay (Húsavík), Iceland
15.35-15.40	**Cécile Vincent** - Using telemetry data to estimate the percentage of seals hauled out during censuses
15.40-15.45	**Signe Sveegaard** - Two decades of harbour porpoise telemetry data reveal long-term stability of hot spots
15.45-15.50	**Susan B Nash** - Signals from the south; humpback whales carry messages of Antarctic sea-ice ecosystem variability
	Speed talk presenters to be present for questions for 10 minutes near the stage after the session

15.50 - 17.15 **First poster session with coffee (Even numbers)**

17.15-18.40	**Fourth session, Chair: Peter T Madsen** **BEHAVIOUR**
17.15-17.25	*This year the session chair begins each session by introducing the subject and presenting 5-10 posters relevant to the subject of the session.*
17.25-17.40	**Lonnie Mikkelsen** - Long-term sound and movement tag deployments on seals – detailed data on energy-time budgets and the effects of anthropogenic noise
17.40-17.55	**Frants Jensen** - Ecological drivers of coordinated foraging in long-finned pilot whales
17.55-18.10	**Hal Whitehead** - Cultural hitchhiking in the matrilineal whales
18.10-18.25	**Jesús A Treviño** - Every beaked whale for itself: individual foraging activity in social groups of Blainville's beaked whale (Mesoplodon densirostris)
18.25-18.40	**Edda E Magnúsdóttir** - Humpback whale song exchange in the North-Atlantic: Song transmission between Iceland and the Cape Verde Islands

21.00 - 23.00 **Video night, Hindsgavl Auditorium, Chair: Jeppe D Balle**

- Steffen De Vreese: Study of the Fin whale (Balaenoptera physalus) on the Catalan Coast
- Jerome Chladek: Alerting harbor porpoises to gillnets
- Katrin Riesenberg: Whale mAPP and Citizen Scientists
- Olga Filatova: White killer whales (Orcinus orca) in the Western North Pacific
- Lonnie Mikkelsen: "Life of Brian", video tags on harbour seals
- Arda Tonay and Ayhan Dede: On the Beach (marine mammal stranding network in Turkey)
- Boris Culik: Ambassador Dolphin "Fiete"
- Silvia Frey: Rough-toothed dolphin encounter in the Eastern Mediterranean Sea

Tuesday 2 May

8.45 - 9.00	Announcements of the day

9.00 - 10.30	**First session, Chair: Ursula Siebert** **HEALTH & MEDICINE**
9.00-9.10	*This year the session chair begins each session by introducing the subject and presenting 5-10 posters relevant to the subject of the session.*
9.10-9.25	**Federica Giorda -** Cetaceans stranded in Italy (2016): unusual mortality event along the Ionian coastline
9.25-9.40	**Jean-Pierre Desforges** - Are environmental pollutants affecting the immune system of marine mammals?
9.40-9.55	**Andrew Brownlow** - Knot a problem? Distribution and pathology of fatal entanglements in large marine animals in Scotland
9.55-10.10	**Erica Marchiori** - Morphological and molecular characterization of Crassicauda boopis (Nematoda; Spirurida) from Mediterranean fin whales: preliminary results
10.10-10.25	**Misty Niemeyer** - Phocine distemper virus (PDV) occurrence in stranded harbor and gray seals on Cape Cod, MA, USA from 2011-2015 and relevance to past epizootic events

10.30 -11.00	**Speed talks, Chair: Signe Sveegaard** **DISTRIBUTION & ABUNDANCE, MANAGEMENT & CONSERVATION**
10.30-10.35	**Simone Panigada** - Can satellite telemetry, aerial surveys and Important Marine Mamma Areas (IMMAs) facilitate cetacean conservation in the harsh environment of the Strait of Sicily?
10.35-10.40	**James Waggitt** - A collation of European at-sea surveys identifies and explains persistent areas of cetacean diversity and abundance at regional and decadal scales
10.40-10.45	**Kexiong Wang** - Influences of vessel traffic on porpoise distributions along the mainstream of Yangtze River
10.45-10.50	**Caterina Lanfredi** - Identification of Important Marine Mammal Areas (IMMA) in the Mediterranean Sea: results of the first IMMA regional expert workshop
10.50-10.55	**Ailbhe Kavanagh** - The effect of seismic surveys on cetacean occurrence across a large marine ecosystem
	Speed talk presenters to be present for questions near the stage during the coffee break

11.00 -11.45	**Coffee break / poster viewing**

11.45-13.00	**Second session, Chair: Jakob Tougaard** **ACOUSTICS & NOISE I**
11.45-11.55	*This year the session chair begins each session by introducing the subject and presenting 5-10 posters relevant to the subject of the session.*
11.55-12.10	**Danuta M Wisniewska** - High rates of vessel noise exposure on wild harbour porpoises (Phocoena phocoena) can disrupt foraging
12.10-12.25	**Michael Ladegaard** - River dolphins out of focus? General target assumptions misrepresent range-dependent biosonar adjustments
12.25-12.40	**Peter T Madsen** - Narrow acoustic field of view drives frequency scaling in toothed whale biosonars
12.40-12.55	**Sander von Benda-Beckmann**- Separating underwater ambient noise from flow noise recorded on stereo acoustic tags attached to marine mammals

13.00-14.00	**Lunch break / poster viewing / Annual ECS student meeting**
14.00-15.40	**Third session, Chair: Mario Acquarone** **PHYSIOLOGY**
14.00-14.10	*This year the session chair begins each session by introducing the subject and presenting 5-10 posters relevant to the subject of the session.*
14.10-14.25	**Marco Bonato** - Vascular dynamics during progressive diving and adaptive bradycardia in dolphins: role of the retia mirabilia.
14.25-14.40	**Jeppe Kaczmarek** - Drivers of the Dive Response in Harbour Seals (Phoca vitulina)
14.40-14.55	**Wolf Hanke** - Hydrodynamic detection of benthic prey breathing currents by harbour seals
14.55-15.10	**Siri Elmegaard** - Cognitive control of diving heart rate in harbor porpoises
15.10-15.25	**Frederike Hanke** - Temporal and spatial abilities in pinnipeds
15.25-15.40	**Julie van der Hoop** - Entanglement is a costly life-history stage in large whales
15.40-17.15	**Second poster session with coffee (Odd numbers)**
17.15-18.00	**Keynote speaker: Asha de Vos: Failing successfully, Chair: Mark Simmonds**
19.00-21.00	**Public evening (In Danish) at Hindsgavl Castle.** *"Marsvin i Middelfart – fra hvalfangst til verdensberømt forskning".* Invited speakers, conference participants and the general public are invited.
19.30-21.00	**R/S Aurora open for conference participants, Harbourfront in Middelfart (free beer from TeeDawn)**
21.00-	**Student party in Middelfart (everyone is welcome), Temabar, Havnegade 13**

Wednesday 3 May

8.45 - 9.00	Announcements of the day
9.00 - 9.45	**Keynote speaker: Len Thomas: Does research benefit conservation? Chair: Jacob Nabe-Nielsen**

9.45 - 11.10	**First session, Chair: Phil Hammond** **ECOLOGY**
9.45-9.55	*This year the session chair begins each session by introducing the subject and presenting 5-10 posters relevant to the subject of the session.*
9.55-10.10	**Laia Rojano-Doñate -** Does a life in the fast lane make porpoises more vulnerable to disturbance?
10.10-10.25	**Mads Peter Heide-Jørgensen** - Movements of walruses in Smith Sound
10.25-10.40	**Emma Carroll** - Harbour Seal Genelemetry: understanding source-sink dynamics across the United Kingdom by combining population survey, genetic and telemetry data
10.40-10.55	**Nynne Lemming** - Unique offshore preference in West Greenland harbour porpoises
10.55-11.10	**Armando M Jaramillo-Legorreta** - The dire status of the Vaquita

11.10-11.40	**Coffee break / poster viewing**

11.40-12.10	**Speed talks, Chair: Carl Kinze** **POLLUTION, ANATOMY, ACOUSTICS**
11.40-11.45	**Matteo Baini** - Which marine litter do the Mediterranean sperm whales prefer?
11.45-11.50	**Tilen Genov**- Polychlorinated biphenyls (PCBs) in free-ranging common bottlenose dolphins from the northern Adriatic Sea, in relation to demographic parameters
11.50-11.55	**Joseph Schnitzler** - Size and shape variations of the bony components of sperm whale cochleae
11.55-12.00	**Kristian Beedholm** - Fighting the data deluge: a dedicated detector stage to limit false alarms in passive acoustic monitoring of beaked whales
12.00-12.05	**Line Kyhn** - Harbour porpoise feeding activity varies between Danish Natura2000 areas
12.05-12.10	**Heather Vance** - Echolocation responses of harbour porpoises (Phocoena phocoena) tracking a moving target
	Speed talk presenters to be present for questions near the stage during the coffee break

12.10-12.30	**Lunch break / poster viewing**
12.30 -14.45	**Annual General Meeting**

14.45-15.40	**Second session, Chair: Line A Kyhn** **NEW TECHNIQUES**
14.45-14.55	*This year the session chair begins each session by introducing the subject and presenting 5-10 posters relevant to the subject of the session.*
14.55-15.10	**Lilian Lieber** - Assessing the effectiveness of multibeam sonar to track marine life interactions with a subsea kite in a tidal channel
15.10-15.25	**Paul J Wensveen** - A method for reconstructing georeferenced fine-scale tracks of marine mammals integrating dead-reckoning and position fixes
15.25-15.40	**Francine Kershaw** - Identifying important marine mammal areas using geospatial genetics

15.40-16.40	**Third poster session with coffee (All posters presented)**
16.40-17.25	**Third session, Chair: Magnus Wahlberg** **ACOUSTICS & NOISE II**
16.40-16.55	**Ursula Verfuss** - Assessing the benefit of noise reduction measures during offshore windfarm construction on harbour porpoises
16.55-17.10	**Jakob Tougaard** - Why is frequency weighting so important in assessment of underwater noise impact?
17.10-17.25	**Michel André** - Contribution of marine mammal sounds to the European Marine Strategy Framework Directive noise measurements in the Arctic region
17.25-18.00	**Awards and Closing remarks**

All bikes returned and posters taken down before 19.00!

19.30-02.30	**Conference banquet and dance (3 course dinner, free wine, beers and soft drinks if you have registered, everyone else can come after 22:00 and pay for drinks in the bar)**

Thursday 4 May

Optional excursions. See activity folder and "conference information" on homepage.

LIST OF POSTERS

Harbour seal investigating grey seal pup Photo: Anders Galatius©

THEMATICS

ABU ABUNDANCE AND DISTRIBUTION
ACO ACOUSTICS
ANA ANATOMY
BE BEHAVIOUR
CO CONSERVATION
ECO ECOLOGY
GEN GENETICS
HE HEALTH AND PATHOLOGY
H HISTORY
HI HUMAN INTERACTIONS
MO MODELLING
MN MONITORING
NT NEW TECHNIQUES
PHY PHYSIOLOGY
ST STRANDING
WW WHALE-WATCHING

ABU ABUNDANCE AND DISTRIBUTION

ABU01: A methodology for assessing marine mammal vulnerability to climate change

Matthew Lettrich

ABU02: Abundance of bottlenose dolphins (*Tursiops truncatus*) in the Gulf of Cadiz (Spain)

Samantha Blakeman, Joan Giménez, Philippe Verborgh, Pauline Gauffier, Ruth Esteban, Renaud De Stephanis

ABU03: Basin wide approach, combined datasets and gap analyses: Options to overcome the lack of sighting data on rare cetacean species

Auriane Virgili, Matthieu Authier, Oliver Boisseau, Ana Cañadas, Diane Claridge, Tim Cole, Peter Corkeron, Ghislain Dorémus, Léa David, Nathalie Di-Méglio, Charlotte Dunn, Tim Dunn, Isabel García Barón, Sophie Laran, Mark Lewis, Maite Louzao, Leire Luiz Sancho, Laura Mannocci, José Martínez-Cedeira, Debra Palka, Simone Panigada, Emeline Pettex, Jason Roberts, Begoña Santos, Olivier Van Canneyt, José Antonio Vázquez Bonales, Pascal Monestiez, Vincent Ridoux

ABU04: Daily, seasonal and yearly variation on the inshore presence of striped dolphin (*Stenella coeruleoalba*) in the Alkionides Gulf (Gulf of Corinth, Greece)

Marta Azzolin, Guido Pietroluongo, Laura Pintore, Gennaro Pingitore, Cristina Giacoma

ABU05: Decadal-scale cetacean distribution in the North Atlantic

Nadya Ramirez-Martinez, Philip Hammond

ABU06: Decisions about handling grey seal (*Halichoerus grypus*) census data influences the conclusions of population models

Søs Engbo, Luca Börger, James Bull, Kate Lock, Tom Stringell, Owen Jones

ABU07: Distribution of beaked whales (*Ziphiidae*) off the west coast of Ireland

Katie Kowarski, Julien Delarue, Bruce Martin, Simon Berrow, Joanne O'Brien, Rossa Meade

ABU08: Evidence of a new summer feeding ground of humpback whales (*Megaptera novaeangliae*) in the North Atlantic

Rikke Guldborg Hansen, Mads Peter Heide-Jørgensen

ABU09: First case of a narwhal (*Monodon monoceros*) in Belgium

Jan Haelters, Francis Kerckhof, Marjan Doom, Peter G.H. Evans, Tom Van den Neucker, Thierry Jauniaux

ABU10: Five-year spatial and temporal distribution of cetaceans in the Macaronesian waters - Analyzing habitat preferences in the area

Ana Mafalda Correia, Raul Valente, Ágatha Gil, Massimiliano Rosso, Graham Pierce, Isabel Sousa Pinto

ABU11: Hide and seek: Co-occurrence of foraging harbour porpoises and fish in the eastern North Sea

Nicole Smialek, Peter Grønkjær, Signe Sveegaard, Jakob Tougaard, Jakob Nabe-Nielsen

ABU12: Identifying fin whale hotspots in southern European waters: insights from oceanographic cruises

Isabel García-Barón, Matthieu Authier, José Luis Murcia, Jose A. Vázquez, Begoña Santos, Maite Louzao

ABU14: Linking the dots: sperm whale corridors and connectivity in the Mediterranean Sea

Nino Pierantonio, Francesco Ventura, Sabina Airoldi

ABU15: Movements of coastal bottlenose dolphins between two areas along the coast of South Portugal mainland

Diana Almeida, Francisco Martinho, Sara Magalhães, Cristina Brito, Inês Carvalho

ABU16: North Atlantic phylogeography and large-scale population differentiation of the harbour seal (*Phoca vitulina*)

Suzanne Rønhøj Schjøtt, Filipe G. Vieira, Rune Dietz, Jonas Teilmann, Anders Galatius, Tero Härkönen, Karin Harding, Sandra Granquist, Aqqalu Rosing-Asvid, Kristina Cammen, Emma Carroll, Ailsa Hall, Morten Tange Olsen

ABU17: Occurrence and group dynamics of cetaceans in Madeira Island based on long-term fine-scale data from platforms of opportunity

Filipe Alves, Rita Ferreira, Miguel Fernandes, Zofia Halicka, Luís Dias, Ana Dinis

ABU18: Population structure of bottlenose dolphins and harbour porpoises in the northern Black Sea and the Sea of Azov

Pavel Gol'din, Elena Gladilina, Karina Vishnyakova

ABU19: Preliminary result of cetacean diversity off the Pacific Ocean of Nicaragua (Central America)

Joëlle De Weerdt, Victoria Pouey-Santalou, Etienne Pouplard

ABU20: Seasonal presence of cetaceans along a trans-regional fixed line transect in the Adriatic and Ionian Sea

Arianna Zampollo, Antonella Arcangeli, Joana Buoninsegni, Ilaria Campana, Roberto Crosti, Andrea Giovannini, Alice Nestola, Miriam Paraboschi, Martina Ramazio, Cristina Giacoma, Marta Azzolin

ABU21: Seasonal variability in occurrence of harbour porpoise (*Phocoena phocoena*) off the Arcachon bay (Northeastern Atlantic, France).

Julie Beesau, Flore Samaran

ABU22: Sighting records of common minke whales (*Balaenoptera acutorostrata*) in the German North Sea: Habitat use and distribution patterns.

Carolin Philipp, Ursula Siebert, Helena Herr

ABU24: Spatial distribution, encounter rates and individual identification of unstudied Delphinidae populations along the Southern coast of Samos Island, Greece

Niki Karagouni, Aylin Akkaya Bas, Anastasia Miliou, Alejandro Garcia Ortega, Heidi Malizia

ABU25: Sperm whale distribution along the Kuril Islands, Russian Far East

Olga Filatova, Ivan Fedutin, Olga Titova, Erich Hoyt

ABU26: Squid as common target: Do areas with fishery-related explosions and dolphin foraging habitats in Southern California overlap?

Anna Meyer-Loebbecke, Kait Fraiser, Anne Simonis, Fairlie Reese, Ella B. Kim, Annette Denzinger, Hans-Ulrich Schnitzler, Simone Baumann-Pickering

ABU27: The Arabian Gulf, a “hot”-spot for cetaceans?

Jeppe Dalgaard Balle, Steffen Bach Sanvig, Jonas Teilmann

ABU28: The distribution of bottlenose dolphins (*Tursiops truncatus*) and common dolphins (*Delphinus delphis*) in the northern North Aegean Sea (Greece) in relation to environmental parameters.

Cristina Milani, Adriana Vella, Pavlos Vidoris, Aristidis Christidis, Georgos Sylaios, Emmanouil Koutrakis, Argyris Kallianiotis

ABU29: Understanding Migratory Routes in the Macaronesia - Assessing Range of Physiographic Variables for Baleen Whales

Raul Valente, Ana Mafalda Correia, Ágatha Gil, Laura González, Isabel Sousa Pinto

ABU30: Using click occurrence to assess important habitat of Endangered Scotian Shelf northern bottlenose whales

Hilary Moors-Murphy, Laura Feyrer, Bruce Martin, Julien Delarue, Katie Kowarski

ABU31: Using distance sampling to estimate Cuvier's Beaked Whales abundance in the Northern Tyrrhenian Sea

Adrien C. Gannier, Alexandre J. Gannier

ABU32: Utility of Platforms of opportunity for the prediction of cetacean habitat in the high seas: Implications for spatial planning initiatives in areas beyond national jurisdiction

Lucy Babey, Mike Tetley, Katrina Gillett

ACO ACOUSTICS

ACO01: Acoustic detections of Minke whales in the Moray Firth, Northeast Scotland

Gary Haskin, Kate Brookes, Ewan Edwards, Denise Risch

ACO02: Bioacoustics of harbour seals (*Phoca vitulina*) in central Limfjorden, Denmark

Anne-Louise Nøhr Krogen, Morten Tange Olsen, Jakob Tougaard

ACO03: Calls produced by Ecotype C Killer Whales (*Orcinus orca*) off the Eckström Iceshelf, Antarctica

Elena Schall, Ilse Van Opzeeland

ACO04: Click types and distribution of Sowerby's beaked whale (*Mesoplodon bidens*) along the Eastern Canadian continental shelf

Emma Clarke, Hal Whitehead, Laura Joan Feyrer

ACO05: Comparing the performance of C-PODs and SoundTrap/PAMGUARD in detecting the acoustic activity of harbour porpoises (*Phocoena phocoena*)

Joanna Sarnocinska, Jakob Tougaard, Mark Johnson, Peter Teglberg Madsen, Magnus Wahlberg

ACO06: Diel patterns and effects of recreational boat traffic on the acoustic behaviour of harbour porpoises in the Great Belt

Danielle Nadine Banemann, Jakob Tougaard, Morten Tange Olsen, Jonas Teilmann

ACO07: Distinctive circadian and seasonal rhythms of harbour porpoise biosonar activity in the northern Little Belt

Caroline Höschle, Veit Hennig

ACO08: Distinguishing between sperm whale individuals using the inter-pulse-interval of their clicks

Anne Bøttcher, Kristian Beedholm, Shane Gero, Peter Teglberg Madsen

ACO09: Diurnal pattern in harbour porpoise sound production in Arctic Norway

Evert Mul, Ronald Smit, Martin Biuw, Mario Acquarone, Meike Schiedam

ACO10: Echolocation behaviour of East Greenland narwhals

Tervo, Outi M., Blackwell, Susanna B., Conrad, Alex S, Hansen, Rikke Guldborg and Heide-Jørgensen, Mads Peter

ACO12: First description of Comorian humpback whales (*Megaptera novaengliae*) mating song

Jacopo Di Clemente, Marco Bonato, Artadji Attoumane, Cristina Giacoma

ACO13: Harbour porpoise click detection in high noise environments

Jillian Duggan, Brian Sanderson, Mark Wood

ACO14: Impact of vibroseismic underwater sound on the behaviour of baleen whales

Marianne Rasmussen, Joseph Schnitzler, Magnus Wahlberg, Tomonari Akamatsu, Klaus Lucke, Jakob Tougaard, Ursula Siebert

ACO15: Inter Pulse Interval analysis of Sperm Whale (*Physeter macrocephalus*) (Linnaeus 1758) "clicks" recorded in Mediterranean Sea between 1996 and 2011: Population structure and distribution of sizes

Lorenzo Gordigiani, Gianni Pavan

ACO16: Interspecific comparison of cetacean feeding calls: A gut-wrenching convergence?

Leticiaa Legat, Janie Wray, Hermann Meuter, Volker Deecke

ACO17: Killer whale dialects are more homogenous in the western than in the eastern North Pacific

Anastasia Y. Danishevskaya, Olga A. Filatova

ACO18: No need to shout? Harbour porpoises (*Phocoena phocoena*) echolocate quietly in confined murky waters of the Wadden Sea

Tom Bär, Elisabeth Herold, Peter Stilz, Michael Dähne

ACO19: Non-whistle sounds used in bottlenose dolphin aggressive interactions recorded on DTAGs

Laela Sayigh, Austin Dziki, Vincent Janik, Edward Kim, Katie McHugh, Peter Tyack, Randall Wells, Frants Jensen

ACO20: Porpoise clicks are downsweeps: the power of waveform analysis in cetacean monitoring.

Nick Tregenza

ACO21: Scientific mimicry - artificial dolphins invade the Baltic Sea
Alexander Schubert, Ansgar Diederichs, Thilo Liesenjohann, Vladislav Kosarev, Rene Gerrits, Georg Nehls

ACO22: Signature whistles and the scope for adaptation to ambient noise in common bottlenose dolphins (*Tursiops truncatus*) living in an urbanized coastal environment
Ida Marie Kragh, Frants H. Jensen, Peter T. Madsen

ACO23: Temporary threshold shift induced for pure tones at 25/28 kHz on harbour porpoise hearing
Andreas Ruser, Magnus Wahlberg, Mathias Andersson, Jakob Hoyer Christensen, Ursula Siebert

ACO24: Variation in bottlenose dolphin (*Tursiops trucatus*) whistle parameters in relation to group composition, surface behaviour and vessel sound profiles
Laura Whiteley

ACO25: When do C-PODs detect click trains? Matching harbour porpoise (*Phocoena phocoena*) sightings to their echolocation
Fadia Al Abbar, Geert Aarts, Mardik Leopold, Rogier von Asmuth, Steve Geelhoed

ACO26: Whistle characteristics of bottlenose dolphins in the Ria of Arousa, Galicia (NW Spain)
Mary Kate Bolger, Bruno Diaz Lopez, Victoria Hope, Severine Methion

ACO27: The effect of anthropogenic noise on the vocalizations of *Tursiops truncatus*: the Kvarner area case study
Ilaria Ceni, Nikolina Rako-Gospić, Marco Bonato, Cristina Giacoma, Matteo Griggio

ANA ANATOMY

ANA01: Ecomorphology of axial skeleton in Odontocetes
Amandine Gillet, Eric Parmentier

ANA02: Identifying sexual maturity in female harbour porpoises (*Phocoena phocoena*) from the North and Baltic Seas using ovarian characteristics
Tina Kesselring, Sacha Viquerat, Ralph Brehm, Ursula Siebert

ANA03: Sperm whales skeletons reconstruction: a tool for educate public awareness
Giuseppe Palmisano, Michele Povinelli, Emanuele Zanetti, Enrico Gallo, Bruno Cozzi, Sandro Mazzariol

ANA04: The acoustic pathway to the inner ear of the harbor porpoise (*Phocoena phocoena*)
Annika Toth, Magnus Wahlberg

BE BEHAVIOUR

BE01: Bottlenose dolphins attracted to a designated Organized Aquaculture Development Area in the West Saronic Gulf, Greece

Nikos Pipinis, Dimos Pipinis

BE02: Investigating habitat preferences of fin whale (*Balaenoptera physalus*) along the water column
Irene Scannavino, Renato Chemello, Paola Tepsich, Massimiliano Rosso, Aurelie Moulins

BE03: Is a lonely harbour seal (*Phoca vitulina*) pup really an orphan?
Margarita Mendez-Arostegui, Beatriz Rapado-Tamarit, Ana Rubio-Garcia, Ton Groothuis

BE04: Diel, tidal and seasonal patterns in the presence of bottlenose dolphins in the Moray Firth (NE Scotland)

Oihane Fernandez, Isla Graham, Thomas Cornulier, Paul Thompson

BE05: Dispersal and foraging activities of juvenile grey seals in the southern North Sea

Verena Peschko, Sabine Müller, Philipp Schwemmer, Tanja Rosenberger, Peter Lienau, Janne Sundermeyer, Stefan Garthe

BE06: Diving and foraging behaviour of a key arctic marine mammal: The Atlantic walrus in Smith Sound

Eva Garde, Signe Jung-Madsen, Susanne Ditlevsen, Rikke G. Hansen, Karl B. Zinglersen, Mads Peter Heide-Jørgensen

BE07: Effects of dispersal on survival rates of Mediterranean monk seal in fragmanted habitats

Merve Kurt, Meltem Ok, Serdar Sakınan, Ali Cemal Gücü

BE08: Effects of environmental enrichment on common seals (*Phoca vitulina)*

Michael Bakker-Paiva

BE09: Energetic consequences and implications for food consumption models when feeding on various sizes of cod in harp seals (*Phoca groenlandica*)

Ann-Isabel Algera, Mario Acquarone, Erling Sverre Nordøy

BE10: First observation of parturition of harbour porpoise *Phocoena phocoena* in Japan

Natsuki Matsui, Nobuya Ise, Masatoshi Tsunokawa, Seiichi Kaji, Ayaka Matsuda, Takashi Matsuishi

BE11: First observations of sperm whales (*Physeter macrocephalus*) taking Greenland halibut (*Reinhardtius hippoglossoides*) from long line fishery in coastal waters of Arctic Norway

Tiu Similä, Evert Mul, Fredrik Lehto

BE12: Harbour porpoise (*Phocoena phocoena*) reactions to pingers
Lotte Kindt-Larsen, Casper Willestofte Berg, Simon Northridge, Finn Larsen

BE13: How vulnerable are harbour seal (*Phoca vitulina*) pups: a study on mother-pup interactions.

Beatriz Rapado-Tamarit, Margarita Mendez-Arostegui, Ana Rubio-Garcia, Ton Groothuis

BE14: Long-term sound and movement tags for behavioural studies of marine mammals

Mark Johnson, Rene Swift

BE15: Prolonged, sub-surface, visual observations of free-living killer whale (*Orcinus orca*) feeding behaviour in northern Norway

Russell Baker, Mario Acquarone

BE16: Seasonal patterns in humpback whale acoustic behavior in the Southern Ocean

Simone Müller, Ilse Van Opzeeland

BE17: Signaling body size in a vocal learning mammal: Physical bases of acoustic allometry in harbor seal pups

Andrea Ravignani, Stephanie Gross, Maxime Garcia, Ana Rubio-Garcia, Bart de Boer

BE18: Structure and group composition of a small community of common bottlenose dolphins in the Sado estuary, Portugal

Ana Coelho, Patrícia Rachinas-Lopes, Manuel E. dos Santos

BE19: Spatio-temporal patterns in Antarctic minke whale (*Balaenoptera bonaerensis*) vocal behaviour in the Weddell Sea

Diego Filun, Olaf Boebel, Elke Burkhardt, Michael Flau, Stefanie Spiesecke, Karolin Thomisch, Victoria Warren, Ilse Van Opzeeland

BE20: The habitat use and behavior of Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) in Hong Kong waters.

Serena Le Double, Hong Yu Lai, Lindsay Porter, Meike Scheidat

BE21: The last Samurai: who said bottlenose dolphins are not tough?

Joan Gonzalvo, Ioannis Giovos

BE22: The Ontogeny of Sexual Segregation in Antarctic Fur Seals (*Arctocephalus gazella*)

Kayleigh Jones, Iain Staniland, Stephen Votier, Norman Ratcliffe

BE23: Timing it right - Tidal and temporal effects on detections and foraging behaviour of the harbour porpoise in the German North Sea

Beate Zein, Benno Woelfing, Tobias Schaffeld, Johannes Baltzer, Michael Dähne, Ursula Siebert

BE24: What makes harbour porpoises jump – Analysis of 'porpoising behaviour' from D-Tag data of free-ranging harbour porpoises in the Baltic Sea

Tobias Schaffeld, Danuta Wisniewska, Miss Laia Doñate, Jonas Teilmann, Andreas Ruser, Ursula Siebert

BE25: High suckling rates and acoustic crypsis maximize energy-transfer between humpback whale mothers and calves

Simone Videsen, Lars Bejder, Mark Johnson, Peter T Madsen

CO CONSERVATION

CO01: An ACCOBAMS certification for highly qualified Marine Mammals Observers
Nathalie Di Meglio, Léa David, Claudio Fossati, Caterina Lanfredi, Silvia Frey, Alssio Maglio, Aurelie Moulins, Barbarra Mussi, Gianni Pavan, Maÿlis Salivas

CO02: Citizen science: a valuable contribution to scientific research that can serve the interests of, and deliver benefits to, coastal communities.
Katie Dyke, Alice Walters

CO03: Collaborating towards the management of mysticeti between Algeciras and Gibraltar
Alessia Scuderi, Rocío Espada Ruíz, Luisa Haasová, Filomena Cardoso Martins, Liliana Olaya Ponzone, José Carlos García Gómez, Javier García Sanabria

CO04: Do we need to conserve the harbour porpoise (*Phocoena phocoena*) population in the Marmara Sea separately?
Begüm Uzun, Arda M. Tonay, Ayhan Dede, Erdem Danyer, Işıl Aytemiz, Sabri Bilgin, Ayaka A. Öztürk, Bayram Öztürk, Raşit Bilgin

CO05: Ecosystem Based Management and Marine Spatial Planning in the Gyaros Marine Protected Area to conserve the Mediterranean monk seal, *Monachus monachus*, through a participatory process: from theory to practice
Spyros Kotomatas, Amalia Alberini, Ioli Christopoulou, Joan Gonzalvo, Constantinos Liarikos, Maria Livanou, Giuseppe Notarbatolo di Sciara, Simone Panigada, Giorgos Paximadis, Christos Papadas, Elina Samara, Magdalene Theochari, Konstantinos Voltis

CO06: Educational programs for the conservation of marine mammal species in Russia

Maria Akinshina, Tatyana Denisenko

CO07: Establishment of the new Marine Protected Areas in the Black Sea

Oleksandr Neprokin, Olha Bratchenko

CO08: EU-project: Marine mammals - using marine mammals for making science education and science careers attractive for young people

Dennis Brennecke, Katrin Knickmeier, Ursula Siebert, Kristina Lehnert-Sobotta, Anja Reckendorf, Helen Sköld, Anna Lorenz, Iwona Pawliczka vel Pawlik, Joanna Jaszczołt, Mikolaj Koss, Magnus Wahlberg, Monika Łaskawska-Wolszcza, Sylvie Gobert, Krishna Das, Eric Parmentier, Katrin Wollny-Goerke, Andreas Essenberger, Katrin Schöps, Katrin Kruse

CO09: Marine caves along the coast of Salento (Southern Italy): hot spots for the conservation of the Mediterranean monk seal

Luigi Bundone, Stefano Guerzoni, Sergio Fai, Paolo D'Ambrosio, Francesco Minonne, Emanuela Molinaroli

CO10: Necessity and challenges in using an Ecosystem Approach to the management of marine mammals: ensuring sustainable ecosystem services

Genevieve Desportes, Jill Prewitt

CO11: Marine debris in marine mammals in Ireland: another issue in marine conservation

Gema Hernandez-Milian, Amy Lusher, Ian O'Connor, Emer Rogan, Simon Berrow

CO12: Sail & whale - Sailors, citizens and science for marine conservation

Laura González, Julia Alonso, Claudio Morganti, Jesús M. Torres-Palenzuela

CO13: Socially important experience as volunteers in the centers for rehabilitation of seals in the Netherlands and the National Marine Park of Zakynthos in Greece.

Nina Generalova, Vladimir Denisenko, Ilya Konovalov, Alisa Degteva, Alisa Drikker, Iuliia Khramushina, Maria Ereshchenko, Polina Grebennikova, Mikhail Ivanov, Artem Sokolov, Tatyana Denisenko, Olga Sokolova

CO14: The ??? of EU fishing policies related to by-catch of protected species

Sven Koschinski, Volker Dierschke, Axel Kreutle

CO15: The role of a tourism ecolabel such as the Blue Flag in marine spatial planning, sustainability and ultimately whale conservancy

Sophie Bachet Granados

CO16: The Swedish Action Plan for improved conservation management of three harbour porpoise populations

Julia Carlström**,** Sara Königson, Susanne Viker

CO17: Updated national action plan (Finland) for the critically endangered Baltic Sea harbour porpoise

Olli Loisa, Penina Blankett

CO18: The French MSFD monitoring programme and evaluation of good environmental status for marine mammals

Benjamin Guichard, Matthieu Authier, Jérôme Spitz

CO19: Identification of bottlenose dolphins' management units to develop a conservation strategy in the French Mediterranean waters

Benjamin Guichard, Matthieu Authier, Jérôme Spitz

ECO ECOLOGY

ECO01: Assessing mortality at the Mediterranean monk seal colony of "Costa de las Focas" reserve (Cabo Blanco peninsula)

Mercedes Muñoz-Cañas, Moulaye Haya, Abba M'Bareck, Miguel Angel Cedenilla, Fernando Aparicio, Hamady M'Bareck, Luis Mariano González, Pablo Fernandez de Larrinoa

ECO02: Local foraging habitat selection of grey seals in different colonies in France and Ireland

Mathilde Huon, Yann Planque, Mark Jessopp, Michelle Cronin, Florence Caurant, Cécile Vincent

ECO03: Multilevel contributions to the study of the fin whale in the Garraf marine area, a foraging hotspot in the North-western Mediterranean

Steffen De Vreese, Mike van der Schaar, Florence Erbs, Margarita Junza, Natalia Amigo, Christina Martín, Alba Solsona Berga, Eduard Degollada, Michel André

ECO04: Potential effects of climate change on cetaceans in the Black Sea

Ayça Eleman

ECO05: Predator-prey interactions between Harbour Porpoises (*Phocoena phocoena*) and Fish observed with a Drone

Kirstine Feldskov Hansen, Jakob Højer Kristensen, Daniela Prömper, Magnus Wahlberg

ECO06: Seasonality in grey seal (*Halichoerus grypus*) body weight and food intake

Kirstin Anderson Hansen, Saa Ortiz, Ursula Siebert, Magnus Wahlberg

ECO07: The vertical dimension of Southern Ocean marine predators: understanding to protect

Giulia Roncon, Sophie Bestley, Clive McMahon, Barbara Wienecke, Mark Hindell

ECO08: Timing and duration of grey seal (*Halichoerus grypus*) moult

Jessica Schop, Geert Aarts, Roger Kirkwood, Jenny Cremer, Sophie Brasseur

ECO09: Variation in isotopic niche suggests population structuring in herring-eating killer whales off Iceland

Filipa Samarra, Morgana Vighi, Alex Aguilar, Gísli Víkingsson

GEN GENETICS

GEN01: Archaeology and ancient genomics of Baltic harp seals

Maiken Bro-Jørgensen, Morten Tange Olsen, Aikaterini Glykou, Kerstin Lidén

GEN02: Genetic investigation on the short-beaked common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncatus*) in the Turkish seas based on mtDNA sequences

Arda M. Tonay, Begüm Uzun, Ayhan Dede, Erdem Danyer, Işıl Aytemiz Danyer, Ayaka A. Öztürk, Bayram Öztürk, Raşit Bilgin

GEN03: Population genomics of Norwegian killer whales (*Orcinus orca*)

Julie Bitz-Thorsen, Kim Præbel, Audun Rikardsen, Rune Dietz, Filipe G. Vieira, Shripathi Bhat, Hanne Strager, Morten Tange Olsen

GEN04: Preliminary assessment of the genetic diversity of *Stenella coeruleoalba* (Meyen, 1833) populations from the Ligurian and Tyrrhenian seas and possible hybridization with *Delphinus delphis* (Linnaeus, 1758).

Biagio Violi, Silvia Cecchetti, Jaclyn Mazzafoglia, Annalisa Sambolino, Alberta Mandich, Jessica Alessi, Cristina Fiori, Dario Angeletti

GEN05: The impact of exploitation on the genomes of ancient and historic walrus genomes.

Xénia Weber, Morten Tange Olsen, Peter Jordan

HE HEALTH AND PATHOLOGY

HE01: Anisakid nematode species identification in harbour porpoises (*Phocoena phocoena*) from the North Sea, Baltic Sea and North Atlantic via RFLP analysis

Jan Lakemeyer, Ursula Siebert, Kristina Lehnert

HE02: Antibiotic resistance of the microorganisms isolated from marine mammals as indicator of parentage of the microflora.

Tatyana Denisenko, Olga Sokolova

HE03: Evidence of mercury bioaccumulation in skin samples of individuals from an isolated bottlenose dolphin population in Panama

Dalia Barragan-Barrera, Andrea Luna-Acosta, Paco Bustamante, Laura May-Collado, Susana Caballero¨

HE04: Fatal Asphyxiation with Laryngeal Displacement caused by Flatfish in Harbour Porpoises (*Phocoena phocoena*)

Marco Roller, Stephanie Gross, Anja Reckendorf, Heidi Andreasen, Peter Wohlsein, Ursula Siebert

HE05: First assessment of organochlorine compounds levels in sperm whales (*Physeter macrocephalus*) stranded in the Canary Islands (Atlantic Ocean) and a comparison with the Mediterranean Sea specimens.

Alice Bartalini, Natalia García-Alvarez, Francesca Capanni, Antonio Fernández, Maria Cristina Fossi, Manuel Arbelo, Javier Almunia, Letizia Marsili

HE06: First comparison of organochlorine levels in stranded striped dolphin (*Stenella coeruleolaba*) of the Mediterranean Sea and of the Atlantic Ocean.

Francesca Capanni, Natalia García-Alvarez, Alice Bartalini, Antonio Fernández, Manuel Arbelo, Eva Sierra, Javier Almunia, Maria Cristina Fossi, Antonella D'Agostino, Letizia Marsili

HE07: From fields to the deep ocean: assessing persistent organic pollutant levels in sperm whales and other cetaceans in the south-eastern Caribbean

Paula Méndez Fernandez, Jeremy Kiszka, Tristan Normand, Gaëlle Vandersarren, Florence Caurant, Jérôme Spit, Rosalinda Montone, Satie Taniguchi, Michael Heithaus

HE08: Investigation of the immune system and microbiota of marine mammals in the light of assessment of the habitat safety of the World Ocean for alive organisms.
Olga Sokolova, Tatyana Denisenko

HE09: I'm in the scat, man! Preliminary investigation into the prevalence of enteric protozoans of marine mammal resident populations in German waters
Miguel Grilo, Kristina Lehnert, Lídia Gomes, Luis Madeira de Carvalho, Ursula Siebert

HE10: Marine mammals immunology
Cinzia Centelleghe, Luca Aresu, Davide Trez, Giovanni Di Guardo, Sandro Mazzariol

HE11: Mediterranean monk seal parasites from Eastern Mediterranean cost of Turkey: Two new records
Erdem Danyer, Işıl Aytemiz Danyer, Arda Tonay

HE12: Necropsy results of harbour seal pups
Ulrike Meinfelder, Katharina Kramer, Tanja Rosenberger

HE13: Parasitological findings in Fin Whales (*Balaenoptera physalus*) stranded along Italian coastlines
Federica Marcer, Sandro Mazzariol, Martina Pagiaro, Walter Mignone, Cinzia Tessarin, Erica Marchiori

HE14: Pathological findings in harbour porpoises (*Phocoena phocoena*): indication for violent interactions with bottlenose dolphins (*Tursiops truncatus*) in the German Baltic Sea of Schleswig-Holstein

Stephanie Gross, Philip Claus, Peter Wohlsein, Andreas Pfander, Cecilie Thuelund, Magnus Wahlberg, Ursula Siebert

HE15: Origin and spread of Phocine Distemper Virus (PDV) causing the 1988 and 2002 epidemics in harbour seals.

Iben Stokholm, Tero Härkonen, Karin Harding, Kristina Lehnert, Ursula Siebert, Rune Dietz, Jonas Teilmann, Anders Galatius, Linnea Worsøe Havmøller, Emma Carroll, Ailsa Hall, Morten Tange Olsen

HE16: Results of microbiological research of the samples of Atlantic Walrus (*Odobenus rosmarus*)

Mary Ereshchenko, Tatyana Denisenko, Andrey Boltunov, Varvara Semenova, Nikita Boltunov, Viktor Nikiforov

HE17: Severe injuries on dolphins observed in two cases from the Turkish coasts

Isil Aytemiz Danyer, Erdem Danyer, Arda M. Tonay, Ayhan Dede

HE18: The first report of *Brucella ceti* infection in a Risso's Dolphin (*Grampus griseus*).

Nicholas Davison, Mariel ten Doeschate, Mark Dagleish, Lorraine Perrett, Claire Dawson, Jakub Muchowski, Andrew Brownlow

HE19: Trace elements and organochlorines in sperm whales stranded on the coast of Schleswig Holstein in 2016

Marianna Pinzone, Joseph Schnitzler, Jean-Pierre Thomé, Krishna Das, Ursula Siebert

HE20: Unusual mass mortality of harbour porpoises on the coast of the western Black Sea (Bulgaria and Turkey) in summer 2016

Ayaka Amaha Öztürk, Arda M. Tonay, Ayhan Dede, Erdem Danyer, Işıl Aytemiz Danyer, Dimitar Popov

HE21: Updating the biodiversity of parasites of the genus *Anisakis* in cetaceans from different oceanographic basins

Paolo Cipriani, Simonetta Mattiucci, Michela Paoletti, Lucilla Giulietti, Federica Marcer, Eleonora Bello, Marialetizia Palomba, Alexandros Frantzis, Andrew Brownlow, Nicholas Davison, Barry McGovern, Catherine Dougnac, Pablo Covelo, Begona Santos, Steve Webb

HE22: Caries and dental calculus in teeth of the Pacific walrus (*Odobenus rosmarus divergens*)
Natalia Kryukova

H HISTORY

H01: Depiction of a humpback whale, *Megaptera novaeangliae Borowski*, 1781 in Eckernförde harbour in 1766

Andreas Friedrich Pfander, Carl Christian Kinze

H02: The Historic Harbour Porpoise Catch in the Northern Little Belt Revisited
Carl Kinze

HI HUMAN INTERACTIONS

HI01: Behavioural responses of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) to tourism on Zanzibar, Tanzania

Emilie Nicoline Stepien, Narriman Saleh Jiddawi, Morten Tange Olsen

HI02: Bringing marine mammal bycatch into International focus.

Mark Peter Simmonds

HI03: Cetacean avoidance to active seismic sources

Patrick Lyne, Myrto Tourgeli Provata, Carla Chicote, Joanne O'Brien

HI04: Distribution patterns of floating marine debris in German Waters between 2010 and 2012

Bianca Unger, Helena Herr, Ursula Siebert

HI05: Effects of boats on surfacing patterns of bottlenose dolphins (*Tursiops truncatus*) in Northeastern Adriatic Sea (Croatia): analysis of group behaviour

Sandra Capitanio, Nikolina Rako Gospić, Marco Bonato, Matteo Griggio

HI06: Integrating empirical data with probability distributions from a numerical 4-D model to assess marine mammal collision risk with a novel marine renewable energy device

Ross Culloch, Pal Schmitt, Lilian Lieber, Louise Kregting

HI07: Interactions between bottlenose dolphins (*Tursiops truncatus*) and trawlers in the Gulf of Trieste

Polona Kotnjek, Ana Hace, Tina Centrih Genov, Tilen Genov

HI09: Quantification and context of near miss event of ship strikes with fin whales on a ferry line in the Mediterranean Sea

Léa David, Nathalie Di-Méglio, Marine Roul

HI10: Short-term effects of tourist boats on the behaviour of common dolphins (*Delphinus delphis*)

Verónica Belchior, José Azevedo, Arianna Cecchetti

HI11: Spatial overlap of high density sperm whale areas with marine traffic in a subarea of the Pelagos Sanctuary, Mediterranean Sea

Silvia Frey, Bruno Claro

HI12: Spatial overlapping of industrial fishing activities with Mediterranean monk seal marine habitat use at Cabo Blanco Peninsula (Mauritania-Morocco)

Pablo Fernández de Larrinoa, Hamdy M'Bareck, Moulaye Haye, Abba M'Bareck, Mercedes Muñoz-Cañas, Miguel A. Cedenilla, Luis Mariano González, Fernando Aparicio

HI13: The effect of pile driving on harbour porpoises' behaviour at two offshore windfarms in and adjacent to the 'Sylt Outer Reef'

Johannes Baltzer, Benno Woelfing, Michael Dähne, Magnus Wahlberg, Matthias Fischer, Tobias Schaffeld, Marianne Rasmussen, Andreas Ruse, Ursula Siebert

HI14: Understanding harbour porpoise use of tidal stream environments to reduce interactions with marine renewable energy installations

Holly Dunn, James Waggitt, Peter Evans, Marco Piano, Peter Robins, Beth Scott, Gemma Veneruso, Jan Hiddink, Laura Holmes, Emma Keen, Ben Murcott, Jenny Whitmore

MO MODELLING

MO01: Effects of noise on the North Sea harbour porpoise population

Jacob Nabe-Nielsen, Jonas Teilmann, Jakob Tougaard, Floris M. van Beest

MO02: Habitat modelling of two deep diving species, sperm whale (*Physeter macrocephalus*) and long-finned pilot whale (*Globicephala melas*) from static acoustic monitoring data from the Irish Porcupine Bight

Myrto Tourgeli Provata, Simon D. Berrow, Joanne M. O'Brien

MO03: Predicting the population-level impact of mitigating harbor porpoise bycatch with pingers and time-area fishing closures

Floris van Beest, Lotte Kindt-Larsen, Francois Bastardie, Valerio Bartolino, Jacob Nabe-Nielsen

MO04: Predictive model for habitat mapping of common dolphins (*Delphinus delphis*) in the waters south of Samos island, Greece

Nikolina Mileva, Marika Panagiotou, John Stuiver, Anastasia Miliou

MO05: The importance of correcting effort for "handling time" in species distribution models from non-dedicated surveys

Anna Schleimer, Christian Ramp, Philip Steven Hammond

MN MONITORING

MN01: 20 years of bottlenose dolphin (*Tursiops truncatus*) photo-identification along French Provencal coast, Mediterranean Sea – page
Julie Jourdan, Hélène Labach, Frank Dhermain, Jean Michel Bompar, Franck Dupraz

MN02: Photo-ID aids monitoring of grey seal (*Halichoerus grypus*) return to their historical sites after absence for 80 years in the German Baltic Sea
Linda Westphal, Anja Gallus, Henning von Nordheim, Michael Dähne

MN03: Citizen Science CETUS Program: an efficient tool for monitoring cetacean occurrence and spatial distribution in Macaronesia offshore waters.
Agatha Gil, Ana Mafalda Correia, Raul Valente, Isabel Sousa-Pinto

MN04: EO4wildlife: a platform for marine wildlife monitoring integrating big Earth observation data
Susan Gallon, Benjamin Guichard

MN05: How automatic detection and classification of southern right whale upcalls is influenced by choice of software and parameter values
Victoria Warren, Daniel Zitterbart

MN06: Marine mammal encounters during the EMBLAS II research cruise (Black Sea, 2016)
Oksana Savenko

MN07: Monitoring cetaceans in the Madeira Archipelago from a ferry along a fixed transect: a preliminary analysis of summer-autumn 2016
Annalisa Sambolino, Filipe Alves, Ana Mafalda Correia, Rita Ferreira, Patrícia Carvalho, Gustavo Silva, Ana Dinis

MN08: Long-term passive acoustic monitoring of common bottlenose dolphins' (*Tursiops truncatus*) presence in Haifa Bay, Israel
Yotam Zuriel, Dani Kerem, Aviad Scheinin

MN09: Places no one else goes – the importance of Marine Mammal Observer data
Opehlie Humphrey, Maja Nimak-Wood

MN11: Resighting rates of Blainville's Beaked Whale (*Mesoplodon densirostris*) off Madeira Island (NE Atlantic)
Ana Dinis, Raquel Marques, Luís Dias, Dinarte Sousa, Claudia Gomes, Nicolau Abreu, Filipe Alves

MN12: Seasonal and yearly fluctuation of cetacean presence in the Istanbul Strait based on passive acoustic monitoring between 2009-2016
Ayhan Dede, Tomonari Akamatsu, Ayaka Amaha Öztürk, Arda Mehmet Tonay, Saho Kameyama

MN13: The ventral patch on the Mediterranean monk seal (*Monachus monachus*). A tool for life monitoring of males.

Miguel Angel Cedenilla, Hamady M'Bareck, Moulaye Haya, Abba M´Bareck, Mercedes Muñoz, Luis Mariano González, Fernando Aparicio, Pablo Fernández de Larrinoa

MN14: Using Linux, Jack (audio connection kit) and AMS (Alsa Modular Synth) for real-time signal processing in PAM

Rocco De Marco

NT NEW TECHNIQUES

NT01: A novel modular tag for marine mammals

Alessandro Bocconcelli, Mark Horn, Mr James Kuo, Daniel Bogorff

NT02: Combining marking and biopsy sampling - successful test of a new flipper tag for phocid seals

Abbo van Neer, Ana Rubio Garcia, Ursula Siebert

NT03:Innovative alerting device (Porpoise Alert, PAL) can significantly reduce bycatch of harbour porpoise in the western Baltic Sea

Jérôme Christophe Chladek, Lotte Kindt-Larsen, Boris Culik, Matthias Conrad, Christian von Dorrien

NT04: Seawetra: Integrated platform for marine environmental monitoring

Paola Tepsich, Dario Rubado, Alessandro Burastero, Antonio Libroia, Massimiliano Rosso, Aurelie Moulins

NT05: JONATHAN: A semi-automated monitoring method of marine megafauna and human activities at sea by digital aerial HD images

Alexis Chevallier, Alexandre Cerruti, Bassem Alsahwa, Gwenaël Quaintenne, Loïc Jomat, Frédéric Maussang, Didier Grosdemange, David Corman, Thierry Micol, René Garello

NT06: New acoustic alerting device PAL increases echolocation intensity in harbour porpoises (*Phocoena phocoena*)

Boris Culik, Jérôme Chladek, Matthias Conrad

NT07: The Geometer: A new device for aerial surveys

Baldur Thorgilsson, Daniel Pike, Thorvaldur Gunnlaugsson, Rikke Guldborg-Hansen, Genevieve Desportes, Jill Prewitt

NT08: The use of modern scannings techniques in whale research: possibilities and limitations

Aage Alstrup

NT09: Using unmanned ariel vehicles (UAV's) for marine mammals detection and underwater noise assessment

Paul Lepper, Steven Lloyd, Simon Pomeroy

NT10: How to make a seal echolocate? Development of a novel animal-borne 'sonar tag'

Pauline Goulet, René Swift, Peter Madsen, Mark Johnson

PHY PHYSIOLOGY

PHY01: A transcriptome analysis of the mechanism of hypoxia tolerance in the whale brain
Alena Krüger, Andrej Fabrizius, Thorsten Burmester

PHY02: Adaptations of the brain to hypoxia induced by diving in marine mammals

Cornelia Geßner, Andrej Fabrizius, Mariana Leivas Müller Hoff, Thorsten Burmester

PHY03: Exploring multi-modal sensory integration of the acoustic startle reflex in relation to behavioural avoidance responses in phocid seals

Chloe Malinka, Vincent Janik, Thomas Gotz

PHY04: Is the slow recovery of southern right whales due to a low metabolic rate?
Mia Lybkær Kronborg Nielsen, Simone K. A. Videsen, Peter T. Madsen, Lars Bejder, Fredrik Christiansen

PHY05: The seasonal buoyancy budget of habour porpoises during dives
Michael Ragkousis, Mette Sif Hansen, Ursula Siebert, Magnus Wahlberg

ST STRANDINGS

ST01: Kinship and origin of a group of male sperm whales (*Physeter macrocephalus*) recently stranded in the North Sea
Marijke Autenrieth, Anja Ernst, Rob Deaville, Fabian Demaret, Lonneke Ijsseldijk, Ursula Siebert, Ralph Tiedemann

ST02: Mass stranding of 10 long-finned pilot whales (*Globicephala melas*) on the beach of Calais (France)

Thierry Jauniaux, Jean Michel Charpentier, Ghislain Doremus, Michel André, Willy Dabin, Jacky Karpouzopoulos, Laetitia Lempereur

ST03: Trends, factors and causes of the cetacean stranding on the Valencian Mediterranean coast of Spain.

Sara Sanchez-Quiñones Rosello, Patricia Gozalbes, Juan Antonio Raga, Mercedes Fernandez, Francisco Javier Aznar

ST04: Stranded Sowerby's beaked whale (*Mesoplodon bidens*) in northern Norway

Ellyne Hamran, Bjørn Hamran, Felipe Matos, Heike Vester

ST05: Studies on sperm whales (*Physeter macrocephalus*) stranded on the coast of Schleswig-Holstein, Germany in 2016.

Uwe Piatkowski, Peter Wohlsein, Abbo van Neer, Joseph Schnitzler, Anja Reckendorf, Kristina Lehnert, Jan Lakemeyer, Miguel Grilo, Helena Herr, Bianca Unger, Vanessa Herder, Ursula Siebert

ST06: Evaluation of stranding response to a mass stranding of Risso's dolphins (Grampus griseus)

Brian Sharp, Jane Hoppe, Kathleen Moore, Misty Niemeyer, Kristen Patchett, Sarah Sharp, Michael Moore

WW WHALE WATCHING

WW01: Describing the whale watch activity in the northern part of the Pelagos Sanctuary as an insight for mitigation through an EBM approach

Ronald Smit, Paola Tepsich, Alessandra Somà, Greta Calamita, Serena Siri, Ilaria Dalle Mura, Alessandro Verga, Elena Scavone, Massimiliano Rosso, Aurelie Moulins

WW02: Mapping Danish marine mammal ecotourism

Christian Riisager-Pedersen, Anders Galatius, Morten Tange Olsen

WW03: Whale Watching industry in the Pelagos Sanctuary: Enhancing satisfaction and sustainable management

Margherita Zorgno, Nicoletta Cino, Alessandra Somà, Greta Calamita, Gabriele Sofio, Michele Luppa, Gianluca Bozzo, Ilaria Dalle Mura, Alessandro Verga, Franco Chiaschetti, Elena Scavone, Massimiliano Rosso, Aurelie Moulins, Paola Tepsich

ABSTRACTS – KEYNOTE SPEAKERS

Bowhead whale, Disko Bay, Greenland Photo: Anders Galatius©

Keynote speaker: Lars Bejder

Murdoch University Cetacean Research Unit

Monday 1 May 2017, 9.30 – 10.15

Chair: Mario Acquarone

Professor Lars Bejder is one of the leading scientists in human disturbance of marine mammals in coastal waters. Among other subjects, his research has contributed to world known studies from Australia on the influences of whale watching, showing how animals escape areas of high whale watching activity and how whale watching has reduced the animals' reproductive success. In recent years, Lars Bejder and his group have been leading in the development of new technologies for the measurement of the condition in whales using drones and electronic instruments. These basic scientific breakthroughs will be used to understand how whale energetics may be influenced by anthropogenic disturbance.

Making science matter: the zipper effect

The intended target audience for this presentation is undergraduate and postgraduate students working in the field of marine mammal science and conservation. Increasing human activities in the marine environment (e.g. port developments, oil and gas exploration, fishing practices, habitat degradation), often lead to conflicts between resource users, management and the conservation of wildlife populations. Rigorous, long-term research is not the 'be-all and end-all' silver-bullet to guarantee successful conservation outcomes. I will present my personal experience and views of the elements required to optimise the implementation and uptake of science into policy; namely in addition to good science, there is need for continued dialogue with managers, and stakeholder engagement and public outreach. I will highlight these principles and their outcomes through case studies of both odontocete (*Tursiops aduncus*, *Stenella longirostris*) and mysticete species (*Megaptera novaeangliae*) across Australia and the United States of America. I will also discuss the significance of understanding the relevant legislative and political frameworks at local, regional (=state/province) and national jurisdictions and the typical, tangled web of decision-making for the management of cetacean populations. I also provide personal experiences of both effective and ineffective science implementation. The take-home messages of my presentation will highlight the values of clearly identifying both short-term and long-terms goals for research, perseverance, picking your battles, transparency, working effectively within the structures of influence, and engaging across sectors and at multiple levels of jurisdiction – the ultimate integration of which I term, *the zipper effect*.

Keynote speaker: Asha De Vos

Founder of Oceanswell, National Geographic Explorer,

Senior Advisor at Oceana and Pew Fellow in Marine Conservation

Tuesday 2 May 2017, 17.15 – 18.00

Chair: Mark Simmonds

Dr Asha De Vos is a dazzling mediator with years of experience with the protection of large whales in the open oceans. She is the founder of blue whale research center in Sri Lanka and an inspiration to many researchers in Asia. Dr Asha De Vos is "TED Senior Fellow" and is selected as a "Young Global Leader" by the World Economic Forum and is thereby shaping the influence of young researchers on the future protection of the oceans.

Failing successfully

As we consider the field of marine conservation, we have few apparent stories of success. But that depends largely on how we define success and on the flip side, how we embrace Failure. In science and conservation we often look at the achievement of our final lofty goal as the ultimate measure of success, but in the meantime over look the baby steps that took us in the direction we were going. In this talk I propose that we begin to consider every step worthy of celebration regardless of the end goal in an effort to maintain researcher enthusiasm, public interest and to keep this field as front page news. I will largely draw examples from my own research with the Indian Ocean blue whales.

Keynote speaker: Len Thomas

Centre for Research into Ecological and Environmental Modelling

Wednesday 3 May 2017, 9.00 – 9.45

Chair: Jacob Nabe-Nielsen

Dr. Len Thomas is known worldwide for his work in developing statistical methods to understand the complex relationships of the interactions between humans and marine mammals. Systematic data collection and development of statistical models is one of the great challenges in identifying long-term effects of disorders and chronic stress on marine mammal populations. Dr. Len Thomas has devoted his research to develop such models and through the development of textbooks and software made it possible for many biologists to employ advanced statistics

Does Research Benefit Conservation?

This is a wide-ranging talk that I hope will generate substantive discussion. I will ask whether the most effective way for us, personally, to achieve conservation goals is by pursuing a career in science or one in advocacy, or by trying to combine the two. If we choose to become scientists then how is our science, and its effectiveness, influenced by the funding opportunities available? I will give some examples of science-led conservation successes, and some notable failures. Given the conference theme of "Conservation in the light of marine spatial use", I will highlight the work of the PELAGIC working group, which is tackling global marine spatial planning, and some smaller-scale efforts to synthesize marine mammal data, such as the UK JNCC Joint Cetacean Protocol.

ABSTRACTS – ORAL PRESENTATIONS

Harbour porpoises Photo: Jeppe Dalgaard Balle©

Monday 1 May 2017

Evolution of narrow band-high frequency biosonar and hearing in odontocetes

Lee Miller[1], Anders Galatius[2], Morten Tange Olsen[3], Rachel Racicot[4], Mette Elstrup Steeman[5], Line A Kyhn[2], Catherine Bradshaw[6]

(1) University of Southern Denmark, Odense, Campusvej 55, Odense M, DK 5230, Denmark.
(2) Department of Bioscience, Aarhus University, Denmark.
(3) Evolutionary Genomics, Natural History Museum of Denmark, University of Copenhagen, Denmark.
(4) The Dinosaur Institute, Natural History Museum of Los Angeles County, Los Angeles, California, USA.
(5) Museum of Southern Jutland, Natural History and Palaeontology, Gram, Denmark.
(6) The Geophysical Institute, University of Bergen and Bjerknes Centre for Climate Research, Bergen, Norway (now at the Met Office, Fitzroy Road, Exeter, EX1 3PB, UK).

Cetaceans use sound for communication, navigation, finding prey and avoiding predators. In at least 14 odontocete species, biosonar frequencies and best hearing converged between 120 and 140 kHz characterizing these as narrow band high frequency (NBHF) species. It has been hypothesized that predation by killer whales (*Orcinus orca*) was the main selection pressure driving the lower frequencies upwards in NBHF species, making them less audible to this predator. Assuming linages pre-dating killer whales had high frequency hearing and NBHF signals, how could this have evolved? We combined mitogenomic phylogenetic analyses, cochlear anatomy, the fossil record, palaeoclimate modelling and ecological data to address the evolution of NBHF species. We show that the cochlear anatomy of the oldest phocoenid fossil, *Salumiphocaena stocktoni*, (11 - 7 million years old) is very similar to that of the modern harbour porpoise. In fact all fossil specimens we examined that have NBHF modern counterparts also have cochleae with similar dimensions. This includes fossil cochlea of pontoporiids and kogiids, indicating that these primordial species were high frequency listeners and by extension used NBHF signals. We also show that the cochlea of the extinct raptorial sperm whale, *Acrophyseter deinodon*, resembles that of the extant killer whale meaning that best hearing lay below 100 kHz. These extinct predators could have provided the selection pressure for driving up the frequencies of NBHF species pre-dating killer whales. To back this up, the fossil record shows an overlap between archaic predators and NBHF species. Finally palaeoclimate modelling shows that sea states remained fairly constant over the last 15 million years having a minimum in ambient sea noise at about 130 kHz and provided a convenient acoustical niche for biosonar and communication click signals of NBHF species.

Monday 1 May 2017

A new specimen of beaked from the Gram formation (Denmark): Implications to the evolution of suction feeding in Ziphiidae

Benjamin Ramassamy[1]

(1) Museum of Southern Jutland, Dept Of Natural History and Palaeontology, Lergravsvej 2, Gram, 6510, Denmark.

A new specimen of Ziphiidae represents the second occurrence of this family in the Upper Miocene Gram Formation (ca. 9.9-7.2 Ma). It consists in fragments of the cranium, part of the right forelimb, mandibles associated with isolated teeth including a tusk, part of the hyoid apparatus and ear bones. This fossil specimen potentially represents a new species, and differs morphologically from *Dagonodum mojnum*, a stem ziphiid from the Gram Formation. Several morphological traits of this new fossil specimen (enlarged and thickened hyoid apparatus, reduction of the tooth count), suggest this specimen to have been able to use suction feeding. The suction feeding abilities of this new ziphiid specimen were likely similar to modern ziphiids. This specialization contrasts with the feeding strategy of long snouted stem ziphiids from the same time period, that possessed limited suction feeding abilities. The co-occurrence of a specialized suction feeder ziphiid with the long snouted stem ziphiid *D. mojnum* suggests that both species occupied different ecological niches, thus precluding direct interspecific competition between the two ziphiid species.

Monday 1 May 2017

Ontogeny of sound production in new-born, free-ranging harbour porpoise (*Phocoena phocoena*) calves

Magnus Wahlberg[1], Jakob Højer Kristensen[2]

(1) University of Southern Denmark, Marine Biological Research Center, Hindsholmvej 11, Keteminde, 5300, Denmark.
(2) Fjord&Bælt, Denmark.

Previous studies on harbour porpoise (*Phocoena phocoena*) births in captivity show that sound production and echolocation can develop rapidly in new-born animals. Here we investigate the swimming and acoustic behaviour of a new-born calf, which spent its first month of life doing daily visits with its mother right outside and even inside the harbour of Kerteminde, Denmark. The porpoise calf and its mother were filmed with daily or weekly intervals with a drone, and sound production was recorded with a 4-hydrophone array from a small boat. In addition, the sounds were recorded of a less than a week old porpoise calf born in the cooling water intake of a power plant in Denmark. The recordings confirm that porpoise calves can produce sounds distinct from adults at a very young age and develop a swimming behaviour that can be very independent from the mother, probably already within the first weeks after birth. Understanding the development and behaviour of harbour porpoise calves is crucial for the protection of this species during its most vulnerable life stage.

Monday 1 May 2017

Large-scale underwater noise pollution from Acoustic Deterrent Devices (ADDs) on the west coast of Scotland

Denise Risch[3], Charlotte Rose Findlay[1,2], Hayden Ripple[2], Steven Benjamins[3], Ben Wilson[3], Frazer Coomber[4]

(1) Joint Nature Conservation Committee, Aberdeen, AB, United Kingdom.
(2) University of St Andrews; Scottish Association for Marine Science.
(3) Scottish Association for Marine Science.
(4) Hebridean Whale and Dolphin Trust.

Expansion of the aquaculture industry off Scotland has lead to conflicts with marine predators such as seals, which predate species bred in aquaculture facilities and cause damage to equipment. To mitigate this, non-lethal management tools have been developed, the most popular of which are Acoustic Deterrent Devices (ADDs) or 'seal scarers'. ADDs broadcast loud, aversive sounds within the hearing range of the target species (i.e. seals). However their success in addressing the issue has been variable. In addition their unregulated use in Scotland could pose unintended ecological impacts to non-target species such as the harbour porpoise (*Phocoena phocoena*). This study aimed to address the gap in knowledge on the extent of ADD use in the Scottish aquaculture industry, and to quantify the scale of their acoustic presence in Scottish waters. Acoustic data collected during cetacean line-transect surveys carried out by the Hebridean Whale and Dolphin Trust (HWDT) were used to map the acoustic presence of ADDs across the west coast between 2006 and 2015. Results found a significant spatial and temporal increase in ADD presence across the west coast study regions (detections per unit effort; 2006 = 0.5%; 2015 = 15.3%). This study highlights the large-scale extent of noise from ADDs use at fish farms across Scotland and illustrates its gradual increase over the study period. The increasing ensonification of the Scottish coastline which includes multiple protected areas for marine mammals, due to these devices may pose a risk to both target and non-target species (e.g. odontocete cetaceans) that use these areas either seasonally or year round. This study is one of the first to highlight the large-scale extent of ADD noise pollution and its overlap with marine mammal habitat. This information is crucial in order to effectively address European legislation related to underwater noise and marine species protection.

Monday 1 May 2017

12.15-12.30

Are cetacean bycatches lost in translation?

Alice Lapijover[1], Nicolas Becu[2], Vincent Ridoux[3]

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Bycatches appear to be one of the main causes of man-induced mortality of dolphins and porpoises in the Bay of Biscay. However bycatch estimations for common dolphins vary between 550 (observer-based estimate) and 4700 (stranding-based estimate) per year in the area depending on the methodological choice. In addition to problematic monitoring, mitigation measures as the use of pingers have been inefficient in French waters. Consequently, improving the understanding of interactions between small cetaceans and fisheries remains a challenge. This paper describes how divergent scientific estimations of cetacean bycatches can affect interactions between stakeholders. By using the Actor-Network Theory, we focused on scientific and managerial instruments translating small cetacean bycatches in the Bay of Biscay. According to this social science perspective, instruments are not neutral and play a central role in defining how stakeholders look at an issue. Translating observations into an aggregated number of bycatches is an expression of power relationships and is closely linked to stakeholders' legitimacy. Similarly, voting a directive on the use of pingers conveys some parties' perspective on the issue. Stakeholders strategies were shown to be influenced by divergent scientific estimations especially if some stakeholders i.e. fishermen or NGOs are not sufficiently involved in the process. Indeed, two different perspectives of the same phenomenon facilitate the controversy and thus reveal the variety of actors' perspectives. Integrating the various stakeholders' viewpoints on small cetacean bycatches is therefore necessary to improve stakeholders' mobilization and so move towards a shared definition of the issue. To conclude, getting a sharper picture of small cetacean bycatches implies being able to include stakeholders' strategies and representations of the system. Integrating the various ways to look at small cetacean bycatches could be done through experimentation workshops focusing on instruments.

Monday 1 May 2017

12.30-12.45

New opportunities in dynamic species management for the harbour porpoise

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Increasing anthropogenic impacts and competition for space in the world's oceans highlight the importance of developing effective marine spatial planning and conservation policies. Identifying regions where disturbances impact marine mammal populations is especially challenging for species such as the harbour porpoise that exhibit substantial temporal and spatial variability in distribution. For such species, dynamic management approaches are most effective but require a sound knowledge of species-habitat relationships. We developed habitat-based density models for harbour porpoises and evaluated their nowcast and forecast capabilities. We aggregated survey data collected year-round over 13 years (2002-2015) by means of dedicated line-transect surveys in the North and Baltic Seas, considering the proportion of missed animals on the transect. We fit generalized additive models of porpoise density to >175,000 km of on-effort survey data with 16,000 sightings of porpoise groups in the North Sea, and >50,000 km and 750 porpoise sightings in the Baltic Sea. Candidate predictors included static and dynamic oceanographic features, such as depth, distance to sandeel (*Ammodytes* spp.) foraging habitats, sea surface temperature (SST), spatial and temporal variation in SST (as proxies for fronts) and day length. As new feature, we also included modelled ocean products, derived from the 3d coupled ecosystem model ECOSMO, where both fish and macrobenthos were included in the model formulation as functional groups linked to the lower trophic levels via predator-prey relationships. Predictive power was evaluated on novel data sets. Results demonstrated that we could effectively predict daily variations in porpoise densities, providing maximum flexibility to meet a variety of temporal scales for dynamic species management. We also produced seasonally-explicit density predictions that will inform EU Habitats and Marine Strategy Framework Directives and will be implemented in marine spatial planning where fine-scale predictions of porpoise distribution are required to assess risks of increasing human activities at sea.

Monday 1 May 2017

Assessing disturbance of harbour porpoises by pile driving during construction of the first seven commercial North Sea offshore wind farms in Germany

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We conducted a throughout analyses of disturbance effects of offshore pile driving on harbour porpoises using acoustic porpoise monitoring data and sound measurements collected during the construction of all seven offshore wind farms between 2010 and 2013 in the German North Sea. At six of these seven wind farms noise mitigation techniques were applied during the majority of piling events, one was constructed without noise mitigation. Applying GAM analyses and using all available data, we found a clear gradient in the decline of porpoise detections during piling that depended on sound level and distance to the piling site. Declines were found down to minimum noise levels of 143 dB re 1 µPa (SEL05) and up to a maximum distance of 17 km. When only considering piling events with noise mitigation, the maximum effect range declined to 14 km. Within the near vicinity of the construction site porpoise detections declined already several hours before the start of piling and were reduced up to about 24 hours afterwards. The application of noise mitigation techniques of the first generation has thus slightly reduced effect ranges of pile driving. However, noise mitigation techniques during these six projects were still under development and did not always work equally efficiently. Since their development has already come a long way since, a further reduction of disturbance effects is expected during future projects.

Monday 1 May 2017

Comparing horizontal and vertical approaches for the identification of harbour and grey seals' foraging areas.

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Improving the assessment of marine mammals foraging areas is central in understanding their ecology and implementing conservation and management regulations. The objective of this study was to compare a horizontal to a vertical approach to detect seals' foraging areas. We analysed GPS locations and dive data obtained through GPS/GSM tags fitted on eight grey seals and nine harbour seals. In the horizontal dimension, we used the First Passage Time to identify Areas-Restricted Search (ARS). In the vertical dimension, we developed two diving criteria indicating the seals' benthic foraging behaviour: the dive shape and vertical descent speed. We analysed 34,621 GPS locations in 1,991 trips and 588,666 dives. We estimated that grey seals spent 38.7% or 29.2% of their tracking time foraging (from the horizontal *vs*. vertical approaches respectively), *versus* 29.4% or 30.2% for harbour seals respectively. The two approaches were spatially compared thanks to the Index of Differences in Spatial Pattern (IDSP), ranging from 0 (identical spatial distribution) to 1 (different spatial distribution). We found a strong overlap between grey seals' foraging areas assessed from the two approaches (IDSP=0.38). The overlap was lower for harbour seals (IDSP=0.58), and we found that the horizontal approach may not be appropriate because the seals performed short trips with few GPS locations. We estimated that the minimum number of locations per trip needed to have a probability of 0.95 to detect an ARS was 15 for harbour seals and 34 for grey seals. Trips including this minimum number of locations represented only 37.8% of the harbour seals tracking time, against 72.7% for grey seals. We suggest that the chosen methodology for the identification of foraging areas should depend on the resolution of data used (number of locations per trip) and the at-sea behaviour of the seals tracked (scale of movements).

Monday 1 May 2017

14.25-14.40

Cetacean population monitoring integrating visual and acoustic observations

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The deep water Gulf of Mexico (GOM) provides habitat for a diverse array of cetaceans including sperm whales, beaked whales and a variety of delphinids. This offshore region is also one of the most highly-impacted marine habitats in the world in terms of anthropogenic activity. Habitat models are needed to understand marine mammal distributions and to mitigate impacts. Shipboard and aerial line-transect visual surveys are the standard methods for estimating abundance and describing the distributions of cetacean populations. Visual surveys conducted by the National Oceanic and Atmospheric Administration's (NOAA's) Southeast Fisheries Science Center (SEFSC) between 2003 and 2014 provide broad spatial coverage of the Gulf region as snapshots in time. These surveys are typically conducted biennially during summer months. Fixed-location passive acoustic monitoring (PAM) provides a complimentary modality for cetacean monitoring by employing acoustic sensors nearly continuously over long periods to record animal presence in the proximity of monitored locations. Since 2010, Scripps Institution of Oceanography (SIO) and NOAA SEFSC have been recording cetacean presence using seafloor-mounted High-frequency Acoustic Recording Packages (HARPs) at six sites in the GOM. These instruments monitor local habitats across seasons and years. Integrated habitat models for GOM marine mammals are being developed using these complementary data sources. The strength of this approach is that visual survey data provide excellent spatial resolution; whereas, acoustic monitoring data provide excellent temporal resolution. We integrate these complimentary datasets and present preliminary composite habitat models for beaked whales and delphinid species. This work supports conservation and management of GOM cetacean populations by developing more a comprehensive understanding of temporal and spatial trends for species abundance than could be achieved using either data type individually.

Monday 1 May 2017

Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys

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A series of large scale surveys for cetaceans in European Atlantic waters was initiated in 1994 in the North Sea and adjacent waters (SCANS) and continued in 2005 in all shelf waters south of 62°N (SCANS-II) and 2007 in offshore waters (CODA). In the mid-1990s, the primary need for a large-scale survey was to obtain the first comprehensive estimates of abundance of harbour porpoise in the North Sea and adjacent waters so that estimates of bycatch could be placed in a population context. This objective is still vital for various species but, in addition, changes in distribution and abundance of cetaceans at an appropriately large spatial scale are the best way to inform Member State responses to the EU Habitats and Marine Strategy Framework Directives (MSFD), as well as under national legislation. In July 2016, SCANS-III, the most extensive collaborative survey in European Atlantic waters to date was conducted using seven aircraft and three ships, covering an area of approximately 1.8 million km2 from the Strait of Gibraltar to Vestfjorden, Norway. Data were collected using the circle-back method for aerial and two-team tracker method for ships to account for animals missed on the transect line. A total of >50,000 and >10,000 km were surveyed by air and ship, respectively, generating more than 4,000 sightings of 19 cetacean species. Provisional design-based abundance estimates for several species including harbour porpoise, common, striped, bottlenose and white-beaked dolphin, pilot, minke, fin, sperm and beaked whales are currently under review and will be presented to ICES in February and then to OSPAR as part of the current MSFD assessment. Using these new estimates, which total more than 1.5 million animals, the aim is to thoroughly evaluate and assess the conservation status of species and Good Environmental Status (GES) for cetaceans in European Atlantic waters.

Monday 1 May 2017

Late summer distribution of bowhead whales in relation to environmental variables in the Canadian Beaufort Sea

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With increasing development in the Arctic, the Bering-Chukchi-Beaufort (BCB) bowhead whale population is being exposed to a growing number of anthropogenic activities across their range. Understanding bowhead whale habitat utilization and defining their critical habitat can support marine spatial planning and decision-making regarding offshore developments. This study models the habitat use of the BCB bowhead whale population on their late summer range in the southeast Beaufort Sea. In late summer, bowhead whales aggregate in the coastal waters of the Canadian Beaufort shelf to feed on their preferred prey, crustaceous zooplankton, which become concentrated by oceanographic processes. Extensive aerial surveys conducted throughout this region in the 1980s and 2000s reveal that whales repeatedly use the same areas; however, the use of any specific area varies between years. In this study, patterns of bowhead distribution and associated inter-annual variation are examined retrospectively, in relation to archived oceanographic data for the same time periods. Our analysis shows that bathymetry, sea surface temperature (SST), and wind stress may be reliable predictors of bowhead whale habitat use, supporting the hypothesis that bowhead whale distribution in late summer is a function of oceanographic features known to concentrate their prey. Cetacean habitat models incorporating oceanographic variability can be useful tools for developing predictions of habitat use and gaining ecological insights about a species' distribution. This study is an important step toward adaptive management and may contribute to a broader understanding of how bowhead whales respond to factors that alter their habitat.

Monday 1 May 2017

Long-term sound and movement tag deployments on seals – detailed data on energy-time budgets and the effects of anthropogenic noise

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Marine mammals face increasing levels of human encroachment in their habitats, and while many recent studies have addressed the effects of underwater noise on cetaceans, comparatively less is known about noise effect on pinnipeds at sea. This data gap likely relates to the fact that studies of pinniped behaviour and responses to anthropogenic noise sources have largely relied on location data from satellite/GPS tracking and dive data with no knowledge on concomitant noise exposure levels. To alleviate that lack of pertinent data, we deployed sound and 3D-movement tags, seal-DTAGs, on two harbour seals and two grey seals in the North Sea during 2015. Each deployment yielded 14 days of continuous sound and movement data, with 0.2 to 45 kHz bandwidth. Synchronous audio and sensor data (triaxial accelerometer and pressure) revealed detailed behavioural states such as feeding events, sleeping and avoidance responses. These behavioural states were verified using custom made tags combining video and accelerometry on wild seals. The seals spent 24-42% of their time hauled out, and exhibited resting/sleeping behaviour in 5-8% of their time at sea. The seals were exposed to ship noise 2-20% of their time in water. Several examples were found where animals changed their behaviour when exposed to high levels of ship noise, either by waking up from resting/sleeping and initiating active swimming, evading the surface, or rushing from haul-out into the water. Such disturbances may have negative fitness consequences for animals in areas with a high overlap between human activities and seals. The data obtained here provide new insights into how wild seals respond to noise, enabling future quantification of the impact of anthropogenic disturbances and to improve efforts to protect seal populations. Furthermore, the enhanced recording time opens potential for both controlled and opportunistic exposure experiments at sea.

Monday 1 May 2017

17.40-17.55

Narrow acoustic field of view drives frequency scaling in toothed whale biosonars

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Toothed whales vary in size from 40 kg porpoises to 50 ton sperm whales, and they have evolved to forage in a very diverse suite of habitats from shallow rivers to mesopelagic depths, targeting prey ranging in size from sardines to giant squid. Common for them is that they navigate and forage by emitting ultrasonic, powerful, directional clicks and listen for returning echoes in a process known as echolocation. The source parameters of these clicks (frequency, bandwidth, source level and sampling rates) vary greatly between species. Yet, surprisingly little is known about why some species use particular parameters and others not, and what the evolutionary driving forces that shape biosonar performance are. Here we seek to address that lack of understanding through a meta-analysis of click source parameters and acoustic tag data from 39 species of toothed whales echolocating in the wild, including porpoises, dolphins, river dolphins, beaked whales and sperm whales. We show that click source levels and inter-click intervals scale with size, so that large toothed whales that dive deep to forage, and hence must locate distant mesopelagic prey resources, use long range sonars. Conversely, small echolocating toothed whales that inhabit shallow, cluttered waters use high sampling rates and low source levels to provide fast updates at short ranges to navigate and forage in highly complex and echoic environments. Click centroid frequencies in turn scale inversely with size from 20 kHz in sperm whales to more than 130 kHz in small dolphins and porpoises to provide surprisingly stable acoustic fields of view of around 10 degrees. We therefore conclude that directionality is the primary evolutionary driver of frequency in toothed whale echolocation clicks, whereas repetition rates and output levels are evolutionarily tuned to the diverse foraging niches toothed whales have evolved to exploit.

Monday 1 May 2017

Cultural hitchhiking in the matrilineal whales

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Five species of whale with matrilineal social systems (daughters remain with mothers) have remarkably low levels of mitochondrial DNA diversity. Non-heritable matriline-level demography could reduce genetic diversity but the required conditions are not consistent with the natural histories of the matrilineal whales. The diversity of nuclear microsatellites is little reduced in the matrilineal whales arguing against bottlenecks. Selective sweeps of the mitochondrial genome are feasible causes but it is not clear why these only occurred in the matrilineal species. Cultural hitchhiking (cultural selection reducing diversity at neutral genetic loci transmitted in parallel to the culture) is supported in sperm whales which possess suitable matrilineal socio-cultural groups (coda clans). Killer whales are delineated into ecotypes which likely originated culturally. Culture, bottlenecks and selection, as well as their interactions, operating between- or within-ecotypes, may have reduced their mitochondrial diversity. The societies, cultures and genetics of false killer and two pilot whale species are insufficiently known to assess drivers of low mitochondrial diversity.

Monday 1 May 2017

Every beaked whale for itself: individual foraging activity in social groups of Blainville's beaked whale (*Mesoplodon densirostris*)

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Blainville's beaked whales (*Mesoplodon densirostris*) perform long deep foraging dives in which they use echolocation to hunt individual prey. Although social groups of Blainville's synchronize their dives, it is unknown if group size may affect their echolocation behaviour and specifically their vocal production, as has been proposed for bottlenose dolphins and orcas. Knowing how group size affects click rate is important to improve estimates of population density of beaked whales based on click counts from passive acoustic monitors. Here, we used sound and movement tags (DTAGs) to record depth, 3D orientation and sound production from 14 Blainville's beaked whales off El Hierro (Canary Islands, Spain). Clicks from tagged and untagged whales were localised with a supervised click detector during deep foraging dives. The two hydrophones in the tags allow us to estimate angles of arrival of the clicks to the tag and thus to quantify the number of animals vocalizing simultaneously, i.e. the minimum number of vocal individuals within acoustic range of the tag. Using these data, we investigated relations between the searching click rate (SCR) of the tagged animals and the vocal group size. Additional parameters investigated included year, season and sex with individual whale considered as a random factor. One-way ANOVA models for each factor and Linear Mixed-Effects Models showed no significant relations between the factors and SCR, suggesting that echolocation activity was independent of group-size. This may suggest that tagged whales neither needed to compensate for interference from other group members (i.e., by changing clicking rate), nor took advantage of echo information elicited by clicks from other animals. These results contrast with the hypothesized behaviour of other odontoceti, but are consistent with inter-whale separation data of beaked whales suggesting an individual rather than coordinated hunting strategy.

Monday 1 May 2017

Humpback whale song exchange in the North-Atlantic: Song transmission between Iceland and the Cape Verde Islands

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Humpback songs associated with breeding behaviours are increasingly reported outside of low latitude breeding grounds. During three winter seasons, from 2009 to 2011, consistent singing was recorded in Iceland. Recordings from 2011 were analysed further to explore structural characteristics and temporal changes during a single sub-arctic winter season. The aim was to investigate if these sub-arctic songs could serve the purpose of a breeding song. The songs were compared to songs from a sub-tropical breeding ground in the Cape Verde Islands (CVI) collected in early spring in 2011 and 2012. Comparison of songs from a feeding ground and a breeding ground during the same and following year could indicate the level of cultural transmission between the two destinations, consequently, the importance of a sub-arctic feeding ground for song exchange during winter. Long-term recordings were collected in NE-Iceland, using a bottom-mounted recorder while opportunistic recordings were collected in the CVI using a pre-amplified handheld hydrophone. Markov analysis was used to investigate cyclical patterns in the songs and a Fisher's Exact Test was applied to investigate the predictability of theme transitions in the Markov matrices. Levenshtein Distance Analysis was used to investigate the song sequence similarity and Dice's Similarity Index was used to measure the consistency of themes between and within the study sites. As a result, a continual singing of sophisticated songs was observed during the breeding season in the sub-arctic. A clear similarity was found between the sub-arctic songs and the sub-tropical songs where the songs from Iceland progressed into a breeding song sung in the Cape Verde. This indicates the importance of both locations for this species during the breeding season. The Icelandic feeding ground as a winter habitat, used for cultural transmission of songs and potential mating ground for overwintering humpback whales and the CVI for breeding.

Cetaceans stranded in Italy (2016): Unusual mortality event along the Ionian coastline

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Dolphin Morbillivirus (DMV) is considered a pathogen of main concern for free-ranging cetaceans since at least 9 morbilliviral epidemics have occurred worldwide throughout the last 25–30 years. Two hundreds and forty-six cetaceans were found stranded along the Italian coastline in 2016; 50% of these were reported along the Ionian coastline, in Southern Italy, by July onwards. Eighty-nine (36,1%) of the stranded animals were necropsied and sampled according to the National Reference Center (C.Re.Di.Ma.) protocols and based on the conservation of the carcass. So far 26 animals (25 *Stenella coeruleoalba* and 1 *Delphinus delphis*) resulted positive for DMV by PCR. Seven of these were also positive by IHC investigations and 5 showed microscopic lesions suggestive of Morbillivirus infection (MI), such as non-suppurative encephalitis and interstitial pneumonia with the presence of syncytial cells. Phylogenetic analyses performed on 2 DMV strains shows the presence of a unique cluster with sequences recently identified in Portugal and Galicia (Bento et al. 2016), suggesting a passage of this strain through the Strait of Gibraltar. After the last Unusual Mortality Event (UME) occurred in the Italian waters in 2013 (Casalone *et al.* 2014), DMV has been constantly found in Italy in absence of both lesions suggestive of MI and IHC positivity, and with the frequent co-presence of secondary infections. These forms were classified as subacute-chronic, with a plausible (DMV) infection's endemization (Giorda pers. Comm. 2016). The viral genome sequencing suggested the circulation of the same virus since the 2006-07 epidemic with very mild changes (Beffagna *et al*., in press). Our preliminary data in this recent UME support the hypothesis of the circulation of a new DMV strain in the Italian waters causing acute systemic infections.

Tuesday 2 May 2017

Are environmental pollutants affecting the immune system of marine mammals?

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Persistent organic pollutants (POPs) are known immunotoxicants in laboratory animals and a growing weight of evidence suggests similar effects occur in wildlife exposed to these chemicals. Outbreaks of distemper and influenza A virus in marine mammals causing death of thousands of animals over the past decades has risen concern about the role that environmental pollutants may have in reducing the immune system's ability to combat infection. To better elucidate the effects of environmental pollutants on the immune system of marine mammals, we first reviewed the available literature and performed a meta-analysis to determine which effects are occurring and at what pollutant concentrations. Secondly, we performed in vitro dose-response experiments for mitogen stimulated lymphocyte proliferation and natural killer (NK) cell activity using live cells collected from polar bears (*Ursus maritimus*), bottlenose dolphins (*Tursiops truncates*), harp seals (*Pagophilus groenlandicus*), hooded seals (*Cystophora cristata*), harbor seals (*Phoca vitulina*) and killer whales (*Orcinus orca*). We developed a method to extract large volumes of chemical cocktails directly from marine mammal adipose tissues in order to capture the realistic mixture of POPs, including polychlorinated biphenyls (PCBs), organochlorinated pesticides, and several legacy and current-use brominated flame retardants. Our review found that both branches of the immune system are influenced by environmental pollutants and thresholds for effects of various immune endpoints occur at contaminant levels commonly detected in many marine mammal species. Our experimental work found that lymphocyte proliferation was dose-dependently suppressed in all species while NK activity was enhanced at the highest exposures. Together, these results significantly advance our understanding of the impacts of global pollution on wildlife and suggest that exposure to immunotoxic contaminants may have significant population level consequences as a contributing factor to increasing anthropogenic stress in wildlife and infectious disease outbreaks.

Knot a problem? Distribution and pathology of fatal entanglements in large marine animals in Scotland

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Marine mammal entanglements are a growing and acutely severe problem. Entanglement can lead to drowning, impaired movement, deep tissue laceration, infection and starvation. It also presents serious safety issues for those involved in disentangling entangled animals and a significant financial cost to fishermen due to loss of gear. Aside from the animal welfare impacts, there is concern that entanglements may be sufficiently prevalent to cause impact at a population level. Recent estimates of fatal entanglement probability in Scottish inshore waters suggests this source of mortality alone may constrain the recovery of humpback whales in the region. We present a summary of entanglement data collected by the Scottish Marine Animal Stranding Scheme over the past 25 years. Whilst the observed prevalence of cases is low, the incidence and range of reported species shows an increase over time. The most common species are large baleen whales, with basking shark, leatherback turtles and killer whale also reported. For species such as minke whales and leatherback turtles, entanglements represent the single largest cause of death, representing up to 40% of all recorded mortalities. The most frequent type of entanglement involves braided polypropylene ropes such as those used in creel fishing. These cases are seldom discovered still entangled in material, so diagnosis is based on pathological examination of the carcase. We describe lesion morphology, outline how pathological and physiological characteristics differ between species presentations and demonstrate how gear type and chronicity can be determined through post mortem examinations. Uncertainties remain regarding the true extent of the entanglement problem and analysis of the distribution and reporting frequency of cases suggests there is a significant underreporting of casualties. Reasons include a lack of awareness among fishermen of the value of reporting cases, or concern that doing so would lead to negative repercussions on individuals or their industry.

Morphological and molecular characterization of *Crassicauda boopis* (Nematoda; Spirurida) from Mediterranean fin whales: preliminary results

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Crassicauda boopis is considered one of most pathogenic nematode parasites in *Balaenoptera physalus* Atlantic population, but no data are available for Mediterranean one. The localization of the adults in the kidney can lead to organ impairment. Hypothesis on somatic migration of larvae through vascular walls have been made but no morphological description has been provided for larval elements. To detect crassicaudosis infection, parasitological examination was carried out on seven carcasses of *B. physalus*, stranded along the Italian coastlines between 2006 and 2015. During necropsy, specimens of adult nematodes (N=124) were found in renal vessels, vena cava, kidneys and ureters of four animals; larvae were also detected in the wall of the intestine (N=21) and inside mesenteric artery intima (N=4) of an adult whale. After isolation at stereomicroscope, adults (10 female tails, 36 male tails, 2 cephalic fragments) and larvae (N=16) were observed using light microscope for morphometric characterization (NIS-D software). Amplification and sequencing of 18S and mt COX 1 genes was carried out on samples from adult and larvae. Morphometric data of adult nematodes fit with the description of *C. boopis* in literature. Some morphologic differences were observed between larvae collected from the intestine and mesenteric arteries, including total body length, cephalic terminal fragment shape and definition of internal structures. Sequences obtained from 18S gene of the examined samples showed high identity (99%) with *Crassicauda magna* (Accession number: KM233410.1); multiple alignment of sequences obtained from adults and larvae showed high identity with each other for mtCOX 1 gene. This work provides data on crassicaudosis infection in Mediterranean population of fin whales, confirms the hypothesis of a somatic migration of larvae in the definitive host and gives the first morphological description of larval stages of Crassicauda; preliminary molecular data provide basis for further systematic studies on the Crassicauda genus.

Tuesday 2 May 2017

Phocine Distemper Virus (PDV) occurrence in stranded harbor and gray seals on Cape Cod, MA, USA from 2011-2015 and relevance to past epizootic events

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Phocine Distemper Virus (PDV), also known as pinniped morbillivirus, is endemic in most harbor and gray seal populations in North America and Europe. However, there have been documented epizootic PDV events on both continents, the most recent being within the Northeastern United States (NEUS) in 2006. While PDV surveillance has occurred in harbor and gray seals in the NEUS, regular, consistent monitoring in stranded dead pinnipeds has rarely been performed outside of declared Unusual Mortality Events (UME). Two recent UME's, each caused by infectious disease, were declared in 2006 (PVD) and 2011 (influenza). This study aims to better understand the occurrence of PDV within NEUS (specifically Cape Cod) as well as the impacts PDV has on local seal populations. Cases were chosen based on gross findings consistent with PDV and availability of brain and lung tissue samples. Three of seven harbor seal cases were positive for PDV and six of 12 gray seals were positive for PDV. For both species, age class varied from recently weaned to adult. Microscopic findings in a few PCR-positive cases were suggestive of PDV infection, including meningitis and pneumonia, but typical inclusion bodies were not identified. PCR sequencing confirmed PDV, and the short 115 H gene sequenced fragment differs from the 2006 H gene sequence. Results include final sequencing data with a comparison to past epizootic events. These findings may better elucidate the relationship between endemic and epizootic PDV events in the NEUS and in Europe. Results of this study highlight the importance of continual monitoring for PDV in harbor and gray seal populations as prevalence of PDV may serve as an indicator of health in these populations.

High rates of vessel noise exposure on wild harbour porpoises (*Phocoena phocoena*) can disrupt foraging

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Expanding anthropogenic activities at sea in the last decades have contributed to a marked increase in noise pollution in the marine environment. Toothed whales may be particularly vulnerable to such pollution, due to their extensive reliance on sound for communication, navigation and foraging. But while significant effort has been devoted to investigating how specific sound sources such as sonar affect these animals, relatively little attention has been paid to shipping, the dominant anthropogenic noise source in the world's oceans. As a result, we know little about vessel encounter rates, exposure levels and avoidance reactions of any toothed whales in the wild. To address this, we used high-resolution sound- and movement-recording tags (DTAGs) to measure the noise budget and foraging effort of six free-ranging harbor porpoises in shallow and highly trafficked coastal waters. We found that porpoises foraged nearly continuously day and night, attempting to capture 0-550 small (3-10 cm) fish prey per hour with a prey capture success rate of >90%. Concurrently, they were exposed to vessel noise between 17 and 89% of the recording time (12-24 hours), primarily during the day. Such high vessel encounter rates suggest that baseline behavior collected by tags may be shifted from a noise-free natural behavior. Exposures were typically low level, but occasional very high levels of vessel noise coincided with several-minute-long vigorous fluking, interrupted foraging, and even cessation of echolocation, leading to a general pattern of reduced foraging effort in the presence of high-level noise. In places where such close vessel passes are frequent, porpoises may not be able to compensate for the increased energy expenditure and missed foraging opportunities potentially compromising their energy balance. In light of their high metabolic requirements, which require near-continuous foraging efforts, vessel noise could thus impact physical condition and have fitness consequences at individual and population levels.

Tuesday 2 May 2017

River dolphins out of focus? General target assumptions misrepresent range-dependent biosonar adjustments

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Biosonar parameters of toothed whales in the wild are not easily quantified in relation to range adjustments when echolocation context and targets are unknown. Generally, recording arrays are assumed to represent primary targets for clicks following specific on-axis criteria, but animals may just as well be engaged in tasks where biosonar focus is closer to or further away than recording arrays. Therefore, even if acoustic source localisation and on-axis click selection are perfect, the localization range itself may only provide muddled insight into range-dependent biosonar adjustments of wild toothed whales. Specifically, we hypothesize that biosonar parameters are not automatically adjusted to objects like arrays that pass through the biosonar beam and that context plays a significant role in forming the measured parameters. To test this, we conducted a semi-controlled study on wild Amazon river dolphins (*Inia geoffrensis*) that approached and intercepted prey presented in front of a two-dimensional hydrophone array thus alleviating uncertainties of echolocation context and focus. We demonstrate that source parameters differ more when comparing known versus unknown target situations within an area than when animals are recorded the same way in different areas. Furthermore, unlike some studies on wild toothed whales, we demonstrate that inter-click intervals are always kept longer than the two-way travel-time to target and back, and additionally contain an obvious lag time with a mean >10 ms before subsequent click emissions. We argue that recording arrays cannot necessarily be assumed to attract biosonar focus of wild toothed whales and that range-dependent adjustments should always be critically evaluated in relation to echolocation context. Exploring intra-species source parameter variations has important implications for designing passive acoustic monitoring studies where inadequate knowledge of biosonar parameter use in wild animals may ultimately lead to incorrect estimations of population sizes or species abundance which could impede proper conservation efforts.

Tuesday 2 May 2017

Narrow acoustic field of view drives frequency scaling in toothed whale biosonars

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Toothed whales vary in size from 40 kg porpoises to 50 ton sperm whales, and they have evolved to forage in a very diverse suite of habitats from shallow rivers to mesopelagic depths, targeting prey ranging in size from sardines to giant squid. Common for them is that they navigate and forage by emitting ultrasonic, powerful, directional clicks and listen for returning echoes in a process known as echolocation. The source parameters of these clicks (frequency, bandwidth, source level and sampling rates) vary greatly between species. Yet, surprisingly little is known about why some species use particular parameters and others not, and what the evolutionary driving forces that shape biosonar performance are. Here we seek to address that lack of understanding through a meta-analysis of click source parameters and acoustic tag data from 39 species of toothed whales echolocating in the wild, including porpoises, dolphins, river dolphins, beaked whales and sperm whales. We show that click source levels and inter-click intervals scale with size, so that large toothed whales that dive deep to forage, and hence must locate distant mesopelagic prey resources, use long range sonars. Conversely, small echolocating toothed whales that inhabit shallow, cluttered waters use high sampling rates and low source levels to provide fast updates at short ranges to navigate and forage in highly complex and echoic environments. Click centroid frequencies in turn scale inversely with size from 20 kHz in sperm whales to more than 130 kHz in small dolphins and porpoises to provide surprisingly stable acoustic fields of view of around 10 degrees. We therefore conclude that directionality is the primary evolutionary driver of frequency in toothed whale echolocation clicks, whereas repetition rates and output levels are evolutionarily tuned to the diverse foraging niches toothed whales have evolved to exploit.

Tuesday 2 May 2017

Separating underwater ambient noise from flow noise recorded on stereo acoustic tags attached to marine mammals

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Sound recording acoustic tags attached to marine animals are commonly used in behavioural studies. Measuring ambient noise is of interest to understand responses of marine mammals to anthropogenic underwater sound, or to assess their communication space. Noise of water flowing around the tag reflects the speed of the animal, but hinders ambient noise measurement. Here we describe a correlation-based method for stereo acoustic tags to separate the relative contributions of flow and ambient noise. The uncorrelated part of the noise measured in DTAG recordings related well to animal swim speed of a humpback whale (*Megaptera novaeangliae*), thus providing a robust measure of flow noise over a wide frequency bandwidth. By removing measurements affected by flow noise, consistent ambient noise estimates were made for two killer whales (*Orcinus orca*) with DTAGs attached simultaneously. The flow/ambient noise separation method proposed in this study may also improve the automatic detection of rorqual lunge-feeding events, by providing a direct measure of the flow noise. The method is applicable to any multi-channel acoustic tag, enabling application to a wide range of marine species.

Vascular dynamics during progressive diving and adaptive bradycardia in dolphins: role of the *retia mirabilia*.

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Heart-rate changes in dolphins, induced by diving, are well documented. However, modifications of the stroke volume (SV) and cardiac output (CO) are difficult to assess experimentally. The retia mirabilia are vascular nets composed by small arteries dispersed among numerous veins, allowing blood storage and flow and pressure damping effect. Here we investigated how important the retia mirabilia are during the diving phase. The whole vertebral retia mirabilia of 3 *Tursiops truncatus* were removed during post-mortem, and the whole body of a fourth specimen was sectioned transversally at 3 cm intervals. Macroscopic examinations and measurements of the retia, and morphological analysis performed at the microscope using common staining technology, allowed an assessment of their diameters to estimate vascular volume and flow rate. Given the total blood volume of a bottlenose dolphin, and using available data on the perfusion of the main organs and body systems, we devised a new mathematical emo-dynamic model to clarify vascular dynamics during diving phase. We computed the minimum blood perfusion necessary to the internal organs, and the SV and CO during the surface state. We then simulated breath-holding conditions and perfusion of the internal organs under the diving-induced bradycardia and reduction of SV and CO, using a maximum limit of 10 bpm for an extended deep dive of over 3 minutes. Under these simulated conditions, the retia mirabilia play a vital role as a reservoir of oxygenated blood that permit functional performances and survival of the heart and brain (equivalent to at least 55 ml of blood for every 100g of cerebral tissue). Our theoretical model, based on the actual blood capacity of the retia mirabilia and available data on organ perfusion, considers the dynamic trend of vasoconstriction in prolonged dives and could be a baseline for future studies on the diving physiology of dolphins.

Tuesday 2 May 2017

14.25-14.40

Drivers of the dive response in harbour seals (*Phoca vitulina*)

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Marine mammals must access to vital, but spatially separated resources: food at depth and oxygen that have prompted a series of adaptations to breathhold diving. The most prominent adaptation to prolonged apnea is the dive response that lower oxygen consumption during dives by lowering the heart rate (bradycardia) and increase peripheral vasoconstriction. Diving heart rates of seals are highly variable and seem to be modulated by many different factors, such as pressure, swimming activity, temperature and even cognitive control, but their individual effects on the diving response are hard to disentangle. With this study, we sought to quantify the effects of sensory inputs as autonomic drivers of the diving response. Specifically, we hypothesized that water stimulation on the face would trigger a dive response and that the larger facial area the deeper the bradycardia. To do that, we measured the heart rate of two harbour seals (*Phoca vitulina*) on land trained to lower their head into a tub with different water levels. While lying on a gently sloping ramp with two heart rate electrodes. We show that bradycardia often occurs just as a function of apnea without face immersion, but that the diving response is positively related to the degree of face immersion. Thus, we conclude that initiation of the diving response is strongly related to breath-holding, but that the degree of bradycardia is modulated autonomically via stimulation of facial mechano- and thermoreceptors upon submergence.

Tuesday 2 May 2017

Hydrodynamic detection of benthic prey breathing currents by harbour seals

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Harbour seals (*Phoca vitulina*) use their vibrissae to detect water movements generated by conspecifics, probably by predators, and by prey. Harbour seals feed on both pelagic and benthic fish. When tracking down pelagic fish in waters with limited visibility, they can detect and analyze the water movements a fish has generated many seconds up to minutes earlier, and follow the path of the fish-generated water disturbances (hydrodynamic trail) up to the position of the prey. However, it was unknown how harbour seals detect camouflaged benthic fish. We found that stationary benthic fish produce significant water movements by breathing (breathing currents). These breathing currents are especially strong in flatfish, which often constitute a major percentage of the harbour seal's diet. Here we tested the hypothesis that harbour seals can detect artificial water movements that closely mimic the breathing currents of flounders in a close-to-natural setting, i. e. while the seal is swimming forward close to the ground at moderate speeds in the presence of background flow. Eight nozzles, mounted to a platform suspended at 1 m depth, produced artificial breathing currents emerging from the ground at an angle of 45°. Strength, spatial extent and angle closely approximated typical breathing currents of flounders, as verified using particle image velocimetry (PIV). The seals were prevented from touching the nozzles directly by a mesh-wire grid 2 to 3 cm above the nozzles. One nozzle at a time emitted a breathing current. After pre-training, the blindfolded seals were asked to detect the active nozzle. Three seals were tested with constant breathing currents, and two of these were additionally tested with pulsed breathing currents, which mimicked the natural breathing frequency of a flounder. All seals detected the active nozzles highly significantly. We conclude that the detection of breathing currents is crucial in pinniped benthic feeding.

Tuesday 2 May 2017

14.55-15.10

Cognitive control of diving heart rate in harbor porpoises

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Marine mammals are equally dependent on oxygen at the surface and the food resources they must access while performing extended breath-hold dives at depth. The key to tolerate these extensive periods of apnea is the dive response, which comprises bradycardia and peripheral vasoconstriction to conserve blood oxygen for the hypoxia sensitive brain and heart. Although initially considered an all-or-nothing reflex, numerous studies on freely diving marine mammals have revealed substantial dynamics of the dive response to meet the impending dive demands of depth, duration and exercise. Such adjustments are both autonomic responses, but are also under acute cognitive control in pinnipeds living amphibiously on land and in water. The fully aquatic cetaceans would similarly benefit from cognitive dive response control to optimize time spend foraging at depth. Therefore, we tested the hypothesis that porpoises modulate bradycardia according to anticipated dive duration by training two harbor porpoises to perform tasks while instrumented with a suction cup mounted ECG-recording tag. During 25 stationary dives of 20 and 80 seconds at one-meter depth, the porpoises promptly adjusted bradycardia to the anticipated duration, thus demonstrating cognitive control of the dive response. Such control enables cardiovascular fine-tuning to increase the overall dive-to surface ratios, and thereby the animal's foraging opportunities and fitness. If intense noise exposures divert attention from such cognitive control they may cause unfavorable cardiovascular regulation, which could be fatal due to oxygen and nitrogen mis-management. Our finding of cetacean cognitive dive response control therefore helps us understand the physiology of these elusive animals, as well as the possible effects of the many human disturbances they face on a regular basis.

Tuesday 2 May 2017

15.10-15.25

Temporal and spatial abilities in pinnipeds

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Time and space are two parameters that seem to be essential for many activities in the context of foraging or navigation. Timing might be required for foraging decisions that result in the animal either staying or leaving a patch. And both, timing and spatial abilities, such as distance estimation, could play a role in path integration by which an animal can integrate all distances covered and all angles steered into a homing vector. This vector leads the animal on the straightest path back to, for example, the start position of its trip. So far, temporal and spatial aspects have not been in focus in marine mammal research. Thus, we set out to investigate the (1) timing abilities, and (2) distance estimation and reproduction performance as one aspect of spatial abilities in pinnipeds. In the timing study, time difference thresholds for time intervals from 100ms to 30s were determined in a modified staircase method. The pinnipeds quickly found access to the task and low timing thresholds were obtained. The time difference thresholds seem to generally follow Weber's law. For assessing distance estimation and reproduction, we asked the seal to swim a specific sample distance marked on a long line and to continue to swim until the sample distance was reproduced. The sample distance was shifted along the line to avoid that the seal was learning and relying its response on absolute end points. Our preliminary results show that the seal first learnt to reproduce one distance and then two distances at a time with high accuracy. Altogether these studies point to the fact that pinnipeds seem to have good temporal and distance estimation abilities that might both complement information provided by the classical senses for various tasks.

Tuesday 2 May 2017

15.25-15.40

Entanglement is a costly life-history stage in large whales

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Individuals store energy to balance deficits in natural cycles; however, unnatural events can also lead to unbalanced energy budgets. Entanglement in fishing gear is one example of an unnatural but relatively common circumstance that imposes energetic demands of a similar order of magnitude and duration of life history events such as migration and pregnancy in large whales. To quantify that, we here present two bioenergetic approaches to estimate the energy associated with entanglement in North Atlantic right whales, and compare these estimates to the natural energetic life history of each individual whale. Differences in measured blubber thicknesses and estimated blubber volumes between normal and entangled, emaciated whales indicate 7.4×1010 - 1.2×1011 J of energy are consumed during the course-to-death of a lethal entanglement. Thrust power estimates suggest that when entangled, whales require 3.95×109 - 4.08×1010 J more energy to swim. Individuals who died from their entanglements performed significantly more work (energy expenditure × time) than those that survived; entanglement duration is therefore critical in determining whales' survival. Significant sublethal energetic impacts also occur. Drag from fishing gear contributes up to 8% of the female reproductive energy budget, delaying time of energetic equilibrium (to restore energy lost by a particular entanglement) for reproduction by months to years. We therefore conclude that, in certain populations, chronic entanglement in fishing gear can be viewed as a costly unnatural life history stage, rather than a rare or short-term incident that should be considered in management and conservation of large whales.

Wednesday 3 May 2017

9.55-10.10

Does a life in the fast lane make porpoises more vulnerable to disturbance?

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Accurate estimation of field metabolic rates (FMR) in wild animals is a key to understand the general limitations for survival, as well as fitness consequences of individual responses to disturbances or environmental changes. However, due to cetaceans aquatic lifestyle, standard methods used to measure metabolic rate are difficult to use on wild cetaceans. Harbour porpoises have been described as animals that live in the fast lane, with a short life span, early maturity, and high reproductive rates. Such characteristics, in addition to potential high costs of thermoregulation in cold water, suggest that porpoises will have high FMRs. Yet, the literature referring to their FMR is conflicting, with studies indicating that the energetic requirements of porpoises resemble FMRs for similar-sized terrestrial mammals. Resolving this discrepancy has important implications in porpoise conservation because if they have high FMR and therefore, high energy requirements, they must spend most of their time feeding, and hence have little room for compensation. With this study, we have addressed this controversy by using a novel approach combining data from captive and wild animals to reliably estimate FMR of wild harbour porpoises. We examined the relationship between ventilation rate and metabolic rate (using two methods: Doubly labelled water and Caloric intake) in captive porpoises. After quantifying the average energy equivalent of a single respiration, we used ventilation counts from DTAG data on wild porpoises to estimate their FMR. We demonstrate that FMRs of wild porpoises are approximately 10 to 30% higher than those measured in captive animals. Additionally, FMRs of wild porpoises are 2 to 3 times higher than similarly-sized terrestrial mammals. This high metabolic rate, and resulting high feeding rate, make these animals particularly vulnerable to even moderate disturbance, emphasizing the concerns about the impacts of human activities on the fitness of both individuals and porpoise populations.

Wednesday 3 May 2017

10.10-10.25

Movements of walruses in Smith Sound

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During 2010–2015, 60 walruses (*Odobenus rosmarus rosmarus*) were instrumented with satellite-linked transmitters in four areas in eastern Smith Sound, Northwest Greenland, in May-June. Of the 50 walruses with functioning transmitters, all departed from Greenland during June-July (average 14th June) and dispersed widely along the east coast of Ellesmere Island and around Devon Island. Most important summering grounds were the Alexandra Fjord system, Talbot Inlet and Craig Harbour, but areas as far west as Wellington Channel and western Jones Sound were also visited. Return migration to the wintering grounds on the eastern part of Smith Sound took place in October. The walruses abandoned the feeding banks along the Greenland coast simultaneously with the disappearing sea ice in June, and moved to the western part of Smith Sound for summering in bays and inlets where persisting ice can be used for haul-out during summer months. Alternatively terrestrial haul-outs may have been used by walruses in the largely ice-free areas in Jones and Lancaster sounds but only for short periods. This study demonstrates that walruses wintering along the Greenland coast of the North Water move long distances into the Canadian High Arctic, although they did not visit areas south of Lancaster Sound.

Wednesday 3 May 2017

Harbour seal genelemetry: understanding source-sink dynamics across the United Kingdom by combining population survey, genetic and telemetry data.

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Harbour seals (*Phoca vitulina*) show regional differences in population trends across the United Kingdom, with some areas showing declines and some areas showing stable or increasing growth. Although these regional differences are relatively concordant with existing management units (MUs) based on previous genetic analyses, there is a lack of information on the contemporary level of connectivity among individual breeding colonies between and within MUs. To gain insight into how gene flow and individual movement influences population-level trends, we combine three different data types collected across the UK: population trends of harbour seal haul-out sites based on multivariate statistical modelling of aerial count data (1988-2013), microsatellite genotypes (14 loci) for 280 individuals, and telemetry data from 230 tagged individuals. There was significant genetic differentiation between most sampling sites in four previously defined management units; southeast England, east Scotland, northeast Scotland (NESC, comprising Moray Firth, North Coast and Orkney and Shetland Island MUs) and the western group (WG, comprising the Western Isles, West Scotland and Northern Ireland). NESC and WG were additionally subdivided; Northern Ireland and Shetland Islands were significantly different from other sampling sites. We used BayesAss to estimate recent migration rates (last 2 generations) between the six inferred genetic clusters and compared this with population trend and telemetry movement data. The source-sink dynamics this analysis revealed, between and within management units, may help explain the regional differences in population trends, a finding that was broadly supported by individual-based telemetry data. For example, Northern Ireland is likely to be a low quality 'sink' breeding area as it has a negative population trend, shows high levels of immigration from West Scotland/Western Isles, but no outward movement based on genetic or telemetry data. Our findings highlight the importance of combining different data types representing different temporal and spatial scales to manage marine mammals.

Wednesday 3 May 2017

10.40-10.55

Unique offshore preference in West Greenland harbour porpoises

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One of the most numerous cetaceans in sub-arctic waters of the North Atlantic is the harbour porpoise (*Phocoena phocoena*), but little is known about their distribution, annual migrations and habitat preferences. Since 2012 31 harbour porpoises from West Greenland have been mounted with satellite transmitters to document their seasonal movements. Two small dinghies actively drove the porpoises into gill nets launched from one of the boats upon detection of a porpoise. The animal was then quickly moved out of the water and into the boat on a foam pad where basic measurements were taken prior to instrumentation of an Argos satellite-linked transmitter to the dorsal fin. The porpoises showed a unique preference for offshore areas during long-range oceanic movements, especially during January-June. Here, they moved in areas over water depths >2500 m and demonstrated a daily diving activity to depths exceeding 200 m, with deepest dives to 410 m. Nine West Greenland porpoises transmitted >1 year and demonstrate their choice of the following summering area; one ended the transmission at the shelf area in South Greenland, six returned to the tagging area (within 44 km), two spent the following summer in coastal areas of East Greenland. We here present an unprecedented ability to utilize highly variable environments during oceanic migrations, site fidelity to coastal areas and surprising diving capability in Greenlandic harbour porpoises.

Wednesday 3 May 2017

10.55-11.10

The dire status of the Vaquita: the 8th Report of the International Committee for the Recovery of Vaquita (CIRVA)

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Vaquita conservation's most pressing challenge today is its capture in the totoaba illegal fishery, for the black markets in China and Hong Kong. A passive acoustics monitoring programme has shown that half of remaining vaquita population was lost between 2015 and 2016. Between 2011 and 2016 the population declined on average by 32% annually. Unless this decline can be stopped by eliminating mortality in illegal gillnets, the vaquita will be extinct in a few years. CIRVA indicated that high levels of illegal fishing continue as shown by a derelict fishing gear removal programme. In only 21 days of work, a total of 136 abandoned fishing gear were discovered, of which 103 were retrieved. Many of them were nets recently set for totoaba fishing. CIRVA reiterated their previous recommendation that a permanent ban on all gillnets throughout the entire range of the vaquita is essential. CIRVA reiterates that existing laws must be strengthened and penalties increased so that they act as a real deterrent to illegal fishing. Unless enforcement and prosecution efforts succeed in preventing illegal fishing for totoaba, the vaquita will soon be extinct. Development of alternative fishing gear must be pursued and CIRVA showed its disappointment that progress has been too slow. CIRVA emphasizes the need for the Mexican Government to follow the recommendations and protocols of the Expert Committee for Fishing Technologies in the Upper Gulf of California. Considering the current situation and vaquita status, CIRVA recommends that attempts be made as a matter of urgency to place some vaquitas into a temporary sanctuary. The goal of this program is to protect these animals until they can be returned into a gillnet-free environment. This work should not divert effort and resources away from extension and enforcement of the gillnet ban, which remains the highest priority conservation action for the species.

Wednesday 3 May 2017

Assessing the effectiveness of multibeam sonar to track marine life interactions with a subsea kite in a tidal channel

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Understanding the oceanographic processes driving the fine-scale water column use by marine mammals in tidally energetic environments still poses a challenge for the developing marine renewable energy (MRE) industry. However, hydroacoustic methods are slowly emerging as a powerful tool for the environmental monitoring of MRE devices. Using high-frequency multibeam sonar, marine mammals, fish and diving seabirds can be detected and tracked, allowing for the collection of ecologically relevant data to feed into collision risk models. Moving away from manned operations, self-contained sonar systems allow autonomous, subsurface monitoring of MRE installations for longer time scales (weeks-months) and can be operated in areas in which traditional boat surveys are less effective. MRE devices are naturally placed in extremely energetic, acoustically noisy environments and tidal streams continue to pose a particular challenge to meaningful acoustic data collection, analysis and interpretation. A novel, quarter-scale tidal turbine, Minesto's Deep Green subsea 'kite', is being tested in a tidal channel located in Strangford Lough, Northern Ireland, UK. The kite consists of a wing with a turbine, attached to the seabed by a tether and 'flies' in a figure-eight shaped trajectory underwater. Seals (*Halichoerus grypus, Phoca vitulina*) frequently transverse the site but can only be detected by Marine Mammal Observers when they are at the surface – impeding the effectiveness of mitigation measures such as the shut-down of the device when a seal is sighted. In order to evaluate fine-scale (10s of meters) seal-kite interactions, multiple Kongsberg M3 multibeam sonar heads were deployed. To gain a better understanding of the hydrodynamic processes driving seal passes and water column usage at the site, current velocities and tidally-driven oceanographic features were concurrently collated at the same spatio-temporal scale. We present preliminary results of sonar visualisations under varying hydrodynamic conditions and introduce algorithm development within Matlab for real-time automated tracking.

Wednesday 3 May 2017

A method for reconstructing georeferenced fine-scale tracks of marine mammals integrating dead-reckoning and position fixes

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Detailed information about animal location and movement is often crucial in studies of natural behaviour and impacts of human disturbance. Instrumentation tags for cetaceans may include sensors for acceleration, speed and compass heading that are sampled at high resolution, which allows for the estimation of fine-scale movement tracks by iteratively predicting each position by projecting swimming direction and speed from its previous position. Without additional fixes of known positions on the earth's surface, however, this technique, known as 'dead-reckoning', results in positional uncertainty that grows with time. Here, we describe a set of Bayesian state-space models for reconstructing georeferenced fine-scale tracks, integrating dead-reckoning using on-animal sensors with measurements of whale locations using on-animal Fastloc-GPS and/or visual observations. The model structure included a relatively simple process model in which errors caused by water current movement, non-location sensor errors, and other dead-reckoning errors were accumulated into a combined error term. Positional observation models were based upon error measurements made during field tests. We exemplify our track reconstruction method using the data sets of 13 humpback whales (*Megaptera novaeangliae*) and one northern bottlenose whale (*Hyperoodon ampullatus*). Positional uncertainty quantified by the model was much greater for data sets with visual positions and few or no GPS positions, indicating a strong benefit to using Fastloc-GPS for track reconstruction. Compared to tracks derived only from position fixes, the inclusion of dead-reckoning data greatly improved the level of detail in the reconstructed tracks. Using cross-validation, an improvement in the predictability of out-of-set Fastloc-GPS data was observed compared to conventional track reconstruction methods. The model structure presented here is made available online, is relatively easy to use and adapt in standard computing software, and is applicable to a wide range of marine species and data recording systems.

Wednesday 3 May 2017

15.25-15.40

Identifying mportant Marine Mammal Areas using geospatial genetics

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Genetic tools have the potential to be highly informative for marine spatial conservation and planning. However, lack of access to and understanding of genetic data represents a key reason why genetics is often overlooked in these efforts. Additionally, increasing consideration to the conservation of genetic resources is becoming a key component in international marine planning and policy. To bridge this gap, a community of conservation geneticists and marine spatial planners is working to develop guidance on how genetic information can be used to inform the identification of Important Marine Mammal Areas (IMMAs), an effort led by the IUCN Joint SSC/WCPA Marine Mammal Protected Area Task Force. The aim of the IMMA classification is to identify and delineate discrete habitat areas that are important for one or more marine mammal species, and that have the potential to be managed for conservation. The intersection of genetics and IMMA identification forms a feedback loop comprising three main stages. 1. Approaches to geospatially map genetic data for marine mammals are developed through expert-reviewed case studies published in the marine spatial planning tool, SeaSketch (www.seasketch.org). These case studies are used to develop specific guidance on how genetics can inform the individual criteria developed by the Task Force to identify IMMAs. 2. Emerging guidance is applied to the identification of candidate IMMAs (cIMMAs) during a series of regional expert workshops held by the Task Force (2016-2021). 3. cIMMAs, once officiated by an independent expert-review process, will represent genetic-based IMMAs for use as a support tool in marine spatial planning and conservation efforts. The policy implications of their application will then inform the delineation of IMMAs based on genetic components and, in combination with other methods, their continual identification in subsequent regions, and also how they meet new international directives on the conservation of marine genetic resources.

Wednesday 3 May 2017

Assessing the benefit of noise reduction measures during offshore windfarm construction on harbour porpoises

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We investigated if and how the use of noise reduction measures could influence the potential impact of wind farm construction on the North Sea harbour porpoise population using the interim PCoD model. This framework relies on the opinions of experts and although the process used to collect this information was designed to minimise potential biases and provide a realistic measure of uncertainty, forecasts of a risk of a population decline should be interpreted with caution until more empirical data are available. To predict the benefit of noise reduction, we modelled maximum forecasts, using a worst-case scenario of construction of all the wind farms in the UK North Sea that were, at the time of investigation, operational, under construction, consented or accepted by the planning inspectorate for examination. Although this provides an unrealistic baseline, it is the relative change in impact that is of most interest, rather than the absolute level of any forecast. The population effects of disturbance were predicted over a 36 year-period and expressed as the probability of a 1% or 2% annual population decline. Different noise reduction scenarios were conducted, with noise reduction measures leading to a 60% and 80% reduction in impact area, respectively, applied either at all wind farms or only those wind farms located within or overlapping with the Southern North Sea possible Special Area of Conservation. The probability of a 1% population decline was predicted to diminish as a result of noise reduction by between 34% and 96% depending on the chosen scenario. The level of reduction increased with increasing numbers of wind farms implementing noise reduction. Similar risk reductions might be achieved by large-scale impact area reductions at a limited number of construction sites or small-scale impact area reductions at many sites. This work was funded by WWF-UK.

Wednesday 3 May 2017

Why is frequency weighting so important in assessment of underwater noise impact?

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Underwater sound, including loud, impulsive sounds from seismic surveys, pile driving and explosions, is recognized as a significant source of impact on marine organisms and is subject to a range of different forms of regulation. A key issue in this context is the question of how to take the frequency dependence of animal hearing into account. One feasible strategy is frequency weighting. In assessment of the sounds not all parts of the frequency spectrum are then weighted equally. The importance of selecting the correct weighting function is illustrated with an example from offshore pile driving at the DanTysk offshore wind farm. Recordings of pile driving were evaluated against recent TTS-thresholds for harbor porpoises by means of four different weighting functions (audiogram, M, Type-II weightings and unweighted). Effectiveness (mitigation efficiency) was calculated as the ratio of exposure time necessary to induce TTS with the bubble curtain in place to the time without bubble curtains. Mitigation efficiency depended strongly on which weighting function was used. Mitigation efficiency was much larger for an audiogram-weighted TTS criterion relative to an unweighted criterion, while M and Type-II weighting fell in between the two. These results cannot be used to argue for or against particular weighting functions, but underlines the importance of selecting the correct weighting so that the desired protection of animals is achieved. It also shows that large uncertainties in assessing underwater noise still remain. Depending on the direction of the errors, these uncertainties can either result in unwanted impact on animals, or an unnecessarily expensive mitigation effort due to overregulation.

Wednesday 3 May 2017

Contribution of marine mammals sounds to the European Marine Strategy Framework Directive noise measurements in the Arctic region

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The Arctic Council's 2009 Arctic Marine Shipping Assessment (AMSA) identified areas of heightened ecological and cultural significance in light of changing climate conditions and increasing multiple marine uses, and where appropriate, encouraged the implementation of measures to protect these areas from the impacts of Arctic marine shipping. Nevertheless, this recommendation did not include noise as a potential threat to marine life. In 2010, the European Marine Strategy Framework Directive demanded the Member States to develop strategies to achieve or maintain a Good Environmental Status (GES) in European Seas, including two indicators on noise. Following the need of monitoring current levels of noise in the Arctic region, three acoustic recorders were deployed in the Barents and Greenland Seas, from fall 2013 to fall 2014. All recorders were operating in a duty cycle, sampling at 39 or 78 kHz and recording in 24 bits. This presentation comparatively reports on the three regions soundscapes, illustrating differences in received sound pressure levels. Contributions to this overall levels from biological, anthropogenic sources and ice movement were extracted in the different seasons. For several marine mammal species, there was a clear seasonal variation in their acoustic presence, while other species such as the sperm whale could be detected year round, particularly in Greenland. Overall, the animal presence was at its lowest during summer months. The distinction between bowhead and humpback whale calls was often inconclusive, complicating the analysis, with bowhead whale calls definitely being detected in winter and spring, at least in the Greenland recordings. Average Sound Pressure Levels presented annual values of MSFD Descriptor 11.2 in the three regions of, 82, 100 and 99 dB, respectively. This data is available online on a dedicated server and playbacks of all detected sources will be displayed during the presentation.

ABSTRACTS – SPEED TALKS

Grey seals and harbour seals Photo: Anders Galatius©

Monday 1 May 2017
15.10-15.15

Do model drones disturb seals?

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Technological advances, reduced production costs and attraction of aerial photography have resulted in an exponential global growth of aerial drones in recent years. Despite the widespread concern about the dangers of flying drones around airports, buildings and people, the same concern has not been given to their effects on wildlife, therefore impact assessments leading to best practise guides and protective legislation are badly needed. Although there have been many important studies using drones in an ecological context, and more recently investigations into the effect these craft have on different species, efforts have generally concentrated on effects from larger aircraft rather than smaller model drones that are more widely owned and used by the public. This study tested the effect of a small model quadcopter drone (Walkera X350 Pro) on 2 populations of hauled-out grey seals in one-off behavioural observations on the south coast of England. Results showed that the craft caused significant behavioural disturbance to the animals at both sites when flown in proximity. Furthermore, the seals were not stressed before the drone, became disturbed once it was detected (AHZ, RHZ 40-50 m), were the most disturbed when it was closest (MZ 10-20 m) and remained disturbed even after it had left the area. Proximity has proven to have a marked effect on animal disturbance, and because overflight of wildlife has the potential to alter animal behaviour, responsible aerial monitoring requires sufficiently quiet craft or high flight ceilings to avoid undue disturbance. We therefore recommend a horizontal and vertical distance of 70 m to be set as an acceptable threshold for future drone-seal work, with the extra 20 m acting as a precautionary buffer zone. It should be stressed however that this is not absolute, and animal reaction can vary depending on species, population, biological state, life history, craft and pilot.

During the review process this abstract was flagged by one or more reviewers due to ethical concerns. This is the response of the authors to these concerns:

To ensure no harm came to the animals the drone was flown with extreme caution at all times using recommended guidelines at the time (Pomeroy et al. 2015; Goebel et al. 2015; Cornwall Seal Group 2015, Vas 2015) and keeping within Civil Aviation Authority (CAA) rules and regulations (CAA 2015). As disturbance to seals is not an offence in England a licence from the MMO was not needed. To ensure disturbance was not excessive, individuals which flushed were not exposed to further observations. The sites where the research was conducted have public access so trespassing did not occur. Ethical approval was given by Kingston Mauward College for the proposed research".

Monday 1 May 2017
15.15-15.20

Sex-dependent environmental drivers of grey seal pup dispersal and predicted spatio-temporal overlap risk with marine energy installations

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Dispersal plays a fundamental role in population dynamics and gene flow. Natal dispersal in young animals typically covers vast areas and has large impacts on individual fitness and population structure. Despite their biological importance, little is known of the early movements of juveniles, which can represent up to half of the total population in long-lived species. This lack of knowledge is particularly pertinent to marine predators, such as grey seal pups (*Halichoerus grypus*), that move alone and with no information from their parents. Such information however is key for understanding and predicting the responses of animals to climate change or human activities such as marine energy developments. We present data from a recently discovered, historical mark-recapture record of newly-weaned grey seal pups in Wales. These mostly unpublished records, spanning 1954-1971, document the early movements of 256 individuals from over 1300 originally marked. Movements are recorded for up to a year following weaning offering a novel understanding of natal dispersal. The squared displacement modelling method is used to quantify movement types and relate these to biological and demographic covariates; including sex, colony and environmental conditions. Results indicate that individuals cover huge ranges during their first few months at sea; travelling as far as Northern Ireland, France and Spain. There is large inter-individual variation and a notable difference in strategies of pups from different colonies. Finally, by combining model predictions of dispersal with recent weekly pup count data from three Welsh colonies, we derive the time window for maximum spatial overlap risk with marine renewables. Our results can inform marine renewable energy industries to devise strategies to minimise risk and policy makers for marine spatial planning.

Monday 1 May 2017
15.20-15.25

Long-term social units of long-finned pilot whales do not show group-specific repertoires of repeated calls

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Long-finned pilot whales, *Globicephala melas*, are thought to live in stable matrilineal groups called 'social units', similar to those found in killer (*Orcinus orca)* and sperm whales (*Physeter macrocephalus*) – where social levels are demarcated by characteristic vocalizations. A large portion of the vocal repertoire of pilot whales contains calls that are rhythmically repeated in sequence, providing good candidates for looking at individual- or unit- specificity. Our study uses these call sequences recorded over a period of 16 years for nineteen social units of long-finned pilot whales repeatedly encountered off Cape Breton Island, Nova Scotia, Canada. From these, 90 different call types were visually categorized from 182 extracted repeated call sequences, with five being further divided into a total of 14 subtypes. Call types and categories – both types and subtypes – that were heard on two or more days during this study showed little evidence of being individual- or unit- specific, as few calls were made by only a single unit and the majority of them were shared between two or more. A network of acoustic similarity between units had low modularity and therefore showed no evidence that pilot whale social units were organized into acoustic clans similar those found in killer and sperm whales. However, when we used tests to look at the temporal distribution of call types, analysis showed that call categories were heard more often than expected within the same field season, while overarching call types were heard over a longer three to five-year period. This suggests that these call types may be horizontally transmitted across social units.

Monday 1 May 2017
15.25-15.30

To mix or not to mix: testing for randomness in mixed-species cetacean groups

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In a previous study, we conducted a broad-scale review of mixed-species cetacean groups in four different habitats: Eastern Tropical Pacific (ETP), California Current System (CCS), Alaska Region, and Pacific Islands. Based on these results, for 17 cetacean species (13 odontocetes and 4 mysticetes), in the ETP and CCS, we conducted additional tests to examine whether the observed species-specific associations resulted by chance or were driven by underlying biological factors. We used Markov chain Monte Carlo (MCMC) randomization tests to assess whether certain species tend to appear systematically together or apart. The randomization preserves the number of appearances of each species, as well as the number of species in each group (cluster). We calculated a C-score (Checkerboard score), to measure the degree of exclusive competition in the dataset and an AS-score (Association Strength), to measure the degree of association between all species in the dataset. For both the ETP and CCS dataset (1986-2014) and all 17 species considered, there was significant evidence of lack of exclusive competition ($p<0.01$) and strong association ($p<0.001$). We further investigated cross-species relationships by computing each species' node strength and edges between species pairs. Spotted, striped, and spinner dolphins had significantly large node strength compared to all other delphinids and whales tested ($p<0.001$). Spotted and spinners, pilot whales and bottlenose dolphins, right whale dolphins, Risso's and Pacific white-sided dolphins all exhibited significantly larger edges than would have occurred at random. Among the whales, only the edge between blue and fin whales was significantly large. These preliminary results provide the foundation for ultimately testing the underlying mechanisms for mixed-species group formation. We further believe that such studies provide the impetus for using behavioral knowledge in wildlife conservation.

Monday 1 May 2017
15.30-15.35

Using behavior and acoustic data from multi-sensor tags to assess responses of humpback whales (*Megaptera novaeangliae*) to whale watching boat noise in Skjálfandi Bay (Húsavík), Iceland

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The rapid development of whale watching in Iceland can represent a serious threat for whales during their critical feeding season. Exposure to boat noise is considered one of the major concerns for whale conservation in Iceland due to a scarcity of noise studies on local populations and lack of regulations for managing noise pollution. While humpback whales (*Megaptera novaeangliae*) are one of the most desired whales for wildlife encounters, little is known regarding potential effects from whale watching. In this study, acoustic tags were attached to seven humpback whales during summers 2013 and 2014 in Skjálfandi Bay, Húsavík, Iceland. We aimed to measure boat noise levels in the study area and to investigate whether or not boats cause changes in natural behavior. A customized breath and lunge detector was built and behavioral patterns were described and analyzed statistically. Generalized linear models were used to test for changes in mean depth, jerk rate, breath rate dive rate and dive duration before, during and after exposure to boat noise. We also tested for effects of tagging, noise intensity and whether boats were just passing or actively approaching. Preliminary results show a significant increase of mean depth and jerk rate in exposure to medium and high noise, irrespective of exposure phase. In addition, whales responded by making longer dives during and after noise exposure and during the first hour of the record (suggesting a tagging effect). We did not find changes for breath and dive rate. These observations might indicate a decrease the energetic efficiency during foraging behavior, affecting the energy availability for subsequent migration and breeding season in the long term. Further, the registered levels of boat noise may impair whale communication for critical functions such as group feeding or socialization that are essential for survival or reproduction.

Monday 1 May 2017
15.35-15.40

Using telemetry data to estimate the percentage of seals hauled out during censuses

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Estimating seal abundance is usually based on pup production for grey seals, or counts on haulout sites during the moult for harbour seals. Seals can move seasonally however, and local managers often wish to estimate the seasonal abundance of seals in a given area. This seasonal abundance estimate may be needed to quantify interactions between seals and human activities, such as fisheries or marine renewable energy constructions. Counts of seals on their haulout sites are then the only available data on their relative abundance, and it is necessary to estimate the proportion of seals hauled out during these censuses. We used telemetry data obtained from 33 grey seals in two colonies and 30 harbour seals in three colonies respectively in order to quantify the percentage of seals hauled out during the censuses, excluding those moving away from the study area at those dates. We found that harbour seals hauled out in the survey area on 52 to 61% of censuses' time windows, depending on the study sites. Grey seals in the Eastern Channel hauled out 35% of the time of censuses, vs. 34% on average in the Western Channel. Interestingly, in this latter area the percentage of seals hauled out during the censuses varied only slightly with seasons, with 31% of presence during summer, 39% during the pre-breeding season, 34% during breeding and 30% at the beginning of the moulting season. During these same seasons, the total proportion of time spent ashore by the seals increased from 14 to 30%, but at the beginning of the moulting season, seals hauled out at any time of the day and not only at low tide, i.e. outside of the time window of censuses. These results can provide correction factors for censuses conducted on these sites.

Monday 1 May 2017
15.40-15.45

Two decades of harbour porpoise telemetry data reveals long-term stability of hot spots

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In 2010, 16 marine protected areas (MPAs) for harbour porpoises were designated in Danish waters under the EU Habitat Directive. The MPAs were designated in areas of high porpoise density (hot spots) and 14 of these were identified primarily by harbour porpoise telemetry data (1997-2007). Since the process of altering or moving MPAs once designate is immense and practically impossible, the long-term stability of the high-density areas is an essential prerequisite for MPAs to be a functional conservation measures to protect the harbour porpoise. Here we examine the stability of the high-density areas as well as the designated MPAs by comparing the original data (1997-2006, n=52) with data gathered in the subsequent ten years (2007-2016, N=53). Distribution and hotspots of porpoises were quantified with Kernel Density Estimates in ArcGIS and compared statistically. Prior to analysis, data was filtered to minimize impact of tagging and autocorrelation. Only porpoises transmitting for >1 month was included. This gave an average transmission time of 152 days with the maximum transmission length being 522 days. The comparison of hotspots over space and time revealed only minor differences between the two time periods. Furthermore, of the 14 designated MPAs, 11 MPAs still held a similar or higher porpoise density compared to 1997-2006. In three MPAs the density had decreased slightly. Our results therefore show a long-term stability of harbour porpoise hot spots in the Danish waters (from the western Baltic to Skagerrak) suggesting that the location of MPAs designated in 2010 are still valid. Protecting porpoises by designating MPAs may thus have a beneficial impact on harbour porpoise conservation depending on the specific regulations implemented within the MPAs.

Monday 1 May 2017
15.45-15.50

Signals from the South: Humpback whales carry messages of Antarctic Sea-ice ecosystem variability

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Southern hemisphere humpback whales (*Megaptera novaeangliae*) are high-fidelity Antarctic krill (*Euphausia superba*) predators that rely on krill summer biomass abundance to fuel the longest-known migrations for any mammal on the planet. It is postulated that this species, already adapted to endure metabolic extremes, will be one of the first Antarctic predators to show measurable physiological change in response to fluctuating principal prey availability in a changing climate. Here we show the synchronous, inter-annual (2008-2013) oscillation of two measures of adiposity, namely the adipocyte index (AI) and lipophilic contaminant burdens, with Southern Ocean environmental variables and climate indices. Further, bulk stable isotope signatures provide strong indication of dietary compensation strategies following years indicated as leaner years. The clear synchronicity of humpback whale dietary and adiposity signals with climate patterns in the Southern Ocean lend strength to their role as powerful Antarctic sea-ice ecosystem sentinels. The work carries significant potential to reform long-term and circumpolar ecosystem surveillance in the region.

Tuesday 2 May 2017
10.30-10.35

Can satellite telemetry, aerial surveys and Important Marine Mammal Areas (IMMAs) facilitate cetacean conservation in the harsh environment of the Strait of Sicily?

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The Strait of Sicily, a 'hotspot' for Mediterranean biodiversity, also represents the main deep-water channel between the Eastern and the Western Mediterranean Sea, with severe traffic volumes between the Suez Canal and the Strait of Gibraltar. Despite its importance, prior to 2016 almost all the available information on cetaceans arose from anecdotal reports. The identification of critical habitats for cetaceans in the Strait of Sicily, along with migration routes to and from summer fin whale feeding grounds in the Central Mediterranean Sea, is therefore crucial to develop efficient and effective conservation efforts. Here we report the results of a dedicated aerial survey carried out in March-April 2016 in an area between south Sicily and the Tunisian coast and of data collected by deployment of satellite transmitters on fin whales off Lampedusa in March 2013 and 2015. A total of 7,450 km were flown in acceptable visibility conditions and best abundance estimates of striped dolphins (N = 15,200-16,400 individuals) and bottlenose dolphins (N = 1,200-2,000 individuals) were computed with model-based and design-based approaches. Five satellite transmitters were deployed to evaluate whale movements and habitat use; a hierarchical switching state-space model was used to identify transiting and area-restricted search (ARS) behaviours, the latter indicating foraging activities, while tracks were independently overlaid with a potential foraging habitat model, based on chlorophyll front detection. Areas where fin whales predominantly engaged in ARS behaviour were identified within the Strait, and some individuals undertook mid- to long-distance migrations, crossing one of the world's busiest maritime routes. The present findings corroborate the identification of Important Marine Mammal Areas (IMMAs), further supporting the need of establishing and implementing an international protection regime based on effective seasonal/dynamic management.

Tuesday 2 May 2017
10.35-10.40

A collation of European at-sea surveys identifies and explains persistent areas of cetacean diversity and abundance at regional and decadal scales

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The processes driving the distributions of cetaceans in space and time, in particular their responses to variations in environmental conditions, remain a widely researched question due to their strong applications in ecology and conservation. Typically, research seeking to explain distribution patterns focuses on particular periods or areas; however, to understand such processes at the regional and decadal scales needed to address fundamental questions, a different approach is needed. As part of the Marine Ecosystems Research Programme (MERP) approximately 2.1 million kilometres of surveys, covering around 8000 days between 1970 and 2016, in north-western Europe have been collated. Maps showing seasonal variations in the densities of ten *balaenopterid* and *delphinid* species have been produced using a habitat modelling approach based entirely on biophysical parameters suspected to influence the abundance and availability of prey species. Similar approaches have been implemented for measures of community diversity and biomass, calculated across all species and families. Using biophysical parameters rather than coordinates and time has allowed better extrapolation of values beyond areas of intense survey effort, and also provides insights into the processes driving patterns of distributions. Analyses on a species-level suggest that densities of all but harbour porpoise *Phocoena phocoena* and minke whales *Balaenoptera acutorostrata* are relatively high along continental shelf-edges; analyses on a community-level show diversity, abundance and biomass also peaking within these areas. Whilst a suite of biophysical parameters explain these patterns, results indicate that a variable associated primarily with increased prey availability (seabed roughness) has more influence that those associated with increased prey abundance or diversity (primary productivity, temperature). Whereas continental shelf edges are widely assumed to support dense and diverse communities, this is the first study to quantify their persistence on a European-scale. As anthropogenic activities increase across our oceans, it is suggested that these areas are considered for protection.

Tuesday 2 May 2017
10.40-10.45

Influences of vessel traffic on porpoise distributions along the mainstream of Yangtze River

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Along the middle and lower reaches of the Yangtze River, in which the Yangtze finless porpoise (*Neophocaena asiaeorientalis asiaeorientalis*) distributes, all the vessels equipped the Automatic Identification System (AIS) can be identified and located on the AIS Information Platform (www.ais.msa.gov.cn). Within or nearby each natural reserve of porpoise along the mainstream of the river, one section with about 20 km long is selected as a sample for counting the type and number of the vessels in the waters. In total, eight sections are selected for counting in May 2016, and the counting covers all day (one time for two or three hours). Obviously, vessel distributions are unequally among the sections, and the numbers with each 5 km in the sections in middle reach are about only one third of those in the sections in lower reach. The numbers and distributions of the porpoises along the mainstream during the range-wide surveys in 2006 and 2012 are reviewed, and are compared with the numbers and distributions of vessels in the sections in this study. The results indicate both the numbers and distributions of porpoises seem to be not positively correlated with those of vessels. It has been widely accepted that vessel traffic has negative effects on the dolphins, but such the effects might be some difference in intensities and ranges among species, and even might be closely related with types of vessels, the other environmental conditions and availabilities of fish resources in the waters.

Tuesday 2 May 2017
10.45-10.50

Identification of Important Marine Mammal Areas (IMMA) in the Mediterranean Sea: results of the first IMMA regional expert workshop

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The IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force (MMPATF) is in the process of identifying a global network of Important Marine Mammal Areas (IMMAs). IMMAs are a place-based conservation tool identifying discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation. The first workshop, organized in collaboration with the Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), was held in October 2016 and was attended by 34 experts covering all of the 8 Mediterranean sub-regions assessed (Alborán Sea, Algero-Provencal Basin, Tyrrhenian Sea, Adriatic Sea, Strait of Sicily-Tunisian Plateau, Ionian Sea-Central Mediterranean, Aegean Sea, and Levantine Sea). Expert information was collated in advance through the use of a Data Appraisal Form (DAF) and an online SeaSketch IMMA facility. This information helped to create an Inventory of knowledge (including citations, expert contacts, and knowledge gaps), and a list of 72 Areas of Interest (AoI) for consideration as candidate IMMAs. After consulting the IMMA selection criteria experts identified 41 candidate IMMAs throughout the region for 10 species of marine mammals (*Physeter macrocephalus*, *Delphinus delphis*, *Tursiops truncatus*, *Ziphius cavirostris*, *Balaenoptera physalus*, *Grampus griseus, Orcinus orca*, *Globicephala melas*, *Phocoena phocoena* and *Monachus monachus*). Additionally, experts identified a new list of 35 AoI in the region which will form the basis of new recommendations for monitoring and future assessments of IMMA status. These Mediterranean cIMMAs, being examined by an independent review panel, will act to enhance efforts of marine biodiversity conservation and ecosystem health for consideration by governments, intergovernmental organisations, conservation groups, and the general public. This includes the activities of ACCOBAMS and the recommendation for an 'advisory' management plan for marine mammals in the Strait of Sicily / Tunisian Plateau.

Tuesday 2 May 2017
10.50-10.55

The effect of seismic surveys on cetacean occurrence across a Large Marine Ecosystem

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Cetaceans face many challenges due to anthropogenic activity in the marine environment, including fisheries competition, bycatch, and noise from sources such as vessel traffic, construction, and sonar. Against this backdrop of increasing anthropogenic disturbance, dwindling fossil fuel reserves are driving the search for hydrocarbon resources further offshore. As a result, assessing the impact of increasing seismic survey effort across diverse habitats is of paramount importance. To date, such research has focused on the effects of seismic surveys on cetacean behaviour on a relatively small spatio-temporal scale, or on individual species. We undertook a significant data acquisition programme based on vessels of opportunity, and compiled MMO reports from seismic surveys, to determine the effect of airgun activity on cetacean occurrence. We modelled 5300 hours of cetacean sightings data collected during both seismic and control surveys across a Large Marine Ecosystem using GEE-GAMs and Spatially Adaptive Local Smoothing Algorithm (SALSA). Analyses accounted for a range of temporal, environmental and spatial variables. Mysticete occurrence was not influenced by airgun activity within a seismic survey (active vs. inactive phase of surveys), however animals were less likely to be observed during seismic surveys compared to control surveys. Odontocetes were more likely to be observed during inactive periods of seismic surveys. Moreover, they were less likely to be observed during seismic surveys in general (active and inactive) when compared to control surveys, although the effect was smaller when airguns were not operational. To our knowledge, this is one of the first studies to examine the effect of seismic surveys on cetacean occurrence on a Large Marine Ecosystem scale, and suggests potentially wide-ranging impacts across multiple cetacean species.

Wednesday 3 May 2017
11.40-11.45

Which marine litter do the Mediterranean sperm whales prefer?

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Ingestion of marine litter, although less visible than entanglement, is one of the most noxious impact on marine organisms and its impact range from the sub-lethal effects to mortality. Marine litter can harm marine mammals in a number of ways. The ingestion of marine debris has been documented in cetacean species worldwide and, among these, the sperm whale (*Physeter macrocephalus*) appears to be particularly exposed to this threat. However few data are available for the Mediterranean Sea and the data are not collected homogeneously. The objective of this study is to implement a standardized protocol for the quantification and characterization of marine litter to properly evaluate the rate of marine litter ingestion and to obtain more detailed information about the sources of ingested debris. Stomach contents of 13 sperm whales stranded from 2009 to 2016, along the Italian coast, were examined for the study of the diet and for the analysis of marine litter using a harmonized protocol. Debris items were weighted, measured and characterised according to the MSFD Descriptor 10 standard protocol developed for sea turtles. To better understand the composition and origin of the debris ingested, an additional analysis was performed using Fourier transform infrared (FT-IR) spectroscopy technique. Marine debris was found in 10 out of 13 specimens and it was composed mainly by plastic. The characterization of the type and the analysis of polymers provide useful information about the sources of this contamination. The polyethylene and polypropylene plastics are the most ingested debris, these plastic types are widely used as packaging material worldwide both in sea- and land-based activities. The increase of information about the sources will help in the implementation of future mitigation measures of marine litter input.

Wednesday 3 May 2017
11.45-11.50

Polychlorinated biphenyls (PCBs) in free-ranging common bottlenose dolphins from the Northern Adriatic Sea, in relation to demographic parameters

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Cetaceans bio-accumulate persistent pollutants such as PCBs, a serious conservation concern for these species. Although PCBs declined in European seas since the 1970s-1980s ban, considerable levels still persist in European and Mediterranean waters. Strandings are a valuable source for pollutant studies, but may introduce biases. Biopsy samples from live, free-ranging cetaceans offer a good alternative for evaluating the toxicological burden of populations, especially when linked to known histories of identified individuals. Here, we evaluate PCB levels in free-ranging bottlenose dolphins (*T. truncatus*) from the Gulf of Trieste (northern Adriatic Sea), one of the most human-impacted areas within the Mediterranean Sea. Further, we test for the effects of sex, parity and social group membership on PCB concentrations. Biopsies were collected from 22 male and female dolphins during 2011–2014. All animals were photo-identified and are part of a well-known population of ~150 individuals monitored since 2002. Values of 25 PCB congeners for each sample were summed to obtain Σ25PCB. Σ25PCB ranged from 3.34 to 293 mg/kg lipid weight (arithmetic mean = 66.3, 95%CI = 38.1–94.6; geometric mean = 43.5, 95%CI = 28.1–67.4). Males had significantly higher concentrations than females (Mann-Whitney U-test, $P<0.001$), suggesting PCB offloading from reproducing females to their offspring via gestation and/or lactation. This is consistent with limited evidence of first-born calf mortality in this population. Furthermore, nulliparous females had substantially higher concentrations than parous ones, providing further support for maternal PCB offloading. Overall, 90.9% of dolphins had concentrations above the toxicity threshold for physiological effects in experimental marine mammal studies (9 mg/kg lw), while 59.1% had concentrations above the highest threshold published for marine mammals based on reproductive impairment in ringed seals (41 mg/kg lw). We demonstrate the utility of combining PCB data with demographic parameters such as sex, reproductive output, etc., resulting from long-term studies.

Wednesday 3 May 2017
11.50-11.55

Size and shape variations of the bony components of sperm whale cochleae

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Several mass strandings of sperm whales occurred in the North Sea during January and February 2016. Twelve animals were necropsied and sampled around 48h after their discovery on German coasts of Schleswig Holstein. The present study aims to explore the morphological variation of the primary sensory organ of sperm whales, i.e. the auditory system, using high-resolution computerized tomography imaging. We performed a quantitative analysis of size and shape of cochleae using landmark-based geometric morphometrics to reveal inter-individual anatomical variations. A hierarchical cluster analysis based on thirty-one external morphometric characters classified these 12 individuals in two separate stranding clusters. A relative amount of shape variation could be attributable to geographical differences among stranding locations and clusters. Our geometric data allowed the discrimination of distinct populations of sperm whales stranded on German coasts. We argue that the cochleae have their own "fingerprint", an individual design with variable proportions depending on the origin of the specimen. Future research might analyse the functional consequences of an ontogenetic variation of cochlear structure. There are increasing concerns about the impact of noise on cetaceans and describing the auditory periphery of odontocetes is a key conservation issue to further assess the effect of acoustic pollution.

Wednesday 3 May 2017
11.55-12.00

Fighting the data deluge: a dedicated detector stage to limit false alarms in passive acoustic monitoring of beaked whales

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Beaked whales are an elusive group of odontocetes occupying little time at the surface. A growing number of mass-strandings of beaked whales associated with naval exercises has spurred interest in the development of methods to detect their presence as part of mitigation procedures. These species have therefore been a preferred target for investigations into the potential for passive acoustic monitoring, PAM, efforts. There is a distinct frequency sweep in beaked whale clicks, and they are therefore rather distinct compared with other transients likely to occur in the oceans, including clicks from other odontocetes. They therefore appear to be well suited for automatic identification. However, the sweep is much more salient when recorded close to the acoustic axis, and it remains to be investigated how robustly a detector will perform in a realistic situation, where other odontocetes are likely to periodically occur in vast quantities and therefore present the detector with a deluge of potential false alarms. To assess this, we have utilized an empirical data set of beaked whale clicks recorded during tagging efforts, recorded at random angles. This set was used in the evaluation of the performance of several discriminator parameters in the presence of a dataset of confounding dolphin clicks. We compared detectors operating on purely spectral, time domain and group delay features (the sweeping). By far the most effective of these single features was the group delay, but best performance resulted with coherent templates, which implicitly incorporates all of these features. Worst performance resulted when input consisted of a power ratio in two third octave bands. The resulting recommendation is that after the detection stage, there should be a dedicated discriminator step using coherent comparisons. This will greatly enhance the success of the PAM operation by decimating the number of false alarms.

Wednesday 3 May 2017
12.00-12.05

Harbour porpoise feeding activity varies between Danish Natura2000 areas

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The Danish National Monitoring Program NOVANA monitors harbour porpoise (*Phocoena phocoena*) presence in six Danish Natura2000 areas (Special Areas of Conservation, SACs) appointed for harbor porpoises. Every third year, each SAC is monitored for a full year with five CPODs at fixed positions. Presence, quantified as porpoise positive minutes per day, month and year are extracted from the data. However, since the SACs may be used differently and have different significance to the animals, we have here explored the importance of the different SACs in relation to foraging to evaluate whether some SACs are more important feeding grounds than others. We analyzed one year of data from each SAC in CPOD.exe using the KERNO classifier to find click trains. Click trains of high and moderate quality in the NBHF category was exported as Click Details. From these Inter-Click-Intervals (ICIs) were calculated by extracting the time of consecutive clicks. A buzz ICI was defined as ICIs below 15 ms from a click train. Regular ICIs were defined as between 15 and 100 ms. Inter click train intervals (ICTI) was defined as longer than 100 ms. Many hours of data with buzzes from different stations were verified visually in CPOD.exe with no false positive buzzes detected. Proportion of buzzes to regular ICIs was then calculated per hour. Analysis for diel patterns of buzzes were done by dividing the day into four phases based on the vertical angle of the sun. Data showed that there were differences between diel phases and that some SACs were more important feeding areas than others judged by a higher proportion of buzzes. This study demonstrates that it is possible to automatically find feeding buzzes in CPOD data.

Wednesday 3 May 2017
12.05-12.10

Echolocation responses of harbour porpoises (*Phocoena phocoena*) tracking a moving target

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Toothed-whales, such as the harbour porpoise (*Phocoena phocoena*), rely on echolocation to capture fast moving, agile prey. During capture attempts toothed whales produce fast click sequences, termed buzzes, that can measure the relative prey position up to 500 times per second but we know little about how they process this barrage of information nor how they respond to changes in the speed and behaviour of targeted prey. While tag data from wild animals suggest that buzzes are highly flexible with clicking rates adapting rapidly to prey movements, it is difficult to disentangle factors that influence responses in these complex data. To address this, target interception experiments were conducted with two trained harbour porpoises at Fjord & Baelt, Kerteminde, Denmark. The animals were equipped with wideband sound and movement recording tags (DTAGs) and trained to track and touch a hydrophone-equipped target (a SoundTrap) within a semi-natural enclosure. By using a computer-controlled stepper motor, the target was moved at different speeds and over different distances, in order to mimic an escaping prey item and therefore induce a vocal-motor response in the porpoise biosonar akin to that seen during predator-prey interactions in the wild. Acoustic data retrieved from Dtags and the SoundTrap were then used to visualize and quantify vocal-motor responses among >450 trials in 13 different conditions (speed of target movement, distance of target movement, distance of porpoise from target at start of movement). Using these variables we show that during target approach, variability in the inter-click interval (ICI) is greater during trials when the target is moved compared to when stationary, suggesting that these animals adjust their clicking rate more frequently to account for the unpredictability of the target location. These findings provide us with a greater understanding of how these animals so successfully capture their fast moving prey.

ABSTRACTS – POSTERS

Harbour seal Photo: Anders Galatius©

MN01

20 years of bottlenose dolphin (*Tursiops truncatus*) photo-identification along French Provencal coast, Mediterranean Sea

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Bottlenose dolphin (*Tursiops truncatus*) is the only coastal cetacean inhabiting Provencal waters. Since 1997, the GECEM association is witnessing the presence of these mammals, investigating, among other things, their distribution, movements, life-history traits, and developing a photo-identification catalogue. Up to date, 134 groups were photo-identified either by GECEM (44%), sea users (32%) or partners (24%), representing a total of 827 different individuals catalogued. Among them, 647 individuals (78%) were captured only once, 181 twice, and 37 were captured at least 5 times (up to 37 times for one individual). Animals were distributed along the entire coast and were sighted year round. Individuals captured at least twice were mostly sighted around Hyères (30%) and Marseille (20%) archipelagos. Recaptures were mostly located westward of Marseille in autumn and winter (24%) (14% in spring and summer) and eastward of Marseille in spring and summer (44%) (17% in autumn and winter). At least five individuals have been sighted along Provencal coast and in Corsican waters, confirming long distance movements. An association index was calculated between individuals captured at least 3 times and seen at least once together. This concerns 75 individuals and 797 pairs. 115 pairs (14%) were seen at least 4 times together. Two pairs were seen up to 10 times together (one mother/calf and a pair of males). Mean association index was 0.213 (SD=0.114). 92% of pairs showed an association index lower than 0.5 and 57 pairs were seen together more than half of the time. One individual identified for the first time in April 2005 was recaptured in December 2016, which is the lengthiest individual monitoring in our Provencal dataset. Such data collected over long time periods provide important information on animal distribution, movement and habitat use and are crucial to inform conservation and management plans.

ABU01:

A methodology for assessing marine mammal vulnerability to climate change

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Climate change is expected to have significant implications for conservation of protected species, which are already at high risk due to a variety of stressors. NOAA Fisheries is developing and implementing a methodology for assessing the vulnerability of marine mammal species to changes in climate. The results from this methodology will provide decision-makers with information on which species may be most vulnerable and why. The methodology provides a rapid but generalized approach that uses empirical data and expert elicitation to assess exposure, sensitivity, and capacity to adapt to climate change. By combining exposure and sensitivity/adaptive capacity scores the methodology produces relative vulnerability scores for each stock, provides information on what attributes contribute most significantly to the stock vulnerability, and identifies key information gaps. By jointly evaluating current life history traits, current distributions, and projections of future climate, the methodology produces a forward-looking assessment of potential response in abundance, distribution, and phenology. These coarse, qualitative projections of trends in abundance, distribution, and phenology can assist managers in planning future recovery or management actions and identify research priorities. In November and December 2016, we piloted the methodology with 16 stocks that included mysticetes, odontocetes, and pinnipeds in the northeast United States. Here we present the marine mammal life history attributes used to assess climate sensitivity and adaptive capacity and the climate factors used to assess exposure to climate change. We describe the recently completed efforts to test the methodology, outline the plans for implementing the methodology at a regional scale, and offer a preliminary view of the outputs that will be provided to managers to incorporate into decision-making.

NT01

A novel modular tag for marine mammals

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There are always limits imposed on research projects associated with deploying sensors and/or instruments into the ocean. Marine mammal tags are typically limited by attachment duration, power availability, data storage, sensor versatility, and recovery system reliability, although the main limiting parameter for non-invasive tags is the nature of the attachment. Deployment periods are typically limited to 12 to 24 hours of continuous data recording. We designed a new non-invasive marine mammal tag that emphasizes improved attachment, endurance, tracking, and recovery. To improve attachment duration the modular tag incorporates several design features such as low profile, suction cups with shaft springs, and silicone elastomer underbody. In addition the new tag is equipped with a new GPS/VHF tracking system, allowing for precision tracking of tagged animals. Currently the prototype tag contains a sensor package designed for large whales, which includes acoustics (two hydrophones), conductivity, temperature, pressure, accelerometer, and magnetometer. The prototype tag will be tested on baleen whales in late spring 2017. The final version of the tag will have a customizable chassis/body frame that can accommodate additional sensors, including video, as needed for different projects.

PHY01

A transcriptome analysis of the mechanism of hypoxia tolerance in the whale brain

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Low oxygen conditions (hypoxia) have immediate effects on the oxidative metabolism of mammals and thus on brain function. While in most mammals, hypoxia causes severe brain damage, whales and seals must have developed strategies of hypoxia tolerance that allows them to dive for up to 2 h without surfacing. Physiological adaptations in diving mammals have been examined extensively but little is known about the molecular mechanisms underlying the hypoxia tolerance of the diving brain. Recent studies have suggested a unique shift in the oxidative energy metabolism from neurons to astrocytes in deep-diving phocid seals which would explain an enhanced hypoxia tolerance. Such shift has not been observed for Cetaceans. In the brain of the minke whale (*Balaenoptera acutorostrata*) and the harbor porpoise (*Phocoena phocoena*), enzymes of the oxidative metabolism reside mainly in neurons as in terrestrial mammals. For a better understanding of the molecular adaptations in the cetacean brain, we compared Illumina-generated transcriptomes of the deep-diving pilot whale (*Globicephala melas*) and the killer whale (*Orcinus orca*) with a terrestrial relative, the cattle (*Bos taurus*). We analyzed the abundances of transcripts in the visual cortex and the cerebellum as well as mRNA expression levels of enzymes of the energy metabolism and typical stress-related genes. Our data suggest a divergent evolutionary strategy in whales and seals to sustain the demands for metabolic energy during cerebral hypoxia.

ABU02

Abundance of bottlenose dolphins (*Tursiops truncatus*) in the Gulf of Cadiz (Spain)

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The bottlenose dolphin (*Tursiops truncatus*) is a top predator whose status can indicate the state of its ecosystem. This species is classified as vulnerable by the Spanish catalogue of endangered species and therefore parameters such as its abundance must be monitored. An ecological management unit has been identified in the coastal waters of the Gulf of Cadiz (south-western Spain). Monitoring of this unit was carried out between February and October 2012 through photo-identification. A total of 230 different individual bottlenose dolphins were identified during the study period organised in 14 sessions. Abundance was estimated by a closed model using Capture in the program MARK (version 6.1). This model assumes that the population remains closed during the study period i.e. no migration, births or deaths occur. The selected model, Chao Mth, resulted in an estimate for the marked population of 365 individuals (CV=0.08, 95%, CI: 319-436). The total population abundance was then estimated using a correction factor based on the proportion of unmarked individuals (0.085). This abundance is estimated to have been 399 individuals (CV=0.18, 95%, CI:264-546). Compared to values of 347 individuals (CV=0.17, 95%, CI: 264-503) in 2005-06 and 397 (CV=0.16, 95%, CI: 300-562) in 2009-10, this estimate shows that the abundance of this species has remained fairly constant in this area over the last decade.

ACO01

Acoustic detections of minke whales in the Moray Firth, Northeast Scotland

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Minke whales produce a variety of seasonally variable sounds across their range. In the western North Atlantic low-frequency pulse trains in the range of 50 - 400 Hz have been attributed to this species. In contrast, only a few recordings of minke whale pulse trains exist from the eastern North Atlantic and North Sea. Minke whales are regularly observed feeding in Scottish coastal waters during summer, and thus the general absence of acoustic recordings of this species from around the UK might be either due to differences in the acoustic behaviour of minke whales in this part of the Atlantic, a lack of recording acoustic effort in this region or both. This study analysed 144 days of acoustic recordings from one location in the Moray Firth, Scotland, collected from August to October 2013 and June to September 2014. Recordings were duty cycled (10 minutes on every 30 minutes) and an automated pulse train detector was used to detect minke whale vocalizations. Minke whale pulse trains were detected on 15 days in 2013 and 2 days in 2014. Most days with detections were in September and October, with 6 and 9 days, respectively. In July and August minke whale pulse trains were detected on 1 day each. Most detections were made during the night. This study highlights the utility of acoustic monitoring to study the presence of minke whales in UK waters. The absence of pulse trains during summer when minke whales are visually observed feeding in the Moray Firth suggests that they may vocalize less while feeding, switch their vocal behaviour at this time of year or that variations in signal structure influenced detection results. Future work will extend this analysis to incorporate recordings made at nine additional sites across the Scottish east coast from 2013 to 2016.

PHY02

Adaptations of the brain to hypoxia induced by diving in marine mammals

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One of the greatest challenges of diving mammals is the cessation of breathing and with it of oxygen supply during dives. The brain is one of the tissues most vulnerable to a lack of oxygen (hypoxia) and yet, whales and some seals exhibit remarkable diving durations without suffering from neuronal damage. Little is known about the protective mechanisms in the brain of diving mammals. We aim to understand the molecular adaptations of the brain to hypoxia. We built upon previous work by our group that identified candidate genes by comparative expression analysis in the visual cortex of the hooded seal and a non-diving carnivore, the ferret. We determined whether a series of candidate genes with known roles in response to oxidative stress show signs of positive selection in the hooded seal and other deep diving mammals. Further, we identified the cellular localization of proteins expressed by our candidate genes using immunofluorescence in the hooded seal compared with the ferret and mouse. We found that clusterin and S100B show markable expression rates in the hooded seal brain. Moreover, high S100B expression was found in brains of other diving mammals. Both genes are known to have roles in the response of the brain to oxidative stress. However, they show no signs of positive selection in deep diving mammals. Our results suggest a possible neuroprotective role of both genes that might be brought about by a change in expression levels but not by functional changes in the amino-acid sequences. We will present ongoing work to identify whether clusterin and S100B are expressed in different cell types in the hooded seal cortex compared to terrestrial mammals to elucidate their potential roles in the ‘brainy response’ to hypoxia.

CO01

An ACCOBAMS certification for highly qualified marine mammals observers

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Based on the outputs issued from the ACCOBAMS Workshop "Developing Tools to Ensure High Quality MMOs in the ACCOBAMS Area", held during the 30th ECS Conference in 2016, ACCOBAMS Parties expressed, during their Sixth Meeting in November 2016, the importance of providing a standardized training programme for Marine Mammals Observers (MMOs) operating during human activities generating noise. The Resolution 6.18 "Implementation of an ACCOBAMS Certification for Highly Qualified Marine Mammals Observers" was adopted in order to guarantee throughout the Agreement area a high quality standardized training of MMOs/PAM. It will: ensure the recognition of the ACCOBAMS Highly Qualified MMOs/PAM operators at the international level, improve the effectiveness of conservation measures to limit the impact of noise on cetaceans. Relevant trainer organizations will be accredited by the Permanent Secretariat based on requirements set up by the ACCOBAMS MMO WG. An "ACCOBAMS School", composed by relevant experts identified by the ACCOBAMS MMO WG, will provide them with standard supports. The accredited trainer organizations will then train and certificate relevant experts to become "Highly Qualified MMO/PAM operators". The objective is to encourage ACCOBAMS Parties to give, in priority, permits for activities in their national area, to industrial companies employing Highly Qualified MMOs/PAM operators or at least other internationally agreed certifications. Experts of the "ACCOBAMS School", identified by the ACCOBAMS MMO WG, will be invited to propose formal standardized supports for trainings by June 2017. In parallel, there will be early this year a launch for organization to candidate for accreditation. The announcement of the ACCOBAMS MMO/PAM "certification" and the first accreditations for trainer organizations are planned to be delivered during the 31th ECS conference. The first ACCOBAMS Highly Qualified MMOs are planned to be certificated during the Fourth Biennial Conference for South Mediterranean Countries (Oran, October 2017).

HE01

Anisakid nematode species identification in harbour porpoises (*Phocoena phocoena*) from the North Sea, Baltic Sea and North Atlantic via RFLP analysis

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Harbour porpoises (*Phocoena phocoena*) are commonly infected with gastric parasites (*Anisakis* spp.), being transmitted via prey fish and associated with chronic ulcerative gastritis. These can cause anisakiasis in humans, an important foodborne zoonosis in Europe, Japan and North America, elicited by raw or undercooked fish containing infectious L3 larvae, which induce severe gastrointestinal symptoms, eosinophilic granulomas and allergies. Responsible species are *Anisakis simplex sensu stricto*, *Anisakis pegreffii* and *Pseudoterranova decipiens*. Anisakid nematode species are very similar morphologically and genetically, especially larvae. The species diversity in harbour porpoises is largely unknown. Gastric nematodes are frequently identified as *Anisakis simplex* in current literature. This study aims to display the anisakid nematode species diversity in harbour porpoises from the northern hemisphere via RFLP. Anisakid nematode specimens (one per animal) derived from German North Sea, Baltic and Greenlandic harbour porpoises (n=30). DNA was isolated and the entire ITS1-5.8S-ITS2 region amplified via PCR using the primers NC5/NC2 (forward/reverse), producing a 950 bp fragment and digested by the restriction enzyme *Hinf* I at 37°C. This recognises GANTC sites only, cuts between G/A (forward) and A/G (reverse) and therefore produces different-sized fragments. These were separated by electrophoresis using a 2% agarose gel stained with ethidium bromide and visualised by shortwave ultraviolet light illumination. The resulting band patterns clearly differed between different anisakid nematode species, showing distinct species specific band patterns. In RFLP, *Anisakis simplex sensu stricto* displayed two bands (620, 240 bp), whereas *Pseudoterranova decipiens* (from one porpoise) showed two more separated bands (693, 179 bp). *Pseudoterranova* usually infects seals, which share prey fish species with porpoises. These are accidental hosts potentially. This study investigates this finding and if *Anisakis simplex* is the only *Anisakis* sp. in porpoises. The results indicate that *Pseudoterranova* can infect porpoises and demonstrate the RFLP´s value for identifying similar species.

HE02

Antibiotic resistance of the microorganisms isolated from marine mammals as indicator of parentage of the microflora.

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One of the methods of the indication the status of marine mammals is the study of the compositions of microbial associations of the body these animals. Analysis of biological properties of the selected microflora is important indicator of determination of its resistance to different antimicrobial drugs. The study of microbiota of wild marine mammals by data on antibiotic resistance is required not so only how methods destruction this microflora but how analysis the origin. Because discovery antibiotic resistant microorganisms may indicate their anthropogenic origin by water pollution of the oceans by sewage or agricultural runoff. The aim of this work was to study the basic biological properties of microorganisms isolated from free-living and captive species of marine mammals; the determination of the origin of the microflora by the study of its antibiotic resistance. Material for microbiological studies were samples of blow air and swabs from the blowhole of cetaceans (Black sea bottlenose dolphin, Gray whale, Beluga); pinnipeds (sea lions, Walruses) were swabs collected from nasal, oral cavity, anus, conjunctiva. To determine the sensitivity of isolated microorganisms to the antibiotics we have used various medical and veterinary antibacterial drugs. Most of the isolated cultures of microorganisms obtained from animals kept in captivity, showed high degree of resistance to many antibacterial drugs: *Baytril, Ciprofloxacin, Cefepime* etc. In the study of the properties of the microflora of free-living marine mammals we obtained various data. So *Staphylococcus* isolated from Atlantic walruses in 2015 showed high degree of resistance to the drug 4th generation - *Cefepime* and to the drugs 1st and 2nd generation. But microorganisms from Gray whale was sensitive to all investigated antibiotics. In our opinion, the presence of antibiotic-resistant strains in organisms of wild marine mammals may indicate biological pollution of their habitats, and in animals in captivity - from human.

GEN01

Archaeology and ancient genomics of Baltic harp seals

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The three existing breeding populations of harp seals are found in the White Sea, on the Jan Mayen Islands and around Newfoundland. Since today the harp seal is a subarctic pelagic species, which depend on pack ice in order to breed successfully, their presences in the Baltic during the middle Holocene have been much debated. Osteometrical age determinations on archaeological harp seal bones have proven that the Baltic Sea maintained a local breeding population of harp seals during the middle and late Holocene. The middle Holocene is known as a warm period, but a hard cold period about 6200 ca. BC has been suggested as a reason for the initial colonization into the Baltic Sea. So far it is not known from where the harp seals that colonized the Baltic originated from and whether multiple colonization events took place. From the warmer Atlantic to the cooler period of the Subboreal, a significant reduction in the mean body size of the Baltic harp seals has been shown, which is likely to be a sign of genetic isolation from the Atlantic population leading to higher levels of inbreeding. This newly started PhD project utilizes palaeogenomic and archaeological techniques covering an outstanding zooarchaeological record, to investigate the colonization history and geographical origin of the harp seals in the Baltic Sea, and to assess genetic, lifehistory and demographic processes associated with the gradual decline and extinction of harp seals in the Baltic Sea. It still remains unclear whether climate or human overexploitation was the main driver of their extinction, but with the investigations of this project we might provide information on the relative effects of both, which may also be useful for comparison with the situation of modern climate change and human exploitation of marine mammals worldwide.

ECO01

Assessing mortality at the Mediterranean monk seal colony of "Costa de las Focas" reserve (Cabo Blanco peninsula)

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The Mediterranean monk seal (*Monachus monachus*) is the most endangered species of pinniped. The population inhabiting Cabo Blanco suffered a mass mortality event in 1997 that reduced its size in two-thirds. Since then, the colony experienced an incredible recovery thanks to the Action Plan for the Conservation of the species and nowadays, the population, which is considered to be a closed one, is 280. Thanks to its accurate and constant monitoring, we know the deaths and disappearances of animals from birth to first molt, (at two months of age), and from animals over 2 years (subadults and adults) when they have enough natural scars to be identified. Because animals between 2 months and 2 years do not have enough natural marks to be identified, they cannot be monitored and therefore the mortality rate of this period is unknown. To make an approximation to that aforesaid mortality rate, we estimated what would be the ideal Cabo Blanco population. To do so, we added to all the pups born from 2003 to 2012, the estimated subadult and adult population in 2005. Then we subtracted all the deaths and disappearances from the known age categories aforementioned and obtained, as result, the ideal population of 337 animals, if the mortality rate for the 2 months-2 years period was zero. Because the current known population older than 2 years of age is 222, this means that 115 individuals out of the total of 296 that survived to first molt, died before reaching those 2 years of age. This results gives a mortality rate of 38,85% for animals between 2 months and 2 years old that were born in the 10 years studied period (2003 to 2012). This finding makes necessary to create new conservation actions for this age period.

ABU03

Basin wide approach, combined datasets and gap analyses: Options to overcome the lack of sighting data on rare cetacean species

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Low densities, wide ranges and short availability times at the surface are all characteristics of deep-divers like sperm whales and beaked whales. Even when massive sighting effort is deployed, sightings datasets remain limited for such species. Hence, it can be difficult to obtain reliable predictions of their distribution and densities and therefore establish meaningful conservation plans. To overcome this lack of data, visual survey data from various platforms and protocols were combined in order to improve habitat models and the reliability of their predictions. The aim of our study was to determine, from this dataset, where we could geographically extrapolate distributions through habitat models by conducting gap analyses that compared the simple overlay of sampled environmental variables and their combination in the available datasets. We focused on beaked whales (*Ziphius cavirostris*, *Mesoplodon spp* and *Hyperoodon ampullatus*), sperm whales (*Physeter macrocephalus*) and kogia whales (*Kogia breviceps* and *K. sima*). We assembled data collected by 13 organisations from 1998-2015 in the North Atlantic Ocean and the Mediterranean Sea, representing 1,116,600 km of on-effort transects, 633 sightings of beaked whales, 844 sightings of sperm whales and 106 sightings of kogias. Data standardisation and methodological choices were necessary because of inconsistencies in data collection protocols regarding observation heights, sighting distances, and/or other parameters. We conducted gap analyses by computing the values of four covariates, depth, slope, net primary production and sea surface temperature with a monthly and 0.25°x0.25° resolutions, at the location of on-effort transects to determine where the predictions provided by the habitat models would be reliable: i.e., where we could geographically extrapolate while remaining within sampled environmental conditions. Gaps, revealed by overlaying the ranges of sampled environmental variables were smaller than gaps revealed by examining the combination of environmental variables but the latter approach would be more conservative than the former.

HI01

Behavioural responses of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) to tourism on Zanzibar, Tanzania

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Dolphin tourism is a growing industry all over the world. While this may bring economic growth to local communities, it also poses a potential threat to the animals if it is not conducted in a sustainable way. On Zanzibar in Tanzania, the resident Indo-pacific bottlenose dolphins (*Tursiops aduncus*) and Indian Ocean humpback dolphins (*Sousa plumbea*) are exposed to a high intensity of tourist activities in the critical areas they use especially for social interactions. The Department of Fisheries and Marine Resources Zanzibar, have issued ten proposed guidelines for dolphin swimming, but they are not enforced, so the behaviour of vessel operators and tourists are not restricted. This study investigated the tourism's impact on the bottlenose dolphins on Zanzibar. A focal pod sample was used to compare the number of dolphins and their behavioural states and events (tail slap, breach and forced to change behaviour/swimming direction), to the number of boats, tourists (in total and in the water) and their amount of inconsiderate behaviour. The observations were vessel based and completed every 3 min. for a trial period of 30 min. The results suggest that the intensity of tourist activities do affect the number of bottlenose dolphins and their behavioural states and events. The pod size decreased with increasing number of boats. The dolphins' social, foraging and resting behaviour decreased with the increasing intensity of tourists, while time spend on travelling increased dramatically. The boats and the tourists all tended to force the dolphins to change their behaviour considerably.

ACO02

Bioacoustics of harbour seals (*Phoca vitulina*) in central Limfjorden, Denmark

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The harbour seal mating ritual is still not fully understood, partly because the behavior occurs only in water. Mating calls produced by the males during the breeding season has therefore been a focus in understanding the mating behavior. Previous studies on mating calls have shown differences both within and between sample populations. What the driving forces behind these differences are is unknown, but several factors have been suggested. Since there has been a development in recording methods through the years, this can affect the end result when comparing datasets across years. Passive acoustic monitoring (PAM) is a relatively new and promising recording method which can prove useful in recording harbour seal mating calls, and possibly aid in highlighting any differences in mating call between sample locations and annual comparisons. Calls were recorded from Danish harbour seals in the central Limfjorden during the mating period of May to August 2016 were analyzed. Recordings from two locations 5 km apart in Limfjorden were compared to detect possible differences in diel call pattern, call frequency throughout the mating period and in the composition of the call itself. Lastly roar type call data from 2016 was compared to previous recordings from 2010 and 2011 at the same location, to look for year-to-year variation. The results show that there were significant differences in call duration and other vocal components tested for, between the two Limfjorden locations in the 2016 dataset. Further analysis also showed significant differences in the vocal components between the 2016 recordings and the recordings from 2010 and 2011. The results highlight the importance of accounting for a very high variation on both small geographical scale and temporal scale, when comparing recordings across geography and time. This has important implications for the design of passive acoustic monitoring programs for harbor seals.

BE01

Bottlenose dolphins attracted to a designated Organized Aquaculture Development Area in the West Saronic Gulf, Greece

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The cetacean survey team of the NGO Archipelagos – enviroment and development, studied the presence and distribution of common bottlenose dolphins (*Tursiops truncatus*) in the West Saronic Gulf, Greece, through 27 dedicated photo-identification boat surveys from March to November 2016. The core of our study area, Sofiko bay, NE Peloponnese, is a designated "Organised Aquaculture Development Area" with a high concentration of cages in clusters, producing mostly european seabass (*Dicentrarchus labrax*) and gilthead seabream (*Sparus auratus*). Most of our survey efforts were concentrated on the fish farms of Sofiko bay and the offshore waters towards Kyra islet. The best quality photographs of dolphin's fins from 42 sightings of groups of bottlenose dolphins were rated according to distinctiveness and archived in a FinBase (photo-identification database). Overall, 30 individuals of high distinctiveness and 17 of average distinctiveness were identified. The gender of 3 individuals was determined by photographs taken during their aerial behavior. With respect to site fidelity, 14 individuals were re-sighted more than 4 times and 5 of them were sighted in the study area for a time span exceeding 200 days. Sightings involved dolphins in groups of an average group size of 6, foraging and socializing close to fish farms, traveling from one fish farm to another or socializing in the offshore waters. On September 2016, a newborn was sighted and photographed in a group foraging close to a fish farm. Furthermore, 19 individuals were sighted only once, and were thus, most probably sporadic visitors to the area. More surveys with a wider spatio-temporal coverage are needed to assess seasonal distribution, site fidelity, movement patterns and social structure. The first results of this study support the growing evidence of a new type of habitat for bottlenose dolphins in the Mediterranean created by aquaculture through the released nutrients.

HI02

Bringing marine mammal bycatch into International focus.

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The issue of the incidental take of marine mammal in fishing nets and other gear (also known as bycatch) is widely regarded as the most immediate threat to these animals worldwide. It is implicated in the ongoing demise of a number of endangered cetacean species and populations including the highly endangered vaquita, *Phocoena sinus*, Maui dolphin, *Cephalorhynchus hectori maui*, and the Baltic harbour porpoise, *Phocoena phocoena*. Hundreds of thousands of marine mammals die as a result of interactions with fisheries each year and bycatch also raises significant animal welfare concerns, in particular for chronically entangled whales. Despite its widespread pressing nature, global initiatives focusing specifically on cetacean bycatch have been lacking. However, this changed in October 2016 when the International Whaling Commission (IWC) agreed to establish a new work programme on this matter, which in due course will probably consist of a steering committee, expert panel and a coordinator. It will also seek to partner with other ongoing efforts, such as work under the auspices of the Food and Agriculture Organisation and the Convention for the Conservation of Migratory Species and its daughter agreements. One major challenge in the development of this new initiative is deciding where it should focus, given the scale of the issue and the range of fisheries operations and species involved. This may be driven by practical considerations, such as an invitation from an IWC member nation to assist in a particular bycatch issue. Another motivating force might be the new rule under the USA Marine Mammal Protection Act that those exporting fish products to the USA will be held to the same standards as U.S. commercial fishing operations. This presentation will explore the role of marine mammal science in bycatch mitigation, including priority setting and likely forward trajectories for this work.

ACO03

Calls produced by Ecotype C Killer Whales (*Orcinus orca*) off the Eckström Iceshelf, Antarctica

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Killer whales (*Orcinus orca*) are highly social top predators distributed throughout the world´s oceans. They are divided into different ecotypes according to foraging specializations, phenotype and social organization. For Northern Hemisphere killer whale ecotypes, acoustic behaviour has been shown to relate to foraging strategies and social organization. In contrast to the intensively studied Northern Hemisphere ecotypes, distribution patterns, social structures and acoustic behaviour of the Southern Hemisphere killer whale ecotypes are poorly known. One of the Southern Hemisphere ecotypes, the Antarctic Ecotype C killer whale is known to occur in regions with dense pack ice. The limited accessibility of these areas make passive acoustic monitoring (PAM) methods a very effective investigation tool to derive information on ecotype-specific abundance and distribution. During two days in February 2013, it was possible to collect concurrent visual and acoustic information of Ecotype C killer whales off the Antarctic continent. From these events, a call type catalogue was compiled. The 2238 examined calls were subjectively classified into 26 discrete call types. Ten percent of examined calls was re-classified by two additional independent observers to examine robustness of the classification. Mean classification accordance among observers was 68%. Most call types were composed of more than one call part. Sixty-five percent of all call types were monophonic and 35% were biphonic. Almost two-third of all call types started with a short, broadband pulse. The variability within call types was relatively high. The Ecotype C vocal repertoire contained typical acoustic features such as biphonation, high call complexity and generally high variability in frequency modulation. For future studies, the distinct characteristics of some of the call types described here could potentially serve as acoustic markers for PAM-based differentiation of killer whale ecotypes in the Southern Ocean.

HE22

Caries and dental calculus in teeth of the Pacific walrus (*Odobenus rosmarus divergens*)

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Caries and dental calculus is the most common disease of teeth in people, however information on occurring of these diseases in marine mammals is absent. Teeth of the dead and the harvest walruses on the coast of the Chukchi Sea and Bering Sea (Russia) were examined. We have investigated 284 functional teeth (except tusks) from 76 individuals and 115 vestigial teeth from 70 individuals of walruses at age of 5 years old and older. Longitudinal microsections of the middle of teeth in the walruses having symptoms of teeth diseases were made. The age of these animals has been determined by layered structure of tooth. In 22 functional teeth in 13 individuals, symptoms of caries have been noted, it's 7,7% of the examined teeth. The centers of a disease were located generally on the erased surface of tooth, and around a tooth neck, and on root walls. Emergence of caries most earlier has been noted in animals at the age of 6 years, however in general (70%) it animals were at the age of 12 years old and are older. The dental calculus is located around a tooth neck. In all 24 teeth (in 10 individuals) with symptoms of a dental calculus were revealed, it's 8,5% of the examined teeth. The youngest individual having a dental calculus was at the age of 9 years. The most part (60% from individuals) had it at the age of 17 years old and older. Caries and a dental calculus affected all functional teeth, except for the third upper incisor (I3). In vestigial teeth it is also not noted these diseases. Apparently, the dental calculus and caries developed only in the teeth subjected to the greatest stress at a feeding and tended to a traumatizing, and as a result, they become infected.

HI03

Cetacean avoidance to active seismic sources

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Data from 14 seismic surveys (12 in Irish waters and 2 in Mediterranean Sea) have been compiled, in order to assess the impact of noise from seismic surveys on cetaceans (both odontocetes and mysticetes), to determine if the various species encountered react differently. In total 1370 cetacean sightings, collected by Marine Mammal Observers (MMOs), were examined, and the data were validated systematically, where indeterminate sightings, and unidentified species were removed from the dataset. Of the 1370 cetacean sightings, 683 were recorded where cetaceans approached the seismic source and these sightings were classified according to periods of shooting and periods when the airguns were not firing. The closest distance from source was used as an indicator of the spatial avoidance of the active source. Sighting rate were compared for 7 odontocetes and 4 mysticetes species. The dataset revealed that some odontocetes Common dolphins (*Delphinus delphis*) and bottlenose dolphins (*Tursiops truncatus*) approached the active source to within 200m, but the sightings were significantly reduced for both species within the 200m zone when the source was active, in comparison with the numbers of sightings when the source was inactive. Some mysticetes species, fin whales (*Balaenoptera physalus*) blue whales (*Balaenoptera musculus*) and minke (*Balaenoptera acutorostrata*) approached within 500m of the source but a clear increase of distances was observed when the source was active in comparison to when the source was inactive. It is suggested that different species react in a different manner to the active seismic source. Most of the cetacean species showed a spatial avoidance of the active source, while long-finned pilot whales (*Globicephala melas*) showed no clear evidence of avoidance. Though such approaches were found, it does not suggest that these were safe distances from the active source for cetaceans, and should be treated cautiously.

MN03

Citizen science CETUS Program: an efficient tool for monitoring cetacean occurrence and spatial distribution in Macaronesia offshore waters.

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CETUS Project is a partnership between research institutions and the Portuguese Company for Maritime Transports - TRANSINSULAR, that allows, since 2012, an effective cetacean monitoring along the routes between Continental Portugal to Madeira, Azores, Canary and Cape Verde islands. The partnership is lead by CIIMAR and the University of Porto (Portugal), in collaboration with CIMA Research Foundation (Italy) and OCEANLAB (University of Aberdeen, Scotland) and is a sound example of Portuguese Citizen Science Program using cargos ships as platforms of opportunity. In the last five years, about 50 volunteers, from 15 countries, participated in CETUS Program enabling data collection on cetacean occurrence over a big habitat extent, mostly in high-seas, where little or no data exists due to logistic and economic constraints, and over a longer period than in more traditional scientific projects. After a volunteer selection process, CETUS team provides an intensive training with practical components and follows-up volunteers guaranteeing data reliability. CETUS Program is running for about 6 months every year, gathering data aboard 3 cargo ships, 3 different routes and visiting over 10 Ports, with only two main resident researchers in the observation team, showing the Citizen Science far-reaching and power. Data collected is being used by researchers and students to investigate and provide new insights into cetacean distribution and abundance in Macaronesia area, delivering habitat models to map, explore and predict cetacean´s hotspots in the area, addressing international and European conservation priorities and supporting management decisions. Moreover, CETUS has participated in several educational activities, with volunteers involved in the entire process. Activities are reaching out to different sea-users, such as local coastal communities and crews of the cargo ships. They learn more about marine life and how to identify cetacean species, becoming themselves contributour to the data collected providing several cetacean occurrences even during non-monitored trips.

CO02

Citizen science: a valuable contribution to scientific research that can serve the interests of, and deliver benefits to, coastal communities.

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Citizen science is not a new concept; amateur researchers have been shaping knowledge for decades. Recently, however, citizen science projects have become increasingly accessible to the public, popular with funders, relied upon and are making important contributions to scientific research. Here, we consider how although the term citizen science is often used to describe the data contributions made by citizens, it can also describe a sense of responsibility within citizens themselves to drive conservation action, serve the wider community and the marine environment. The shore-based cetacean monitoring WDC Shorewatch Programme is achieving both these aims. Starting at one site in 2005, Shorewatch began to expand in 2010 and currently operates from 23 sites around Scotland. Over that time, trained volunteers have done 42,700 effort-based watches and made 10,400 sightings of cetaceans and pinnipeds across 17 species. These data were rigorously analysed to demonstrate that they can detect trends in the occurrence of a protected population of bottlenose dolphins. The data have also been made available through the NBN Gateway, have been used towards informing Environmental Impact Assessments for local developments, contributed to suggested MPA designations, used for comparison with other research efforts, and have formed the basis for student projects. Along with contributing data, the Shorewatch Programme highlights that there is a great benefit to empowering the local community through citizen science projects and demonstrates the varied support which can be offered to volunteers and the challenges faced. Volunteers have been given the tools to raise and champion concerns about local threats to cetaceans and the environment, taking these issues to the community, local agencies and government levels. Through participation in Shorewatch, these citizen scientists have developed a sense of responsibility to engage in and drive environmental policy and public awareness as informed ambassadors for the marine environment.

ACO04

Click types and distribution of Sowerby's beaked whale (*Mesoplodon bidens*) along the Eastern Canadian continental shelf

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Infrequently sighted in the wild due to their offshore habitat, small size, and elusive nature, little is known about Sowerby's beaked whales (*Mesoplodon bidens*). Given the difficulty of studying Sowerby's whales by other methods, passive acoustic monitoring of their echolocation clicks is key to investigating the distribution and abundance of these cetaceans. Sowerby's clicks are known to have a stereotyped upsweep waveform and frequency (~67kHz), based on a single published encounter with Sowerby's beaked whales. Drawing on recordings from 41 visual encounters with Sowerby's in the North Atlantic over the summers of 2015 and 2016, I characterized the echolocation clicks of Sowerby's where no other cetacean species were seen within 30 minutes, for comparison with this published account. Preliminary results are comparable for three of the four previously described click types, indicate that the majority of clicks are not in the ~67kHz range. Sowerby's whales emit echolocation clicks at several different frequencies, with peaks in centroid frequency around 28kHz, 32kHz and 77kHz. I applied my appreciation of the characteristics of Sowerby's beaked whale clicks to manually validate the results of an automated detector, which is based only on the 67kHz centroid click type. Forty automated detections were manually verified, and this data was then used to identify the presence-absence of Sowerby's from a continuous acoustic transect of the eastern Canadian continental shelf from the US border to southern Labrador in 2015-2016. This study demonstrates that passive acoustic monitoring is a powerful technique, which must be carefully applied due to the risk of false negative rates, but can still be effective for studying cryptic offshore cetaceans like Sowerby's beaked whales. Increasing the accuracy of acoustic detections for Sowerby's is crucial to learning more about their distribution patterns and habitat preferences in the North Atlantic, and is vital to their conservation.

CO03

Collaborating towards the management of mysticeti in the between the Algeciras and Gibraltar

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The waters between the City of Algeciras and Gibraltar host several species of cetaceans and therefore represent a conservation hotspot, along with being a particularly important geopolitical and economic area. Here we analysed Mysticete occurrence data with the aim to inform management and conservation in the Bay area. Using different platforms of opportunity belonging to whale watching companies and Government institutions, twenty-one sightings of four different species of Balaenopteridae were recorded between 2009 and 2010 as well as between 2013 and 2016. During the first two years seven sightings of fin whales, one of humpback whale and one of minke whale were registered, while between 2013 and 2016 ten sightings of fin whales, one of humpback whale and one of sei whale were made. The identification at the species level was done by experienced observers such as marine biologists, environmental guides and environmental officials. Whenever possible, during each sighting, photographs and/or videos were collected to help the classification of the species and to photoidentify the animals. Positional data as well as data on environmental and sea conditions were also recorded. These are the first results of a collaboration between universities, private and public agencies in an attempt to generate a dataset on the presence of cetaceans in the area and to report on their occurrence. This first cooperation also puts the basis for the creation of a larger framework bringing together more actors with the aim of optimizing the collection of data and finally to inform management decisions. Despite the great potential of the collaboration and of the use of platforms of opportunity, to maximise the outcome we suggest the conformation of data collection protocols as well training sessions for operators and official environmental workers along with a better planning of research effort.

NT02

Combining marking and biopsy sampling - successful test of a new flipper tag for phocid seals

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Marking of animals for re-identification purposes is a standard tool in ecology in order to assess home range, migration, population development amongst a broad range of other research questions. It is a straight forward, cheap and relatively little invasive method to use even in long term studies. For phocid seals conventional livestock ear tags have been successfully used for decades. In order to increase the gain of knowledge we assessed a new type of flipper tag which simultaneously takes a skin biopsy sample from the marked animal. The possibilities of using biopsy samples have been continuously increasing over the last years. E.g. information on genetics, infectious diseases, immune status, pollution levels, fatty acids or stable isotopes can be extracted from these samples. The new tags were assessed in light of animal welfare and practicability and successfully tested on 12 harbour seals (*Phoca vitulina*) in rehabilitation.

ACO05

Comparing the performance of C-PODs and SoundTrap/PAMGUARD in detecting the acoustic activity of harbour porpoises (*Phocoena phocoena*)

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The C-POD logger is a widely used instrument for passive acoustic monitoring of harbour porpoises, but the absence of a continuous recording in this device makes it difficult to verify its performance. An alternative but more labor-intensive approach is to use a wideband sound recorder and off-line detection software. Here we compare the performance of the C-POD with that of a HF SoundTrap recorder analysed with PAMGUARD software. Seven deployments were made with C-PODs and SoundTraps in the Danish Great and Little Belts between June and November, 2015. There was a positive but generally poor correlation between PAMGUARD and C-POD detections, with the C-PODs detecting only about 21-94% of the click trains detected by PAMGUARD based on the broadband recordings. The main explanation behind this poor correspondence is likely that PAMGUARD performs classification on single clicks, whereas the C-POD classifies groups of clicks (‘trains’) collectively. Such poor correlation between two common methods can have severe implications for conclusions reached in effect and abundance studies.

ABU04

Daily, seasonal and yearly variation on the inshore presence of striped dolphin (*Stenella coeruleoalba*) in the Alkionides Gulf (Gulf of Corinth, Greece)

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During the period 2014-2016 a land based study was conducted to analyse the daily, seasonal and yearly presence of striped dolphin (*Stenella coeruleoalba*) in the inshore waters of the Alkionides Gulf (Gulf of Corinth, Greece). The presence of striped dolphin in the Alkionides Gulf was known from a previous study (Azzolin et al., 2010). Land-based monitoring was chosen because it allows analyzing sighting frequencies, seasonal variations, spatial distribution along coastal area, for long period, without impacting dolphin behaviour. The area of study presents deep waters and the characteristics of a pelagic habitat close to shore, making it an ideal area for land base monitoring. During the years 2014 and 2015, surveys were conducted only during the summer season, from two different locations: “Milokopi” and “Melangavi Cap”. During the 2016 season, surveys were conducted from spring to winter, and a new monitoring spot was added: “Petrita”. Survey spots are located about 8km from each other and allow monitoring 30km of coastline. An effort of 126 surveys and 270 hours of monitoring was carried out. 70 sightings were realized. The sighting frequency for the whole period is 0,36sights/hour. Daylight hours were divided into 5 classes (from 6 a.m. to 9 p.m.). Sighting frequency results statistically greater for evening hours. 2016 data allowed making a comparison among seasons. Statistical analysis shows that the spring presence of striped dolphin is for time greater (0,84 sights/hour) than during the summer (0,20 sights/hour), while dolphins are not spotted during the fall. A comparison of summer data among years doesn’t show any statistically significant differences in sighting frequency. Future study on the ecology and interaction with boat traffic of striped dolphin in the study area would allow evaluating if seasonal and diurnal presence in the inshore area is linked to prey movements or connected with boat traffic.

ABU05

Decadal-scale cetacean distribution in the North Atlantic

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The North Atlantic during the summer months is a productive feeding ground that aggregates several cetacean species. Species distributions are generally known but knowledge about variation at a large spatio-temporal scale is missing. Here, to investigate species distribution, available data on cetaceans from two series of surveys conducted only in summer since 1987 over the North Atlantic were used: the Norwegian Independent Line Transect Surveys (NILS) and the North Atlantic Sightings Survey (NASS). For analysis, species sightings were grouped as Mysticeti (minke, fin and humpback whales), Deep divers (pilot, northern bottlenose and sperm whales) and Delphinidae (killer whales, short-beaked common, Atlantic white-sided, white-beaked and bottlenose dolphins). The preliminary spatial results of joining these datasets showed that over the whole period studied: minke whales seemed widely distributed and abundant in NILS but more restricted and "coastal" in NASS. Fin whales had the highest occurrence in deep waters by west Svalbard and south-east Greenland. Humpback whales were found in coastal and deep waters in both surveyed areas, sharing common areas with minke and fin whales. Pilot whales and sperm whales were more common and widely distributed in the NASS and NILS, respectively. Northern bottlenose whales were seen mainly around Iceland, the Faroe Islands and Jan Mayen. Bottlenose and short-beaked common dolphins were not reported in NILS, and Atlantic white-sided dolphins were rare. Killer whales and white-beaked dolphins were common in NILS and NASS surveys, although there was little spatial overlap. This work provides a better understanding of how these species are distributed in the area and forms a basis for future modelling of cetacean distribution as function of physical and biological variables to identify the key factors and preferences that have influenced their distribution and habitat use.

ABU06

Decisions about handling grey seal (*Halichoerus grypus*) census data influences the conclusions of population models

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The toolbox of matrix population modelling is useful for exploring the fate of populations, and consequently where to aim conservation or management efforts. However, the raw census data used to create matrix population models (MPMs) are often heterogeneous. For example, it may be obtained from surveys of numerous sites over many years that can then be pooled in a variety of ways, and the distribution and quality of data often varies both spatially temporally. Decisions about how to combine the data may cause differences in the conclusions drawn from the models. We addressed this topic to determine to what extent the amount of seal pup census data and variation in it may influence estimates of population dynamics made from the data. We used data collected on seal pups at three locations in south-west Wales between 1992-2015 and combined these with fixed juvenile and adult survival rates to produce MPMs. Then, by systematically varying the source data used to make the MPMs (i.e. inclusion, or not, of different locations/years), and examining the model outputs we explored the sensitivity of our inferences to how the data are pooled. We find that inferences from the MPMs (e.g. population growth rate etc.) are indeed influenced by decisions about how the data are combined (both site location and number of years). We conclude that managers and researchers should carefully consider the implications that these simple early-stage decisions have on their final results especially when difficult decisions regarding conservation and management must be taken in the future.

H01

Depiction of a humpback whale, *Megaptera novaeangliae Borowski*, 1781 in Eckernförde harbour in 1766

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In recent years several series of humpback whale sightings have documented non-erratic visits to the Baltic Sea based on photographic evidence. Such visits may also have occurred in earlier times, but historic records usually are devoid of high quality depictions. However, there is a 250 years old exceptional record: 17th August 1766 a humpback whale appeared in the harbour of Eckernförde on the Baltic Sea board of Schleswig Holstein and was killed by local fishermen after a seven-hour hunt. According to the municipal protocol, the animal measured 34 feet 7 inches (10,5 meters) in length and at least 21 feet (6,40 meters) in circumference, allowing to estimate its weight at 15 tons and its age class as juvenile. Johan Leihamer (1748-1796), a local artist working as a porcelain painter in Eckernförde was tasked with “a depiction that may perpetually memorialize the big fish captured in our local harbour”. An anticipated life-size portrait of the whale was never created, but twelve miniature copies were commissioned of which two have been preserved till today. Leithammer’s gouage represents both one of the earliest known correct depictions of the exterior looks of humpback whale and provides documentation of an earlier humpback whale visit to the western Baltic Sea.

WW01

Describing the whale watch activity in the northern part of the Pelagos Sanctuary as an insight for mitigation through an EBM approach

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Considering the direct impact of the whale-watching activity on cetacean populations, it is essential to monitor and manage it, especially in the MPA. This work aims to map the human use of the marine environment by whale-watching operators and assess the potential risk of disturbance for cetaceans over time and space. The study analyses data from the 2 main companies operating in the northern part of the MPA, from 2011 to 2016 (336 trips, 581 sightings of striped dolphin, 62 of Cuvier's beaked whale, 124 of fin whale, 92 of sperm whale). Both use 30m-long motor-vessels for one-day trips, leaving from 4 ports. The level of pressure is expressed using Unit Effort (UE) in function of the significant daily on-effort track per vessel over a 1km grid resolution. UE and sighting quantity were then calculated on two grids (5km and 10km). The risk was computed per species as the product of pressure (normalized UE) and species sightings (normalized number of sightings). Results are represented as low risk (0.25-0.5), medium risk (0.5-0.75) and high risk (0.75-1). On the 5km-grid, whale-watching is distributed over about 1450km2 and 50% are into an area of 350km2: 3 cells over the Genoa canyon, 7 cells off Andora and 4 cells off Bordighera. For fin whale, the risk remains low in 7 cells (no cell off Genoa). For sperm whale, the risk is high off Genoa in 1 cell, medium in 2 cells off Andora and low in 3 cells. For Cuvier's beaked whale, the risk is medium-low only off Genoa in 7 cells. Results on 10km grid allow to highlight the overlapping of the risk areas for 3 species. Our results provide essential information for Marine Spatial Planning in an Ecosystem Based Management approach in order to implement measures of mitigation in Pelagos.

ACO06

Diel patterns and effects of recreational boat traffic on the acoustic behaviour of harbour porpoises in the Great Belt

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Harbour Porpoises can actively forage both day and night, due to echolocation. Any diel rhythm in echolocation behaviour of Harbour Porpoises is thus believed to be driven primarily by food preferences and behaviour of the prey. Recreational boat traffic on the other hand has a pronounced diel pattern, being almost exclusively present in the daylight hours. The variation in diel patterns among closely spaced geographical locations and possible influence of boat traffic was studied in two locations within a NATURA2000 area in the Great Belt. The two sites were outside the marinas in Kerteminde and Korsør. Four C-pod stations were deployed in different distances from the marinas and recreational boat traffic monitored by automatic wildlife cameras at the harbour entrances. The C-pods recorded the echolocation clicks from porpoises in the two areas. Data showed a daylight diel pattern of recreational boat traffic, with an increase of boats during weekends and public holidays. Furthermore, the data showed a clear pattern in the diel rhythm of harbour porpoises in the Great Belt, with pronounced differences between stations. Porpoises in the Kerteminde area were nocturnal, mostly active just before sunrise and after sunset, while the porpoises outside Korsør marina in general were more active during daylight hours. However, the stations closest to Korsør marina had indications of nocturnal activity. We propose that these differences in diel pattern are mainly due to prey diel rhythm; however, ships traffic in the marinas might influence the activity of Harbour Porpoises closest to the marinas.

BE04

Diel, tidal and seasonal patterns in the presence of bottlenose dolphins in the Moray Firth (NE Scotland)

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Bottlenose dolphins (*Tursiops truncatus*) have developed highly flexible behaviours in response to the dynamic environments in which they live. Environmental rhythms such as diel, tidal and seasonal cycles dominate many marine ecosystems and, individually, have often been linked to changes in cetacean habitat use. The effects of interactions between these cycles at different temporal scales have been less well studied. We used passive acoustic monitoring to examine the combined effect of three environmental cycles (diel, tidal and seasonal) on the presence of bottlenose dolphins in four discrete areas within the Moray Firth Special Area of Conservation (SAC) in NE Scotland. Our analyses were based on echolocation detections from CPODs that were deployed year-round in each area between 2010 and 2016. Patterns of occurrence in relation to individual cycles were first described using circular statistics (Rayleigh test). Generalised Additive Mixed Models were then used to explore the interactions between cycles and the relative importance of each variable. Site specific responses were found across the SAC, and these patterns were consistent across years. At certain sites, which coincide with areas of most intensive use, a previously unreported seasonal shift in the dolphins' diel behaviour was detected. In summer, dolphin occurrence was diurnal. However, there was a marked shift to nocturnal occurrence during the winter months, which is hypothesised to be a response to an influx of over-wintering clupeids to deeper waters within the SAC. These results show how diel, tidal and seasonal cycles interact causing different responses in each of the four areas. This demonstrates the plastic behaviour of this species, even at a small scale within a single Marine Protected Area, and underlines the need for site-specific knowledge to develop effective management strategies for such an opportunistic species.

BE05

Dispersal and foraging activities of juvenile grey seals in the southern North Sea

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The grey seal population in the German North Sea has been steadily growing during the last decades. So far little is known on the at-sea distribution, behaviour and habitat use of this species in the German North Sea. As a marine top predator the grey seal plays an important role in the marine ecosystem and is confronted with different anthropogenic pressures, such as offshore wind farms. To better understand their ecologic role and to assess possible anthropogenic impacts it is of great importance to increase the knowledge on grey seals in German waters. Eleven wild juvenile grey seals were tagged with GPS/Argos data loggers on the island of Helgoland (the largest grey seal colony in Germany) for the first time in German waters from 2015 to 2017. The devices were glued to the fur on the upper back of the animals and recorded GPS positions for up to ten months. All tagged animals showed individual space use patterns, some conducted long foraging trips for up to several weeks in different offshore areas, some repeatedly used the same areas closer to shore. An area to the northwest of the island of Helgoland was intensively used by different individuals both in 2015 and 2016, hence indicating a potentially important foraging site. Several individuals crossed the newly established wind farms north of Helgoland while travelling to other foraging areas. Some juvenile seals even stayed in the wind farm areas for several hours, in contrast to some others that did not exhibit any spatial overlap with the wind farms. Our data suggest a high degree of individual variability in space use. Currently, there is no indication of an adverse effect of offshore windfarms on the habitat use of juvenile grey seals.

ACO07

Distinctive circadian and seasonal rhythms of harbour porpoise biosonar activity in the northern Little Belt

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The area of the northern Little Belt, between Jutland, the Island of Fænø and Funen has been documented from 13th century to the WW II to be historically relevant for winter harbour porpoise (*Phocoena phocoena* L., 1758) hunts due to higher porpoise abundance from November to February. The area is characterized by narrow belts with shallow coastal areas and steep changes in bathymetry to 81 m depth and strong currents with local changes depending on the wind direction. Passive acoustic monitoring by CPODs deployed at 15 m depth at three different locations, west of Fænø, Strib and outside of Gamborg Fjord showed that harbour porpoises are present throughout the year. A distinctive circadian pattern was recorded with significantly higher echolocation recordings during night time at all three study sites. The proportion of feeding click trains relative to all recorded click trains was also higher at night, indicating that porpoises probably increase their foraging activity at night. During winter, from September to February, when porpoise recordings increased, the circadian rhythms were also most pronounced. We assume the circadian and seasonal patterns in porpoise recordings to be tightly linked to the herring migration through the Little Belt and their vertical migration up in the water column at night. Future systematic sampling trials with a 3-D structure scan (outside the hearing range of the harbour porpoise) of both fish and harbour porpoise will be conducted to reveal more detail about the spatial and temporal associations of predator and prey.

ACO08

Distinguishing between sperm whale individuals using the inter-pulse-interval of their clicks

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Sperm whales have a hypertrophied nasal complex producing clicks both for long range echolocation and communication. Communication clicks are produced in complex patterns called codas. Both click types are multi-pulsed with the inter-pulse-interval (IPI) directly related to the size of the sound producing nose. It has been hypothesized that sexual selection on these IPIs has led to the evolution of large noses in sperm whales. Researchers have also used these IPIs to tell individuals apart in order to test for differences in coda repertoires, to estimate growth rates of individuals, and to passively monitor the abundance within an area. For both listening sperm whales and humans, reliable size estimation via IPIs requires that they are stable for an individual across both clicks types. Therefore, this study aims to evaluate whether the IPI is a sufficiently stable measure to distinguish between individuals based on both 57 far field recordings and 14 animal-borne DTAG recordings. The performance of three different methods (simple envelope, cepstrum and cross-correlation) were evaluated to estimate the IPI for each click rendering the envelope method the most precise IPIs (smallest inter-quartile-range). Using that method, we find that the IPI for one whale can vary with more than 0.2 ms between recording types as well as within the same recording. Some of this variation can be attributed to change in depth. We suggest that this is also the reason why coda click IPI's are generally longer than echolocation click IPI's, as codas are predominantly produced at shallower depths. We conclude that the IPI can be used to recognize each individual if their IPIs are more than 0.2 ms apart, whereas the observed variation is likely too large to serve as an acoustic vehicle for sexual selection of large noses.

ABU07

Distribution of beaked whales (Ziphiidae) off the west coast of Ireland

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Beaked whales are among the least understood cetaceans in terms of distribution and habitat use. This applies to the west coast of Ireland where proposed oil and gas exploration poses a potential threat to these elusive species. In an effort to document the baseline occurrence of beaked whales along the continental slope off western Ireland, a large-scale acoustic and visual monitoring program was carried out from May to December 2015 on the northwest slopes and from March to November 2016 west and south of Porcupine Bank under the ObSERVE-Acoustic project. Visual sighting data collected during 6 ship-board surveys (3 per year) classified most sightings (n=13) as unidentified beaked whales (n=7). Sightings identified to species level were of Sowerby's beaked whales (n=5; SBW) and Cuvier's beaked whales (n=1; CBW). Bottom-mounted acoustic recorders were deployed at 8 locations (4 per year) ranging in depth from 1620 to 1971 m and recorded at 250 kHz for 2 of every 8 min in year 1 and 1.5 of every 14.5 min in year 2. Automated time-series-based detectors were used to identify the occurrence of beaked whale acoustic signals. A portion of detections were validated by acoustic analysts to determine detector accuracy. Acoustic recordings revealed the presence of northern bottlenose whale (NBW), CBW and SBW. While NBW acoustic signals were rare, CBW and SBW occurred consistently throughout the recording periods. The latter two species were sympatric at stations directly surrounding Porcupine Bank. SBW detections were rare at the southernmost stations while CBW were infrequent at the northernmost stations. The results shed light on the potential significance of the region to beaked whales and provide a baseline against which future changes in species occurrence can be assessed. Findings will contribute to improving mitigation measures for potential oil and gas activities off Ireland.

HI04

Distribution patterns of floating marine debris in German Waters between 2010 and 2012

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Marine debris is a threat to the marine environment, especially for marine biota, such as marine mammals inhabiting German Waters (harbour porpoises, harbour and grey seals). The implementation of the Marine Strategy Framework Directive (MSRL) and thus the achievement of a Good Environmental Status (GES) requires the regulation of several anthropogenic factors, including the input and reduction of marine debris. For evaluating effective measures to condemn marine debris input and thus negative impacts on the ecosystem it is essential to gain knowledge on the distribution of marine debris and its origin. During regularly conducted aerial surveys for harbor porpoise abundance in German waters, information on floating marine debris items has been documented systematically since 2003. We analyzed data of 2 years from aerial surveys conducted between 2010 and 2012 in order to evaluate this data source as a monitoring option. The analysis included a spatial display of the distribution of floating marine debris and an evaluation of the encounter rate (number of objects per kilometer flight route) for every year and each season separately. Floating Marine debris showed distinct geographical and seasonal patterns: the area around the North-Frisian Island of Sylt was one of the areas with highest densities of marine debris. This overlapped with important conservation areas for harbour porpoises, such as the SCI Sylt Outer Reef indicating potential for conflict. Moreover, the evaluation showed an increase of debris sightings over the years. Furthermore, the classification of debris items provided first insights into origins of marine debris and thus an approach to identify perpetrators.

ACO09

Diurnal pattern in harbour porpoise sound production in Arctic Norway

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The acoustic activity of harbour porpoises (*Phocoena phocoena*) was recorded continuously for several months in a high-velocity tidal current near Tromsø, northern Norway with the use of C-PODs. High numbers of fish-eaters, including porpoises, seals, seabirds and humans (it is a popular destination for recreational fishermen), indicate a high fish abundance in the area. We found a negative correlation between the frequency of porpoise click recordings and the hours of daylight. Our results show that porpoise clicks were recorded more frequently during the night even though porpoises were often observed during daytime visual observations. Other studies have reported similar diurnal patterns, either in sound production (through acoustic monitoring devices) or in diving activity (through telemetry devices). However, to our knowledge this is the first project to study diurnal patterns in the occurrence of harbour porpoises north of the Arctic circle. Although diurnal patterns in porpoise sound production have been briefly discussed in literature, there is currently no consensus in the driving force behind these patterns. In this study we thoroughly examine several potential causes and we hypothesize that while orientation and foraging require echolocation during the night, porpoises rely on eyesight during the day. This would result in an increased sound production during the night. We discuss other potential causes including diurnal patterns in the distribution of prey species, diurnal patterns in human activities (e.g. shipping) which are often higher during the day, and general variation in porpoise behaviour during the day versus the night. Our results highlight the importance of understanding the drivers behind such patterns in relation to planning human activity, as the consequences of human activity on the distribution of harbour porpoises may differ throughout the day.

BE06

Diving and foraging behaviour of a key arctic marine mammal: The Atlantic walrus in Smith Sound

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Investigations of diving and foraging behaviour of the Atlantic walrus (*Odobenus rosmarus rosmarus*) in the high Arctic area of Smith Sound, Northwest (NW) Greenland, are important for understanding vital habits of a key Arctic marine mammal and the ecological effects that a top-predator has on an ecosystem in change. Furthermore, information on spatial use, consumption and carrying capacity of walrus in Smith Sound is essential in conservation decisions of this utilized species. From 2010–2013, 27 walruses in Smith Sound were tagged with satellite-linked transmitters providing data on positions and diving. Dive rates, haul-out periods, vertical speeds and depths of dives were estimated. Majority of dives targeted depths <100 m, which is also the main bathymetric distribution of walrus preferred prey. It was estimated that walrus in NW Greenland consume ~28 kg bivalves day-1 and that annual predation on the standing bivalve biomass (within 5–100 m of depth) was 3.2% based on mean biomass of walrus preferred prey. Two female walruses dived to extraordinary depths between 500–600 m; the deepest dives ever documented for a walrus. Diving to such great depths could prove essential was walrus to shift their diet towards higher-trophic level prey as an alternative to benthic prey. Based on daily consumption and annual predation on standing stock and yearly production of bivalves it is suggested that the Atlantic walrus in Smith Sound acts as a bioturbator in the same way as the Pacific walrus in Beringia. As such the walrus probably fulfill an important ecological role in Arctic ecosystem functioning. From a correlation between shallow water habitat, current population size (n=2544) and walrus pre-exploitation population sizes it is proposed that the carrying capacity in the Smith Sound region do not exceed 5000 walruses.

CO04

Do we need to conserve the harbour porpoise (*Phocoena phocoena)* population in the Marmara Sea separately?

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In the Mediterranean basin, the harbour porpoise lives mainly in the Black Sea, and is less common in Turkish Straits System (TSS, consisting of the Marmara Sea, Istanbul and Çanakkale Straits) and Aegean Sea. The Black Sea population is recognized as the subspecies *Phocoena phocoena relicta* distinct from the Atlantic subspecies both morphologically and genetically. It has been listed as endangered in the IUCN Red List since 2008. In previous studies, 186 individuals from the Black Sea, TSS and the Aegean Sea were analyzed in total based on mitochondrial DNA (mtDNA) control region sequence variation, and 24 haplotypes were found. In the present study, mtDNA sequences of 74 samples of the harbour porpoise collected between 1999 and 2016 in the Turkish Black Sea coast (44 western, 13 eastern), Istanbul (4), Çanakkale (1) Straits, Marmara Sea (10), and Aegean Sea (2) exhibited ten haplotypes, two of which were new. One of the new haplotypes were detected in TSS, while the other one was found in the western Black Sea coast. A unique haplotype, which was predominantly found in the Marmara Sea in previous studies, was also detected in four more individuals from the same sea, and just one individual from western Black Sea coast. Moreover, TSS population was found genetically differentiated from other populations in the Black Sea based on haplotype frequencies. These findings strengthened the possibility of a harbour porpoise subpopulation in the Marmara Sea, which is under heavy anthropogenic stress due to bycatch, intense shipping traffic, overfishing, and pollution. Although there is no estimate for the abundance of the harbour porpoises in the TSS, it may require a unique conservation plan considering the above mentioned threats. More samples will be sequenced with the same mtDNA marker, as well as with RAD-sequencing in the context of an ongoing project, CetaGen.

ACO10

Echolocation behaviour of East Greenland narwhals

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The narwhal (*Monodon monoceros*) is a high Arctic species inhabiting one of the most remote areas on Earth – an area that is also experiencing radical changes due to climate change and an associated increase in anthropogenic activities. The key for assessing the consequences of these changes for the species is to understand their natural behaviour first. In order to do that, narwhals (n = 5) were instrumented with satellite-linked transmitters and acoustic recorders (Acousonde) in Scoresby Sound in East Greenland in 2013-2016. The animals were caught in nets and released after instrumentation. All the instrumented individuals were females, one being accompanied by a calf. The female and calf were visually monitored after release and the pair reunited immediately. The instruments collected detailed information on the movements, diving behaviour (depth and movement in 3D) and acoustic behaviour of the individuals. Recording was continuous and deployment durations ranged from 10 hours to 8 days. The acoustic data were analysed for echolocation events i.e. clicking and buzzing. An automated detector provided the time of occurrence of buzzes (n = 7190), which are typical toothed whale vocal signals characterised by a short inter click interval (ICI) and used in the final phase of prey capture. After an initial silent period possibly due to tagging, the narwhals spent 20 % - 30 % of their time echolocating. The buzzes were more numerous between 7 pm and 4 am. Relative to the percentage of time spent at different depths, the narwhals buzzed proportionately more at depths between 300 m and 600 m. They dive down to these depths presumably to forage on Cephalopods that have also been found in the stomach contents of individuals harvested in the area. However, the relatively small quantities of prey in the stomach contents do not support the notion of Scoresby Sound being a primary foraging area for the narwhals leaving the question of the role of this habitat open for more research.

During the review process this abstract was flagged by one or more reviewers due to ethical concerns. This is the response of the authors to these concerns:

The handling and instrumentation are carried out under the permit from Greenland Ministry of Fisheries, Hunting and Agriculture. The handling and deployment procedure was reviewed and approved by the Animal Welfare Committee, Faculty of Health Sciences, University of Copenhagen in accordance with the current IACUC guidelines. Satellite transmitters were attached with two nylon pins through the dorsal ridge of the animal. The Acousonde was attached with suction cups and a thin nylon tether pierced through the dorsal ridge. In the case of capturing the female with the calf, the handling time was 56 minutes. During all this time the calf was visually monitored and seen surfacing close to the mother. The mother and calf were in acoustic contact (heard through the surface of the water and later in the recording). After release, the female and the calf were immediately united. The pair was visually monitored for 45 minutes during which they were seen surfacing next to each other and swimming in cohesion. We are certain that this cow calf pair was the only one in our dataset. We are confident in that the flat, calm and relatively shallow water at the capturing site will allow for detection of a calf.

ANA01

Ecomorphology of axial skeleton in Odontocetes

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Ecomorphology concerns the study of the relationships between functional design and the environmental constraints acting on organisms. It aims to understand how the morphological variations among species can be related to environmental factors and impact fitness. Having a large diversity both in their morphology and ecology, the cetacean taxa appears to be the ideal taxa to tackle the relationships between the locomotor system and way of life. Different studies have already showed that the number and shape of vertebrae in different cetaceans can reflect the stiffness of the body and consequently can impact their swimming mode. The aim of this study is to establish relationships between characteristics of the vertebral column of different cetaceans and their ecology. Meristic and morphometric data were collected on the vertebrae (centrum lengths, heights and widths, neural spine heights and transverse processes lengths) of species of odontocetes housed in different Natural History Museums in the world (AM-ULg, RBINS, MNHN, SMNS, NRM, Queensland, PEM, Iziko). Preliminary results show clear morphological variations between species at the level of the number and sizes of vertebrae. There is a clear relationship between body size and number of vertebrae except in Delphinidae. This family has an important higher vertebral count. These differences should be related to different swimming modes and reflect the different ecological behaviours of the studied cetaceans.

CO05

Ecosystem Based Management and Marine Spatial Planning in the Gyaros Marine Protected Area to conserve the Mediterranean monk seal, *Monachus monachus*, through a participatory process: from theory to practice

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The recent case study of the new Gyaros Marine Protected Area (MPA) in the Cyclades, Greece that aims to conserve one of the largest monk seal (*Monachus monachus*) populations in the Mediterranean will be presented. In the context of designing the Gyaros MPA, an Ecosystem Based Management Plan and a Marine Spatial Plan were formulated based on all available data for the wider region in relation to the area's marine and terrestrial biodiversity (including the Mediterranean monk seal, the important marine habitats, the local fisheries, the avifauna, the terrestrial fauna and flora), as well as in relation to human activities and socio-economic trends. The results of these studies and the management proposals developed will be presented. These studies were utilized as baseline in the actual design of the Gyaros MPA's conservation measures, through a highly participatory process engaging the local key stakeholders. The resulting proposed conservation measures that include fisheries and tourism related measures (i.e. no take zone, fisheries regulations, recreational regulations, etc.) which will be agreed by the main stakeholders involved, will be then formally adopted by the national competent authorities, and thus will form the actual zoning and management plan of the new MPA. Key lessons learned during this consultative process and the key tools utilized to establish the first co-management governance scheme for a MPA in the country will be presented.

CO06

Educational programs for the conservation of marine mammal species in Russia

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At the present time the urgent question of the conservations of marine mammals. To raise this issue is necessary from childhood. Therefore, our school has class named "Zoo doktor", where are students do biology study. We have a lot of lessons dedicated to the protection of animals, including the conservation of marine mammals. We organize thematic sessions on the topic of the biology of marine fauna and conservation of the habitat these animals. For this purpose we invite experts and scientist who study marine mammals. In Russia there are many species of cetaceans, pinnipeds and Polar bear. But most especially interesting to children is study seals of closed water (Ladoga lake and Kaspian sea) the Ladoga ringed seal and the Caspian seal. With the pupils we do the research work. And in the process of studying various aspects of biology and ecology of these animals, the children make their own suggestions and ideas for the conservation of marine mammals. For example, in connection with global warming, Ice forms on the lake later, than usual, and it prevents normal reproduction of the Ladoga ringed seals. Children offer to build a special pontoon on the water, like ice, on it will lay the snow, where a seal will be able to give birth the pups. This idea can be implemented. Thus, it will can to help the conservation of the population of the Ladoga seal. In our presentation will show the methods of preservation of marine mammals proposed by our students. Educational technology in working at the biological class help educate not only future scientists, but also help shape a humane society.

HI05

Effects of boats on surfacing patterns of bottlenose dolphins (*Tursiops truncatus*) in Northeastern Adriatic Sea (Croatia): analysis of group behaviour

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Since 1990, a resident population of bottlenose dolphin (*Tursiops truncatus*), in the Kvarnerić area (Croatia), has been consistently monitored. This area is subjected to strong human pressure, mainly represented by intense leisure boat traffic during summer months. This study aimed to characterize the group behaviour of Kvarnerić bottlenose dolphins and investigate possible effects of boat presence on dolphins' surfacing patterns. Data collection was performed since January 2013 to August 2015. During each sighting, data on group size and composition, boat presence and their distance from the group, Inter-Breath Intervals (IBIs) surfacing pattern, behaviour and environmental conditions (sea state and visibility) were recorded along with the GPS position. A total of 302 hours, including 28807 Inter-breath intervals (IBIs), were recorded applying continuous sampling procedure. This allowed comparison of dolphins' surfacing pattern in the conditions of different occurrence of boats. The results of this study indicated that boat traffic in Kvarnerić area affects the overall behavioural budget of dolphins. The changes in behaviour were reflected in differences of IBIs distribution. Boat presence causes a decrease of social activities, involving application of tactics of horizontal avoidance of boats and longer dive intervals. The study results are consistent with the findings of studies on bottlenose dolphins in other sites and changes in surfacing patterns seemed to be related to a combination of factors. However, further research is necessary in order to prevent possible long-term cumulative effects on dolphins. Based on the results of this study, implementations of code of conduct for leisure boats are strongly recommend, in order to reduce their impact on this resident dolphin population.

BE07

Effects of dispersal on survival rates of Mediterranean monk seal in fragmanted habitats

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Although its status downgraded to endangered recently, Mediterranean monk seal (*Monachus monachus)* in the Northeastern Mediterranean is still exposed to several threats and do not show any sign of recovery. This is mainly due to loss of critical habitats as a consequence of industrial developments and tourism on the coast. Today, the colony in the Eastern Mediterranean is alarmingly fragmented. On the other hand being one of the very last strongholds, the colony has vital importance for the survival of the species. Results of the recent surveys, however are not very optimistic about the fate of the species. Some important breeding caves, which are regularly used for whelping, are no longer visited. The breeding habitat regressed to small areas under protection and fecundity declines consequently. In this study we focused on dispersal and tested to what extent dispersal helps colony to survive. A various viability scenarios fed with field observations were tested with VORTEX Software. In the first scenario source population assumed to be dispersed to 4 documented populations with different dispersal patterns. In the second scenario each population is assumed to be isolated than the others. Results showed that when dispersal was allowed, existence of small populations relies largely on the existence of the source population. Occurrence of such small populations has positive effect to probability of survival of the metapopulation as expected. On the other hand even with the most optimistic model parameters isolated population failed to survive. The results showed that connectivity between protected sites and particularly stepping stones connecting populations are of great importance for the survival of the species.

BE08

Effects of environmental enrichment on common seals (*Phoca vitulina)*

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Stereotypic behaviour is relatively common in facilities that house animals, as these are more predictable, sterile and lacking in complexity. Stereotypic behaviour can cause stress and central nervous system dysfunctions, resulting in body mass loss and therefor in a longer rehabilitation time and an extended period away from the wild environment. A commonly used attribute to improve animal environments and enhance its behavioural biology is environmental enrichment. The main focus of this study is to find what effect a felt forest enrichment has on the active behaviour of common seals. The study was carried out in an enclosure in the Sealcentre Pieterburen. The study consisted of two age classes, juveniles and pups, which were divided in two enriched and two control groups. At the end of the study a total of 30 seals were observed, 10 juveniles and 20 pups. The enrichment was placed for six hours a day, in different periods for six days, to avoid habituation to the enrichment. The data collection was a total of 405 hours. BORIS software was used to analyse the data, this showed that all control groups combined were more active than the enriched groups, although it did not show any statistical significant difference ($P = 0.134$). The enriched groups of the juveniles showed a higher percentage of active behaviour compared to the juvenile control groups, although this difference was not statistically significant ($P = 0.331$). The control groups of the pups showed a higher percentage of active behaviour when compared to the enriched groups. The enriched pups compared to the enriched juveniles do show a higher percentage, although this is not statistically significant ($P = 0.089$). This difference in active behaviour could be explained due to juvenile seals seeming scared of the environmental enrichment for the first two to three days.

MO01

Effects of noise on the North Sea harbour porpoise population

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The harbour porpoise (*Phocoena phocoena*) is strictly protected in the European Union, which implies that marine developments cannot be permitted if they have negative impacts on the population. In this study, we demonstrate how such negative population effects due to noise from offshore wind farm construction can be simulated using an individual-based model (IBM). In the model, population dynamics emerge from competition for food between autonomous individuals. The fine-scale movements of animals were derived from and correspond to those of real animals. When model animals are deterred by pile driving noise, it results in realistic changes in density around the construction site. Deterrence also reduces the individual animals' foraging efficiency and energy stores, which in turn increases their risk of death. Population dynamics are therefore linked to some of the mechanisms that are most likely to influence the behaviour and fitness of individual porpoises in nature, namely food intake and disturbance behaviour. Our results show that the population effects of noise from wind farm construction were ephemeral when building a number of virtual wind farms corresponding to the number currently planned for the North Sea. The model was sensitive to the threshold above which individual porpoises react to noise, suggesting that this parameter is a top priority for future field studies. The framework we present here is being developed as part of the DEPONS project. It is one of the first frameworks that can be used for marine spatial planning aimed at protecting a species at the population level.

BE09

Energetic consequences and implications for food consumption models when feeding on various sizes of cod in harp seals (*Phoca groenlandica*)

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The current population-based food consumption models assume that harp seals are swallowing fish whole. However, behaviours such as belly-biting and rejection of fishes' heads has been observed, possibly biasing diet analysis based on hard parts, and consequently underestimating the total food consumption. The purpose of this study was to examine whether individual fish are being consumed in their entirety or if behaviours such as belly-biting and rejection of fish heads is occurring under certain circumstances. Two female harp seals, maintained in human care, were fed live cod and saithe ranging from 90 g – 2710 g and 20 cm – 70 cm (permit n. 6093). The caloric energy content of the discarded piece(s) was quantified, estimating the energy loss by the seals when they consume different sizes of prey. Fish that were too large to swallow were consequently torn into pieces before ingested. The adult harp seal was unable/did not choose to swallow whole those fish weighing above 750 g, whereas the juvenile showed the same trend at 380 g. Fish parts frequently rejected included the head, the head with parts of the back attached, and all but the abdomen. 81 % and 100 % of the remains left by the adult and juvenile respectively, contained otoliths. 1 % to 40 % of the caloric content in the fish was lost depending on the fish body mass, i.e. a larger body mass yielded a larger caloric loss. The findings from this study indicate that harp seals may seek out the most energy-rich parts of a fish, subsequently leaving "lower-energy" remains behind, and that this "loss" of energy increases with the mass of its prey. As such, reassessment of the current estimations of food consumption may be valuable in terms of applying a suitable correction factor to account for this energy loss.

MN04

EO4wildlife: a platform for marine wildlife monitoring integrating big Earth observation data

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Decision-making in today's contentious world requires high quality data and tools that are trusted by a wide range of stakeholders. New and evolving technologies provide managers with the potential to bring such data and decision tools into Marine Protected Area (MPA) discussions, hopefully reducing the cycle of disagreement and stalemate that characterize many forums. The easy-to-use EO4wildlife platform will allow querying, searching, mining and extracting information from different databanks (i.e. owner database, archive database and online database). Scientists or MPAs managers will be able to fusion and cross correlate heterogeneous data via advanced data analytics tools in order to discover patterns, validate or invalidate hypothesis, detect potential similar or reproducible behaviour or favourable conditions associated to the movement of animals or any kind of geo localized data (i.e. transects surveys). This platform will facilitate obtaining, visualizing and sharing extracted Earth Observation data that will be used to better understand the environmental factors that may influence the distribution and habitat preferences of tracked/surveyed species in order to better identify/predict important marine mammals areas (IMMAs). The big innovation is that the processing of the Earth Ocean big data will run in a cloud outside personal computers, meaning users will access the visualization of their data and the result of their model in 'a-click'. This will facilitate data exchange and communication between scientists, MPAs managers and stakeholders.

CO07

Establishment of the new Marine Protected Areas in the Black Sea

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One of the first experience using the Maritime Spatial Planning (MSP) for conservation on the National level in Ukraine was preparation of the proposal to establish MPA in Ukrainian North-Western part of the Black Sea - Zernov's Phyllophora Field. Based on the spatial data collected by UkrSCES were defined the boundaries of the future MPA, approved by the Ministry of Environment and Natural Resources of Ukraine and established by the Presidential decree signed in the end of 2008. UkrSCES was appointed as the managing authority of the Zernov's Phyllophora Field. The second activity on the conservation using MSP was concentrated on gaining experience with the establishment of MPA in the Black Sea within the Project Environmental Collaboration for the Black Sea. The selected Pilot area was the Small Phyllophora Field in Karkinitsky Bay of the Black Sea. Within this Project, UkrSCES prepared many spatial datasets – navigational charts, Ecological sensitivity maps of the area, monitoring data maps, etc. It was also performed researche to define the future monitoring stations network within the Project. After the successful completion the marine survey in 2009 UkrSCES GIS team carried out spatial analysis of the newly received monitoring data, created the different distribution maps of Phyllophora and other species within the study area. As the results of the Project the boundaries for the new MPA – Small Phyllophora Field in Karkinitskyi Bay were proposed in the Draft Policy Document on the establishment of marine reserves in the Black Sea. After completion of the Project and using its results in the 2012 was established the Botanical Reserve Small Phyllophora Field.

CO08

EU-project: Marine mammals - using marine mammals for making science education and science careers attractive for young people

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The decline of young people's participation and interest in science, technology, engineering and mathematics (STEM) is of international concern. To increase young people's interest in natural science and in order to prevent shortage of specialists in the STEM area, nine scientific educational and research institutes and NGO's from Germany, Poland, Sweden, Belgium and Denmark joined forces for the project "Marine Mammals" in September 2016, as part of Horizon 2020 funded actions. One focus of this project is to provide learning materials for school teachers and students. The material is developed by an international team of experts consisting of marine scientists, educational researchers and teachers. The materials will be based on current research questions and will introduce scientific topics as well as different research methods to students. Often seen as ambassadors for oceans and at the same time threatened by anthropogenic impacts such as noise and plastic pollution present in the oceans, marine mammals were chosen as key animals for this project. Developed materials will be introduced to teachers in teacher trainings and to secondary school students participating in summer schools in each participating country. Thereby their interest, understanding and enthusiasm for STEM subjects and topics can be increased. All materials will be published on SCIENTIX, ensuring free access. Furthermore, expedition boxes, developed within the project, can be borrowed for independent project work in schools. These expedition boxes will include tools and instructions for hands-on activities. Other planned extracurricular activities such as digital posters and podcasts will be additionally developed to arouse students' interest in natural sciences.

ST06

Evaluation of stranding response to a mass stranding of Risso's dolphins (Grampus griseus)

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Mass strandings of Risso's dolphins are poorly documented in the stranding literature. Three documented mass strandings of Risso's dolphins (8 in 2003, 3 in 2008 and 10 in 2017) have occurred on Cape Cod, Massachusetts, USA since the formalization of its stranding team in 1998. The most recent mass stranding occurred on 1 January 2017 in Wellfleet Harbor, Wellfleet, MA. Ten dolphins were found stranded on a rising tide deep in a natural harbor known for extremely high historic levels of cetacean stranding activity. Initially, stranding responders from the International Fund for Animal Welfare attempted to use acoustic and physical deterrents to herd the group to deeper water, but these efforts proved unsuccessful. The ten dolphins (5 adult females, 1 juvenile male, 1 juvenile female, 2 calves female and 1 calf male) eventually stranded. All ten dolphins were triaged, assessed, transported and released at a beach with more open water access. All were affixed with temporary static identification tags on the dorsal fins. The next morning, three of those dolphins (2 adults and 1 calf) were found restranded 3.8 kilometers south of the release site. The three dolphins were again re-assessed, treated, transported and released at a release site with better access to deep water. During the second stranding, one adult female Risso's dolphin was fitted with a temporary single pin satellite tag (Wildlife Computers Finmount Spot6-299). Within nine days of the second release, the satellite tagged dolphin was transmitting from the edge of the North American continental shelf and had traveled over 314 kilometers (average of 34.9 km/day). This represents the first known satellite tagging and immediate release of a Risso's dolphin involved in a mass stranding. The case shows the value of coordinated stranding response, triage, refined health assessments, treatment, release, and post-release monitoring.

ABU08

Evidence of a new summer feeding ground of humpback whales (*Megaptera novaeangliae*) in the North Atlantic

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North Atlantic humpback whales (*Megaptera novaeangliae*) migrate annually between their summer feeding grounds in the North Atlantic and their winter breeding grounds in the Caribbean and West Indies. Four distinct feeding aggregations have been delineated in the North Atlantic: Golf of Maine, eastern Canada (Gulf of St. Lawrence, Labrador and Newfoundland), West Greenland and eastern North Atlantic (Iceland and Norway). Here we propose a fifth summer feeding ground off the coast in East Greenland. An area where humpback whales were rarely seen 10 years ago but are now visiting yearly in large numbers. An aerial line transect survey of whales in East Greenland was conducted in August 2015. The survey lines covered the area from the coast up to 50 km offshore crossing the shelf break. A total of 61 sightings were obtained and abundance estimates were developed. The at-surface abundance estimates were corrected for both perception bias and availability bias. The fully corrected abundance estimates was 4,012 (95% CI: 2,044-7,873) humpback whales. The abundance of cetaceans in coastal areas of East Greenland has not been estimated before, but despite the lack of previous information from the area the achieved abundance estimate was remarkably high. The East Greenland shelf areas are likely to experience climate driven changes in pelagic productivity that may have accelerated favourable conditions for baleen whales. The increase in humpback whale abundance off East Greenland is likely due to emigration from West Greenland.

HE03

Evidence of mercury bioaccumulation in skin samples of individuals from an isolated bottlenose dolphin population in Panama

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In Bocas del Toro (BDT-Panama) inhabits a small bottlenose dolphin population, which is highly phylopatric and is genetically isolated in the Caribbean. This population is under pressure by the largest dolphin-watching industry in Panama, particularly individuals distributed in Dolphin Bay, where this activity is concentrated. Together, these factors make this population highly vulnerable to disease and side effects of pollutants like mercury. Mercury has been reported previously in sediments and corals from Almirante Bay, where the local port is located. With the purpose of carrying out a first approach to mercury concentrations in skin samples of bottlenose dolphins in BDT, we processed 25 samples collected from wild dolphins using the PAXARMS system. Skin samples were analyzed to determine total-Hg using an advanced mercury analyzer (AMA-254, Altec). Results of these analyses show total-Hg concentrations that ranged between 94-2909 µg/kg (mean=896 µg/kg, SD=719). No significant differences were found between sex ($p>0.05$) and season (dry and rainy) ($p>0.05$). Conversely, significant differences were found between localities (Dolphin Bay and Almirante Bay) ($p<0.05$). Comparisons with isotopic data show a negative correlation between ‰C and Hg values, whereas ‰N values show a positive correlation with Hg concentrations. High ‰N values indicate that dolphins are at a high trophic level, and the positive correlation shows tendency of bioaccumulation in dolphins because they´re top predators. Although Hg concentrations reported here are relatively low compared to populations in Japan or the Mediterranean Sea, they're similar to other coastal populations such as the ones in Sarasota Bay (Florida). These low values suggest coastal habits of dolphins in BDT, since coastal fish are not Hg-rich, reinforcing our hypothesis of an isolated "inshore form" for this population. This isolation could affect the conservation status of dolphins in BDT, and therefore it's essential to implement a management plan to conserve this population.

PHY03

Exploring multi-modal sensory integration of the acoustic startle reflex in relation to behavioural avoidance responses in phocid seals

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The acoustic startle response is mediated by an oligo-synaptic reflex arc which is elicited by rapid-onset sounds. Grey seals that were exposed to repeated startling sounds have been shown to develop sustained avoidance responses. Hence, the startle reflex is relevant for developing a better understanding of the mechanisms mediating marine mammal responses to anthropogenic ocean noise (e.g. pile-driving, sonar). The startle response can also be used to reduce pinniped predation on fish farms and fisheries, a problem which is causing spatial management challenges worldwide. Recently, a new target-specific acoustic deterrence system has been developed which is capable of significantly reducing phocid predation on fish farms by harnessing the startle reflex. However, acoustic deterrence will have limited success in animals that previously suffered age-related hearing loss or in species with reduced underwater auditory sensitivity. In this study, we tested whether multi-modal integration could lay the foundation for expanding sustainable deterrence methods. In addition, we investigated the link between the magnitude of startle flinches and behavioural follow-up responses. Specifically, we tested the fine-scale and behavioural avoidance responses of both independent and combined sensory inputs of synchronized 200ms light flashes and band-limited noise pulses (200ms duration) on trained juvenile harbour (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) in the temporarily-captive seal facility at SMRU. Seals were tagged with a DTAG-4 to both capture the fine-scale accelerometry signatures of startle responses, with which norm-jerk, overall dynamic body acceleration and vectorial dynamic body acceleration were calculated. The DTAGs also recorded the on-animal received levels of the sound exposures. Videos were used to code behavioural responses of avoidance. Generalised linear mixed models were used to test both how fine scale and behavioural responses varied by exposure type, as well as to test whether the magnitude of the startle response could be used to predict behavioural responses.

HE04

Fatal Asphyxiation with Laryngeal Displacement caused by Flatfish in Harbour Porpoises (*Phocoena phocoena*)

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For the physiological respiration of cetaceans an articulation of the larynx and the nasal passages is necessary. Due to the distinctive anatomy of the upper respiratory tract, a separation of the airways for food intake is possible. In the event of obstruction and impeded re-articulation of the larynx, no connection between blowhole and lungs can be obtained which ultimately leads to lethal hypoxia. Only a few cases of fatal asphyxiation with laryngeal displacement and airway obstruction of odontocetes caused by different prey fish species have been reported in the literature. As part of the German stranding network of Schleswig-Holstein, stranded marine mammals are necropsied at the Institute for Terrestrial and Aquatic Wildlife Research (ITAW). During postmortem examinations of harbour porpoises (*Phocoena phocoena*) in 2016, eleven animals were found with fatal asphyxiation due to obstruction of the upper respiratory tract caused by ingested flatfish. Nine of these animals stranded on the German North Sea island of Sylt between April and July. Between 1990 and 2015 death due to asphyxiation caused by flatfish were found in 31 porpoises. Again, the majority were found stranded on the Island of Sylt during the summer months. The extremely increased local occurrence of this cause of death around the Island of Sylt is noticeable in 2016, especially since to our knowledge no similar cases have been reported from other bordering countries and North Sea stranding networks. The cause for this incidence is unknown, but one possible explanation might be an unusually high population density of flatfish around the Island of Sylt and thereby an increased consumption of these prey fish by harbour porpoises.

HE05

First assessment of organochlorine compounds levels in sperm whales (*Physeter macrocephalus*) stranded in the Canary Islands (Atlantic Ocean) and a comparison with the Mediterranean Sea specimens.

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Marine mammals are known to accumulate organochlorine contaminants in their tissues and although many studies have been performed in different species and areas, data on sperm whale are lacking. In this study, we analyzed for the first time the levels of DDTs, PCBs and HCB in sperm whales (*Physeter macrocephalus*) stranded along the coasts of Canary Islands (Atlantic Ocean) from 2006 to 2015 and we compared these results with the organochlorine levels of Mediterranean sperm whales stranded along the Italian coast from 2008 to 2016. Among the Mediterranean specimens, five males in 2009 and three females in 2014, died in two mass stranding events along the Adriatic coasts of Italy. Subcutaneous blubber was collected from twenty specimens from Canary Islands and from seventeen specimens from Adriatic coast (3 analyzed in this study and 14 obtained from existing literature) and analyzed by gas chromatography after an extraction in a Soxhlet apparatus followed by sulphuric acid cleanup and Florisil chromatography. The specimens were separated by sex and sexual maturity and the results show that total levels of DDTs and PCBs were higher in males than in females (the differences were not statistically significant with non-parametric test Kolmogorov-Smirnov). Although any statistically significant difference was detected between sexually mature and immature specimens, the young females showed the highest concentrations of organochlorine compounds analyzed. Comparing the two areas the DDTs were the main contaminants both in the Atlantic and Mediterranean specimens, followed by PCBs and HCB. The levels of DDTs and PCBs detected in the Mediterranean sperm whales were higher than those found in the Atlantic sperm whales. Future studies are needed to deeply investigate any possible correlation between contaminant levels, immunosuppression and pathological diseases.

ABU09

First case of a narwhal (*Monodon monoceros*) in Belgium

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On 27 April 2016, a decomposed carcass of a juvenile male narwhal (*Monodon Monoceros*) was found in the river Scheldt at Bornem (Belgium), 92 km upriver. It later became clear that the animal had been sighted near the stranding location almost a month earlier, but at that time had been misidentified. The animal had probably died due to starvation. In the stomach no substantial remains of food items were found, but it did contain litter. However, its state of decomposition did not allow to exclude possible physical dysfunction or disease. This case adds to the very short list of sightings and strandings of narwhals in Europe, with the previous record from the North Sea dating from almost 70 years ago. It is the first record ever of a narwhal in Belgium. This out of range occurrence of an Arctic species adds to other similar recent records, and together they might be attributed to the break-up of Arctic ice, and the ice drifting much further south into the North Atlantic.

HE06

First comparison of organochlorine levels in stranded striped dolphin (*Stenella coeruleolaba*) of the Mediterranean Sea and of the Atlantic Ocean.

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The striped dolphin (*Stenella coeruleoalba*) is one of the most studied cetaceans in the field of environmental contamination, especially in the Mediterranean Sea. In spite of this, data on the ecotoxicological status of striped dolphins inhabiting the waters of the Canary Archipelago (Atlantic Ocean) are lacking. This study, for the first time, assesses the organochlorine levels in 20 specimens of striped dolphins stranded during the period 2005-2016 along the coasts of Canary Islands. These data have been compared with the results obtained from the analysis of 86 striped dolphins stranded along the Italian coasts (Mediterranean Sea) during the same temporal period. The levels of 30 polychlorinated biphenyls congeners (PCBs), the dichlorodiphenyltrichloroethane (DDT) and its metabolites and hexachlorobenzene (HCB) have been evaluated in the blubber of each specimen by gas chromatography analytic technique. The average abundance pattern of target contaminants was PCBs>DDTs>HCB for both areas. Median values of HCB, PCBs and DDTs are 500 ng/g lipid weight (l.w.), 86410 ng/g l.w. and 54664 ng/g l.w. respectively in the Atlantic Ocean, and 432 ng/g lipid weight (l.w.), 162148 ng/g l.w. and 111779 ng/g l.w in the Mediterranean Sea. In both areas, among PCBs, the highly chlorinated IUPAC number 180, 153 and 138 were the predominant congeners and among DDTs, the most present was pp'DDE, suggesting a not recent contamination by DDTs. Statistically significant differences (Kolmogorov-Smirnov test – $p<0.05$) have been found between Atlantic males and females for most of the compounds analysed. Although, the differences between the contamination pattern of Atlantic and Mediterranean area were not high as expected. Interestingly, the highest levels of total OCs of striped dolphins stranded along the Canary Islands coasts were comparable to those measured in stranded striped dolphins from the Mediterranean Sea.

ACO12

First description of Comorian humpback whales (*Megaptera novaengliae*) mating song

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Humpback whales (*Megaptera novaengliae*) migrate annually from summer feeding grounds located in high latitudes to wintering grounds in low latitudes, where they mate and reproduce. Mating songs are a crucial aspect of their breeding behaviour and previous studies suggest that male humpback whales from different ocean basins produce distinctive songs. In the Southern Indian Ocean, 4 different humpback whales stocks occur (C1, C2, C3, C4) and the waters around the Union of the Comoros is the breeding ground of the stock C2. We present the first description of the mating song of Comorian humpback whales and identify their distinctive features. Data were collected from a 7 m boat equipped with a 15 hp engine in Grande Comore Island (Union of the Comoros) from June to August, 2013. Vocalizations were recorded by a hydrophone (Sensor Technology SQ 26-08, sampling rate 96 kHz) with 30-meter cable. 7:52 hours of humpback whale vocalizations were recorded over 49 opportunistic surveys. We identified 32 different units for a total of 682 vocalizations, ranging from 47 Hz to 3233 Hz. This work represents a crucial step towards the conservation status of Comorian humpback whales. Furthermore, it will allow future comparisons among the mating songs of the different humpback whales' stocks occurring in the South West Indian Ocean.

ACO12

First ecotoxicological investigation of gray whale (*Eschrichtius robustus*) in two Mexican breeding grounds: POPs and biomarkers responses in reproductive females and calves

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Gray whales migrate from North Pacific Ocean to the waters off Baja California where they breed in several lagoons. The main objective of this project was to investigate for the first time the ecotoxicological status of gray whale (*Eschrichtius robustus*) in the breeding areas of San Ignacio Lagoon and Bahia Magdalena (BC, Mexico). The differences in cytochrome P450 (CYP1A1 and CYP2B) expression, and contaminant levels (organochlorines - OCs and polycyclic aromatic hydrocarbons - PAHs) were investigated in two different periods of the breeding season, between mothers and calves and between the two breeding areas. Whale skin biopsies (n=54) were collected in 2012 and 2013. The POPs level in females were higher in the whales sampled at the beginning (January) than at the end (late March-April) of the breeding season. The OCs and PAHs levels were high both in the blubber from calves and mothers, suggesting the maternal transfer of POPs trough lactation. Whales from the two sampling areas show differences in the average levels of OCs and PAHs, with higher values detected in the Bahia Magdalena whales. More interestingly, the contaminant fingerprint is different among all samples and between the two lagoons, allowing to separate in three specific clusters the whales sampled. This result suggests a different feeding ground in the North Pacific of the whales which frequent the two lagoons and, consequentially, a different ecotoxicological exposure. In both sampling areas, the levels of CYPs were lower in calves compared to the adult females. In conclusion, these data point out that there is an accumulation of POPs in gray whale calves resulting from the maternal transfer to the offspring due to reproduction and lactation. Further investigation needed to explored how exposure to POPs at early life stages could have negative impacts on their developing endocrine, immune and neural systems.

BE10

First observation of parturition of harbour porpoise *Phocoena phocoena* in Japan

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The information about pregnancy and confinement of harbour porpoise is quite limited, because of the difficulty to collect data in wild and also because few aquariums keep harbour porpoises. Otaru aquarium, Hokkaido, Japan, keeps four harbour porpoises which were rescued from set nets. One of them, Atsuko, a female harbour porpoise was found to be pregnant in August 2014 from routinely monitored progesterone level, and gave childbirth at 0:29 on 15th May 2015, but unfortunately the calf died 9 minutes after the birth. Her behaviour was observed in detail from 13th to 15th in May 2015, that was the first observation of the childbirth of the harbour porpoise in Japan. The objective of this study is to report the behaviour and routinely monitored parameters and to compare them between non-pregnant period and pregnant period. For the behaviour observation, lactation rate, breath rate and surfacing time were monitored for 10 minutes at every 30 minutes from 13th to 15th May. Maximum lactation rate was 1.0/min when 67 minutes before the childbirth. Breath rate and surfacing time increased towards to the end of expulsion of the calf. The number of clicks, detected by an A-tag set in the pool was largest (1.97/min) just after the A-tag was put in the pool, but after that, no clicks were observed even during childbirth. As the routinely monitored parameters, food intake, weight and progesterone level in the blood were analysed. It is well known that they have seasonal patterns which increase in winter and decrease in summer during non-pregnant period. The food intake and weight had followed the seasonal patterns before July 2014 when progesterone level was 10.2ng/ml, but after then progesterone level continued increasing until birth to 40ng/ml, and weight and food intake also increased. These changes correspond with the results of preceding studies.

BE11

First observations of sperm whales (*Physeter macrocephalus*) taking Greenland halibut (*Reinhardtius hippoglossoides*) from long line fishery in coastal waters of Arctic Norway

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Adult male sperm whales (*Physeter macrocephalus*) are present throughout the year in waters off Vesterålen islands in Arctic Norway. Photo-identification and behavioral studies have been conducted in the area since 1987, mainly from whale-watching boats. A deepwater canyon has been identified as an important feeding ground for the whales. In august 2014 fishermen reported for the first time in these waters that sperm whales were taking Greenland halibut (*Reinhardtius hippoglossoides*) from long lines on fishing grounds south of the deepwater canyon. In the summer of 2016 a pilot study was conducted using fishing boats as observation platforms to document sperm whales behavior as a first step towards a long term project to assess and find solutions to this behavior. The depredation events were registered through observers onboard the fishing vessels. Not all depredation events were reported and therefore further work is necessary to document the current scope and the potential increase of this beahvior. The individual first seen taking fish from long lines (August 2014) was observed in five different depredation events in 2016. This whale has not been previously identified in the study area. Depredation events of between one and three sperm whales per long line were reported. The sperm whales approached the fishing boats as soon as the line was started to be hauled in and stayed for the whole period (up to two hours) with several shallow dives close to the line. Based on comparison on catches with/without sperm whales, fishermen estimated between 30 and 50 % loss of catches to the whales

ABU10

Five-year spatial and temporal distribution of cetaceans in the Macaronesian waters - Analyzing habitat preferences in the area

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In the Eastern Atlantic Ocean, Macaronesia constitutes habitat for many resident and migratory cetaceans, providing a wide range of habitat characteristics due to its many topographic features (seamounts, canyons, abyssal plains), oceanographic dynamics (Portuguese and African coastal upwellings, influence of several oceanic currents) and oceanic archipelagos (Azores, Madeira, Canaries and Cape Verde). However, so far, published data on cetacean occurrence and distribution in the area is limited. To fully understand cetacean distribution, data covering a large proportion of Macaronesia and over a long period of time are needed, as well as good knowledge of the species' habitat preferences. We present the results from 5 years of surveys in Macaronesia (2012-2016), along 3 routes that cover around 9000 nautical miles: from Continental Portugal to Madeira (67 trips), Azores (20 trips) and Canaries and Cape Verde (12 trips). A total of 26 species and 2072 sightings were recorded: 1224 dolphins, 349 toothed and 329 baleen whales, 3 porpoises and 178 non-identified cetaceans (sightings with associated species accounted twice in the groups). We computed relative abundances for species/groups considering survey effort and analyzed temporal variability as well as generating distribution and kernel density maps. Habitat range was accessed through quantiles analysis and boxplots. Used and available habitat were investigated to define habitat preferences and map suitable habitats in the area. Results show several hotspots of sightings density along the routes and that species richness and profile varies geographically and are strongly influenced by habitat variables. Maps of suitable habitat indicate that several offshore areas, poorly surveyed, are potential hotspots for cetaceans, thus in need of dedicated surveys. This study addresses international and European Priorities for the conservation of cetaceans, contributing to the implementation of effective management actions in the area, such as the definition of Ecologically or Biologically Significant Marine Areas.

HE07

From fields to the deep ocean: assessing persistent organic pollutant levels in sperm whales and other cetaceans in the south-eastern Caribbean

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Throughout the 20th century many tropical islands have been subjected to the extensive use of Persistent Organic Pollutants (POPs) on agricultural lands, especially organochlorine pesticides. In the French West Indies (SE Caribbean), the insecticide Chlordecone has been extensively highly used to control the banana weevil (*Cosmopolites sordidus*). A variety of these POPs have been banned since the 1990s. However, many compounds are still present in soils, land, and coastal waters, and in consequence a number of freshwater and marine species have been prohibited from human consumption. Since a decline of sperm whales (*Physeter macrocephalus*) has recently been documented in the SE Caribbean, our goal was to assess POP contamination of sperm whales and other oceanic delphinids from the Guadeloupe archipelago. Stable isotope ratios of carbon (d13C) and nitrogen (d15N) were also measured to assess the relationship between foraging habitat preferences, relative trophic position and measured POP concentrations. *Pseudorca crassidens* exhibited the highest concentrations for PCBs, DDTs and PBDEs (27668, 11535 and 480ng/g lipid weight, respectively), whereas *P. macrocephalus* had the highest concentrations for other organochlorine pesticides (mirex, HCHs, HCB and heptachlor). *Lagenodelphis hosei* had the second highest concentrations for most POPs, whereas *Stenella attenuata* had the lowest. There was a positive correlation between POP concentrations and d15N values, suggesting a positive correlation between trophic level and POP concentrations. Interestingly, deep-diving and oceanic species had higher concentrations than more coastal species, suggesting a predominant role of trophic position than habitat. Counter intuitively, Chlordecone showed concentrations below the limit of detection for quantification in all individuals. This study shows that POPs from land activities have attainted high trophic levels in oceanic food webs from the French West Indies. Most of these concentrations did not exceed toxic thresholds for direct health effect, however, synergic or cumulative effects cannot be excluded.

GEN02

Genetic investigation on the short-beaked common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncatus*) in the Turkish seas based on mtDNA sequences

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The short-beaked common dolphin and bottlenose dolphin are cosmopolitan species, having extremely wide distribution in temperate waters including the Mediterranean and Black Sea. Their Black Sea populations have been suggested as the subspecies *Delphinus delphis ponticus* and *Tursiops truncatus ponticus* due to their genetic and morphological differences. The sample sizes were relatively small for common dolphins and no bottlenose dolphin sample from the Turkish waters has been included in the previous studies. In this study, mitochondrial DNA sequences of 38 common dolphin samples collected between 1994 and 2016 in the Turkish Black Sea coast (11 western, 6 eastern), Turkish Straits System-TSS (20) and Aegean Sea (1) revealed 14 haplotypes, nine of which were new. Six of these new haplotypes were detected in TSS connecting the Black and Mediterranean Sea. Moreover, genetic differentiation of the Black Sea and TSS population was detected based on haplotype frequencies, supporting the previous inferences that these common dolphins have been differentiated from those in the Atlantic. At the same time, the result suggests that the common dolphins in the Turkish Black Sea and TSS have some degree of genetic connectivity to the Mediterranean populations. As for bottlenose dolphins collected between 1999 and 2016 in the Turkish Black Sea coast (30 western, 1 eastern), TSS (31), Aegean Sea (7) and Mediterranean Sea (5), 74 samples in total, mtDNA sequences showed 15 haplotypes. Based on the haplotype network, there might be two bottlenose dolphin subpopulations in the Turkish Black Sea; one might have originated from the Mediterranean Sea, whereas the other might have been initially present in the Black Sea, and subsequently migrated south to the Aegean and the Mediterranean Sea. More samples from the Turkish waters will be sequenced with the same mtDNA marker for better understanding of the genetic population structure of this species.

MO02

Habitat modelling of two deep diving species, sperm whale (*Physeter macrocephalus*) and long-finned pilot whale (*Globicephala melas*) from static acoustic monitoring data from the Irish Porcupine Bight

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A number of deep-diving cetacean species exist within the Irish EEZ, but little is known about their populations, distribution, habitat preferences or other ecological factors. As deep divers use sound to communicate, locate prey and sense their environment, marine industrial operations constitute a significant possible threat to these species. These operations emit intense sound mainly of low frequencies and usually run for long periods and this noise may impact deep divers through hearing impairment or even fatal injury. Thus, the improvement of our knowledge about species distribution and habitat preferences are of great importance in order to address the effects of human activities. The main objectives of this study are to identify important habitats for sperm whales and long-finned pilot whales, the most abundant species within Irish offshore waters and to estimate their spatial distribution with the use of GIS in combination with strictly selected topographical and hydrological variables, such as sea surface temperature (SST), depth and distance from shore. To accomplish this, acoustic data collected from two static acoustic devices (SAM) deployed in the Irish Porcupine Bight between March and October will be used. In 2014 static devices were deployed for five months in three locations and in 2016 SAM data was collected for six months at two sites, one of which was the same as 2014. Data was analysed for daily detection rates of and diurnal and seasonal variation was examined. This present study will aid government agencies tasked with consenting offshore seismic licenses while taking into account Ireland's requirement under international legislation such as the habitats Directive for the protection of all cetacean species.

BE12

Harbour porpoise (*Phocoena phocoena*) reactions to pingers

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The use of acoustic alarms (pingers) has been mandated in several gillnet fisheries around the world to help reduce the incidental catch of porpoises and other small cetaceans. Even though pingers have shown to reduce the bycatch of harbour porpoises there are still questions to be answered in relation to effective range, habituation and displacement. In the present study, the vocalisation behaviour of porpoises was recorded in response to two different pingers with different acoustic properties at three different locations in Denmark and Scotland. The AQUAmark100 produces broad-band complex high frequency signals; whereas the AQUAmark 300 pinger produces tonal 10 KHz pulses. The Scottish experiment included one AQUAmark100 pinger running in cycles of 23 hours on and off. The pinger was placed at the centre of a triangular array of 14 acoustic click detectors (C-PODs) spaced at 0, 200, 400, 800, 1600, 2400, and 3600m distances from the pinger. In Denmark, three experiments were conducted. One had a 23-hour period on-off AQUAmark100 pinger placed in an array of five C-PODs at 0, 200, 400, 800, 1600m. The second and third experiment used an AQUAmark300 pinger in a shorter array with two C-PODs at 0 and 300m distances only. The results showed that in the UK the AQUAmark100 significantly reduced the number of porpoise clicks at 0 and 200 m distances, whereas in Denmark a significant reduction in clicks was found at 0, 200 and 400m distances from the pinger. In none of the studies of the AQUAmark100 did the vocalisation behaviour reveal any signs of habituation. The studies of the AQUAmark300 revealed only a significant reduction in the number of clicks at 0m distance. At this station, however, habituation effects were indicated by an increase in clicks over time.

ACO13

Harbour porpoise click detection in high noise environments

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Harbour porpoises (*Phocoena phocoena*) are one of the most widely distributed and furthest ranging odontocetes in the world. They show a strong preference to coastal waters. Measuring the species' abundance can prove difficult when detecting their high frequency narrow bandwidth clicks in high noise environments, such as tidal passages. Many porpoise click detectors may be found in the literature, while others are proprietary. Literature indicates that performance varies among environments and methods. The question is raised whether a method can be developed that works in a range of noise conditions whilst being efficient at providing real-time results directly from algorithms embedded in a digital hydrophone. An approach has been developed to improve detection rates, minimizing missed detections as well as false detections. The work investigates an algorithm tested using a digital hydrophone (icListen Smart Hydrophone) with data collected in Minas Passage in the Bay of Fundy. Results from field tests will be presented and discussed in comparison with existing detectors. The research also examines the method's success detecting the presence of other odontocete clicks, such as an orca (*Orincus orca*).

ABU11

Hide and seek: Co-occurrence of foraging harbour porpoises and fish in the eastern North Sea

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The spatial and temporal distribution of harbour porpoises and fishes in the eastern North Sea was analysed based on hydroacoustic data sampled in August 2016 on board the R/V Aurora. The aim of this study was to investigate the association of harbour porpoises with prey patches of particular size and with particular spatial distribution. To date, this has only been studied on a relatively coarse spatial scale that is unlikely to be relevant to marine mammals that are likely to be more affected by the level of spatial aggregation of their prey rather than by the average fish densities that are typically predicted by ICES. The data was obtained using scientific echosounder, Simrad EK60 and a towed array. We investigated three areas on a small spatio-temporal scale in the Danish Waters differing in depth and distance to shore. Each study area covered approximately 14 x 71 km and was surveyed for 18 hours to determine porpoise occurrence, respectively. Within each area we conducted a fish survey in a randomly selected sub-area (3.4 x 6.1 km). The sub-area was surveyed for 24 hours. Furthermore, we deployed six C-PODs in the sub-area to record porpoise clicks throughout the sampling period. We evaluated (i) what fish species were present, (ii) the spatial distribution and temporal dynamics of fish patches, (iii) what environmental factors influence the spatial and temporal dynamics of the fish patches, (iv) and to what extent patches with different fish species compositions are selected by harbour porpoises. We demonstrated how scientific echosounder and high-frequency passive acoustic monitoring can be used together in predator-prey interaction studies to further our understanding of the factors that influence the distribution and movement of harbour porpoises on a spatio-temporal scale.

ABU11

High accumulation of mercury and persistent organic pollutants in free-ranging bottlenose dolphins (*Tursiops truncatus*) inhabiting the Norman-Breton gulf, France

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Marine mammals are particularly sensitive species to bioaccumulation of pollutants because of their high trophic position in the marine food web, their extensive thick layer of blubber and their habitat. Numerous authors have highlighted possible effects of toxic substances in marine mammals, such as immunotoxicity, impaired reproduction and endocrine systems disruption. To date, while almost all the European coasts display data on the levels of chemical contamination in marine mammals, there have been very limited studies carried out on marine mammals inhabiting the English Channel. Thus, the objective of this study was to quantify persistent organic pollutant (POPs: NDL-PCBs, PBDEs, DDT, HCH, HCB, Dieldrin, Endosulfan, Chlordane, PCDD/Fs and DL-PCBs) and mercury (T-Hg) levels in biopsies taken from bottlenose dolphins living in the Norman-Breton gulf (France), one of the largest populations of bottlenose dolphins in Europe. PCBs are the main compounds found in male (Σ6PCBs: 132 940 ± 78 899 ng.g-1 lipids, n= 47) and female bottlenose dolphins (64 504 ± 74 087 ng.g-1 lipids, n =11), while the concentrations of PCDD/Fs remain low (males: 342 ± 112 pg.g-1 lipids, n=9; females: 154 ± 158 pg.g-1 lipids, n= 3). POPs concentrations are higher in males compared to females because of POPs transfer from mother to offspring. PCBs concentrations in bottlenose dolphins from Norman-Breton gulf are higher than those from other locations around the world. Similarly, T-Hg concentrations in skin are in the same range of other locations with the highest T-Hg concentrations reported (males: 9,4 ± 3,5 µg.g-1 dw, n=49; females: 11,2 ± 5,7 µg.g-1 dw, n=20). Our toxicological data show that bottlenose dolphins from the Norman-Breton gulf exceed concentrations at which severe toxic effects are known to occur. To conclude, POPs and mercury remain high in the tissues of bottlenose dolphins inhabiting the Norman-Breton gulf despite regulation and mitigation measures.

BE25

High suckling rates and acoustic crypsis maximize energy-transfer between humpback whale mothers and calves

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The migration of humpback whales to and from their breeding grounds results in a short, critical time window during which calves must acquire sufficient energy via suckling from their fasting mothers to survive the long return journey. Understanding calf suckling behavior is critical for understanding the energetics and evolution of humpback whale migratory behavior and for informing conservation efforts. However, despite its importance, very little is known about this critical energy-transfer. To address this pertinent data gap on calf suckling behavior we deployed suction cup based multi-sensor Dtags on eight humpback whale calves and two mothers on a known resting ground, Exmouth Gulf, WA. This allowed us to analyze detailed suckling and acoustic behavior for a total of 68.8 hours. Suckling dives were performed 20.7±7% of the total tagging time with the mothers either resting at the surface or at depth with the calves hanging motionless with roll and pitch angles close to zero. Vocalizations between mother and calf included weak tonal and grunting sounds. These were produced more frequently during active dives than suckling dives, suggesting that mechanical stimuli rather than acoustic cues are used to initiate nursing. This use of mechanical cues for initiating suckling and low level vocalizations with an active space of less than 100 meters indicate a strong selection pressure for acoustic crypsis. Such inconspicuous behavior likely reduces the risk of exposure to eavesdropping predators such as killer whales and male humpback whale escorts that may disrupt the high proportion of time spent nursing and resting, and hence ultimately compromise calf fitness. Furthermore, the small active space of the weak calls between mother and calf is very sensitive to increases in ambient noise from human encroachment thereby increasing the risk of mother-calf separation.

During the review process this abstract was flagged by one or more reviewers due to ethical concerns. This is the response of the authors to these concerns:

All the study animals were tagged with non-invasive, digital archival Dtags using a 9m carbon fibre pole. Version 3 Dtags were attached between the blowhole and the dorsal fin with four 50 mm diameter soft silicone suction cups. These tags have a frontal cross-sectional area of 20 cm^2 and a net buoyancy in water of 10g and so are unlikely to add drag that could have an energetic impact on the calves. We did an extensive focal follow on the mother-calf pairs before and after tagging with the observation platform 200> meter away to ensure that the tagging did not disrupt natural behaviour between mother and calf. During tagging we approached the mother-calf pair slowly and saw very mild reactions from mother and calf during and after tagging.

These tags on calves have helped us improve our knowledge on the early life stages of large cetaceans including bioenergetics and nursing of which our knowledge is sparse. This helps us to better inform conservation efforts of how to best mitigate potential disturbances that could have an impact on the success rate of these whales.

MN05

How automatic detection and classification of southern right whale upcalls is influenced by choice of software and parameter values

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Cetacean density can be estimated from passively-collected acoustic data via received calls attributed to the species of interest. Acoustic equipment can be used to gather data continuously for long periods, at high sampling rates, and over multiple channels, resulting in vast datasets. Humans are assumed to be the gold-standard for extracting features of interest from acoustic data, but automatic detection and classification software is necessary for large datasets where human auditing is not feasible. Here, we compare the abilities of two freely-available software (PAMGuard and the Low Frequency Detection and Classification System (LFDCS)) to detect and classify Argentinian southern right whale (*Eubalaena australis*) upcalls based on 4417 human ground-truthed calls. The number of detected calls varied substantially between the two software (PAMGuard recorded approximately the same number of true positives as LFDCS, but up to ten times as many false positives), and between separate runs of LFDCS with different parameter values (the results of which varied by up to a factor of four). The resulting differences between detected and truly-present calls can significantly impact subsequent density estimates. While it is possible to apply correction multipliers to outputs obtained from automated software, the aim is to minimise the amount of extrapolation required in order to maintain robust results. When using automatic detection algorithms, it is therefore essential that a rigorous, data-based detector performance analysis is conducted.

NT10

How to make a seal echolocate? Development of a novel animal-borne 'sonar tag'.

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Sound and movement tags deployed on some echolocating toothed whales record echoes from prey, enabling the quantification of prey fields encountered, and the selection and capture tactics, of tagged animals. In comparison, information on the in-situ abundance of prey exploited by non-echolocating species, such as seals, remains difficult to obtain. Here we describe a miniature animal-borne echosounder for non-echolocating marine mammals developed to characterise the biotic environment near tagged animals, and estimate prey capture success, using active acoustic backscatter. The tag comprises a modified DTAG-4 that transmits a 750kHz - 1.5MHz ping with a repetition rate of up to 50Hz and a beam-width of 5° out to biologically relevant ranges (~3m) The sonar uses a piezo-composite transducer to reduce size and weight. The tag also includes a fast-acquisition GPS together with high rate accelerometers, magnetometers and depth sensors allowing geo-referenced reconstruction of movements and prey strikes. The 8x4x3 cm tag should record continuously for up to one month. Sonar performance was evaluated using calibration spheres and biological targets. Although the frequency generated by this sonar is well beyond the hearing range of marine mammals, sonars also produce low frequency noise (sidebands) that may be audible. To reduce audibility of sidebands, we modified signal shape and filtering iteratively, measuring output levels in the hearing range of phocid seals at each step using a calibrated low-noise hydrophone. Deployments on captive harbour seals will be performed next to test audibility of the sonar tag by observing any behavioural changes when the sonar is pinging vs non-pinging. If we are able to verify that the tag is inaudible, it will be deployed on elephant seals in the Southern Ocean where high resolution information on biotic environment, prey captures and body condition will provide a unique window into the foraging ecology of these wide-ranging animals.

BE13

How vulnerable are harbour seal (*Phoca vitulina*) pups: a study on mother-pup interactions.

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As a rehabilitation centre for seals it is important to assess whether a pup that has lost contact with its mother is in need of help or can be taken care of and nursed by other females of the breeding colony in the Eems-Dollard estuary. During the breeding season of harbour seals (*Phoca vitulina*) on 2015 and 2016 in the Eems-Dollard estuary, the interaction between the mothers and their pups was studied. To observe and follow the behaviour of the female-pup pair, the seals were photo identified so they could be recognized from the distance. To collect proper data about the suckling and fostering behaviour of the female-pup pair focal sampling with continuous recording was performed. From a sample of 78 pups, only 57.7 % was nursed by 1 female only but the rest were nursed at least by 2 to even 6 different females. A similar analysis was made from the females' perspective, showing that only 43.1 % of them nursed one pup only. The remaining 56.9 % of the females nursed from 2 pups to a remarkable 18 different pups. Registration of pup deliveries where we could establish the biological mother of the pup with 100% certainty could corroborate these results. These findings might help us to obtain a better insight into the mothering behaviour of harbour seals in the Wadden Sea and its consequences for their pups' survival. It may also provide a sound basis for the development of accurate protocols for rescuing seal pups. Currently data on competition among peers for suckling and rejection rates of females are being analysed.

CO19

Identification of bottlenose dolphins' management units to develop a conservation strategy in the French Mediterranean waters

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The Mediterranean bottlenose dolphin's (Tursiops truncatus) subpopulation is listed as vulnerable by IUCN. This species is strictly protected in France and requires Sites of Community Importance designation under the European Habitat Directive. However, little information was available so far about the structure, dynamic and distribution of the population in the French Mediterranean waters. Scientific campaigns at sea, involving many partners, were conducted every season between 2013 and 2015 all along the French Mediterranean coast, covering a total amount of 21,464 km. We encountered 151 groups of bottlenose dolphins and 928 animals were uniquely photo-identified. We studied the population structure through a multi-disciplinary approach in order to identify management units. First, the analysis of 25 microsatellite markers on 74 samples from biopsied and stranded dolphins led to the identification of a single genetic unit in the North-Western Mediterranean Sea which was distinct from two others units identified in Gibraltar and Galicia (Spain). Second, cluster analyses on the Half Weight Index between individuals sighted at least three times along the continental coast revealed preferential association between dolphins inside 4 social communities. Although some movements have historically been documented between the continental and Corsican coasts, the lack of recaptures suggest a distinct social community in Corsica. Third, we inferred home ranges (HR) of dolphins sighted at least 5 times using kernel density estimation. The estimation of HR 50% surfaces showed differences between the utilization distribution in the Gulf of Lion and Provence suggesting specific ecological requirements between dolphins using the two regions, which was confirmed by a much higher frequency of feeding activities observed in interactions with fisheries in the Gulf of Lion. These results are used to set up a monitoring design and develop conservation strategies for the bottlenose dolphin's population in the French Mediterranean waters.

ABU12

Identifying fin whale hotspots in southern European waters: insights from oceanographic cruises

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The fin whale (*Balaenoptera physalus*) is a cosmopolitan species occurring in all major oceans usually in temperate and polar latitudes. This species performs latitudinal migrations and their study in southern European areas remains scarce, such as in the Bay of Biscay. Despite their large distribution range, obtaining precise spatial estimations of their relative abundance is a difficult task due to spatially heterogeneous observation efforts and sparse and infrequent sightings. Nonetheless, understanding spatial and temporal patterns of fin whale distribution and abundance is fundamental for their successful conservation and management. Within this context, we developed a spatial modelling framework to study the spatial abundance of fin whales during the late summer periods of 2007-2008 and 2013-2016 based on sighting data collected during the multidisciplinary oceanographic cruises JUVENA and PELACUS. Fin whale abundance and spatial models were developed based on Generalized Additive Models and model selection was based on the Information Theoretic approach after performing a model averaging approach. We used physiographic predictors (depth, slope, distance to the nearest coastline, distance to the closest shelf break (200-m isobath) and distance to the closest 2,000-m isobath) and oceanographic predictors from remotely-sensed data (sea surface temperature, chlorophyll-a concentration and their spatial gradients, geostrophic currents and sea level anomaly). Our analyses suggest both physiographic and oceanographic predictors are relevant in order to explain the fin whale spatial abundance predicting that the highest densities of fin whales occur in deeper and colder waters, far from the coast. These results provide one of the first assessments of abundance and habitat preferences for fin whales in the inner part of the Bay of Biscay. This study contributes to the identification of important concentration areas during late summer in addition to representing a valuable conservation tool in the development of conservation plans for protecting marine habitats and species.

ANA02

Identifying sexual maturity in female harbour porpoises (*Phocoena phocoena*) from the North and Baltic Seas using ovarian characteristics

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As the only cetacean species native to German waters, the harbour porpoise undergoes human pressures and influences that may shorten their reproductive lifespan. With providing baseline knowledge on the age of attainment at sexual maturity in female harbour porpoises over a long period of time, changes in a population´s life history can be detected. The ovaries from 97 female harbour porpoises from the German North and Baltic Seas (1999 – 2015) were examined for the presence and structure of functional bodies like follicles, corpora lutea and corpora albicantia. Based on the ovarian characteristics we performed an estimation of age at sexual maturity for harbour porpoises from German waters. Our results showed, that first signs of puberty, which include functional bodies and larger follicles, can be found in porpoises aged 2.54 years, while corpora lutea and corpora albicantia, as signs of former ovulation could be found in individuals at an age of 4.01 years. Although no significant differences between specimens from the North and Baltic Sea were detected, our data differ from investigations in adjacent waters supporting the idea of local management plans for an effective protection of harbour porpoises.

ACO14

Impact of vibroseismic underwater sound on the behaviour of baleen whales

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The overall goal of the project is to study effects of marine vibrator sounds on the behaviour of baleen whales. Marine vibrators (MV) are discussed as an alternative for seismic airguns with a high potential to reduce auditory harm and disturbance effects for marine mammals, as they operate with considerable lower peak pressure levels, lower rise time and reduced energy above 100 Hz. The ability of marine vibrators to spread the energy output over time as a continuous frequency-modulated (FM) or as a pseudo-random noise (PRN) sweep makes it a promising alternative technology to airguns. However, there are concerns regarding the masking potential for low frequency specialists such as baleen whales. There is limited knowledge regarding masking and the type of signal produced by MV. It is currently perceived that FM sweeps will have the least amount of impact on these species, which are therefore used in our project. First part of the project was to determine the acoustic characteristics of the sound source which will be used for the playback experiments. An underwater Argotec Undersea speaker, capable of generating signals similar to those produced by marine vibrators was tested in Iceland in October 2016. We constructed a 10 s linear upsweep signal from 20 to 100 Hz. We played back sounds at different distance from the hydrophone (10, 100, 500 and 1500 m) and recorded the projected signal with the hydrophone. Water depth was up to 15 m during testing. The calculated maximum source level was 170 dB re 1 µPa @ 1m which seems feasible for playback experiments. Field trials with blue whales (*Balaenoptera musculus*) or humpback whales (*Megaptera novaeangliae*) as target species will start in June 2017: Acoustic and behaviour tags will be deployed on the animals using playback signals generated by the Argotec speaker.

NT03

Innovative alerting device (Porpoise Alert, PAL) can significantly reduce bycatch of harbour porpoise in the western Baltic Sea

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Gillnet fisheries may be one of the main anthropogenic causes of mortality for harbour porpoises (*Phoceona phocoena*) (L. 1758). A new kind of acoustic alerting device (Porpoise ALert, PAL) was tested in the commercial gillnet fishery, one of the main fisheries in the Western Baltic Sea. The PAL emits synthetic harbour porpoise communication signals, unlike conventional acoustic deterrent devices (‘pingers‘) which emit artificial noise. Nets equipped with PAL devices were tested against nets without any devices (‘normal nets‘) by three commercial gillnet vessels during their usual fishing for cod and flatfish from 2014 to 2016. Two vessels fished in Kiel Bay and around Fehmarn and one vessel fished in the Öresund. More than 900 net hauls were analysed. Overall, 18 harbour porpoise were bycaught in normal nets, while only three harbour porpoise were bycaught in nets equipped with PALs. The results reveal a significant effect of the PAL both for the trial as a whole (Fisher’s exact test two-tailed, $p = 0.0014$) but also for German and Danish fishing vessels, separately ($p = 0.038$ each). Furthermore, the positively buoyant PAL proved to be mechanically robust and withstand the demanding physical strain of commercial gillnet fisheries. In conclusion PALs can significantly reduce bycatch of harbour porpoise in gillnets deployed in the Western Baltic Sea, thus reconciling anthropogenic use and protection of the marine environment.

HI06

Integrating empirical data with probability distributions from a numerical 4-D model to assess marine mammal collision risk with a novel marine renewable energy device

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With the growing number of marine renewable energy (MRE) devices being installed across the world, some concern has been raised about the possibility of harming mobile, marine fauna by collision. Although physical contact between a MRE device and an organism has not been reported to-date, these novel sub-sea structures pose a challenge for accurately estimating collision risks as part of environmental impact assessments, where, even if the animal motion is simplified to linear translation, the mathematical problem of establishing an impact probability is not trivial. We summarise a numerical algorithm to obtain such probability distributions using transient, four-dimensional simulations of a novel MRE device, herein referred to as the 'kite', which moves in a figure-of-eight trajectory. The kite assembly is defined as two parts in the model, a tether (attached to the seabed) and the kite. Over several scenarios (e.g. varying kite depth and speed), the results from the probability distributions obtained from the four-dimensional model showed that, close to the bottom where the tether amplitude is small, the path is always blocked and the impact probability is 100%. Whilst higher up in the water column, the collision probability is twice as high in the midline where the tether passes twice per period than at the extremes of its trajectory. We then incorporate empirical data (e.g. diving behaviour) collated from studies on marine mammals to showcase how the probability distributions obtained from the four-dimensional model can be used to assess the collision risk with an MRE device under varying operating conditions. With respect to future work in this field, we note the pressing need to address the lack of empirical data on avoidance and evasive behaviour around MRE devices, which is often the factor limiting our confidence in accurately estimating collision risk.

ACO15:

Inter Pulse Interval analysis of Sperm Whale (*Physeter macrocephalus*) (Linnaeus 1758) "clicks" recorded in Mediterranean Sea between 1996 and 2011: Population structure and distribution of sizes.

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The population of Mediterranean sperm whales (*Physeter macrocephalus*) appears to be partially segregated and a genetic divergence with Atlantic populations is evidenced by preliminary genetic studies. To date, in Mediterranean Sea, no animals have been estimated to be longer than 14 meters by using IPI (Inter Pulse Interval) analysis; this is in contrast with the length reported in literature for sperm whales in other oceans of the world; the size of adult males in Atlantic and Pacific Ocean is reported to reach 17-18 meters. A Stable Inter Pulse Interval can be identified among pulses that compose a single click, and thus the size of the spermaceti can be estimated. Then is possible to determine the whole size of the animal by using some experimental equations. But the sample of IPI analyzed Mediterranean sperm whales is limited in the literature. With this research, trying to fill a literature gap, we aimed to analyze unexplored recordings made by C.I.B.R.A between 2000 and 2011 in the Mediterranean Sea, provided they had the required quality. Furthermore, we analyzed historical recordings already present in the literature. The acoustic estimate of sperm whale size provided information on the population structure and evidenced the presence of specific size classes. The distribution of size classes could provide useful information on the structure of the population and its trends. Analysis required the selection of suitable recordings, sperm whales sounds with good quality and eligible Signal to Noise Ratio, and was based both on manual examination with visual inspection of waveforms and of high resolution spectrograms, and on automatic methods developed in Matlab, mainly based on Cepstrum analysis. Available algorithms have been tested. In optimal cases, automatic analysis provided good data and required minimal time to perform IPI verification. In less than optimal recordings, only manual analysis provided reliable results.

HI07

Interactions between bottlenose dolphins (*Tursiops truncatus*) and trawlers in the Gulf of Trieste

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Interactions between cetaceans and fisheries are a widespread occurrence in the Mediterranean Sea and worldwide, effects of which range from positive to negative for one or both sides involved. Between 2002 and 2012, we studied interactions between common bottlenose dolphins (*Tursiops truncatus*) and different types of trawlers in the Gulf of Trieste and adjacent waters, as part of a long-term study on bottlenose dolphin ecology and conservation. Out of 205 recorded sightings, 22 % involved an interaction with trawlers. Of those, 51.1 % interactions were with pelagic pair trawlers, while 46.7 % were with bottom trawlers. Even though the frequency of interactions among two types of trawlers was similar, dolphins appeared more likely to follow pelagic pair trawlers, with the fleet size 15 times smaller than that of bottom trawlers. We also compared the frequency of interactions with trawler catch quantity and type. The amount of total catch is largely influenced by the catch of pelagic pair trawlers. We found that the cumulative quantity of catch has dramatically declined over a decade (more than 6 times). Despite catch decline, there was no trend in frequency of interactions or overall sightings. The most important catch was represented by anchovies (fam. Engraulidae), sprats (fam. Clupeidae) and golden grey mullets (fam. Mugilidae), suggesting that this was also the target prey for dolphins. Group size during interactions ranged from 1 to 28 individuals. Calves were present in almost half of all interactions. The animals followed trawlers for a variable amount of time, from 9 to 149 minutes. Photo-identification data showed that most recorded interactions involved the same identified individuals, while such behaviour was never observed in others. Out of all identified individuals more than 50 % were included in the interactions at least once. Both types of trawlers appear to attract dolphins and thus alter their movements and behaviour.

ACO16

Interspecific comparison of cetacean feeding calls: A gut-wrenching convergence?

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Icelandic killer whales (*Orcinus orca*) and North Pacific humpback whales (*Megaptera novaeangliae*) have independently developed call types used exclusively while feeding on herring (*Clupea harengus* and *C. pallasii*), which may serve to modify prey schooling behaviour. This study quantitatively compared these calls, testing the hypothesis of convergent evolution. Data were collected in summers of 2014–2016 in Vestmannaeyjar archipelago, Iceland and 2014–2015 off Gil Island, British Columbia, Canada. Acoustic recordings were collected in Iceland with a towed hydrophone array deployed from a small vessel. In Canada, stationary hydrophone stations transmitted data to a central recording station. Feeding calls were identified from acoustic context (i.e. preceding underwater tail slaps for killer whales or bubble-net feeding associated noise for humpbacks). Fifty feeding calls and 50 associated social calls were randomly selected per species for further analysis. Beluga software was used to extract frequency contours and measure mean, start, end, mid call, maximum and minimum frequencies, duration, presence or absence >2 inflection points, and slope at beginning and end of each call. A stepwise discriminant function analysis including all variables was conducted on SPSS, using 4 groups (feeding and social calls from each species) and a jackknife cross-validation technique. This analysis accounted for 95% of between group variability, cross-validated correct classification was 90.6%. Main discriminating predictors were presence of inflection points and duration, followed by mean frequency. Clear separation of feeding and social calls occurred. Only one KW and 4 HW feeding calls were misclassified (respectively, 97.8% and 91.1% correct classification scores). All misclassifications in feeding calls happened when calls were assigned to wrong species. HW and KW social calls presented classification scores of 100% and 91,1%, respectively. While the exact function of the calls remains unclear, our results support the hypothesis of evolutionary convergence in behaviour of these species.

BE02

Investigating habitat preferences of fin whale (*Balaenoptera physalus*) along the water column

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Oceanographic habitat of fin whale (*Balaenoptera physalus*) in the western Mediterranean Sea is usually investigated using environmental variables related to sea surface. This study aims to provide the characterization of fin whale habitat along the water column, using both remotely sensed variables both results of an oceanographic model. In particular, we investigate species preferences towards temperature, Chl-a concentration, current speed, sea surface height, diffuse attenuation coefficient and eddy kinetic energy from surface to 1000m depth, derived from physical and biological components of the Mediterranean Forecasting System. We use data of fin whale presence collected during the summer months (June to September) from 2009 to 2015, along three fixed transects between France, Italy and Corsica, using ferries as platform of opportunities. We then use Generalized Additive Models to evidence how different variables act in shaping species distribution. The study area relies in the central part of the Pelagos Sanctuary (North-western Mediterranean Sea). In total 153 surveys were performed during which we collected 998 sightings of fin whale, for a total number of 1.444 fin whales. Results show that fin whales during summer are aggregating in areas with peculiar conditions of the water column. In particular, a sub-superficial (50m to 100m depth) bloom is evidenced by higher chlorophyll concentrations and higher values of Eddy Kinetic Energy. Differences in habitat preferences are also evidenced in different parts of the study area: a highly dynamic oceanographic habitat is preferred in the western part, while a more stable one seem to be present in the eastern part. These results can put the basis for a more effective management of the Pelagos Sanctuary, adaptable to species preferences and to changing environmental conditions.

HE08

Investigation of the immune system and microbiota of marine mammals in the light of assessment of the habitat safety of the World Ocean for alive organisms.

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The continuous water cover which occupies ¾ the surfaces of our planet is well-known under the name the World Ocean. Water, being fine solvent for a set of chemical elements, creates conditions for a rapid current of various biochemical reactions. High concentration of salts increases electric conductance of seawater, adding "spark" to a “stormy biochemical boiler”. The permanent system of circulation of waters of the World Ocean and the atmosphere provides close interaction between land and water ecosystems. The slightest failure of biochemical balance in this fragile system, also anthropogenous origin, can make the water environment of the planet unsuitable for maintenance of life. Constant control of safety of the environment of the World Ocean is necessary for live organisms. One of perspective methods is: "The health assessment of populations of the biological species - indicators of water and land ecosystems". An essential part of it is conducted by the investigation of reactivity of the immune system of individuals in populations, and also her ability to resist against pathogenic species of microbic communities of species –indicators of the environment. Occupying the top trophic levels in ecosystems of World Ocean, marine mammals are excellent biological species- indicators, and can serve for control of safety of the environment of the World Ocean. From 2001 till 2017 hematologic, immunological and microbiological researches of species - indicators: *Tursiops truncatus*, *Delphinapterus leucas*, *Eumetopias jubatus*, *Pusa hispida ladogensis*, *Eschrichtius robustus*, *Ursus maritimus*, *Odobenus rosmarus* were conducted. The general regularities of change of parameters of immune responsiveness of an organism and properties of the microbiota depending on a condition of the habitat have been as a result found. Complex assessment of safety of environment in ecosystems of Northern Atlantic and Northern Pacific, Ladoga Lake, Black Sea and Russian Arctic was carried out.

BE03

Is a lonely harbour seal (*Phoca vitulina*) pup really an orphan?

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Harbour seals (*Phoca vitulina*) in the Netherlands breed normally in areas that are temporarily exposed by the tides. In the tidal and protected Eems-Dollard estuary there are two sand ridges close to the dike that allow the seals to have a dry area the whole time. Due to the high number of seemingly orphan pups that were taken in as a rescue strategy from this area the last years, Seal centre Pieterburen, as a rehabilitation centre, felt the duty to investigate the need for such rescues. In the course of the breeding period in 2015 and 2016, a study was performed to observe the behaviour between mothers and pups specifically in these sand ridges. The aim of this project was to establish how many hours pups laying alone had to be observed before they could be considered orphan and taken into rehabilitation. Pup deliveries were filmed and photo identification of all the adults and pups in the area was carried out to recognize the mothers and their pups. A random continuous focal sampling of the pups left alone in the area was performed. The results show that the pups can be alone in the area for much longer than two hours (the current criteria for taking pups away) before any risk for their health becomes apparent. Moreover, and in contrast to common belief, mothers come back to pick up their pups after several hours. In case the pup disappeared, mothers keep coming back and show searching behaviour for days or even weeks. Nonfilial nursing was also observed several times. The results strongly suggest that the current protocol for taking in lonely pups has to be adjusted and may do more harm than good in several cases.

PHY04

Is the slow recovery of southern right whales due to a low metabolic rate?

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Longevity in mammals is generally paired with a low fecundity and a long developmental time, but it potentially comes with the advantage of a low metabolic rate. For large whales it is unknown how such life history parameters associated with reproduction is related to metabolic rates and how this might influence the recovery from whaling and vulnerability to human encroachment. Here we test if the lower recovery rate of the southern right whales in Australia is related to a lower metabolic rate compared to the much faster recovering humpback whales in the same habitat. To test that hypothesis, we used respiration rates as a proxy for field metabolic rates (FMR) and compared this between lactating southern right and humpback whales. The respiration rates were obtained from multi-sensor Dtags deployed on eight southern right and 16 humpback whales at their respective nursing grounds in Western Australia (2013-2015). This allowed for an analysis of movements and respiration rates. Focal follows from a boat with a minimum distance to the focal whale of 200 meters and deployment of an unmanned aerial vehicle were also conducted for all whales in the study, providing data on respiration rates and behaviour. We find that the FMRs of southern right whales were considerably lower than for humpback whales. This supports the idea that a long-living mammal has a lower reproductive rate and hence a slower recovery rate. Further, the slow reproducing southern right whales could be vulnerable to relatively minor anthropogenic disturbances that might increase its metabolic rate, which is important to take into consideration in management of this and other long-lived species.

HE09

I'm in the scat, man! Preliminary investigation into the prevalence of enteric protozoans of marine mammal resident populations in German waters

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Enteric protozoans are frequently the cause of gastrointestinal disorders in both humans and other animals. *Cryptosporidium* sp. and *Giardia* sp. are some of the most relevant species worldwide, with a high-impact in the One-Health context. These parasites have been described to infect marine mammal populations around the globe. In a large number of the reports, infection with species most described in humans are common. In the North and Baltic Seas, such information is lacking.
In order to unravel the prevalence of *Cryptosporidium* sp. and *Giardia* sp., faeces from harbour porpoises (*Phocoena phocoena*) and harbour seals (*Phoca vitulina*) were either collected during post-mortem examinations of animals found on the North and Baltic Seas coasts of Schleswig-Holstein, during live-catches for health checks or scat survey in sand banks in the North Sea. Faecal smears were produced and stained with a modified Ziehl-Neelsen technique in order to identify *Cryptosporidium* sp. oocysts and *Giardia* sp. cysts based on typical colouration and morphology. In total, 41 samples were analysed (harbour porpoises, n=11; harbour seals, n=30). Current overall prevalence is 2.4% for both *Cryptosporidium* sp. and *Giardia* sp. (1/41). Positive samples were found in two harbour seals. Future actions include the molecular identification of positive samples, as well as the establishment of phylogenetic analysis to compare similarity with samples from different sources (clinical samples, domestic animals, environment); the histopathological evaluation of intestinal samples in dead animals and the clinical evaluation in live animals for the characterization of the pathogenicity of these parasites in marine mammals; and the determination of risk factors in the establishment of the infection in marine mammals. Such knowledge is not only important for wildlife populations' management but also as a risk-analysis public health's strategy.

NT05

JONATHAN: A semi-automated monitoring method of marine megafauna and human activities at sea by digital aerial HD images

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The need to improve our knowledge on marine megafauna and the growing number of offshore wind projects in France and Europe, urge to develop more efficient new methods and adapted to the latest requirements for monitoring maritime areas. With the rapid development of advanced technology, new digital monitoring methods are now available and are already being used in some countries. However, post processing of large amount of images is time consuming and is thus costly. During two years, and thanks to cofounding with ADEME (The French Environment and Energy Management Agency), JONATHAN project aimed to develop a semi-automated monitoring method of marine megafauna and human activities at sea by digital aerial HD images. Up to 3200 pictures of positive and negative targets were collected to develop a detection and pre-identification model. This model has been integrated into a software that enable multi user mode, big data quick analysis, human validation, export and backup of final data. This innovation permits a valuable time saving in analysing the photos compare to a tedious total manual analysis. In terms of protocol, the results show that the JONATHAN method provides similar data to those collected by the current standard visual observation method, while overcoming its limitations (restricted height, animal disturbance, health and safety risks), and allowing access to data for replay. JONATHAN is currently always in progress by feeding the model with new targets to improve its effectiveness. Ultimately, the development of an Unmanned Aerial Vehicle (UAV) system for images acquisition is also expected to reduce costs and risks associated with at sea flights.

ACO17

Killer whale dialects are more homogenous in the western than in the eastern North Pacific

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Killer whale families have dialects – unique repertoires of stereotyped calls. Dialects are socially learned and slowly change in time as families diverge and their social bonds fade. To some extent, dialect similarity can be used a proxy of relatedness. In this study we compared the dialects of five resident (fish-eating) communities from the North Pacific: three from the eastern (Southern Residents, Northern Residents and Alaskan Residents) and two from the western (Kamchatka Residents and Commander Residents) North Pacific. To determine the similarity between the repertoires, we used two methods: categorization by the independent observer and dynamic time warping. We used two calls from each type/subtype from each community. The independent observer categorized the pooled samples into the structural categories without the prior knowledge about their community affiliation. Using the dynamic time warping, we compared the similarity of calls from all communities and classified the calls with the similarity >70% as a same call type. After that, we calculated the similarity between the communities based on the number of shared calls using Dice's similarity coefficient. We found that the calls of Kamchatkan and Commander killer whales were more similar to each other, than calls of any of the three eastern North Pacific communities. This finding is consistent with the fact that there is a small exchange between the communities in the western North Pacific: the killer whales from the Kamchatkan community sometimes visit the Commander Islands and socialize with the local whales, and vice versa. In the eastern North Pacific, despite some area overlap between the three communities, no social contact has been registered between them, which can explain the higher level of divergence between their repertoires.

ST01

Kinship and origin of a group of male sperm whales (*Physeter macrocephalus*) recently stranded in the North Sea

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The worldwide distributed sperm whale (*Physeter macrocephalus*) shows a matrilineal population structure with predominant male dispersal. At the beginning of 2016, a group of male sperm whales stranded in the North Sea. It has been postulated that these individuals where on a migration route from the north to the equator where females live in social groups. This event provides a unique chance to investigate a male grouping, based on a large opportunistic dataset. Here, we sequenced 422bp of the mitochondrial control region to infer the geographical and familial origin of these male sperm whales and their relation to each other. This provided insight into the so far unknowing genetic structure of male groupings and their dispersal tendencies. Based on four SNPs within the mitochondrial control region, five matrilineages could be distinguished within the male group, four matching published haplotypes found in the Atlantic. Further investigations showed that the genetic diversity of the bachelor group represents the genetic diversity of the overall Atlantic Ocean. This dataset holds a great opportunity to further investigate the male groupings of sperm whales and the overall species genomics.

ABU14

Linking the dots: sperm whale corridors and connectivity in the Mediterranean Sea

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Moving among multiple, connected habitats is paramount to the persistence and conservation of a species. Sperm whales in the Mediterranean roam across the basin but information on the movement routes are lacking. Based on the species habitat preference only, we implemented Corridor Loss Penalty (CLP) to obtain a baseline map of all the potential corridors of movements across the entire Mediterranean. We then used Least-Cost Corridor (LCC) modelling in combination with circuit theory to identify and prioritise movement routes amongst known core areas. The quality and importance of each identified corridor were assessed through cost-weighted distance to Euclidean distance (CWD:ED) and the cost-weighted distance to least-cost path ratios (CWD:LCP). Pair-wise and global current-flow centrality (CFC) was used to evaluate the contribution of each core area and corridor in facilitating animal movement. LCC analysis show that the mapped corridors vary in their importance in the overall network, with the highest quality ones being Alboran Sea-Balearic, Gulf of Lion-Ligurian Sea and Hellenic Trench-Island of Rhodes ones. The results of CFC analysis show that the waters surrounding the Island of Ischia, the Balearic Islands and the Strait of Messina have the highest centrality scores (CS) values, suggesting that they represent important nodes in keeping the core areas interconnected. The corridors between the Strait of Messina and the waters surrounding the Island of Ischia and the Hellenic Trench have the highest CS values, highlighting that the Strait of Messina could be the main corridor between the Eastern and Western Mediterranean. This is the first attempt to assess regional-scale connectivity for the Mediterranean Sea sub-population of sperm whales. This information could be critical to focus mitigation and conservation actions and to help planning and developing networks of Marine Protected Areas and the recently proposed Important Marine Mammal Area across the Mediterranean Region.

ECO02

Local foraging habitat selection of grey seals in different colonies in France and Ireland

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Grey seals are listed in Annex II of the European Habitats Directive, as species of special conservation interest. Interactions between seals and human activities such as fisheries are widely reported across their range. To effectively mitigate against negative interactions it is important to understand seals' habitat selection, its key drivers and geographical variations. The objective of this study was to examine foraging habitat selection of grey seals in different colonies in France and Ireland. We tagged 27 seals in France; 19 and 8 respectively in the Iroise Sea (IS) and in the Bay of Somme (BdS); and 18 in Ireland; 10 and 8 respectively at the Blasket Island (BI) and at Raven Point (RP). Foraging activities were identified by using dive data and then were used to model foraging habitat selection. Mixed models suggested that the main variable explaining foraging habitat selection were related to the fact that grey seals are central place foragers, i.e. distance from the haulout site (37% to 72% of deviance explained). The relative importance of other covariates on habitat selection varied with location; bathymetry varied from 0% to 27% and the distance from the shore from 10% to 62%. Overall seals selected shallow foraging habitat close to their haulout and to the shore. However, the influences of tidal current and sediments (<10% together) were different across sites and depended on the available habitat locally. Overall the study shows that grey seals will adapt their behaviour depending on local conditions and availability of habitat and that the drivers of habitat selection will vary regionally. This has management implications and suggests that management decisions to minimise seal/human interactions based on limited telemetry data from one study region should not be used to make decisions about habitat use elsewhere across the species range.

MN08

Long-term passive acoustic monitoring of common bottlenose dolphins' (*Tursiops truncatus*) presence in Haifa Bay, Israel

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In 2013, the Israeli government decided to expand Haifa and Ashdod ports. Noise emitted from the proposed construction activities, i.e. pile driving and sand mining, have the potential to adversely affect local resident marine mammals. Common bottlenose dolphin, the most prevalent dolphin in Israeli coastal waters and with confirmed presence in Haifa Bay and the Port area is the most likely to be affected. Accordingly, for the first time in Israel, IMMRAC convinced the Israeli Ministry of Environmental Protection and Israel Ports' Company to implement an acoustic monitoring of CBD's presence before beginning construction, in order to recommend timing for the noisy activities and to serve as a baseline for future reference.
C-pods were deployed at 3 different locations in Haifa Bay and at a location north of the Bay, as control.
After analyzing data collected between 2013 and 2015, it was found that CBDs were present at all sampling points, with the control site registering the lowest presence. CBD presence in the Haifa Bay was lower than in other areas around the world, including the Mediterranean Sea, as obtained by the same methodology. At the sampling station closest to the Port, dolphins maintained a year-round presence and were engaged in foraging activity ~ 10 % of the time, suggesting an importance of the area to dolphins' livelihood. Main presence of dolphins was found to occur from 4 p.m. till 9 a.m., therefore it was recommended to time the noisy work accordingly.
The results emphasize the need to formalize a conservation policy that will reduce human interference on coastal cetaceans. Continuation of long term monitoring during and after Port constructions and expanding it to other sites affected by human environmental interferences is essential to understand the impact of the latter on dolphins' distribution and habitat preferences.

BE14

Long-term sound and movement tags for behavioural studies of marine mammals

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Studies of acoustic ecology and the impact of anthropogenic sound on marine mammals have been greatly aided by multi-sensor tags such as the DTAG that simultaneously sample the acoustic environment of animals and their fine-scale behavior. However, the recording time of these tags has been limited to a few days due to battery, size and memory constraints. Here we report a new miniature, low-power sound and movement tag, the DTAG-4, that is capable of multi-week recordings. This highly integrated tag samples depth, acceleration and magnetic field sensors at sample rates up to 1kHz, as well as a fast-acquisition (64 ms per fix) GPS receiver enabling positioning on animals that make rapid surfacings. The tag has an acoustic bandwidth of up to 160 kHz, and is thus capable of recording sounds from all cetaceans, most sonars, and acoustic telemetry devices used for tacking fish. Lossless sound compression is used to increase memory capacity, and store-on-detect operation for high frequency transient sounds will also be supported. The packaging of the tag has been adapted for use on seals, cetaceans and manatees as well as terrestrial animals. It could also be fitted to oceanographic gliders to allow monitoring of marine mammal populations in remote areas. First deployments of the DTAG-4 on harbour seals have produced high quality 3 week recordings from 2 Lithium AA batteries while tags currently deployed on manatees should record for up to 6 weeks. A suction cup attached version has also been used to obtain wide bandwidth behavioural recordings on porpoises and humpback whales. The long duration of the new tag together with its compact size make it well-suited to noise exposure monitoring of marine animals in our increasingly industrialized seas.

WW02

Mapping Danish marine mammal ecotourism

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This study presents the results from the first mapping of Danish marine mammal related ecotourism activities. Using questionnaire feedback it was found that Denmark in 2015 had 17 operators focussing on seal watching activities, three operators on harbour porpoises and one combined operator. In total, 28,890 visitors took part in seal related tours, and 12,120 in harbour porpoise related tours producing a total revenue exceeding 6,5 m. Dkr. 16 out of 17 operators targeted haul out sites in Natura 2000 areas, with the majority of tours conducted between May and August. A positive trend between the number of seal-tourism operators and the number of seals were found between 2003 -2015, representing the period following the last outbreak of phocine distemper virus, which severely reduced the number of harbour seals. The study therefore provides the first evidence for a direct positive benefit to the Danish economy of increasing populations of both harbour and grey seals. On a global scale, activities in Denmark confirm the trend of ecotourism as an increasing importance for economies. On a local scale this information is relevant to the discussion concerning the economic consequences of increasing seal populations, which until now have mainly focused on the costs experienced by fisheries. With the observed growth in marine mammal watching activities, the impact of these on the populations should be investigated to ensure that they are sustainable.

CO09

Marine caves along the coast of Salento (Southern Italy): hot spots for the conservation of the Mediterranean monk seal

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Habitat availability is a key component in the conservation of the Mediterranean monk seal (MMS). Nowadays marine caves (included in the EU Habitat Directive) represent the most important coastal habitat for MMS survival, since they are used for breed and rest. The present work focuses on ~ 70 km of the overall 215 km of Salento's coastline (Lecce, Italy), characterized by convex sloping rocky coast and cliffs. From December 2013 to July 2015 the coastal area was surveyed to record the main physical characteristics of marine caves as potential available habitat for the MMS. A total of 58 caves were surveyed, 15 of which were selected for a detailed study, due to the former frequentation or since they showed the best eligible features for potential use by the species. Caves were then classified from a morphological point of view in different levels of suitability (resting cave, good-optimal-ideal breeding cave) and the degree of cave's accessibility (DCA) was calculated to assess the anthropic pressure of the coastal zone, which might represent a limiting factor for the local survival and natural re-colonization of MMS individuals. The DCA was obtained by combining the type of threshold and the minimum distance from the closest touristic place. Of the 10 caves that were classified as potential breeding caves, only one showed no impacts, owing to the anthropic pressure.
Our results and the recurring sightings of MMS along the Adriatic-Ionian region (Albania, Montenegro, Croatia and Southern Italy) over the last 20 years, as well as a known reproductive population in the Greek Ionian Islands, suggest that Salento area could be an important site to improve and expand the marine and coastal protection, in this context. This measure might be ineffective unless is included in an Adriatic-Ionian regional strategy for the conservation of the species.

CO11

Marine debris in marine mammals in Ireland: another issue in marine conservation

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Marine non-biodegradable debris is not uncommon in the ocean, in fact, it is regularly reported on shorelines, in the water column and in the deep sea. Interactions between marine organisms and marine debris are also reported and can include deleterious effects. Plastics as marine pollutants fall under Descriptor 10 of the MSFD. It is crucial to know the incidence, effects and their movement between trophic levels in marine ecosystems, and top predators can be used to understand these issues. Digestive tracts of cetaceans and seals stranded and bycaught in Irish territory were inspected from 1990 to 2016 (n=379). Furthermore, from 2009 to 2015 incidence of microplastics were also investigated (n=44). Twelve species of marine mammals (ten cetaceans and two seals) presented macrodebris (n=51, 12%) and only two of them did not present any food items. Several different types of macrodebris were identified (plastic, paper, nets, lead, etc). Microplastics were detected in all animals studied, but in 43% of them macrodebris was also present. No significant relationship was found between incidence of marine litter (either macro and micro debris) and presence of food. Incidence of marine debris was not related to species habitat (inshore vs. offshore waters).

MN06

Marine mammal encounters during the EMBLAS II research cruise (Black Sea, 2016)

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Cetacean populations in the Black Sea are affected by a range of human activities and the data on their distribution is beneficial for many conservation and management purposes. The multitasking research cruise of the EU-UNDP project ”Improving Environmental Monitoring in the Black Sea” (EMBLAS II) was conducted onboard the RV “Mare Nigrum”, during May – June 2016 (20 days). The Joint Open Sea Survey across the Black Sea and the National Pilot Monitoring Studies in the Ukrainian and Georgian coastal and offshore waters were performed. Our goal was to evaluate cetacean distribution patterns during this period. Visual observations were conducted by one experienced observer from the height of approximately 10.5 m above the sea surface in good or moderate conditions (Beaufort Sea state ≤3). During the survey following data were collected: weather conditions, GPS position, bearing angle and distance to the group, species identification, group size, its composition, and behaviour. We encountered 481 groups (2,352 individuals) of all three species of the Black Sea cetaceans. The short-beaked common dolphin (*Delphinus delphis*) was the most common species (373 sightings; 2,034 individuals), with the highest concentration rates in the deep-water central part of the sea and in its eastern regions, followed by the harbour porpoise ((*Phocoena phocoena*); 98 sightings; 263 individuals) which was distributed more sporadically. The low encounter rate of the bottlenose dolphin ((*Tursiops truncatus*); 10 sightings; 55 individuals) can be explained by the features of the seasonal distribution of this species. Our pilot study allowed us to identify areas of predicted high density of marine mammals. This knowledge will be used in the design of the future line transect surveys for the Black Sea cetacean abundance estimates.

HE10

Marine mammals immunology

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The study of cetaceans immunology plays an important role on conservation, as well as environmental health indicator, but its current knowledge and functions are still incomplete. This study is aimed to investigate cetaceans immune response in normal conditions to provide a base-line for assessing the immune response of bottlenose (*Tursiops truncatus*) and striped (*Stenella coeruleoalba*) dolphins. 16 animals (4 bottlenose and 12 striped dolphins) stranded in the Mediterranean Sea and 11 found stranded in the Canary Islands due to ship strikes (used as control) were included in this study dividing them considering biological data (sex, age, coming) along with pathological, microbiological, and toxicological results. Samples from lymphoid organs were taken within 48 hours from death, formalin-fixed, paraffin-embedded and routinely prepared for microscopic examination using hematoxylin-eosin staining. A quantification by immunohistochemical (IHC) analysis was performed by counting T lymphocytes (by using Monoclonal Mouse Anti-Human CD3), mature B cells (Monoclonal Mouse Anti-Human CD20) and cells presenting major histocompatibility complex type II (Monoclonal Mouse Anti-Human alpha-HLA-DR Antigen) in 10 fields at 40x magnification and statistically analyzing obtained data using T TEST method. The antibodies used in IHC were validated for bottlenose and striped dolphin tissues by means of Western blotting. No significant correlations were found between the variables considered and the expression of the different lymphocyte populations, except for the expression of anti-CD20 positive staining cells (B lymphocytes) in normal and hypoplastic lymph nodes, whose p-value was very close to that considered indicative of a strong association. Future analysis should be aimed to analyze the relationship between CD4+ and CD8+ cells in order to understand the effect of the major immunomodulatory pathogens, such as dolphin morbillivirus, on T cells sub-populations and to compare the immune system data to the environmental pollutants tissue concentration in order to understand their role on marine mammals health.

ST02

Mass stranding of 10 long-finned pilot whales (*Globicephala melas*) on the beach of Calais (France)

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A mass stranding of 10 long-finned pilot whales occurred on November 2nd 2015 on the beach of Calais (France). They were found ashore alive at low tide but seven of them died (three adult females and four adult males) within few hours, while the three smallest individuals survived and could be released at sea 3 hours after their discovery. Necropsies were started 24h hours after the stranding. All specimens were in good nutritional status with a thick blubber layer (mean= 46 mm), with empty gastro-intestinal tract, except one where few otoliths and one cephalopod beak were found. Significant observations were subcutis congestion and hemorrhages, presence of parasite cysts (presumably *Monorigma sp.*) in the blubber and the peritoneum, lung congestion and edema with moderate hemorrhagic froth in airways. One female had skin ulcers infested by *Isocyamus delphinii* and disseminated chronic ulcers in the stomach. Although pilot whales are one of the most frequent species involved in mass stranding, this is the first reported case in northern France. The pilot whales occurring in all deep waters areas of the north-eastern Atlantic except the eastern English Channel and the southernmost part of the North Sea. Only 7 other single strandings of pilot whale have been recorded on this area since 1970 (1977, 1978, 1981, 1992 (2), 1993, 1994). No military exercise nor seismic activities were reported in the area to explain this event. The topography of the northern France coastline is complex with shallow waters, numerous sandbanks and treacherous differences in tides. This area is totally unfamiliar for deep divers like pilot whales that have probably be grounded by the falling tide, trapped between sandbanks. Finally, this mass stranding should be considered with unusual strandings that occurred in the southern North Sea during the 2015-2016 winter such as sperm whales and narwhal.

HE11

Mediterranean monk seal parasites from Eastern Mediterranean cost of Turkey: Two new records

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The Mediterranean monk seal, *Monachus monachus* (Hermann, 1779), is an endangered species according to International Union for the Conservation of Nature (IUCN) Red List. Every individual's survival is very important for the species' existence. Since parasitic infections could cause mortalities, parasitological examination is one of the first steps in health assessment. Between 2013 and 2014, three monk seal necropsies were done from Eastern Mediterranean cost of Turkey; a male pup, a female adult and a male adult. *Orthohalarachne attenuata* (Arachnida: Halarachnidae) around the nostril of the pup; *Anisakis* sp. (Nematode: Anisikidae) and *Diphylobothrium* sp. (Cestoda: Pseudophyllidea) in oral cavity and, *Braunina cordiformis* Wolf, 1903 (Trematoda: Brauninidae) on the stomach wall of the female have been identified by morphological examinations. There was no parasitic infestation in adult male monk seal. Halarachnidae are respiratory tract parasites and cause significant pathologies on nasal mucosa and lungs. *Braunina cordiformis*, *Anisakis* sp. and *Diphylobothrium* sp. can cause gastritis, ulceration, enteritis, diarrhea, dehydration, and anemia, which can be fatal to hosts. Prevention or removal of these parasites should be taken into consideration during rehabilitation process. In this study, *Orthohalarachne attenuata*. and *Braunina cordiformis* are reported for the first time in the Mediterranean monk seal.

MN07

Monitoring cetaceans in the Madeira Archipelago from a ferry along a fixed transect: a preliminary analysis of summer-autumn 2016

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The use of ferries as platforms of opportunity for cetacean monitoring is wide spreading from several years. This is a cost-effective and efficient system, allowing a regular and continuous effort, both in space and in time, through fixed transect surveys. In order to start a long-term monitoring programme in the ferry route between Madeira and Porto Santo, CIIMAR-Madeira set up a collaboration with Porto Santo Line. The ferry operates all year round and visual surveys were undertaken three days per week by two trained observers from July to December 2016. Observations were limited to Beaufort sea state ≤ 4, with observers covering 180° on the front of the ship. Encounter rate (ER) was calculated as the number of sightings/100km. Number of vessels was recorded considering vessel size categories, to assess their density in the area, calculated as number of boats/km. Analysis to compare seasonal differences in the relative abundance of the two most sighted species (see below) has also been carried out. In 118 trips, 5.095 km were covered with an effort of 155 hours of observation. A total of 185 sightings from seven species were recorded: *Stenella frontalis* (53), *Tursiops truncatus* (30), G*lobicephala macrorhynchus* (15), *Delphinus delphis* (12), *Balaenoptera brydei* (12), *Physeter macrocephalus* (7), and *Grampus griseus* (1). Mean ER was 3,6. These preliminary results show a relatively high encounter rate in this area compared to ones registered in Madeira's offshore areas, however, the maritime traffic density values recorded are low (small vessels [<5m]: 0,05; medium vessels [5-20m]: 0,07; big vessels [>20m]: 0,02). The ongoing programme is important to enhance the understanding of collision risk and the knowledge about cetacean abundance and distribution in the area. Moreover, the presence of the observers on-board contributes to raise awareness about cetacean conservation among tourists and local people.

ABU15

Movements of coastal bottlenose dolphins between two areas along the coast of South Portugal mainland

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Bottlenose dolphins are highly mobile and could have different ranging patterns. Many studies have shown that bottlenose dolphins groups have different levels of residency and fidelity to a particular area and many groups are composed by resident individuals and transient individuals. In Portugal mainland, there is very little information about the habitat use and movements of coastal bottlenose dolphins, with the exception of the resident population of Sado estuary. The aim of this study was to identify mid-movements of bottlenose dolphins between two coastal areas, Sesimbra and Sagres, which are separated almost by 300 km. The movements were identified through photo-identification techniques by using photo-identification catalogues, which were composed by individuals sighted, during boat-surveys conducted between 2007 and 2014. It was considered a total of 338 individuals, 156 individuals from the Sesimbra catalogue and 182 individuals from the Sagres catalogue. 30 individuals were resighted among the two regions. Of these individuals, six were sighted and resighted in Sesimbra and Sagres during the August of 2014, which half of the individuals spent less than 15 days to travel between the areas, with a minimum temporam variaton of 11 days, and 24 were individuals sighted between years. This study was the first evidence of movements of coastal bottlenose dolphins between these areas and give a new perspective of how individuals could be highly mobile and rapidly change from one area to other, in Portuguese waters. Understanding the spatial use and movements dynamics of coastal bottlenose dolphins in Portugal mainland are crucial information for effective conservation and management measures in the recent Special Areas of Conservation (SICs) proposed by the national government for this species.

ECO03

Multilevel contributions to the study of the fin whale in the Garraf marine area, a foraging hotspot in the North-western Mediterranean

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The Garraf coast, situated between Barcelona and Tarragona, is recognised to be of ecological importance as part of the Natura 2000 network and Plan for Areas of Natural Interest (PEIN – Plan de Espacios de Interés Natural). It has been declared both Site of Community Importance (SCI) and Special Protection Area (SPA) for the conservation of wild birds. In the scope of the Fin whale Project, the EDMAKTUB Association has studied the fin whale (*Balaenoptera physalus*) presence in the area since 2011. The research includes almost daily random transect surveys with visual detection, and acoustic surveying on-board and from a stationary buoy. The Garraf Marine Area comprises specific geographical and environmental conditions that favour the growth of northern krill (*Meganyctiphanes norvegica*), and when present, the whales often show feeding and defecating behaviour. There is no obvious unidirectional migratory movement through this feeding ground, but the findings point to a complex opportunistic feeding behaviour with intra-seasonal and inter-annual reoccurrence of individuals. Every spring, and particularly from March to May, the area serves as a foraging hotspot for fin whales, and site fidelity of individuals across years indicates its importance. Remarkably, the acoustic survey of 2015 and 2016 showed no typical 20 Hz pulses, and only very rare higher frequency downsweeps that could have been produced by fin whales. This could concur with other studies in that the whales hardly vocalize during feeding. However, the signals might have been masked by fish sounds with high SNR, at least in 2016. This study contributes to the knowledge on the abundance and population trends of several cetacean and other marine species, and depicts the importance of the Garraf Marine Area as a feeding ground for the Mediterranean fin whale.

CO10

Necessity and challenges in using an Ecosystem Approach to the management of marine mammals: ensuring sustainable ecosystem services

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NAMMCO (North Atlantic Marine Mammal Commission) provides advice on the conservation, management, and study of marine mammals to its parties. These parties recognize the rights of coastal communities to utilize all marine resources, and also have committed to their sustainable utilisation. The management of hunting activities has become relatively straightforward when reliable data on abundance, trends, and biological parameters is available, and quotas and catch reporting are well-managed. Increasing stocks of narwhal, beluga, and walrus off Greenland are clear examples of sound and science-based management, following advice from NAMMCO. However, the continuity of marine mammal stocks as provisioning and cultural ecosystem services, as well as supporting and regulating services, are not solely dependent on the sound management of whaling and sealing activities. The impacts of increasing human activities in Northern waters must be integrated into the management advice process, which can be challenging, given that these impacts can be difficult to quantify and the effects may be cumulative. These impacts include: 1) by-catch and competition from fisheries, 2) changes in behaviour and distribution due to tourism, resource exploration and extraction, and shipping, 3) ship-strikes from shipping and 4) lethal and sub-lethal effects of pollution, such as reproductive failure. In addition, environmental and ecosystem changes due to climate change are already affecting marine mammals in various ways, including changes in habitat availability, shifts in distribution, and competition with new species. One example of a clear conflict between impacts is the number of narwhals susceptible to ship strikes from mining-related shipping which has been predicted to equal the hunting quota for some stocks. Additional examples of such impacts will be presented to stress the necessity of incorporating these impacts into NAMMCO's management advice, to move towards an ecosystem approach to the management of marine mammals.

HE12

Necropsy results of harbour seal pups

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According to the international seal agreement, the Seal Centre Friedrichskoog is the only authorised organisation for the rearing and rehabilitation of abandoned or sick seals in the state of Schleswig-Holstein, Germany. The care of harbour seal pups is the main focus of the Centre's work during the summer. There was a record number of 282 pups in care during the season 2016. Unfortunately, not all animals survived. A sample of the pups, which died or were euthanized at the Seal Centre Friedrichskoog were examined at the Landeslabor Schleswig-Holstein, Neumünster, Germany on a regular basis. A total of 26 animals were investigated in 2016. Necropsy was performed after routine protocol and samples were taken for histological, microbiological and molecularbiological investigations to search for the causative agent. Last season no homogenous disease pattern was noted. The results can be used to improve the treatment of sick seal pups in the Seal Centre. They also provide information about the health status of harbour seal pups in the Wadden Sea, especially considering the greater number of dead pups found in coastal regions in Schleswig-Holstein, Germany in 2016.

NT06

New acoustic alerting device PAL increases echolocation intensity in harbour porpoises (*Phocoena phocoena*)

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Fishery trials show that PAL significantly reduces porpoise by-catch in Western Baltic Sea gillnet fisheries. In Fyns Hoved, Denmark, we investigated porpoise reaction to PAL as opposed to two standard acoustic deterrent devices (ADDs), the Aquamark 100 and the banana pinger. Five buoys carrying a click detector each and spaced approx. 100 m from the next were moored in line along the 8 m depth contour. The middle buoy (no. 3) carried the acoustic device to be tested. The area was visually monitored for porpoises from an elevated vantage point on the cliff. Via theodolite tracking, travelling direction, speed and minimum surface time were recorded. PAL synthesizes aggressive porpoise communication clicktrains at 133 kHz whereas both ADDs generate wide band acoustic deterring signals. Source levels of the three devices were comparable at 150 - 154 dB. Results show that porpoise groups avoid the banana pinger by maintaining a large median minimum distance (202 m, n= 33) as opposed to Aquamark 100 (109 m, n= 382) and PAL (127 m; n=311; Kuskall-Wallis test, $p< 0.05$). Simultaneously, however, echolocation activity is reduced (chi² test, $p < 0.001$) during ADD operation (3% porpoise positive 10 min intervals during banana pinger and 5% during Aquamark 100) as opposed to PAL (19% positive intervals). Furthermore, the number of clicks counted per interval is half as high in Aquamark 100 (34; n= 38; ANOVA, $p < 0.001$), than in PAL (69; n= 85). These results indicate that PAL is an acoustic alerting device, enticing porpoises to acoustically investigate the surroundings of the sound source. In contrast, pingers do work as ADDs: Porpoises physically avoid the conventional banana pinger and reduce echolocation when exposed to either ADD.
Funded by the German Fed. Min. of Food, Agriculture and Consumer Protection (BMELV).

ACO18

No need to shout? Harbour porpoises (*Phocoena phocoena*) echolocate quietly in confined murky waters of the Wadden Sea

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Harbour porpoises (*Phocoena phocoena*) use echolocation to find prey, navigate and communicate. Recent studies gave evidence that they adapt their source level to the environmental characteristics in different habitats. The Wadden Sea is an acoustically and geomorphologically complex habitat. It is characterised by canyon-like underwater structures within flat and shallow waters with high tidally driven particle resuspension – unique in European waters. In this study echolocation clicks of free-ranging harbour porpoises in the German Wadden Sea were recorded with a vertical linear six-element hydrophone array. To estimate source levels of these porpoise clicks time-of-arrival-differences (TOAD) were used. The calculated distances of porpoises to the array led to a back-calculated mean source level of 169±5 dB re 1 µPa pp. This is significantly lower than the so far reported mean source levels of free-ranging harbour porpoises from Inner Danish Waters (+20 dB) and British Columbia (+9 dB). A second finding for rms-bandwidth indicated even narrower signals than formerly found. This study confirms that porpoises adapt their source parameters to different acoustic habitats with large implications for acoustic monitoring. Static acoustic monitoring represents a good method to receive long term information about migratory behaviour, abundance and population density of echolocating odontocetes by recording their clicks in defined radii around click-loggers. Since these loggers have only one hydrophone their detection range depends directly on the sensitivity of the hydrophone, but also on the source level of the clicks recorded. A decrease in source level by 20 dB may in the worst case result in a 90% reduction in effective detection radius. Further studies on population density of harbour porpoises and comparative studies should take account of the habitat dependent source levels to reliably estimate abundance and derive the correct comparisons on porpoise occurrence rates between areas.

ACO19

Non-whistle sounds used in bottlenose dolphin aggressive interactions recorded on DTAGs

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Bottlenose dolphins (*Tursiops truncatus*) produce a wide array of sounds, including clicks for echolocation and whistles for communication, both of which have been studied intensively. However, sounds other than whistles and echolocation clicks have received less attention, probably due to their high variability. These include the class of sounds loosely described as "burst pulses," which in several studies of dolphins under human care have been linked to aggressive interactions. Few studies have been carried out in the wild, beyond those describing basic acoustic parameters of sounds. Here we use acoustic and movement recording tags (DTAGs) placed simultaneously on both members of pairs of free-ranging bottlenose dolphins in Sarasota Bay, Florida, USA, to investigate acoustic behavior during aggressive interactions between male alliances and female-calf pairs. Between 2011 and 2016, DTAGs have been hand-placed on 19 mother-calf pairs, 7 male pairs, and 16 other dolphins during brief capture-release events. Upon release, tagged animals were followed and observed, which included documentation of aggressive interactions. A sample of 1255 high quality sounds (with >10 dB SNR and no overlapping sounds) recorded during aggressive interactions were tested using unsupervised clustering and discriminant function analysis on parameters such as frequency content, duration and rise time. This analysis separated three different sound types: broadband burst pulses, highly resonant cracks, and low-frequency narrowband quacks. Quacks seem to be produced by both members of highly coordinated male alliances, and may be involved in pair coordination; a very similar sound type was also recorded during an apparent infanticide attempt by a male alliance in Savannah, Georgia. Burst pulses and cracks appear more linked with aggressive interactions. These characterizations may not only provide insights into how these sounds function in the dolphin communication system, but also may assist researchers in assigning behavioral states to animals from passive acoustic monitoring data alone.

ABU16

North Atlantic phylogeography and large-scale population differentiation of the harbour seal (*Phoca vitulina*)

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The harbour seal (*Phoca vitulina*) is the most widespread phocid in the Northern Hemisphere and many local populations have experienced a number of recent declines, due to epizootics, hunting and habitat loss. Hence they offer a great opportunity for investigating how recent historical events influence population structure and distribution patterns of a marine species. In this study we have examined 174 harbour seals from 15 locations across the Northern Atlantic, and used genotyping-by-sequencing (GBS) as it allows for identifying a vast number of polymorphisms from single nucleotide polymorphisms (SNPs). 159 individual samples met the quality control measurements, and a total of 11.633 SNPs were discovered in the dataset. The number of SNPs was reduced to 6.584 when implementing a minor allele frequency MAF > 0.02 to retain a SNP. We identified a clear substructuring across major harbour seal sites in the Northern Atlantic, and the results support the proposal that the harbour seals have colonized the Northern Atlantic from West to East through the High Arctic. The analysis further show that the Icelandic population of harbour seals is closer related to the Eastern Atlantic harbour seal (*P. v. vitulina*) than the Western Atlantic harbour seal (*P. v. concolor*) as previous suggested. Furthermore, the results show that the harbour seals populating the regions of Kattegat, Skagerrak, Limfjorden, the Danish Wadden Sea, and the Western and Eastern Baltic Sea in the Southern Scandinavia have a patchier distribution then previously found. This is shown as harbour seals from Anholt in Kattegat and Limfjord West in Limfjorden are more related to populations from Scotland and Iceland, than nearby colonies inhibiting the Southern Scandinavia. These findings are novel and very useful in future scientific studies on harbour seals.

ABU17

Occurrence and group dynamics of cetaceans in Madeira Island based on long-term fine-scale data from platforms of opportunity

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This study uses daily presence-absence sighting data of cetaceans collected year-round from whale-watching boats in the pelagic environment of the Madeira Island between 2005-2015 to analyze the species' occurrence and group dynamics. Data from 7551 (daily) sightings comprising 22 species were collected from 3527 surveyed days during 11 years (mean of 321 days per year, SD = 17). Cetaceans were observed in 92% of the surveyed days, and a mean of 15.4 (SD=1.5), 8.2 (SD=2.0), and 2.1 (SD=1.2) species were recorded per year, month, and day, respectively. The highest diversity was recorded in June, and at least nine species, comprising 96% of all sightings, were found to use the Madeiran waters in a regular basis, such as the Atlantic spotted dolphin *Stenella frontalis*, the bottlenose dolphin *Tursiops truncatus*, the short-beaked common dolphin *Delphinus delphis*, the Bryde's whale *Balaenoptera brydei*, or the short-finned pilot whale *Globicephala macrorhynchus*. In addition, ten species were found to use the Madeiran waters for traveling, feeding, resting, socializing, and calving. This suggests that the southern and southeastern waters of Madeira Island constitutes an area of interest for a large number of cetacean species, including some featured in the IUCN Red List as Endangered, Vulnerable, and Data Deficient. This study characterizes the cetaceans' community structure (occurrence, aggregation sizes, behaviours, proportion of calves, and inter-specific relationships) of a poorly studied region, providing important information for managers.

HE15

Origin and spread of Phocine Distemper Virus (PDV) causing the 1988 and 2002 epidemics in harbour seals.

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Over the past decades, several major virus epidemics have been recorded in seal populations around the globe. The pathogens responsible for these epidemics have mainly been identified as influenza A, Canine Distemper Virus (CDV) and Phocine Distemper Virus (PDV). The PDV epidemics in 2002 and 1988 are known as some of the most devastating mass mortality events ever recorded among marine mammals. In both epidemics, the first reports of dead seals came from Anholt in central Kattegat, Denmark. During the next months, the disease spread and dying seals were observed along the North European coasts, resulting in the death of more than 50.000 harbour seals. However, despite its large impact on harbour seal population health, very little is known about the origin and spread of PDV – in part because of limited sampling and genomic coverage. Here we investigate the origin and spread of the two PDV outbreaks by analysing 7200bp of the PDV genome (P, M, F and H genes) in 32 harbour seals collected in Denmark, Sweden, Germany and Scotland during the 2002 and 1988 epidemics. Overall, we found a clear phylogenetic split between the 1988 and 2002 outbreaks, and less genetic variation within outbreaks. Moreover, in contrast to previous studies, the genomic data from the 2002 outbreak suggest at least two independent waves of PDV transmission from the epicentre in central Kattegat; one to the Wadden Sea and one to the Limfjord. Importantly, while not contradicting the hypothesized role of grey seals as interspecific PDV carriers, our results do open for the possibility of long-distance transmission events by harbour seals.

HE13

Parasitological findings in Fin Whales (*Balaenoptera physalus*) stranded along Italian coastlines

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The fin whale (*Balaenoptera physalus*) is the commonest large whale species in the Mediterranean Sea. These whales concentrate in some specific feeding areas of this basin, among which the International Pelagos Sanctuary. Few reports on parassitofauna of Mediterranean fin whale population are available in literature. In the period October 2006 - January 2015, post-mortem examinations were performed on seven fin whales, found stranded along Tyrrenian and Ligurian coastlines. Biometric data, carcass conservation code, body condition score, age estimation and sex of stranded animals were collected during necropsy. A complete parasitological exam on skin, blubber and gastrointestinal, cardiovascular, respiratory and urogenital systems was carried out. The parasites were fixed in 70% ethanol for the subsequent morphometric identification. Tissue samples of the major organs were formalin fixed, paraffin embedded and routinely processed for histological examination. Six out of seven fin whales were positive for one or more parasite species; one crustacean (*Pennella balaeonpterae*) and four helminth taxa (*Ogmogaster antarcticus*, *Crassicauda boopis*, *Tetrabothrium* sp., *Bolbosoma* sp.) were identified. Crassicaudosis infection was observed in five out of seven examined animals. Adult *C. boopis* were found in four fin whales. Another animal showed typical vascular lesions with ruined fragments of the nematode inside. Chronic severe vasculitis, associated with thrombosis, was observed in renal vessels and vena cava, leading to almost complete occlusion of vessels lumen in three cases. Nematoda larvae were found in the wall of the intestine and mesenteric arteries in one animal. Histology showed mild renal fibrosis, perirenal granulomas and disseminated Crassicauda eggs in renal vessels, renal pelvis and adrenal glands. This study provides data on the ecto and endoparasites of fin whales stranded along Italian coastlines and particularly on presence and pathogenic effects of *C. boopis* in Mediterranean population of fin whales.

HE14

Pathological findings in harbour porpoises (*Phocoena phocoena*): indication for violent interactions with bottlenose dolphins (*Tursiops truncatus*) in the German Baltic Sea of Schleswig-Holstein

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In the years 2015 and 2016, four bottlenose dolphins (*Tursiops truncatus*) were registered in the Danish and German area of the Baltic Sea. They stayed individually or in pairs in the bays/firths of Fredericia, Flensburg, Eckernföde, Kiel, and in the Great Belt. Necropsies performed in the Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, in 2016, revealed traumata of varying extent in 3.8% (6/159) of the examined harbour porpoises (*Phocoena phocoena*) found on the coast of the Baltic Sea of Schleswig-Holstein (data as of January 4th 2017). Pathological findings in these six animals include subcutaneous and internal haematoma, bleeding into thorax, pericardium and abdomen, broken ribs, and one broken mandible. Externally, four animals showed signs of trauma including abrasion of the skin, small skin cuts and one long cut in the flank with stomach and intestines partly hanging out. All these animals were found in areas were the dolphins have been sighted what supports the suspicion of dolphin caused traumata and killing. It should be noted that all reported porpoise deaths coincide with the presence of a single bottlenose dolphin, while the presence of a dolphin pair did not result in any German porpoise deaths. In Denmark, attacks on porpoises were observed by both the same single individual and dolphin pair. Already in the 1990s, dolphin attacks against harbour porpoises were witnessed in Scotland and Wales. Between 2007 and 2009, aggressive interactions of bottlenose dolphins against harbour porpoises were reported in Monterey Bay, California, and now, for the first time, also in the Baltic Sea. Furthermore, rangers reported that harbour porpoises avoided areas where bottlenose dolphins were sighted. The motive for the attack and killing is unknown. Assumptions for the reason of this behavior include food competition, object-orientated play, sexual frustration, and training of infanticide.

MN02

Photo-ID aids monitoring of grey seal (*Halichoerus grypus*) return to their historical sites after absence for 80 years in the German Baltic Sea

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Grey Seals were assumed to be extinct in the German Baltic Sea after 1920. Due to combined international efforts (HELCOM), since 2004 grey seals are returning in increasing numbers to their historical haul out sites around the "Island of Ruegen". Currently monitoring and reliable knowledge about habitat use, population size and site fidelity is critically needed.
The method photo-identification (photo-id) was tested in the field for the given conditions. The matching program ExtractCompare was used to extract pattern cells from photographs of five different body parts. The extract was then numerically described, rectified and similar seals from the database were suggested. Potential pairs were visually checked. Several institutions provided their data (>3000 images) from 2007 to 2016. Data were additionally collected with high effort, especially at the "Stubber bank", a shallow submarine elevation of coarse sands with few glacial rocks piercing the water surface in the "Greifswald Lagoon" from March until July 2016. Due to very limited rock space not all animals can haul-out at the same time. A photo-id catalogue consisting currently of 415 images and 187 seals (all aspects) was established. As result 15 seals were repeatedly seen (matched) in the study area. They were sighted from two to seven times over a period of up to 839 days. Most seals (13 out of 15) were sighted again at the same site, which indicates certain site fidelity. At least seven seals could be identified as 'residents', since they seasonally returned into the same area. Grey seals seem to increasingly use German Baltic waters as a permanent foraging area. The presented results indicate that photo-id is useful in addition to haul out and on-site counts and needs continuous application to establish reliable estimates of abundance and to aid management decisions of the conservation authorities.

MN09

Places no one else goes – the importance of Marine Mammal Observer data

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Marine Mammal Observers (MMOs) are used worldwide in both inshore and offshore areas for a range of activities including geophysical surveys. Their primary role is to protect species of concern from the impacts of these activities in order to comply with specific regulations or as best practice. MMOs also collect data besides that required for mitigation purposes. The importance of such data is immense given that most comes from remote locations with little or no research effort. Recently the value of MMO data was recognised in New Zealand's 'Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations' which has research as one of its primary objectives. Since 2008, Gardline Environmental has undertaken over 250 MMO jobs in 52 countries resulting in hundreds of hours of effort and thousands of sightings, which are often the first recorded in an area. Hence our database has a great potential to fill in knowledge gaps about distribution, abundance, seasonality and importance of habitats in offshore areas. Here we present a case study on cetacean distribution in West Africa with data collected during geophysical surveys by MMOs. The dataset includes 646 sightings of 23 species. Ecological modelling analyses comparing sightings data with underlying environmental features enabled determination and geographic delineation of specific niches. This study, which spatio-temporally quantifies these inter-specific environmental relationships, furthers our understanding of cetacean distribution and forms a foundation for further ecosystem led research of this understudied and under-managed region. Additionally it highlights the importance of data collected onboard seismic vessels and unlocks the potential for similar studies in other under-researched, heavily exploited areas. In order to use these datasets meaningfully and to extract such vital information, coordinated cooperation between industry and academia is needed as well as improvements in data collection, quality and training of MMOs.

GEN03

Population genomics of Norwegian killer whales (*Orcinus orca*)

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Only one species of killer whale is recognized, but it is suggested, that there exist two ecotypes of North Atlantic killer whales – feeding on fish or marine mammals respectively. In the waters of northern Norway, in the Troms area these years, killer whales aggregate during the winter to feed on the Norwegian spring-spawning stock of herring. Little is known about the genetic relationship among these feeding aggregations, and how they are connected to other killer whale populations in the North Atlantic. A range of biopsies from the North Atlantic was collected – samples of Norwegian killer whales observed eating herring, samples from fish-eating killer whales in the North Sea and finally mammal-eating whales from Greenland. To investigate the population genomics of killer whales in the North Atlantic, a genome-wide SNP data-approach, RAD-seq, was used for the genetic analyses. The objectives of the study were 1) to investigate if the Norwegian killer whales in fact are "Norwegian" since these aggregations only happen in winter, they must travel elsewhere, 2) to look into whether the killer whales are there only to eat or perhaps also mate and finally 3) to infer whether two North Atlantic ecotypes exist. The data suggests no genomic difference between the killer whales across the North Atlantic. Thus, we cannot say where the "Norwegian" killer whales might come from, but we can infer that the two supposed ecotypes of the North Atlantic are not genetically different. This is also supported by observations of Norwegian killer whales attacking and eating seals, although they have been thought to only prey on fish. Lastly, no genomic difference across the North Atlantic supports the theory that killer whale pods are not breeding pods or harems. Males breed outside their maternal group, thus maintaining gene flow and preventing or at least slowing the speciatio process.

ABU18

Population structure of bottlenose dolphins and harbour porpoises in the northern Black Sea and the Sea of Azov

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Bottlenose dolphins (*Tursiops truncatus*) and harbour porpoises (*Phocoena phocoena*) in the Black Sea are considered as local endemic subspecies (*T. t. ponticus* and *P. p. relicta*) which are currently endangered due to consequences of resource depletion, epizooties and bycatch. However, these generalizations are to be specified in regard to population structure which has been little described. This study was focused on the Sea of Azov and the coastal waters of the northern Black Sea in 1999-2014. Bottlenose dolphins form a network of loosely connected local coastal populations. Some of them can be classified as local resident stocks, whereas others as summer-resident coastal migrating stocks. At present, they are abundant (ca. 500 to 1500 individuals each) and even expand to new areas. However, their abundance is unstable, and they are at the best vulnerable. In addition, there are morphologically distinct large dolphins with long rostra which probably represent an offshore form: there is an indirect evidence for their ecological ties with the Mediterranean Sea. Therefore, only coastal stocks are for sure *T. t. ponticus*, while taxonomy of the presumed offshore population needs future assessment. On the contrary, Black Sea harbour porpoises clearly represent an isolated subspecies divided into big populations differing in morphology, ecology and demography. One of them inhabits the Sea of Azov in summer and moves to the north-eastern Black Sea for winter; this is an endangered declining population, highly susceptible to bycatch. Another population inhabits at least the northern Black Sea and, possibly, all the Black Sea area, seasonally migrating across the sea; this population is stable and sustainable. The third tentative population may be located in the north-western Black Sea. Thus, cetacean populations in the northern Black Sea are highly heterogeneous, and in many habitats they should be specifically managed as separate units.

ACO20

Porpoise clicks are downsweeps: the power of waveform analysis in cetacean monitoring.

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Traditional analysis of cetacean echo-location clicks is heavily based on the frequency spectrum but this approach entirely loses information on the relative timing of features within the click. To 'look inside the click' the C-POD-F instrument times features of click waveforms to a resolution of 250ns.
Analysis of 700 porpoise clicks from the north and south coasts of Cornwall in the SW of the island of Britain shows that the narrow band high frequency (NBHF) clicks produced by porpoises are often recieved as shallow frequency downsweeps, with wavelenghts increasing by around 5% over 8 cycles. This feature does not show in the spectrum, and is not seen in similar narrow-band high frequency click waveforms from the other sources we have examined. When echoes of such a click structure interfere with each other (with small time delays) they generate higher and lower frequencies that have differences that could be detectable to porpoises, although the significance of that is not yet clear. Identification of click trains is needed to reduce false positive levels in acoustic monitoring and examination of successive waveforms received in a click train shows time features that are sometimes very consistent between successive clicks. This greatly assists train identification, and some of these features are described.

ECO04

Potential effects of climate change on cetaceans in the Black Sea

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The changes in the atmosphere caused by human activities are now resulting in changes in the oceans, which now are a major concern. Combination of factors such as pollution, eutrophication, unsustainable fishing practices, lack of adequate management, and introduction of alien species has had a detrimental effect on Black Sea and climate change induced impacts are expected to deteriorate this situation. As sentinels of marine ecosystems, cetaceans are important tracers for environmental change. This review highlights the current and potential threats of climate change to the Black Sea and its cetacean populations and stresses the necessity for urgent conservation measures. The possible direct effects in the Black Sea basin include habitat loss and displacement, while indirect effects include changes in prey, severe weather events, infectious disease, and increase in human disturbance via aquaculture, pollution, and coastal construction.

ECO05

Predator-prey interactions between Harbour Porpoises (*Phocoena phocoena*) and Fish observed with a Drone

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Harbour porpoises (*Phocoena phocoena*) are opportunistic foragers of small fish. We filmed them with a drone while they were foraging on single and schooling fish in shallow waters (depth 1-3 m). Data was collected around the island of Funen, Denmark. By observing the movements of the porpoises and the fish it was possible to assess at which distances fish initiated evasive manoeuvers to avoid the approaching predator. The observations indicate that fish may use a combination of visual and hydrodynamic cues to detect the porpoise. Their evasive movements caused the porpoises to spend considerable time chasing single and multiple fish before being able to catch prey. Even when foraging on large schools of fish, it is evident from this analysis that the evasive manoeuvres of the fish forced the porpoise to spend significant time and energy resources on chasing each prospective prey item. Therefore, harbour porpoises may be sensitive to disturbances in their foraging activities, also when foraging in areas where there evidently is a considerable amount of fish for them to catch.

MO03

Predicting the population-level impact of mitigating harbor porpoise bycatch with pingers and time-area fishing closures

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Fisheries bycatch is considered a threat to the long-term persistence of marine mammal populations. An increasingly common strategy to mitigate bycatch of harbor porpoises (*Phocoena phocoena*) involves the use of pingers (acoustic alarms that emit underwater noise) and time-area fishing closures. Although these mitigation measures can reduce harbor porpoise bycatch in gillnet fisheries considerably, inference about the long-term population-level consequences is currently lacking. We developed a spatially explicit individual-based simulation model (IBM) with the aim to evaluate the effectiveness of these two bycatch mitigation measures. We quantified both the direct positive effects (i.e. reduced bycatch) as well as any indirect negative effects (i.e. reduced foraging efficiency) on the population size using the inner Danish waters (IDW) as a biological system. The model incorporated empirical data on gillnet fishing effort and noise avoidance behavior by free ranging harbor porpoises exposed to pinger signals. The IBM simulations revealed a synergistic relationship between the implementation of time-area fishing closures and pinger deployment. Time-area fishing closures reduced bycatch rates substantially but not completely. In contrast, widespread pinger deployment resulted in total mitigation of bycatch but frequent and recurrent noise avoidance behavior in high quality foraging habitat negatively affected individual survival and the total population size. When implemented both bycatch mitigation measures simultaneously the negative impact of pinger noise-induced sub-lethal behavioral effects on the population was largely eliminated with a positive effect on the population size that was larger than when the mitigation measures were used independently. Our results suggest that conservationists and policy makers need to consider and balance both the direct and indirect effects of harbor porpoise bycatch mitigation measures before enforcing their widespread implementation. IBMs, such as the one presented here, offer a valuable framework to design adaptive management strategies that satisfy both ecological and socioeconomic demands on marine ecosystems.

MO04

Predictive model for habitat mapping of common dolphins (*Delphinus delphis*) in the waters south of Samos island, Greece

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The short-beaked common dolphin (*Delphinus delphis*) is classified as an endangered species by the IUCN. Their populations are threatened mostly by diminishing food sources due to fish stock overexploitation and incidental mortality, by fishing gear. Many of the conservation efforts are therefore, aimed at assessing the extent of conflicts with human activities. In order to protect *D. delphis*, conservationists require information about the areas of their occurrence and their competition with fishers, for the same resources. Boat surveys, during which occurrence data was collected, were conducted between May and November 2015 and between April and August 2016. The presence data collected, together with randomly created absence points, were used to model the spatial distribution of *D. delphis*, in the waters south of Samos Island, Greece. The random forest algorithm applied, made use of three static variables: bathymetry, distance to coast and slope. In addition, four dynamic variables: chlorophyll a, salinity, sea surface height and sea surface temperature, were added to the model. The results demonstrate that static variables are more significant than dynamic variables, with bathymetry and distance to coast having the most explanatory value. The model pinpointed some important habitat areas in the waters south of Samos island and in the northern Dodecanese region. The output of the model can be used by conservationists for setting up protected areas or managing fisheries activities, in regions where there are interactions and conflicts between humans and *D. delphis*. However, when making management decisions based on spatial predictions, it is important to consult more than one model, in order to account for spatial uncertainty. Expanding the study area and conducting surveys throughout the whole year, covering pre-defined transects, would improve the accuracy of the model and strengthen conservation efforts.

GEN04

Preliminary assessment of the genetic diversity of *Stenella coeruleoalba* (Meyen, 1833) populations from the Ligurian and Tyrrhenian seas and possible hybridization with *Delphinus delphis* (Linnaeus, 1758).

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The striped dolphin (*Stenella coeruleoalba*) is the most abundant species in Mediterranean. According to the IUCN Red List, the Mediterranean subpopulation is classified as vulnerable, because it is facing several threats, such as morbillivirus infections and organochlorine pollutants associated with immunosuppressive effects. Genetic diversity is a useful measurement to assess the conservation status of populations, since it is demographically linked and has implications for adaptive potential. We performed a preliminary assessment of genetic diversity of the striped dolphin population from the Ligurian and Tyrrhenian seas, analysing 5 nuclear loci (356–775 bp), the mtDNA control region (850 bp), and the mtDNA cytochrome b gene (448 bp) across 18 individuals. We also looked for possible hybridization traits between striped dolphin and the endangered short-beaked common dolphin (*Delphinus delphis*), given frequent sightings of individuals of the latter species within the groups of striped dolphin and report on the literature. Our results showed no significant differences in the genetic variation of our samples compared to that reported in the literature for the Atlantic population. A median-joining analysis based on mitochondrial and nuclear marker, which included further Atlantic sequences from GenBank, did not reveal any geographical structure among the putative populations. Atlantic mtDNA haplotypes were found in the Mediterranean and three Mediterranean haplotypes were unique, suggesting gene flow from the Atlantic towards the Mediterranean and that the Gibraltar strait is not a geographical barrier to dispersal. A broader phylogeny, using sequences from two mitochondrial markers, from 18 striped dolphin and 33 common dolphins revealed an intermediate clustering for two Atlantic and one Mediterranean individual of striped dolphin. Our findings suggest the existence of a divergent lineage of striped dolphin but further investigations, including more samples and nuclear loci are needed to fully resolve the phylogenetic relationships of striped dolphin populations in the region.

GEN04

Preliminary result of cetacean diversity off the Pacific Ocean of Nicaragua (Central America)

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This is the first study that has been conducted in the waters of Nicaragua (Central America) along the Pacific Ocean to assess the diversity and occurrence of cetaceans. Boat based surveys were carried out in San Juan del Sur (South-Western Nicaragua) and in Padre Ramos (North-Western Nicaragua) in August 2015 and January -March 2016. Boat based surveys were also effectuated in San Juan del Sur in July 2016 as well as Land based surveys from January-March 2016 (93h of effort). During this period 166 hours and 189 hours of boat based effort has been spent in San Juan del Sur and Padre Ramos respectively. 104 Sightings were recorded during the surveys and 6 cetacean species were identified: one mysticete (*Megaptera novaeangliae* (n=13)) and five odontocetes (*Stenella attenuata* (n=70), *Stenella longirostris* (n=1), *Tursiops truncatus* (n=17), *Steno bredanensis* (n=1), *Pseudorca crassidens* (n=2)). For each sighting: species, groups size, geographic position and primary behavior was recorded. These results will have important implications for future spatial management in the frame of the construction of the canal of Nicaragua.

BE15

Prolonged, sub-surface, visual observations of free-living killer whale (*Orcinus orca*) feeding behaviour in northern Norway

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Cetacean behaviour is typically inferred from visual observations or from analysis of data from instruments attached to the animals. Proxies for behaviour are employed when using instrumental data (e.g location, depth, speed, acceleration and sounds produced). Direct visual observation is typically limited to above or just below surface displays while indirect visual observation even at depth through photos or videos is usually limited in view field. We gathered direct sub-surface observations up to a depth of 15 m of orca feeding and social behaviour that can be integrated with other data for a more profound understanding of the ecology of this species. A single person snorkelling in the proximity of the animals gathered the data over four years using a minimal-impact protocol that aimed at maximising the chance of observing naturally acting animals. Particular behaviours have been recorded on video. Our observations revealed that in our area, although feeding mostly on herring, occasionally orcas take seals. Herring capture happens frequently for up to two hours in a carousel situation often with reduced acoustic behaviour, at different depths often herding the bait ball. Tail slapping with actual fish contact follows, occasionally simultaneous by up to 3 individuals. Sharing of the stunned fish is the norm. The bait-ball is incompletely consumed and usually no stunned fish are left. Large whales irrupt in the carousel and depredate the ball after which the carousel is resumed, but aggressive reactions by the orcas have occasionally been witnessed. Shallow water feeding by adult males alone or in small groups involves isolating individual fish for direct capture. Predation on harbor seals after feeding on fish has also been observed testifying that these orcas are not specialists. We believe that our observations can provide essential information for the interpretation of tag data with particular regard to accelerometry.

HI09

Quantification and context of near miss event of ship strikes with fin whales on a ferry line in the Mediterranean Sea

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Collisions with vessels along the shipping lanes are one of the biggest pressure on Fin whale's population in the Mediterranean Sea. Known records of death related to ship strikes are few and the impact on the population is therefore difficult to assess. Since 2007 the Fixed Line Transect (FLT) Mediterranean Network started transect line method from ferries to record abundance, ship strike and near-miss event (NME). NME is defined as: an animal located 50 m from the front of the vessel bow and 25 m on the side, not showing an active approaching behavior. At each NME, notes are taken describing the situation. EcoOcéan Institut is part of the FLTMedNetwork and in charge of the Toulon-Ajaccio line since 2011. Until 2016 we surveyed almost 13,000 Km, recording no ship strike and nine NME with Fin whale, given a global NME rate of 0.0008 NME.km-1. All NME have been witnessed during the "hot" period (April to October), when the relative abundance is the highest (0.018 ind.km-1 compare to 0.007 ind.km-1 in the cool period). Concerning the behavior results, two main situations occur leading to NME: in three cases (33%) animals were seen on the trajectory on front of the vessel between 500 and 900 m away, sleeping or swimming gently, and in the six other cases (67%) animals just "pop up" from their dive in front of the bow (less than 50 m). In the first situation, observers were able to warn the crew who deviated the ferry from its course to avoid the animals. In the second situation, there is no time to do anything for the crew, and the animals avoid the vessel with a startle effect. These results bring interesting knowledge to help finding way to assess and mitigate ship-strikes.

MN11

Resighting rates of Blainville's Beaked Whale (*Mesoplodon densirostris*) off Madeira Island (NE Atlantic)

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Patterns of residency or site-fidelity of beaked whales (Family *Ziphiidae*) are hard to assess, mainly due to the difficulty in finding and approaching free-ranging individuals. Site fidelity is frequently indicative of the ecology of a population as confirmation of repeated sightings in the same area can be used to identify important habitats. Photographic data of Blainville's beaked whales were collected opportunistically off the southern coast of Madeira Island in whale-watching platforms between 2004 and June 2016.A photo-identification catalogue was compiled and a dataset of capture histories was subsequently created. Resighting rates (RR) were defined as the number of individuals seen more than once divided by the total number of individuals identified during the study period. We identified 62 well-marked individuals throughout the study period, of which 17 were re-sighted. The overall RR was 0.27. Although the majority of whales were only seen in one year (median = 1, maximum = 3), eight whales were sighted in multiple years whereas the remaining nine whales were seen within the same year in multiple days. Of the 17 re-sighted whales, five were adult males and 12 were adult females. There were three pairs of females that were sighted together twice; two of them were sighted in two consecutive days, and one was sighted 30 days apart. Despite the small catalog size and the limited number of photographs, we recorded a relatively high rate of individuals being seen on more than one occasion. The inter-annual sightings suggest some degree of long-term site fidelity, and some level of association between adult females. This study demonstrates, for the first time, the existence of short and long-term site-fidelity of Blainville's beaked whale off Madeira Island, indicating that these waters can be an important area for this species.

HE16

Results of microbiological research of the samples of Atlantic Walrus (*Odobenus rosmarus*)

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To assess the status of the health of free-living marine mammals usually use various veterinary methods of researches: clinical, laboratory, hardware and others. Microbiological research as a part of complex assessment of health of animals allows to indicate the pathogenic microorganisms and to define their etiologic role in the presence of pathologies. And also allows to carry out sanitary and ecological assessment of an area of habitat of a walrus. Purpose of our research: to research the species composition and biological properties of microorganisms in biological material from the Atlantic walrus. Material for a research has been selected in 2015-2016 by forces of collaborators of Marine Mammals Council of Russia. We have studied the following samples: smears from a mucous membrane of oral, nasal cavities, a conjunctiva and anus. Our researches were done by cultural methods with obligatory studying of factors of pathogenicity of the selected microorganisms.
As a result of our work we have selected and have studied 131 cultures of microorganisms received from 16 individuals of a walrus. Growth of microorganisms at the mediums was observed in 100% of samples. The greatest number of isolates has been presented by Gram-positive coccus. At the same time more than 89% of them were the *Staphylococcus* bacteria. Allocated *Staphylococcus* belonged different species and showed various degree of pathogenicity. The quantity and properties of the isolated microflora can indicate possible health problems of the studied individuals of a walrus.

CO12

Sail & whale - Sailors, citizens and science for marine conservation

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Nowadays, one of the biggest challenges to study cetaceans is to get their occurrence data. Traditionally, whales and dolphins have been studied from dedicated platforms of observation (e.g. boats or planes) mainly in coastal areas. However, the implicit economic and logistical constrictions of their data collection, have recently lead to emerging opportunistic data sources such as whale watching, ferries or cargo ships. With the goal of getting data otherwise inaccesible, specially in high seas, we thought about sailboats, which are travelling around the world's oceans wiht less temporal or spatial restrictions than traditional platforms.
Sail & Whale is a pilot project, which intends to establish a long term useful cetacean monitoring program creating a network of sailors, citizens and scientists. The innovative nature of this project relies on several bases. Firstly, the use of non-traditional platforms of observation, i.e. sailboats. Secondly, the low cost nature of the project and its potential to be self-sustainable and easy to expand, which make it a great opportunity to get long-term series. Finally, it provides data otherwise unavailable, which will be openly shared to take the most of it in collaboration with other organizations and ongoing scientific projects. Furthermore, increasing public awareness, not only among the participants and partners, but also among the surrounding society, it is a key stone for this project, getting to know the real people involved, learning from each other and divulgating experiences and knowledge. Sail & Whale was launched in November 2016 with a website (www.sailandwhale.com) and a Facebook page. Even with its short life, several partners have joined the project so far, and first sightings of several cetacean species are arriving from different places of the Atlantic, mainly from Galicia, the Canaries and sailing trips between the Macaronesian islands.

ACO21

Scientific mimicry - artificial dolphins invade the Baltic Sea

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Anthropogenic noise emission into the marine environment is considerably increasing. Shipping traffic, pile driving, offshore oil exploration and mining, acoustic deterrents (e.g. pinger, seal scarer), military and other activities contribute to that emission in various ways. In the framework of environmental monitoring for an offshore wind farm, we conducted long-term passive acoustic monitoring (PAM) of harbour porpoises (*Phocoena phocoena*) close to the offshore research platform Fino2 in the German EEZ of the Baltic Sea using C-PODs. Harbour porpoise detections were as rare as expected, whereas dolphin detections were recorded at an unexpected high rate. While dolphins may enter the Baltic Sea occasionally, their occurrence is very unlikely, especially at the rate our PAM suggested. Further investigations revealed that scientific devices such as underwater acoustic modems are mimicking dolphin click sound energy patterns to transmit data as acoustic signals. Frequencies of these clicks ranged between 48 and 78 kHz with a source level of 166 dB re 1 µPa at 1 m and could reach a maximum of 187 dB re 1 µPa. Signals were received by C-PODs at distances above 500 m. By comparison, frequently used acoustic deterrents use frequencies ranging between 20-160 kHz (Pinger) and of approximately 14 kHz (Seal Scarer) with a source level of 145 dB re 1 µPa (Pinger) and 189 dB re 1 µPa (Seal Scarer). A significant deterrence effect on harbour porpoises up to several km has been shown for Seal Scarer, indicating a potential deterrence effect of underwater acoustic modems. It has to be taken into account in future passive acoustic monitoring that anthropogenic mimicry of cetacean sound patterns may not always be as easy to identify as in this study and may lead to incorrect results.

MN12

Seasonal and yearly fluctuation of cetacean presence in the Istanbul Strait based on passive acoustic monitoring between 2009-2016

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There are three cetacean species known in the İstanbul Strait, namely harbour porpoise (*Phocoena phocoena*), common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncatus*). The Turkish Straits System (TSS) is known as an important migratory pathway between the Aegean and Black Sea for many marine organisms, including cetacean species together with migratory fish. In this study, cetacean presence in the İstanbul Strait was followed via passive acoustic monitoring (PAM) system deployed to the coastline in the halfway of the strait. The study was started in July 2009 and still continues with A-tag (ML200-ASII; Marine Micro Technology, Inc., Saitama, Japan) used as PAM system. Cetacean sounds were recorded as click trains (CT) and analyzed. Diel, monthly, seasonal, yearly distribution of click trains, sound source directions, interclick intervals (ICI) were defined and *Delphinidae-Phocoenidae* family discrimination via narrow/broadband analyses was made. Besides, relation with environmental parameters such as fish presence and surface water temperature were also evaluated. PAM recorded 8046 click trains in 2009 (6 months), 23702 in 2010, 22705 in 2011, 59563 in 2012, 27231 in 2013, 29368 in 2014, 23744 in 2015, 41315 in 2016, with the mean 32518±SD13525 for 2010-2016, thus showing high yearly fluctuation. Spring 2012 and fall 2016 had particularly high number of CTs which reflects the fish availability in the area around the TSS. April is the month with the largest number of CTs, followed by May, March, and October. Most of the CT's were detected at night-time period. Short-range sonar (ICI<50ms) indicating foraging fish was detected frequently in spring months. PAM findings suggest that cetaceans mostly travel in the narrowest part of the middle Strait, except in spring and fall when they use this area for feeding on migratory pelagic fish, such as sprat and sardine.

BE16

Seasonal patterns in humpback whale acoustic behavior in the Southern Ocean

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Evidence of off-season humpback whale (*Megaptera novaeangliae*) acoustic presence in high latitude feeding areas is accumulating for Northern Hemisphere waters. To date, however, long-term studies investigating humpback whale vocal behavior in the Southern Ocean were limited to the coastal region. This study provides preliminary baseline data from three recording sites on humpback whale vocal behavior on Antarctic feeding grounds. Passive acoustic recorders were located in a transect along the Greenwich meridian at 59'S (SV0002), at 64'S (SV1000) and 66'S (SV1001). Humpback whales were acoustically present from January to August (SV0002), from January to June (SV1000) and from January until May (SV1001). Acoustic presence was most pronounced (>60% of recording days containing calls) from May to July (SV0002), and April to May (SV1000 and SV1001), concurring with substantial increases in ice cover (>90%) at all three sites. During the period of ice formation (February to April) acoustic presence was sparser. Calls were divided into 27 call categories with a maximum of 10 subtypes per category. For all three recorders 4 to 8 call categories made up <80% of all calls, 3 call categories of which were the same for all three recorders. The vocal repertoire was more diverse in March, April and May compared to January, February, June, July and August in all three recorders. Furthermore, humpback whale song was present at all three recording sites, at SV0002 in May and June, SV1000 in March and SV1001 in April. This study demonstrates that pervasive humpback whale presence in the Southern Ocean is not limited to the coast, but extends to pelagic regions. The presence of social sounds and song during extended periods suggests that whales were not just transiting the area, but roamed the area for some time, possibly to exploit the presence of local food patches and open water.

ABU20

Seasonal presence of cetaceans along a trans-regional fixed line transect in the Adriatic and Ionian Sea

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Starting in December 2014 a systematic cetacean monitoring project that employs ferry as research platform, started along a trans-regional fixed line transect of 1300km, that lies in the Adriatic and Ionian Sea. During the first two years of study (December 2014-December 2016) 61 surveys were carried out, about 16500km (340 hours) of effort were conducted in good weather condition, and 119 sightings of cetaceans belonging to 4 species (bottlenose dolphin, striped dolphin, Cuvier's beaked whale and fin whale) were realised. The mean SPUE and the mean sighting frequency of the whole period are respectively 0,007 (sight/Km of effort), and 0,37 (sight/hour of effort). Bottlenose dolphin and striped dolphin are the two most sighted species with respectively 48 and 43 sightings. For bottlenose dolphin SPUE and sighting frequency are 0,003 sight/Km and 0,17 sight/hour. For striped dolphin SPUE and sighting frequency are 0,002 sight/Km and 0,12 sight/hour. Presence and distribution of species varied among the seasons. Even if not statistically significant, for bottlenose dolphin mean SPUE is greater during the summer and the winter, while for striped dolphin it is greater during the spring. Analysis of spatial distribution of sightings shows that bottlenose dolphin is distributed over a wider area during the summer and fall than during the rest of the year, when sightings are located in smaller area in the Adriatic and Ionian Sea. Striped dolphin distributed mainly in the Ionian sea during winter while sightings were performed more north in the Adriatic sea during the summer.

ABU21

Seasonal variability in occurrence of harbour porpoise (*Phocoena phocoena*) off the Arcachon bay (Northeastern Atlantic, France).

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Harbour porpoise is protected under the Habitats Directive (92/43/EEC) and listed as a species whose conservation requires the designation of Special Areas of Conservation. Since several years, porpoise bycatch has been regularly reported by fishermen off the Arcachon Bay (Bay of Biscay, Atlantic French coast). To better understand porpoise seasonal occurrence and distribution over seasons in this area, fine scale static acoustic study was conducted using four acoustic data loggers (C-PODs, Chelonia Limited). Two sites close to the shore and two sites further offshore have been monitored over one year. The diel echolocation activity as well as the feeding activity (using click train properties) were monitored to assess the use of this habitat by porpoises. Acoustic detection of harbour porpoises were increasing in winter compared with the remaining year. This result confirmed the general picture of seasonal variability of porpoise distribution suggested by aerial surveys and stranding data in the Bay of Biscay. Porpoise detections around the deployment sites were slightly influenced by the time of the day (a bit higher during the night time). Detections of feeding buzzes among sites show that the offshore sites seem more important for foraging activities. These results reveal the potential of acoustic monitoring to complement or potentially replace visual surveys in coastal areas to investigate habitat use and spatio-temporal changes in cetacean distribution. Related to the return of harbour porpoise in the Bay of Biscay, our study site appeared to be an important area for this specie. As a new marine protected area is recently created there, acoustic loggers should be implemented the local monitoring strategy to detect any changes and evaluate long-term interactions between human activities and harbour porpoise population in this MPA.

ECO06

Seasonality in grey seal (*Halichoerus grypus*) body weight and food intake

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The population of grey seals (*Halichoerus grypus*) is increasing in German and Danish waters, causing large concerns for their impact on fisheries and the current status of fish stocks. Little is known about grey seal feeding habits: Of special interest is how much fish the seals catch during different seasons. Two male grey seals were kept in an outdoor facility with access to water of ambient temperature, in Kerteminde, Denmark. Ambient air and water temperatures ranged from over 20°C during the summer to around or below 0°C in the winter time. This caused the seals to seasonally change their blubber thickness and weight to keep an appropriate insulation. The amount of fish given to the seals was carefully monitored every day and compared to the water temperature in air and in water, as well as with the body weights measured with monthly intervals. The data can be used to assess the grey seals' impact on fish populations of Denmark and Germany, as well as to understand the seals' metabolic budget throughout the different seasons.

NT04

Seawetra: Integrated platform for marine environmental monitoring

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Effective marine spatial planning needs tools that enable different end users to access directly to marine environmental and conservation data-sets. At this end, we present a web based application called Seawetra. Seawetra is a near real-time integrated system for Mediterranean marine ecosystem monitoring and conservation. The system has been conceived and organized following two main objectives: 1) to collect, archive, visualize and share geographical information coming from multiple sources over a large spectrum, in an inter-operable format and according to an international standard, 2) to provide stakeholders and different end users with dedicated tools. Data are inserted and managed within the platform, taking into account their diverse space-time scales and degrees of uncertainty and reliability. The Seawetra platform architecture is based on open-source software and open-data and is compliant with standard OGC (WXS) and INSPIRE Directive (2007/2/EC). The application provides, through a graphical interface, a high-resolution and continuously updated information, allowing the user to monitor environmental conditions of the marine realm, from coastal waters to open sea. Seawetra allows each computer connected to the Internet to the use of the integrated data, regardless of the provider. Seawetra is able to load and display geo-referenced static and dynamic layers, allowing the end users to monitor the values of different environmental variables at the same time thus providing a comprehensive snapshot of the marine environmental conditions. In this first release seawetra allows access to many oceanographic products provided by CMEMS (Copernicus Marine Environmental Services). Through the platform end users can access and visualize also data related to species presence and human activities (e.g AIS data). We present two case studies related to conservation of cetaceans in the Pelagos Sanctuary (NW Mediterranean Sea): evaluation and monitoring of collision risk along main shipping routes; monitoring and assessing impact of whale watching activity.

HE17

Severe injuries on dolphins observed in two cases from the Turkish coasts

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Cetaceans suffer from anthropogenic, interspecific and intraspecific traumas which effect welfare of individual animals. Severity of traumas can be categorized from insignificant injuries to death. In this study, two cases from the Turkish coasts are discussed based on their severe traumas. The first case was seen in an adult, cachectic, 223 cm long female bottlenose dolphin (*Tursiops truncatus*) stranded on the Marmara Sea coast on 03 November 2015. Necropsy revealed that she suffered from a deep wound with spine trauma in her tail fluke due to a piece of rope entangled for a long time. Based on the examination of the Mediterranean mussels (*Mytilus galloprovincialis*) found on the rope, it is estimated the injury occurred around one year ago. The second case was seen in an adult, 208 cm long female common dolphin (*Delphinus delphis*), with an amputated pectoral fin, stranded on the Aegean Sea coast on 15 November 2015. Her digital bones were lost but the remaining part of the fin was well healed and nutritive condition was good. Necropsy revealed that she died from pneumonia. In literature, there are various methods proposed for differentiating the severity of traumas in marine mammals. Although both cases were determined as serious injuries according to the existing charts, the location of injury and probable cause lead to different healing process in each case. Documentation of these injuries and understanding their effects are important to develop strategies for caring the welfare of cetaceans and determining the approach for each case is essential when responding to live strandings.

HI10

Short-term effects of tourist boats on the behaviour of common dolphins (*Delphinus delphis*)

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The short-term effects of tourist boats on the behaviour of common dolphins (*Delphinus delphis*) were investigated off the south coast of São Miguel, Açores (Portugal), identifying a school of dolphins and continually evaluating their behaviour (socializing, foraging, travelling, resting) in the presence (impact) and absence (control) of tourist boats. By using a time discrete, first order, Markov chain model, the transition probabilities of changing from one behavioural state to another were calculated and compared between impact and control situations. The data were further used to construct behavioural budgets obtaining the proportion of time that the dolphin spend in each behavioral state. In the presence of tourist boats, dolphins were less likely to stay in a foraging activity and were more likely to start socializing, after foraging, as inferred from the Markov chain model. The behavioral budgets showed that foraging activity decreased significantly as an effect of tourist boat presence and that socializing activities increased. The impacts identified in this study demonstrate the need to adopt conservation measures, promoting a precautionary approach of dolphin tourism, until there are long-term impact studies.

ABU22

Sighting records of common minke whales (*Balaenoptera acutorostrata*) in the German North Sea: Habitat use and distribution patterns.

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The common minke whale (*Balaenoptera acutorostrata*) is a cosmopolitan species which also occurs in European inshore and offshore waters. It is the only native baleen whale species in the North Sea, and little is known about their distribution and habitat use. Sightings of minke whales are regularly recorded during surveys for harbour porpoises or sea birds. These data provide a source of information which has until now not been analysed.
In this study, data from various sources were assessed to compile records of minke whale sightings and stranded carcasses. An example for this are the nine strandings of minke whales at the North Sea shoreline of Germany since 1990. All these data were aggregated and used to describe distribution patterns and habitat use in the German North Sea. The Dogger Bank was identified as the potentially most important habitat of *B. acutorostrata* for this sea.
We propose that the results of this study should be taken into consideration for European management schemes, like Natura 2000 e.g. included in the management plan for designated Natura 2000 sites such as the German SCI “Doggerbank”.

BE17

Signaling body size in a vocal learning mammal: Physical bases of acoustic allometry in harbor seal pups

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Vocal communication is a crucial aspect of animal behavior and ecology. The mechanism which most terrestrial mammals and pinnipeds use to vocalize relies on three anatomical components. First, air is pushed out of the lungs. Second, as the airstream goes through the glottis, sound is produced via vocal fold vibration. Third, this sound is further filtered by the geometry and length of the upper vocal tract. Evidence from mammalian anatomy and bioacoustics suggests that some of these three components may covary with an animal's body size. The framework provided by acoustic allometry suggests that vocal tract length (VTL) is more strongly constrained by body size than vocal fold length (VFL), hence generating more reliable acoustic cues to an animal's size. Here, we test the anatomical bases of the acoustic allometry hypothesis in harbour seal pups (*Phoca vitulina*). Harbour seals are particularly suitable to test this hypothesis, as their vocal behaviour is often described acoustically but rarely anatomically. We dissected and measured post-mortem the vocal tract, vocal folds and other parameters of 15 harbour seals (which died of causes unrelated to this research). We found that, while VTL correlates with body size, VFL does not. This suggests that, while body growth puts constraints on how vocalizations are filtered by harbour seals' vocal tract, no such constraints appear to exist on vocal folds, at least during puppyhood. It is particularly interesting to find constraints on harbour seals' vocal tracts, the same anatomical region whose dynamic control likely allows this vocal learning species to produce novel, flexible vocalizations.

ACO22

Signature whistles and the scope for adaptation to ambient noise in common bottlenose dolphins (*Tursiops truncatus*) living in an urbanized coastal environment

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Bottlenose dolphins produce individually distinctive signature whistles (SWs), which they use for individual recognition and to facilitate group cohesion. When bottlenose dolphins are isolated from their group, their whistle rate increases greatly with SWs accounting for essentially all emitted whistles. This suggests that SWs also play an important role in signalling stress level to conspecifics. Bottlenose dolphins often live in urbanized coastal environments where ambient noise from watercraft traffic may have deleterious impacts on acoustic behaviour, e.g. by masking the whistles from conspecifics. To overcome such negative effects of anthropogenic noise, bottlenose dolphins must compensate by increasing their acoustic output level in order to maintain their active space for social interactions. Here, we test the hypotheses that i) there is a difference in output level and, thus, active space, when comparing SWs to non-signature whistles (NSWs), and ii) that bottlenose dolphins increase their output levels of SWs and NSWs in the face of increasing ambient noise. We do that by analyzing data from 13 deployments of acoustic- and movement-logging Dtags deployed on pairs of common bottlenose dolphins (*Tursiops truncatus*) between 2014 and 2017 in Florida, USA. We find that SWs are consistently emitted at a higher output level than NSWs. Moreover, we demonstrate that modifications of both SW and NSW output levels are positively correlated with increasing ambient noise. However, NSWs were modified more extensively over a broader range, compared to SWs. Since SWs are already being emitted at a higher output level than NSWs, they have a smaller scope for adaptation, leaving little room for compensation if anthropogenic noise levels increase. This ultimately leads to a reduction in active space for acoustic communication, which can have severe consequences for fitness by compromising critical sound-mediated behavioral transitions.

CO13

Socially important experience as volunteers in the centers for rehabilitation of seals in the Netherlands and the National Marine Park of Zakynthos in Greece.

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Since 2014 till this day, the educational program: "The international ecological practicum" step by step develops. The main aim of this program is through concrete practical work to impart useful skills of the wild nature protection activity, to teach to understand alive systems: how alive systems are arranged, how they work. Also initial experience of conducting research activity in the field of biology and ecology, implementation of research projects is gained. Students from 7 till 18 years old who studies at ecological and biological educational courses in PCCY "Intellect", their parents, brothers, sisters etc. take part in this program.

During three years of this program it has been made: Step 1 – participation in volunteer activity at the Lenie 't Hart Seal Rehabilitation and Research Centre (Pieterburen, The Netherlands); Step 2 – participation in volunteer activity at the Seal Rehabilitation Centre "A seal" (Stellendam, the Netherlands); Step 3 - participation in volunteer nature protection activity at the National Marine Park of Zakynthos (Greece). Volunteers worked with pups of the harbor seal (*Phoca vitulina*), the grey seal (*Halichoerus grypus*), and also helped rescue of newborn loggerhead sea turtles (*Caretta caretta*). The taking part in such programs the whole families, several generations, also working side by side with people from other countries speaking other foreign languages, the younger generation “absorbs” the correct careful attitude to the nature of the our planet, learns to understand a similarities between the nature protection perspective in other countries, learns to place priorities correctly. Thus, the good-quality social environment which is very favorable for conscious participation in the solution of practical tasks of rescue of wild animals of wild populations and to recovery of ecosystems of the planet in collaboration with experts of other countries is formed, based on the principles of continuity of generations.

ABU24

Spatial distribution, encounter rates and individual identification of unstudied Delphinidae populations along the Southern coast of Samos Island, Greece

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Identifying critical habitats is the first step towards the establishment of effective management. However, the lack of baseline data on bottlenose dolphins (*Tursiops truncates*) and common dolphins (*Delphinus delphis*) has contributed to knowledge gaps on their population status, thus preventing effective conservation strategies within the eastern Mediterranean Sea. Once widely distributed, population sizes of *T. truncatus* and *D. delphis* are now assumed to have been reduced by 30% and 50%, respectively. Systematic cetacean monitoring is a high priority to ensure and update the compilation of accurate baseline information. This study presents the first systematic cetacean surveys along the southern coast of Samos island investigating their spatial distribution, resighting patterns and encounter rates between April 2015 and December 2016. In total, 103 boat surveys were carried out with 8103.82 km and 338.58 hours of survey effort. *T. truncatus* and *D. delphis* were sighted on 23 and 43 occasions, respectively. The mean group size was 7.45±0.26 for *D. delphis* and 7.44±0.34 for *T. truncatus*. 108 individuals were catalogued in 2015 (77 *D. delphis* and 31 *T. truncatus*), of which 45 were re-sighted (30 *D. delphis* and 15 *T. truncatus*) in 2016. Species sightings were in one case overlapping, when the two species were sighted in the same group. The species showed an uneven distribution pattern in the coastal zones of the study area. Overall encounter rate was 5.07group/100 km for *D. delphis* and 2.69group/100km for *T. truncatus*. Considering the season, highest encounter rates were recorded for summer (8.07group/100km) and spring (6.09group/100km) for *D. delphis* and *T. truncatus*, respectivelly. This study demonstrates that the coastal waters of Samos island support important delphinidae habitats with a continuous presence of both species. Further research with wider survey coverage will have a critical importance in the development and implementation of conservation and management measures.

HI11

Spatial overlap of high density sperm whale areas with marine traffic in a subarea of the Pelagos Sanctuary, Mediterranean Sea

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Accounting for approx. 30% of global shipping activity, the Mediterranean Sea is among the busiest waterways worldwide. Marine traffic has considerable impact in the Pelagos Sanctuary for Mediterranean marine mammals where a high percentage of cetacean-ship strikes are reported. This study aims at identifying and mapping high density sperm whale (*Physeter macrocephalus*) areas and their possible overlap with busy marine traffic routes.

Visual and acoustic data from ship based surveys from 2001 to 2014 in the marine region between Ile de Porquerolles, Southern France and Monaco have been analysed. In order to integrate acoustic and visual data and to account for differences in detection probabilities of the two survey methods, a correction factor (CF) for the survey effort was used. CF was calculated based on the number of acoustic/visual detections not captured by one of the methods when both methods were applied. Acoustic detections were defined as records of sperm whales separated by at least one hour of silence between consecutive detections. Kernel density estimator analysis was performed with the encounter rate (grid resolution 4 km). Furthermore, a kernel density analysis was performed on AIS location data of moving vessels with a set course in order to detect and map high traffic density areas. The spatial overlap of the encounter rate density distribution with traffic density areas was mapped by using percent contour values obtained from kernel analysis.

A total effort of 22,972 km and 84 sperm whale detections were considered in the analysis. Three main high density distribution areas for sperm whales have been identified, of which two overlap with high density marine traffic routes.

This study presents important basic findings for marine spatial planning that contributes to cetacean conservation through consideration of mitigation measures for cetacean-ship strikes and noise pollution by marine traffic in the study area.

HI12

Spatial overlapping of industrial fishing activities with Mediterranean monk seal marine habitat use at Cabo Blanco Peninsula (Mauritania-Morocco)

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The largest Mediterranean monk seal colony of the world inhabits the Atlantic coast of the Cabo Blanco peninsula. To determinate the use of the marine habitat by this population, 24 individuals of different age categories were tagged from 2007 to 2014 with Fastloc GPS receptors. 15 of them were adult males, five breeding females and four juveniles, resulting in a total monitoring time of 77 months. To determinate the fishing activity of the industrial fleets operating in the area, we obtained data through the Automatic Information System (AIS) from August 2015 to June 2016. The location data from the fishing vessels was filtered to locations of speed less than 5.5 knots, assuming that these locations represent fishing activity instead of movements among different places. Although not coinciding in time, both data overlapped, monk seal locations and vessels fishing locations, suggest interesting results in the way of a low degree of spatial interaction among them. Monk seals use of the marine habitat is mainly concentrated in the 12 nm stretch along the coast, while the fishing industrial activity is illegal in this area. Moreover, when monk seals use marine habitat further than those 12 nm is in an area at the latitude of the breeding caves where fishing activity is scarce. The main risk area where monk seals and fishing activity are overlapped and higher degree of interaction could occur is when monk seals travel to the south overpassing the latitude of the tip of the Cabo Blanco peninsula, where fishing activity is very intense near the coast. Since interaction with fisheries is one of the main mortality causes of many species of pinnipeds, this low spatial overlapping among monk seals and industrial fishing activities at Cabo Blanco may explain the high survival rates of sub adults and adults from this population.

BE19

Spatio-temporal patterns in Antarctic minke whale (*Balaenoptera bonaerensis*) vocal behaviour in the Weddell Sea

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Antarctic minke whales (*Baleanoptera bonaerensis*) occur in open as well as ice-covered waters throughout the Southern Ocean. Their low visual detectability and ice-associated habitat makes the species difficult to study using traditional visual methods. The recent identification of Antarctic minke whale vocalizations now allows the use of passive acoustic monitoring to investigate year-round spatio-temporal patterns in occurrence in ice-covered areas. Here we present preliminary results on Antarctic minke whale occurrence patterns based on a multi-year passive acoustic data set from 6 locations throughout the Atlantic sector of the Southern Ocean. Analyses were based on daily presence of the bio-duck call, which is characterized by its repetitive nature, consisting of regular down-sweeped pulses with most energy located in the 50-300 Hz band.
Antarctic minke whales were present at all six Antarctic recording locations from June to December, with highest presence occurring between August and November (>80% of days with bioduck calls present). At the southernmost recording locations, the bioduck call was present up to ten months of the year. Substantial inter-annual variation in the seasonal on- and offset period of vocal activity was observed at the different recording positions, possibly corresponding to variation in local ice conditions.

ABU25

Sperm whale distribution along the Kuril Islands, Russian Far East

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The Kuril Islands is a 1000 m long island chain that border Kamchatka peninsula in the north and Japan in the south. The Islands are known as an important feeding area for sperm whales, but no recent analysis of sperm whale distribution and area usage in this region has been published since whaling era. We conducted a survey along the Kuril Islands in August 2016 on board of 10m yacht and estimated the distribution of sperm whales using visual observations and PAM. We found that the distribution of sperm whales was very irregular: in some areas the density was very high, while in others the whales were absent. We analyzed the dependence of whale density from different factors. We found that the whales were the most abundant in straits between the islands, probably because the strong tidal currents provide high productivity in these areas. The depth was another important factor that predicted the whale distribution. The results of this study can be used to determine the critical habitats of sperm whales in the Kuril Islands. However, more surveys are needed to estimate the variability in whale distribution in different seasons of the year and in different years.

ANA03

Sperm whales skeletons reconstruction: a tool for educate public awareness

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Postmortem examinations are aimed at understanding the cause of death. More in details, necropsies could help to assess the incidence and impact of eventual anthropic threats (including interaction with fisheries, ship strikes and pollution) on marine mammals conservation. Applying an appropriate protocol, this procedure could be helpful also for skeleton preservation for museum porpoises and could add relevant information for educational activities. In 2016, two sperm whales were found stranded in Sicily and Sardinia. Necropsies carried out on the field revealed serial cuts of the head and trunk in one animal, and bone fractures due to blunt trauma force in the other, both suggestive of a ship strike. This was confirmed by using the osmium tetroxide post-fixation technique: these results, along with the absence of any other relevant ongoing diseases, further indicated a collision as the possible cause of death. After necropsies, the skeleton preparation was commissioned to the Department of Comparative Biomedicine and Food Science of the University of Padova. Procedures related to the preparation of the skeletons evidenced important bones damages not previously observed seen in the field. The whole skeletons, currently still in the assembly stage, thus yielded additional data important for a complete post-mortem assessment. They will be exposed in local Museums along with the information on the species and the cause of death. Application of proper protocols during postmortem examinations could support cetaceans' conservation, by providing educational tools.

ABU26

Squid as common target: Do areas with fishery-related explosions and dolphin foraging habitats in Southern California overlap?

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Up to ten different dolphin species occur in the Southern California Bight (SCB). One of them, Risso's dolphins (*Grampus griseus*), are known to exclusively prey on cephalopods. In the SCB, market and jumbo squid (*Doryteuthis opalescen*s and *Dosidicus gigas*) are their main prey species. The commercial fishery for market squids, a near shore species endemic to the North-Eastern Pacific, is one of the largest fisheries in California, both in terms of landing volume and value. Using passive acoustic monitoring data collected over the past ten years (2005 – 2015) at multiple sites within the SCB, Risso's dolphin echolocation activity was compared to received sound exposure levels and patterns of small-charge underwater explosion occurrence. These explosions are generated by the use of explosive deterrents in fisheries, so called "seal bombs", which are large waterproof firecrackers consisting of an explosive flash powder mixture. By comparing the spatial and temporal explosion patterns to daily catch origins and timing of landings from various commercial fisheries, a significant relationship with the market squid fishery was found. As both the fishery and Risso's dolphins share squids as their main target, a potential overlap between areas of seal bomb use and Risso's dolphin foraging habitats is likely. Risso's dolphin echolocation activity and squid fishing mainly happen at nighttime and the animals might be at risk of exposure to increased noise levels, potentially affecting their echolocation behavior.

ST04

Stranded Sowerby's beaked whale (*Mesoplodon bidens*) in northern Norway

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Sowerby's beaked whales (*Mesoplodon bidens*) live in deep waters and are rarely seen alive; our knowledge about this species is therefore limited. Here we describe the first record of a Sowerby's beaked whale that swam close to shore into shallow waters in the Bodø area and died on 12 August 2016. The 4.8 meter subadult male displayed good organ, muscle and blubber health, however no immediate fatal causes were detected. Samples from the blubber, heart, lungs, liver, stomach, intestines, blubber, and an anemone (attached to the mouth) are currently being analyzed and further DNA analyzes are planned. The stomach contained only fish otoliths that are currently being identified. After necropsy and analysis, we describe the appearance and condition of the whale and discuss possible factors that could have led to its death. This report will add valuable information to our understanding of this reclusive species in the Norwegian waters and its' potential threats.

BE18

Structure and group composition of a small community of common bottlenose dolphins in the Sado estuary, Portugal

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Bottlenose dolphins live in fission-fusion societies, characterized by fluid and dynamic patterns of association. Group size and composition are important aspects of social organization, and can be influenced by several ecological factors, affecting interactions between individuals. Studies of social structure rely on data on association patterns and are important for the monitoring of population dynamics, and its management and conservation. Data on social organization and activity patterns of a resident community of common bottlenose dolphins (*Tursiops truncatus*), in the Sado region, Portugal, was collected through photo-id and observational techniques. This is a small and aged community, composed by 19 adults, six subadults and two calves (2015/2016 data). Groups mean size was 11.6 individuals, with the larger and most frequent groups including members of all age classes. Group size was uncorrelated with spreading degree of the animals within the group or their activity patterns. The association patterns between age and sex classes, and within classes, were analysed with SOCPROG 2.7. Short-term preferred association and a mean coefficient of association of 0.25 were obtained. Social structure and association patterns in this community might have changed recently, due to the removal of some individuals (by death or migration) that were present in the community for decades. Mean group size increased, and mean association index and the number of long-term preferred associations decreased, in comparison to previous studies, suggesting a reorganization of the social system of this community. It is essential to implement a continuous monitoring of this community. Understanding social relationships between individuals may contribute to the development of target management plans, particularly important for small and aged communities.

ST05

Studies on sperm whales (*Physeter macrocephalus*) stranded on the coast of Schleswig-Holstein, Germany in 2016

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Multiple strandings of sperm whales (*Physeter macrocephalus)* have been reported from the coastal North Sea over the last decades. In January and February 2016, however, the largest sperm whale mortality event known so far was reported. 30 sperm whales stranded of which 13 animals died at the coasts of Schleswig-Holstein, Germany. Measurements and photos were taken of all animals, and necropsies were conducted on 12 individuals. Age was determined and further investigations were conducted to collect the maximum information of the animals. The digestive tract was completely opened and contents were collected and preserved. All whales were immature males. Lengths ranged between 10.18 m and 12.34 m, and age between 10 and 15 years. Based on blubber thickness and muscle condition all animals had been in a good nutritional status. No signs of severe trauma or diseases were found. Metazoic parasites were present on the skin, in the blubber, stomach and intestine mostly associated with mild lesions. Four whales displayed marine litter in the digestive tract including fishing related and general debris, such as netting and a car part. Diet consisted of cephalopod beaks and fish remains and was by far dominated by beaks (ca. 104 000) of the Boreoatlantic armhook squid, a cephalopod living in the north Atlantic seas. All sperm whales were healthy and prey remains indicate that they fed prior to the stranding on their preferred prey in the North Altantic. It remains unclear why the animals migrated into the North Sea. Main assumption is that due to climatic conditions in the North Atlantic in winter 2015/16, such as above average water temperature and storm velocities, major prey species migrated southwards and attracted the whales to leave their traditional migration routes to follow their prey towards the shallow waters of the southern North Sea.

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ACO23

Temporary threshold shift induced for pure tones at 25/28 kHz on harbour porpoise hearing

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Harbour porpoises rely on their hearing ability and they show behavioural reactions to anthropogenic sound sources. Like other mammals, when exposed to strong sound pulses, they experience a brief reduction in their hearing abilities to detect environmental sounds and therefore potential important information to survive. It has been suggested that this so-called temporary thresholds shift (TTS) could be used as a standardize limit of tolerance for exposure of human sound sources Therefore there are several recent studies investigating TTS in porpoises exposed to various types of anthropogenic noise. However, most of these studies have focused on rather low-frequency signals, below 10 kHz, but there are other frequently occurring sound sources in the oceans such as e. g. echo-sounders, high speed ferries and naval sonars in the frequency range of 20-50 kHz.
Here we estimated the onset of TTS in a harbour porpoise exposed to 25 / 28 kHz tonal sound stimuli of 0.5 and 3.5 s duration measuring the auditory brainstem response. The study was made at Fjord&Bælt, where three harbour porpoises are kept in the harbour of Kerteminde, Denmark. The porpoise pen is connected to the harbour through a series of nets so that the animals experience ambient sound levels and water temperatures year around. The average ambient noise levels during the trials are not expected to have had a great influence on the TTS data derived here. For both fatiguing signals we found the onset of TTS at 141 dB re 1µPa²s, which is much lower than the onset of TTS at lower frequencies. This fits well with the prediction that the onset of TTS is related to the hearing sensitivity at the exposure frequency. Investigations are continued in the ongoing project “UWE” - Impacts of underwater noise of offshore windfarms on marine mammals.

CO14

The ??? of EU fishing policies related to by-catch of protected species

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Since the 1980's, scientists and conservationists have been trying to influence policy makers to protect vulnerable species such as the harbour porpoise (*Phocoena phocoena*) from by-catch in static gillnets and entangling nets. The impression arises that in order to protect fisheries, policy often neglects, compromises or prunes away management measures necessary for the conservation of endangered small cetaceans. A pinger obligation and by-catch monitoring only for a minor fraction of the fleet is a typical example from the past.
As an example for the Baltic Sea, a flowchart is presented shedding light on this complicated matter for those who want to protect small cetaceans or other protected species (such as seabirds) from by-catch in gillnet fisheries. Some of the questions to be dealt with are:

- Which institutions dealing with fisheries and nature conservation aspects of the by-catch issue are involved?
- Which instruments in the EU regulatory framework are relevant in the context of by-catch?
- Which relevant communication processes are currently underway?
- Which blockades must be circumvented?
- Which elements of the process rely on input from scientists?
- Is there a way to achieve sufficient measures?

From the conservation perspective it needs considerable effort to find the most promising part in the complicated framework of laws and regulations for intervening successfully. In many cases just compliance with existing laws or regulations would be sufficient for better protection of cetaceans, whereas in other cases changing obligations would be desirable.

ANA04

The acoustic pathway to the inner ear of the harbor porpoise (*Phocoena phocoena*)

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Odontocetes do not have an outer ear that guides sound waves to the middle and inner ear, as it is the case in terrestrial mammals. Therefore, it is hypothesized that specialized sound receiving structures have evolved. The hypothesis of the lower jaw as sound receiving structure is commonly accepted and well supported by numerous studies, which however are based on only a few species. This study addresses how well the harbor porpoise (*Phocoena phocoena)* detects sounds presented at five different positions across the animal's head. The hearing ability was measured on an adult female harbor porpoise using auditory brainstem response (ABR). A synthetic porpoise click with a centre frequency of 130 kHz was chosen as stimulus and directly transmitted through a contact hydrophone. The location with best hearing threshold was found at the middle of the lower jaw. The results confirm earlier studies, but also suggest that there are differences between species, probably due to morphological differences of the head of the lower jaw.

ABU27

The Arabian Gulf, a “hot”-spot for cetaceans?

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Gaining knowledge about the biodiversity of an area is a prerequisite to understand and protect the inhabiting species. Little is known about cetacean species and their distribution in Qatar marine waters. The Al Shaheen offshore oil field is situated in the Arabian Gulf 85 km NE of Qatar mainland have been identified as a hotspot for plankton feeding whale sharks and several cetacean species have been sighted on a regular base, but no official records have been published nor has any long term monitoring been carried out. It is important for conservation and management to understand the human impact on marine habitats. Data indicates that oil and gas platforms attracts harbour porpoises regardless of the noise levels in the North Sea. It is possible that a similar effect is present with the cetacean species observed in the Al Shaheen area. Alternatively, Al Shaheen may have a high natural productivity, attracting large fish and cetaceans. Using state of the art marine acoustic technology, two passive acoustic monitoring stations using Wildlife Acoustic SM3M+ broadband loggers (384 kHz sample rate) with Sub Sea Sonic AR-60-E acoustic releasers were deployed in August 2014. One station was deployed within 800 m of an operating oil platform and a reference station was placed 12
kilometres areaway from the platform. Data shows strong nocturnal activity with animals present up to 31% (800 m) and 24,5% (12 km) of the time. Four species were visually identified (Brydes whale, long-beaked common dolphin, indo-pacific bottlenose dolphin and dwarf spinner dolphin) in the Al Shaheen area. The sightings and recordings both indicate an attraction to the oil platform, but also a high cetacean activity in the area of both known and
new species to the Arabian Gulf.

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ABU28

The distribution of bottlenose dolphins (*Tursiops truncatus*) and common dolphins (*Delphinus delphis*) in the northern North Aegean Sea (Greece) in relation to environmental parameters.

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The distribution of cetacean species in the study area was investigated between 2005 and 2013 through dedicated scientific marine surveys. Data were collected during a total boat survey effort covering 14,701 km in sea conditions < Beaufort 4, in a study area of 2000km2. Bottlenose dolphins and common dolphins were observed constantly during all the period of the study. Apart from these two most abundant species mentioned, other visiting cetacean species include: striped dolphins (*Stenella coeruleoalba*), harbour porpoises (*Phocoena phocoena*) and Risso's dolphins (*Grampus griseus*). The Mysticete fin whale (*Balaenoptera physalus*) and the pinniped Mediterranean monk seal (*Monachus monachus*) were rarely sighted. Dolphin sightings of the two main species of the region were correlated to eight environmental variables (distance from the coast, depth, slope, salinity gradient (dS/dD), median salinity, temperature gradient (dT/dD), median temperature and mean current) using GAM and PCA. Bottlenose dolphin sightings were found to correlate with depth and median temperature. Common dolphin sightings correlated with depth, temperature (median and gradient) and salinity (median and gradient). Among the two species a different distribution according to the distance from the coast was also recorded. This research has provided the first distribution data of bottlenose dolphins and common dolphins in the northern part of the North Aegean Sea. This area is relevant for cetacean species, as this site has been proposed as a potential cetacean conservation area by ACCOBAMS. In addition the Hellenic Ministry for the Environment has recently proposed the establishment of three new NATURA sites and the enlargements of two existing ones in the northern portion of the North Aegean Sea where the study took place, confirming the importance of the area for conservation purposes.

HI13

The effect of pile driving on harbour porpoises' behaviour at two offshore windfarms in and adjacent to the 'Sylt Outer Reef'

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The 'Sylt Outer Reef' is protected under the Habitats Directive due to great importance for the local harbour porpoise population using the area for calving and mating. The construction of offshore wind farms was therefore discussed extensively. In 2014/2015 two offshore wind farms 'Butendiek' (BUD) and 'Amrumbank West' (ABW) were constructed in and adjacent to the 'Sylt Outer Reef'. Due to close proximity to the Natura 2000 site all feasible technical mitigation techniques were used: pingers and seal scarers to displace porpoises from the immediate construction site and noise mitigation (bubble curtains and IHC noise mitigation screen). In order to investigate whether the construction of these offshore wind farms disturbed harbour porpoises behaviour, echolocation click loggers (C-PODs) were deployed around the construction site to record harbour porpoises. Our results clearly show a displacement, avoidance behaviour, of harbour porpoises during the construction. The effect of pile driving could be shown on a spatial and temporal scale. A significant decrease in harbour porpoise detections in the area around the construction site of BUD was determined during pile driving and up to 3 hours after. A significant avoidance response ranged to a distance of 10 km. This effect was detectable at a range of up to 20 km. During the construction of the wind farm ABW, harbour porpoise detections were significantly reduced within 6.5 km of the construction site lasting for 2 days after pile driving. Although noise mitigation was employed, displacement radii were therefore not reduced to negligible levels in this high-density area for porpoises.

HE18

The first report of *Brucella ceti* infection in a Risso's Dolphin (*Grampus griseus*)

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Brucella ceti has been isolated from multiple organs from nine different species of cetacean in the UK: harbor porpoise (*Phocoena phocoena*), short-beaked common dolphin (*Delphinus delphis*), common bottlenose dolphin (*Tursiops truncatus*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), striped dolphin (*Stenella coeruleoalba*), white-beaked dolphin (*Lagenorhynchus albirostris*), common minke whale (*Balaenoptera acutorostrata*), long-finned pilot whale (*Globicephala melas*) and Sowerby's beaked whale (*Mesoploden bidens*). However, *B. ceti* has not been isolated from Risso's dolphins (*Grampus griseus*) nor has there been any serological evidence to suggest they have been infected despite 228 reported strandings and 47 necropsies since 1990. This poster describes the first report of a *B. ceti* isolation from an adult female Risso's dolphin. *B. ceti* was isolated from a large, 12-15 cm in diameter invasive hepatic mass containing necrotic, friable, dry, yellow/green plicated tissue. The relatively low numbers of animals necropsied may be an explanation for the organism not being previously reported in this species. The isolation of *B. ceti* from yet another member of the family *Delphinidae* shows the increasing range of species susceptibility and increases the number of host species affected by this bacterium around the coast of the UK to ten.

CO18

The French MSFD monitoring programme and evaluation of good environmental status for marine mammals

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The Marine Strategy Framework Directive (MSFD) aims to maintain or restore good environmental status of European marine waters, through 6-years action cycles that started in 2012 with an initial evaluation. The French monitoring programme was adopted by national authorities in early 2015 and notified to the European Commission in July 2015. For the first MSFD cycle (2015-2021), this programme will produce data allowing the calculation of ecological state indicators and will contribute to the definition of the next environmental objectives and programme of measures.
The French monitoring program covers thirteen topics through the eleven MFSD descriptors and one of these topics is dedicated to marine mammals. Each topic is run by a scientific supervisor and a programme coordinator, from *Observatoire PELAGIS* (Jérôme Spitz) and the French Biodiversity Agency (Benjamin Guichard) respectively for marine mammals. The marine mammal monitoring strategy is made of 5 sub-programmes: coastal cetaceans (SP1), coastal seals (SP2), offshore populations (SP3), strandings (SP4) and interactions with human activities (SP5). For the first MSFD cycle, the main actions for each sub-programme will be:

- SP1: monitoring of bottlenose dolphins coastal populations by MPAs and NGOs
- SP2: monitoring of seals colonies by MPAs and NGOs
- SP3: summer and winter aerial survey of all French waters once in the cycle; annual boat surveys on scientific fishery campaigns
- SP4: reinforcing the national stranding network, improving diagnosis of the causes of death
- SP5: fishery observers to report by-catch; data modelling from stranding data

To assess the marine mammal status in 2018, France will use OSPAR common indicators − on seals and cetaceans abundance − and develop additional national indicators to document the abundance and occupancy of cetaceans, the recurrence of extreme mortality events for harbor porpoises, common and striped dolphins as well as mortality rates from collision and by-catch.

NT07

The Geometer: A new device for aerial surveys

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Aerial surveys employing distance sampling techniques are widely used in estimating the abundance of marine mammals and other wildlife. Distances are estimated using the declination angle from the observer to the sighting, which is either estimated by the observer or measured using an analogue forestry inclinometer. Angle estimation is imprecise and inaccurate, while using analogue inclinometers is cumbersome, slow and requires manual transcription of recorded data. A new device, called a geometer, was therefore developed in Iceland for the NASS 2015 survey. The geometer is a handheld, USB-connected device that measures pitch, roll and yaw and records these measurements with date and time when the user depresses a button. The observer simply aims the device at the sighting using a red-dot rifle sight, and depresses the button to record these data to a computer. The associated software also facilitates the recording of GPS data, voice and video. Up to four or more geometers can be recorded simultaneously on a single computer. The major advantages of the geometer over other measurement devices are: 1) ease of use, reducing observer training time and enabling faster measurements in high-density areas; 2) no recording or transcription error; 3) accurate timing of observations, improving the precision of distance measurements and duplicate identification; and 4) elimination of time-consuming data transcription. Extensive testing has shown that angle measurements are at least as accurate and precise as those taken by other methods, with no calibration drift over time. To date geometers have been employed successfully in two aerial surveys in Iceland and one in Greenland.

BE20

The habitat use and behavior of Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) in Hong Kong waters.

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Indo-Pacific finless porpoises are resident in Hong Kong waters. Relatively little is known about these animals as the lack of a dorsal fin and their small size makes them very inconspicuous and difficult to study. This lack of knowledge could have negative impacts, since they are exposed to a number of potentially harmful anthropogenic activities such as ship noise, ship strike, bycatch in fisheries, and contamination of their habitat and food sources. Over the last years a marked increase in mortality has been observed for the Hong Kong finless porpoise population. By analysing the porpoise's specific high-frequency acoustic signals through passive acoustic monitoring, knowledge about their habitat use and behavior can be obtained. This information is urgently needed to help define and facilitate future conservation efforts. In this study we aimed to answer the following questions: How do Indo-Pacific finless porpoises use the area around Lamma island in Hong Kong coastal waters? And which factors (e.g. seasons, time of day, food availability, currents, temperature) influence these patterns? Three Cetacean-Porpoise Detectors (C-PODs) were deployed around Lamma island for more than one year (from July 2015 to November 2016) at water depths from 8 to 11m. The C-PODs were serviced every 2 to 3 months using divers, to exchange batteries and download data. The data was analysed with the corresponding CPOD software using different descriptors for porpoise presence (such as porpoise positive hours, porpoise positive days, encounters). The results show that porpoise occurrence was highly seasonal and also indicated a diurnal pattern. Clear differences in habitat use between the recording sites were also found. We discuss what kind of parameters most likely drive the observed patterns in porpoise occurrence. We are hoping that this small study can be extended to help further conservation efforts for this local population.

H02

The Historic Harbour Porpoise Catch in the Northern Little Belt Revisited

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In the Northern Little Belt a drive catch for harbour porpoises (*Phocoena phocoena*) was operational between at least 1593 and 1897 with two minor resumptions during two world war periods 1917-19 (WW1) and 1941-44 (WW2), respectively. Traditionally, this winter catch (November through January) was considered indicative of large seasonal porpoise migrations out of the Baltic Sea and the declining catch figures in the late 19th century and during the war periods assumed to be a good proxy for the general decline of the Baltic population of the harbour porpoise. Catch statistics have now become available for the entire 19th century period with 78 catch seasons. A reanalysis incorporating weather conditions and catch economics severely challenges the traditional narrative. The reason for picking the particular season may not have been an ecological (high abundance of animals due to seasonal migration) but an economic one (seasonally high blubber content of the animals). The catch reportedly was not discontinued due to a decreasing porpoise abundance but a market crash in porpoise oil. The catch statistics are incomparable and do not indicate a decline since WW1 and WW2 catches were performed by more inexperienced people, commencing the catch slightly earlier at a different catch site and applying a different drive method.

GEN05

The impact of exploitation on the genomes of ancient and historic walrus genomes.

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Atlantic walruses (*Odobenus rosmarus rosmarus*) have been exploited over millennia throughout the arctic for their tusks, meat, skin and blubber. The intensity, distribution and focus of hunting efforts has varied over time. Early attempts focused on sourcing food and fuel for subsistence by the Dorset and Thule cultures were followed by an increasing focus on ivory, blubber and hide by the Vikings and Pomors as prestige goods to be traded on the European market. The effect of these activities on population size, genetic diversity, particular adaptations (such as tusk size) and on the evolution of the species remains unknown. Ancient DNA offers the possibility to reveal the impact of past human-environmental interactions by comparing skeletal remains and artefacts found across northern Canada, Greenland, Iceland, Svalbard and Russia, known to date from 6000 years ago to today. The preliminary results from this project reveal for the first time the quality and extent of genomic data obtained from a range of historic bones, skull and teeth collected from the Thule region, Greenland. This poster outlines the broad project aims as well as the early findings from genomic analyses indicating the influence of preservation and origin of material on data quality and quantity.

MO05

The importance of correcting effort for "handling time" in species distribution models from non-dedicated surveys

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In regard to marine spatial use, species distribution models (SDM) are a valuable tool for ecologists and conservation biologists because of their high power in explaining or predicting changes in marine mammal distribution or abundance. Ideally, data are collected within the framework of a robust sampling design to minimise the introduction of bias and to meet the underlying assumptions of SDM. Because data from dedicated surveys can be timely and costly to obtain, data from opportunistic platforms, such as whale-watching boats or fishing vessels, are considered a valuable trade-off. Data from such non-dedicated surveys tend to be prone to sample selection bias and uneven survey effort needs to be accounted for to assure reliable model performance. In this study, the habitat use of fin whales (*Balaenoptera physalus*) in the Jacques Cartier Passage was modelled in relation to environmental parameters from 2007 to 2013 using generalised additive models (GAMs). Surveys were designed to maximise photo-identification effort, which is why effort was biased towards areas where high numbers of cetaceans were expected to be encountered. Such "whaler behaviour" introduced a significant sample bias and was accounted for by dividing the study area into 1x1km grid cells and by using effort in each grid cell as a weighting factor. Four different measures of effort were compared: no effort, number of surveys per grid cell, total time per grid cell and total time minus "handling time" per grid cell. The concept of "handling time" was introduced in order to account for the time during which the team was collecting samples (e.g. photo-identification or biopsies) and was not actively searching for more whales. The weight of the effort changed in grid cells depending on the effort definition used, highlighting the importance of considering the effect of sampling designs from non-dedicated surveys on true survey effort.

BE22

The Ontogeny of Sexual Segregation in Antarctic Fur Seals (*Arctocephalus gazella*)

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Sexual segregation has been widely studied in terrestrial animals, particularly ungulates, but understanding is still developing in marine mammals. Sexual segregation in seals has mostly been explained by sexual size dimorphism and the constraints of parental care on females. However, sexual segregation occurs from early life in Antarctic fur seals (*Arctocephalus gazella*), as male and female pups display preferences for different habitats at a breeding site at Bird Island, South Georgia. At this breeding site, sexual segregation in foraging has been observed in adult seals during the mating season, and after mating when males disperse from the breeding colonies whilst females remain to provision their pups. The foraging distributions of juveniles and males are poorly understood and deploying tracking devices can provide insight to their movements. Stable isotopes δ13C and δ15N in whiskers and teeth provide records of changes in foraging niche, which can be used to determine how sexual segregation develops throughout life. This study aims to fill research gaps by determining annual distributions of male and female Antarctic fur seals, identifying and comparing patterns in foraging niches throughout development, and exploring underlying drivers of sexual segregation.

CO15

The role of a tourism ecolabel such as the Blue Flag in marine spatial planning, sustainability and ultimately whale conservancy

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The United Nations General Assembly declared 2017 as the International Year of Sustainable Tourism for Development recalling the potential of tourism to advance the universal 2030 Agenda for Sustainable Development and the 17 Sustainable Development Goals (SDGs). This International Year aims to support a change in policies, business practices and consumer behavior towards a more sustainable tourism sector than can contribute effectively to the SDGs. To this effect, the Blue Flag is collaborating with the United Nations to contribute to this change. In order to continue its work towards integrated coastal zone management, the Blue Flag programme has built on its 30 year of experience and has launched in 2016 a set of criteria to award eco-tourism boats, including whale-watching boats. These new criteria are built hand in hand with the whale watching stakeholders. Since 1987, the Blue Flag programme has awarded more than 4260 beaches and marinas in 47 countries. Through the very complete set of criteria, Blue Flag wishes to ensure sustainability of the coastal management. Indeed, through the Blue Flag programme, the management of beaches, marinas and eco-tourism boats is a powerful tool for marine spatial planning, where resources have to be shared with many stakeholders. As such, we wish to discuss how the Blue Flag ecolabel can be a tool towards marine spatial planning, sustainability and ultimately whale conservancy. The Blue Flag programme is run by the Foundation for Environmental Education, a worldwide non-profit. The Blue Flag programme awards beaches, boats and marinas who comply with a set of stringent criteria, in the categories of environmental management, education, safety, water quality and services. Blue Flag works with many partners such as the United Nations Environment Programme, the World Tourism Organisation, the European Environment Agency, the World Health Organisation, IUCN, etc.

PHY05

The seasonal buoyancy budget of habour porpoises during dives

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The harbour porpoise (*Phocoena phocoena*) is one of the smallest species of cetaceans. They populate temperate and Arctic waters with large temperature fluctuations between seasons. Therefore, this is a marine mammal characterised by extreme blubber accumulations in preparation for cold winter conditions. As blubber has a smaller density than sea water, one may wonder if the large accumulation of blubber during winter months imbalances the equilibrium of buoyancy forces for the animal while diving. Density measurements of tissues from harbour porpoises were used as input to a model investigating the effect of variations in blubber thickness of the animal's buoyancy. Both data from lactating females, pregnant non-lactating females, immature males and females as well as calves were used. The model shows that animals are positively buoyant while being at the surface, but neutrally buoyant at 10 to 20 meters of depth depending on blubber mass augmentation. The largest variation in buoyancy for a surfaced animal is caused by the amount of air inhaled. At 10 m depth, the lung volume only contribute with approximately 30 % to the animal's buoyancy and its contribution continues decreasing with depth. The results indicate that the increased blubber thickness during winter time has little effect on the buoyancy of porpoises while foraging.

CO16

The Swedish Action Plan for improved conservation management of three harbour porpoise populations

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Sweden is currently increasing its national undertakings for the conservation management of the three harbour porpoise populations present in Swedish waters; the North Sea, the Belt Sea and the Baltic Proper populations, whereof the Baltic Proper population is listed as critically endangered (CR). The responsible authority is the Swedish Agency for Marine and Water Management. A significant policy action is the proposal of four new Natura 2000 sites, and the enlargement of two others. Of these, the largest site cover >1 million ha of the Baltic Proper, being the second largest for harbour porpoises in Europe after Dogger Bank. A central document outlining the national process is the National Action Plan (NAP) for harbour porpoises. A draft revised NAP will be subject to public hearing and circulation for comments in spring 2017 before its finalization. The draft includes >30 actions in three priority classes, with the aim of maintaining or restoring the harbour porpoise populations at a favourable conservation status. The main stakeholders are national and regional authorities, the fisheries sector, researchers, NGOs and the general public. Several of the actions are focused on, but not limited to, the Natura 2000 sites. The actions are grouped into categories ranging from information and research to concrete conservation measures and monitoring. The actions concern the threats posed by bycatches, environmental contaminants, underwater noise and habitat quality, however the concrete conservation actions focus on bycatch reduction. A national monitoring programme is planned to be launched in 2017, starting with acoustic monitoring in the Baltic Proper. The NAP is being presented with the aim of further international harmonization of the mitigation and monitoring measures for the three harbour porpoise populations.

NT08

The use of modern scannings techniques in whale research: possibilities and limitations

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Scanning techniques such as magnetic resonance imaging (MRI) and computed tomography (CT) are useful tools in veterinary and human medicine. However, they can also be used for investigations of wild marine mammals, such as whales. Here, I will describe three examples of how we have used scanning for investigations of resente and extinct whales.
CT to describe bone changes. Necropsy of a stranded fin whale (*Balaenoptera physalus*) revealed that two vertebrae were fused. By CT it was possible to show periosteal exostoses on the mid-ventral and ventro-lateral aspects of the vertebral body. As none of the other pathological findings can account convincingly for the stranding of the whale, it is possible that the found ankylosing spondylosis may have constrained spinal mobility and contributed to its stranding. MRI and CT to describe anatomy. MRI and CT scans of sperm whale (*Physeter macrocephalus*) teeth were performed and compared with each other and to current standard methods for evaluation of tooth layering. For CT two different clinical scanners were used. The three scanners did not provide sufficient information to allow age determination, but both MRI and CT provided anatomical information about the tooth cortex and medulla without the need for sectioning the teeth. MRI scanning was also employed for visualizing the vascularization of an intact eye from a stranded sperm whale, and it possible to describe the in situ vascularization. CT to describe anatomy of fossil whales. We have used CT scanning to examine the skulls of several fossil whales (7 to 30 million year old). CT scans provided information about the cranial bone structure, including bone sutures on the well preserved inside. This information was valuable for determining the species of whales. In addition, CT scans can be used by conservators to plan the subsequent preservation of the fossils and to document sediment placement.

MN13

The ventral patch on the Mediterranean monk seal (*Monachus monachus*). A tool for life monitoring of males

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The Mediterranean Monk Seal (*Monachus monachus*) is one of the most threatened mammals in the world. In species of long life and slow reproduction, it is essential to know the population parameters for its conservation and management and individual identification is crucial. A non-invasive alternative to artificial marking is the identification using their color pattern and natural marks. This species is sexually dimorphic in adult coloration. Females have a dorsal grayish coloration and a whitish ventral zone. Males have a black coloration and a white ventral patch whose design is unique for each individual allowing identification. Pups are born with a uniform black lanugo interrupted by a white ventral patch whose design is sexually dimorphic and also unique for each individual. Thus and with an exhaustive monitoring through video and photo-identification, we can identify and monitory almost 100% of the individuals in the colony. The pups molt the black lanugo to the prototypical grayish coloration at two months old, which masks the ventral patch, except for the lateral lines of their design which allows to continue identification in quite a few cases. Thanks to this, we used a control group of offspring monitored from birth to the change to adult males (n = 7) and we were able to verify that **the young males, when they reach the sexual maturity, it recovers the black color and the design of the white ventral patch reappears exactly like the breeding stage in the 100% of them**. We do not know the genetic regulatory mechanism of this phenomenon, but the result of this study constitutes an important tool for monitoring and the construction of the complete history life of the male part of the population of a long-lived species such as the Mediterranean monk seal.

ECO07

The vertical dimension of Southern Ocean marine predators: understanding to protect

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The Southern Ocean is a dynamic oceanic system undergoing rapid climate related changes. It is home to a great diversity of marine predators (cetaceans, pinnipeds, flying and diving seabirds) well adapted to exploit its diversity of habitats from coastal shelf, sea ice and open ocean zones. Many SO species have a high conservation value and it's increasingly important to be able to predict how this ecological system will change in response to a range of climate stressors.
Predators need to acquire sufficient resources (determined by prey distribution, abundance, quality) is balanced against their physiological constraints (e.g. oxygen stores, age, size, sex influence diving capacity). The interplay between these is reflected in what is observable, that we can measure i.e. the dive behaviour, using simple telemetry devices like time-depth recorders. In this study, we compiled archived dive datasets for key Antarctic seal (southern elephant, Antarctic fur and crabeater) and penguin (Adelie, Emperor and king) species. We aimed to employ a comparative analytical approach across species to investigate foraging capabilities and limits. For each species we derived a suite of the most commonly used basic (e.g. dive depth and duration, bottom time, descent and ascent rates and surface interval) as well as further derived dive parameters (e.g. hunting time, wiggles, dive- and surface-residuals) used for inference of foraging effort and cost. This synthetic approach to diving behaviour will provide insights on Antarctic predator's usage of the water column, habitat selection and ultimately species capacity to respond to change.

ECO08

Timing and duration of grey seal (*Halichoerus grypus*) moult

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Regular wildlife surveys are commonly used to monitor population size and trends. Pinniped surveys are often conducted during the annual moult, a period when generally a large proportion of seals are on land. If, however environmental conditions alter the timing and duration of moult, this can influence such population size estimate. Therefore, an understanding of the moult process is essential to improve the accuracy of these surveys and their use to monitor the seal populations. In this study, we concentrated on the timing and duration of grey seal (*Halichoerus grypus*) moult in the Dutch Wadden Sea. Moult was monitored in nine captive grey seals, and the observed moult phases were applied to wild seals over seven moult periods between 2004 and 2010, recorded by aerial photography. The timing of moult in wild seals was correlated with various environmental variables averaged over different periods to test which of those are most influential. Additional simulations based on the collected data provided insights in how the moult duration, variability in the annual onset and individual variability may affect the number of moulting seals over time. In wild seals, there was a significant inter-annual variation, where the mean moult date could differ up to 28 days between years. Of the large set of environmental variables, one environmental variable correlated with the observed shift in timing, but was able to explain the observed inter-year variability. Hence, the causes of the observed inter-annual variability in the timing of moult remain unclear. We hypotheses that either food conditions several months before the moult or variable influx of animals from different colonies could explain the annual variability. Regardless, if moult survey results are used to monitor population size, we should be aware of annual variability in the peak of moult in grey seals, but possibly also in other pinniped species.

BE23

Timing it right - Tidal and temporal effects on detections and foraging behaviour of the harbour porpoise in the German North Sea

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A deeper insight into spatial and temporal animal occurrence and foraging patterns is essential for setting up effective conservation management. For odontocetes a continuous, automatic and weather independent way of monitoring is using static, passive acoustic devices. Apart from porpoise occurrence, echolocation click loggers (PODs) can give insights on porpoise behaviour. Therefore, recordings of click sequences with very short inter-click intervals (< 10 milliseconds) can be categorized as buzzes and indicate foraging behaviour. In the present study, we analysed four years of acoustic recordings of harbour porpoises in coastal and offshore areas in the German North Sea. Temporal and tidal effects on the occurrence and foraging behaviour of the harbour porpoise were studied. Season, time of day and tidal time significantly influenced the probability of harbour porpoise detections and are likely explained by changes in prey distribution. Consecutively effects on foraging behaviour are expected and will be compared between areas and sites. These results on temporal and tidal foraging patterns can be relevant in future management especially in the area of the Wadden Sea.

HE19

Trace elements and organochlorines in sperm whales stranded on the coast of Schleswig Holstein in 2016

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Several strandings of sperm whales occurred in the North Sea during January and February 2016. Twelve animals were necropsied and sampled after their discovery on German coasts of Schleswig Holstein. Muscle, liver, kidney and blubber samples were taken from all specimens for toxicological analyses. The concentrations of lipophilic organic pollutants such as polychlorinated biphenyl (PCB) and pesticides such as DDT were determined in adipose tissue. Metals and trace elements such as cadmium, selenium and mercury were measured in the liver, kidney and muscle. Polychlorinated biphenyls (PCBs) and pesticides such as DDTs were determined in adipose tissue at levels of 0.9 and 1.3 mg.kg-1 lipid weight respectively. Cadmium, selenium and mercury were measured in the liver at respective concentrations of 57, 52 and 81 mg.kg-1 dry weight. The investigated 12 sperm whales stranded on the coasts of Schleswig Holstein in spring 2016 showed a lower contamination of organic pollutants than the 7 sperm whales stranded along the Belgian and Dutch coast in the winter of 1994/95. These animals were clearly larger and older than the ones that stranded in Schleswig-Holstein. So, lower contaminant burden may be due to shorter life span. It seems unlikely that contamination is the direct cause of the death of sperm whales. However, debilitating role of pollutants cannot be excluded, as strandings are often a multi factorial event. Further investigations on the contaminant patterns among the 30 sperm whales at different stranding sites may also give indications on the feeding strategy and linkage among the individuals.

ST03

Trends, factors and causes of the cetacean stranding on the Valencian Mediterranean coast of Spain.

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In this study we analysed stranding patterns of cetaceans on the Mediterranean coast of Spain (40°31'N, 0° 31.'E to 37° 50'N, 1° 37'W) in 1980-2016, investigating four questions: (1) What is the global trend in the number of stranded cetaceans over time?; (2) Is there a relationship between the number of stranded animals per species and the relative density of their populations in the study area?; (3) Are there significant differences in the number of stranded animals depending on season and sex?, (4) What is the relationship between the spatial distribution of stranded animals and local predictors of the probability of death (local cetacean abundance), stranding (perpendicular distance to continental slope) and detection (type of coast and human population size in the area)? 1297 cetaceans from 10 species were recorded, six with >20 records: striped dolphin (*Stenella coeruleoalba*) (662); bottlenose dolphin (*Tursiops truncatus*) (128), sperm whale (*Physeter macrocephalus*) (41), Risso's dolphin (*Grampus griseus*) (36), long-finned pilot whale (*Globicephala melas*) (28), and common dolphin (*Delphinus delphis*) (24). A total of 351 carcasses could not be identified to species. The results for the questions posed above were as follows: (1) the number of stranded animals linearly increased over time, suggesting that full detection has not been reached yet. The establishment of the stranding network in 1990 led to an overall increase of detected animals. (2) An exponential relationship was found between the relative population density of each cetacean species and its stranding frequency. (3) Stranded records increased in spring and summer which, prima facie, could be associated to higher detection due to the affluence of people. Interestingly, a higher number of stranded males was found. (4) The geographical variation in the number of stranded cetaceans was accounted for by the conjoint influence of local cetacean abundance, distance to slope and human population size in the area.

ECS 29 April - 3 May 2017 Middelfart Denmark

HI14

Understanding harbour porpoise use of tidal stream environments to reduce interactions with marine renewable energy installations

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The potential for construction of marine renewable energy installations (MREI) extracting tidal stream resources to negatively impact harbour porpoise populations in coastal regions through collisions and displacement from foraging areas has raised widespread concerns. Harbour porpoise exploiting these regions often forage in hydrodynamic features (e.g. eddies, divergences/ convergences, shear-lines) originating from interactions between tidal currents and bathymetric features. An increased understanding of which and when hydrodynamic features are exploited by harbour porpoise, including the physical quantification of these hydrodynamic features, could allow interactions between harbour porpoise and installations to be better predicted and mitigated within regions earmarked for such developments. To improve our understanding, observational surveys have been combined with computational models to quantify relationships between harbour porpoise and hydrodynamic features in four tidal stream environments across Anglesey, UK. Harbour porpoise were found to associate with numerous hydrodynamic features. These associations differed among sites, indicative of site-specific habitat-use. However, variations in habitat-use among sites correlated with differences in general characteristics of these sites. Harbour porpoise using relatively high-energy locations associated strongly with spatially and temporally ephemeral features (shear-lines), with animals generally being detected at specific tidal states and locations containing these features within sites. By contrast, those in relatively low-energy sites were associated with more homogenous features (shallow depths and fast horizontal currents), with animals detected more evenly across tidal states and/or locations within sites. Therefore, restricting installations to relatively high-energy sites and away from shear-lines could reduce the likelihood for interactions. However, as array installations of MREI could increase habitat complexity and reduce energy-levels, these results suggest that animals might actually exploit development sites more following installations. This research therefore highlights the importance of not only quantifying but also understanding habitat-use on a site by site basis when estimating potential impacts from anthropogenic activities on cetacean populations.

ABU29

Understanding Migratory Routes in the Macaronesia - Assessing Range of Physiographic Variables for Baleen Whales

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Baleen whales are migratory animals undertaking long annual migrations between cold summer feeding grounds in high latitudes, and winter tropical waters for mating and calving. In the Eastern Atlantic Ocean, long migrations cross Macaronesia, being all their archipelagos commonly visited by migratory baleen whales. Although most of the migration patterns are well described, the routes themselves remain almost unknown. To fill this gap, a comprehensive analysis on existing data from different sources and the collection of baleen whale occurrences in less-surveyed areas is needed. Moreover, to better understand migrations, an analysis on species-habitat relationships is extremely important, as physiographic variables may play a fundamental role in shaping the migratory routes of these large cetaceans. The aim of the present study is to characterize the habitat preferences according to physiographic variables for four species of baleen whales that pass through Macaronesian waters (Minke, fin, humpback and blue whales) during their northward/southward migrations. A total 1797 sightings: 121 Minke, 1071 fin, 188 humpback and 417 blue; were obtained from several sources: 51 online databases, 101 scientific articles, 16 reports, 1516 whale-watching databases and 113 from CETUS Project (a long-term monitoring programme that collects data on cargo ships' long transects in Macaronesia). A spatial and temporal analysis was performed, with a calculated effort measure (number of data sources considered), to infer on potential migratory routes in the area. Topographic and geographic variables were assessed in order to characterize whales' range of habitat in the area through environmental envelope techniques. Preliminary analysis highlights different patterns of occurrence for each species and potentially different paths of migration. This study will provide new knowledge on baleen whales' distribution and their migratory patterns and routes within Macaronesia, as it undertakes an integrated analysis on existing data, previously analyzed separately, contributing to the protection of these large-cetaceans.

HE20

Unusual mass mortality of harbour porpoises on the coast of the western Black Sea (Bulgaria and Turkey) in summer 2016

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Between late June and late August 2016, an unusual mass mortality of harbour porpoises (*Phocoena phocoena*) relicta was observed on the western Black Sea coasts of Turkey and Bulgaria. The information were collected by stranding surveys, İÜ-TUDAV Cetacean Stranding Network, media (newspaper, TV, online news), social media, environmental authorities (RIOEW-Burgas), as well as the website and app of BlackSeaWatch Project. In total 443 stranded cetaceans (435 harbour porpoises, five common dolphins, two bottlenose dolphins, one unidentified) were reported in Turkey on the coastline of approximately 300km and 234 (218 harbour porpoises, one common dolphin, 14 bottlenose dolphins and one unidentified) along the southern Bulgarian coast of 238 km. In Bulgaria the number goes up to 361 if the cases reported by citizens but not confirmed by experts are included. The peak was reached in July in both Bulgaria and Turkey. Highest cetacean stranding rate was recorded (7.1 ind./km) in Turkey since 2003 by regular monitoring surveys compared to normal rates ranging between 0.1 and 1.1 (ind./km) in summer months. Most of them (about 90%) were neonates (<1 year of age), around 70cm in body length. Almost all specimens were at the advanced stage of decomposition (stage 4-5), which made it impossible to determine the reason for such mortality. The carcases, however, were mainly of very young animals (<1 year of age) and not of adults. This indicates that potential causes such as bycatch, biotoxin, infectious diseases, starvation, acoustic trauma, heavy metals and chemical contamination are unlikely causes. Based on the available stranding rate of carcases, we assume thousands of juveniles died during this mortality event in western Black Sea coast. Such damage to an already threatened population of Black Sea harbour porpoises needs to be monitored and taken into consideration for elaborating the conservation plan.

CO17

Updated national action plan (Finland) for the critically endangered Baltic Sea harbour porpoise

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The Baltic Sea harbour porpoise population collapsed during the second half of 1900s and is now classed as critically endangered. The species was regularly recorded also along the Finnish coast before the collapse, but is now classified as regionally extinct in the national red list as the latest documented breeding records date back to 1930's. The international LIFE+ funded SAMBAH project estimated the Baltic Proper population size to ca. 500 animals and also revealed a more regular presence of animals in the Finnish offshore area in the northern Baltic Sea. The Finnish Ministry of the Environment set up a working group, consisting of members from governmental authorities, research organizations, fisheries sector and NGOs, to update the previous national action plan from 2006 with the latest available information on the species. The work was finished in August 2016 and the report is electronically available in Finnish and Swedish languages. Proposed actions include e.g. continued passive acoustic monitoring and opportunistic sightings collection, recommendations for measures concerning the recognized threats and active international co-operation especially with ASCOBANS/Jastarnia group and HELCOM and participation to transnational monitoring and management efforts. The new action plan is expected to support the other recent conservation efforts for the endangered population, such as the updated Jastarnia recovery plan and recently proposed large Natura 2000 areas in Swedish waters.

HE21

Updating the biodiversity of parasites of the genus *Anisakis* in cetaceans from different oceanographic basins

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The application of genetic markers to nematodes of the genus *Anisakis*, parasites of cetaceans in all world's seas and oceans, has advanced the knowledge about their systematics, ecology and phylogeny. Aim of the present work was to update and reviewing biodiversity of *Anisakis* spp. from their definitive hosts (cetaceans) identified by multilocus genetic approach. Several adult specimens of *Anisakis* spp. collected from stranded cetacean species along Mediterranean Sea coasts, Atlantic and Pacific Oceans, were identified by diagnostic allozymes, sequences analysis of mitochondrial and nuclear genes (mtDNA cox2, rrnS, EF1 α−1 nDNA) and DNA microsatellites. From *Physeter macrocephalus* stranded from off the Adriatic Sea, several adults of *A. physeteris* were identified; while, from off the Scotland coast, several *A. physeteris* and *A. simplex* (s.s.) were identfied in the same cetacean species. From the ziphiid *Ziphius cavirostris* from off Greece coast, a mixed infection by rare preadults of *A. physeteris* and *A. pegreffii* was observed; while, from that ziphiid of the Italian and the Chile coasts, *A. ziphidarum* was recorded. The dolphins *Stenella coeruleoalba* and *Tursiops truncatus* stranded off the Italian coast, harboured only *A. pegreffii.* Whereas, in *Delphinus delphis, Phocoena phocoena, S. coeruleoalba, T. truncatus* stranded along the Atlantic Iberian coast, the sympatric occurrence of *A pegreffii* and *A. simplex* (s. s.) was found. The dolphins *Lagenorhynchus albirostris, P. phocoena, S. coeruleoalba* from Scottish waters harboured only *A. simplex* (s. s.). Finally, in the *Globicephala melas* and *Grampus griseus* stranded along New Zealand coast sympatric occurrence of *A. pegreffii* and *A. berlandi* was found. The results achieved support the host-parasite association between *Anisakis spp.* and different cetacean species. They also enlarge the knowledge on the geographical distribution and hosts of the *Anisakis spp.*, improving information on their evolutionary and ecological aspects.

ABU30

Using click occurrence to assess important habitat of Endangered Scotian Shelf northern bottlenose whales

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The Scotian Shelf population of northern bottlenose whales (*Hyperoodon ampullatus*) is primarily found along the continental slope off Nova Scotia, Canada. These whales are commonly sighted in the Gully Marine Protected Area (MPA) and nearby Shortland and Haldimand canyons and all three areas have been designated as critical habitat for this endangered population. While it is known that individuals travel between the three canyons, to what extent the population uses between-canyon slope habitat and whether these areas constitute critical habitat for the population is not well understood. To address this important knowledge gap, two years (October 2012-September 2014) of acoustic data were collected from the Gully MPA and two between-canyon locations (halfway between the Gully and Shortland canyons, and Shortland and Haldimand canyons) using Autonomous Multichannel Acoustic Recorders (AMARs). These bottom-moored recorders were deployed at depths of 1400-1900 m and sampling rates were duty-cycled between 16 kHz for 13 min and 2 min at 128 kHz (during the first year) or 250 kHz (during the second year). A time-series based detector was used to determine the presence of northern bottlenose whale clicks on the higher frequency 2-min recordings. Click presence over various temporal scales was compared between the three locations. While click presence was highest in the Gully, northern bottlenose whale clicks consistently occurred at both between-canyon locations throughout the year, suggesting that between-canyon areas are also important habitat regularly used by the population. The significance of migratory corridors for marine mammals is not well understood, but consideration should be given to protecting habitat connectivity for endangered species.

ABU31

Using distance sampling to estimate Cuvier's Beaked Whales abundance in the Northern Tyrrhenian Sea

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The Tyrrhenian Sea is known to be substantially inhabited by Cuvier's beaked whales (*Ziphius cavirostris*). However, there is no abundance estimate concerning this important CBW sub-population. Distance sampling is one of the standard ways to estimate cetaceans' local densities and abundances. This methodology is based on line transect data and visual sighting variables for the focus species. Six terms (area size, line transect effort, number of observations, mean cluster size, effective strip width and availability correction factor) should be determined to estimate an abundance. These parameters were obtained for the CBW during summer sailboat surveys in the Northern Tyrrhenian Sea. The studied area covered a surface of 22,600 km² and was delimited to match the supposed favourable habitat of CBW. Line transect data were selected from GREC's survey database for the 2007-2012 period. A total of 41 CBW sightings were obtained in optimal standardized conditions (wind < 2 Beaufort), and were used to estimate mean cluster size (2.18) and effective strip width (825 m) with DISTANCE 6 dedicated software. Pooled together, 24 eligible transect segments represented a total effective effort of 1288 km and provided 26 on-effort CBW sightings. Availability bias was estimated using a Matlab-written script based on observed dive cycles measured during our surveys. Several parameters specific to our survey conditions and to CBW diving habits were processed and delivered a correcting factor g0 of 0.48. The resulting density estimate was 0.05 individual/km² (95% CI: 0.029-0.088) which resulted in an average summer abundance of 1100 individuals (95% CI: 650-2000) for the CBW in the Northern Tyrrhenian Sea. Processing options, such as data stratification, were then implemented to provide a discussion basis. Although our estimates might be biased because of sampling heterogeneity, they would confirm this area as a hotspot for the CBW in the Mediterranean Sea.

MN14

Using Linux, Jack (audio connection kit) and AMS (Alsa Modular Synth) for real-time signal processing in PAM

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Using Linux, in conjunction with a high-level sound card, and many available open source software allows to arrange inexpensive PAM (Passive Acoustic Monitoring) station able to operate 24/365 days. An implementation has been developed in 2014 and used for months in acoustic monitoring of marine mammals during oil and gas company related activities, in Adriatic Sea. The Linux operative system is commonly considered robust and able to provide high performance and reliability. Over the years it has been more and more used in audio applications, offering professional tools used both for professional (recording studios) and for scientific purpose. One of its more important sound component, in professional use, is Jack – Audio connection kit. Jack is an open source audio infrastructure that allows real-time, low-latency connections for audio devices between applications and vice-versa. Using Jack it is possible connecting a sound source (for example two or more hydrophones) to one or more specific signal processing modules, so the filtered sound can be returned to the headphones, and at the same time save the raw data to disk and show, always in real-time, the spectrogram on the display. AMS (Alsa Modular Synth) is a real-time modular synthesizer and effect processor. AMS gives different kind of modules really useful in PAM (Passive Acoustic Monitoring), avoiding the needs of analogic external devices, to equalize sound, apply bandpass filters and also divide the sound frequencies allowing, e.g. to listen cetacean clicks in real-time.

NT09

Using unmanned Ariel Vehicles (UAV's) for marine mammal detection and underwater noise assessment

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Underwater sound fields are likely to play a predominant role in the sensory perception of all marine mammal species. The introduction of additional anthropogenic generated noise in already complex acoustic environments has been the subject of intensive investigation for the last couple of decades. Associated with this research there has been a growing requirement to assess introduced underwater noise from human offshore operations. To make these assessments sound fields are typically measured using hydrophones deployed via boats, drifting systems or moored long term acoustic data loggers. Many of these assessments require short-term measurements of either the sound field around a specific operation or the monitoring of an area for vocalizing marine mammals. These types of measurements are often limited by cost and flexibility when using traditional boat based or mooring based acoustic recording deployments. Recent development in small Unmanned Arial Vehicles (UAV) or drones offers opportunities to provide highly flexible underwater acoustic recording deployment platforms. Multi-rotor UAV systems have been developed that can quickly fly from land or control vessel, land on the water and deploy underwater listening systems. These systems can be used to acquire and record acoustic data on site then be quickly retrieved or redeployed. Multiple systems can be used to provide wide spatial acoustic array configuration and dynamic reconfiguration of acoustic sensors previously difficult with boat-based deployments. Results are presented from testing a proto-type multi-rotor system in an open water site capable of flying to site, landing on the water, deploying a wideband hydrophone for underwater noise assessment and then returning to base. The prototype development and trials have demonstrated the overall feasibility of deployment of underwater marine mammal detection and noise assessment sensors using a UAV platform and its potential application to sound field assessment and marine mammal acoustic monitoring.

ABU32

Utility of Platforms of opportunity for the prediction of cetacean habitat in the high seas: Implications for spatial planning initiatives in areas beyond national jurisdiction

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Marine mammals are an important component for international conservation efforts and marine spatial planning initiatives. This is due to their dual function as indicators of ecosystem change and umbrellas for conserving other co-occurring species. New planning instruments are being development internationally for the management of biodiversity in high seas areas beyond national jurisdiction (ABNJ). This study aimed to determine the efficacy of commercial cruise ship platforms of opportunity to collect information for modelling the habitat probability of cetaceans in the North Atlantic. Approximately 90,000 kilometres of track-line were collected from five vessels (2006-2015), providing 2,208 records of presence from 28 species. Maxent, a commonly used presence-only model, was used to estimate habitat range based on percentage probability against co-occurring environmental variables (depth, slope, mean annual sea surface temperature, chlorophyll-a concentration, sea bottom temperature, annual sea ice cover). Outputs were validated using a standard AUC procedure utilizing a random 30% of the data across 500 model iterations. Results of the study showed that for 9 species reasonably robust distributions of habitat probability (AUC >0.7) could be produced. The output distributions for these species matched closely to published IUCN range estimates and highlighted potentially important discrete portions of habitat in both national exclusive economic zones and in the ABNJ of the North Atlantic. In particular, for sperm whale, fin whale, and northern bottlenose whale, >50% of their predicted likely preferred habitat occurred within the ABNJ. Such platforms of opportunity (cruise, container, and deep-sea research vessels), alongside other dedicated observer platforms, can have an important role in gathering evidence of marine mammal distribution and likely habitat importance in the high seas. These can support the activities of new planning tools for conserving biodiversity beyond national jurisdiction and marine mammals through the identification of areas of interest for Important Marine Mammal Areas (IMMAs).

ACO24

Variation in bottlenose dolphin (*Tursiops trucatus*) whistle parameters in relation to group composition, surface behaviour and vessel sound profiles

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An increase in wild cetacean watching from tour boats has recently been documented, perhaps as it is considered a more ethical alternative to watching these species in captivity. However, tourist vessels have been widely recorded to have both long and short term effects on cetaceans. This includes impacts on marine mammal vocalisations, which can be disrupted by underwater noise disturbance. This project investigated the effects of boat noise on the whistles of bottlenose dolphin (*Tursiops truncatus*) population within Cardigan Bay. Sound profiles of four vessels (A-D) operating within the Bay were captured, allowing for an investigation into the potential impacts of the boats on dolphin vessels. Dolphin behaviour, group composition, and boat activity were also recorded to examine the effects individual vessels sound profiles might have on the dolphin population. The four vessels were found to differ in sound characteristics, with boat A and boat D producing the highest frequencies at the loudest band energy, potentially masking dolphin vocalisations. Boat D contained a water jet powered engine, with the longest whistle duration and highest number of inflection points observed. This was hypothesised to be related to the vessels bubble production output. Larger group sizes (7-9 individuals) were recorded to increase the beginning frequency whistle parameter. With bow riding behaviour recorded to increase average maximum whistle frequency. Idling sound profiles were different between the four vessels, with higher whistle frequencies observed in the presence of boat C. Overall the four vessels differed in their sound signatures, which might have implications on dolphin communication. Recommendations include restricting loud boat activities such as reversing in the presence of dolphins. Further monitoring of the four vessels is recommended in order to protect the dolphin population, and increase the sustainability of the dolphin watching industry in New Quay, Wales.

ECO09

Variation in isotopic niche suggests population structuring in herring-eating killer whales off Iceland

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Understanding the effects of ecosystem changes on predator populations requires knowledge on their dietary preferences. In Iceland, large aggregations of killer whales in herring grounds have led to the suggestion that this population specialises on herring, although to date this has not been tested. To test the hypothesis of diet specialisation on herring, isotopic ratios of carbon and nitrogen were measured in 67 skin biopsy samples from 56 individual killer whales, sampled in herring overwintering (winter) grounds and spawning (summer) grounds in Iceland when the whales were presumably feeding upon herring. These measurements were combined with individual information, including sex, sighting frequency and movement patterns. Whales that appeared to follow the herring stock migration year-round (n = 31) had lower δ15N values, consistent with a diet predominantly composed of herring and supporting the existence of herring-specialists in the population. In contrast, whales that were only photo-identified either in winter or in summer (n = 25) had larger variation in δ15N values, with only some whales grouping with putative herring-specialists. A discriminant function analysis clearly distinguished between putative herring-specialists and whales seasonally travelling to Scotland in summer (n = 3). These whales were seen regularly in herring overwintering grounds in Iceland but had distinctly large δ15N values indicative of a diet including higher trophic level prey. This study shows that within the population of herring-eating killer whales in Iceland, some individuals or groups differ in the proportional contribution of different prey items to their diet. This variation occurs in the absence of social and, potentially, reproductive isolation. Although further information will be required to assess the degree of structuring within the population, such heterogeneity should be taken into account in future conservation and management plans.

WW03

Whale Watching industry in the Pelagos Sanctuary: Enhancing satisfaction and sustainable management

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Whale watching industry is well developed in the Pelagos Sanctuary (Ligurian Sea), where it started in late 1990s and rapidly increased in the last 10 years. The aim of this study is to give the bases for a better management of the whale watching activity in the area. First, general information about whale watchers are analyzed in order to draw a picture of the type of tourists interested in the activity. Secondly, satisfaction of tourists towards the activity is analyzed both using importance-performance (IP) analysis and a performance-only perspective, in order to identify tour aspects that mostly contribute to satisfaction. The study is based on a survey of 469 questionnaires distributed from July to September 2016 on board of 4 different whale watching boats in Liguria (Italy). Tourists were coming from 18 different countries, mostly European; 70% of the total resulted from Italy, among which 34% from Liguria. Almost half of the tourists were family groups, with an average age between 35 and 45 years old and 43% with university qualification. Results indicate that tourists going on whale watching tours do not have prior experience in whale watching and are not particularly passionate about cetaceans, while are passionate about wildlife tours in general. The overall satisfaction resulted quite high, with an average of 8.1 on a scale from 1 to 10. The most important expectations resulted to be to see bigger species (sperm whale or fin whale), to see several cetaceans and the commitment to the environment by the operator. IP analysis evidences that at the moment only commitment to the environment is fully satisfied by whale watching tours while satisfaction towards sighted species must be improved. Results from this research provide useful information for a sustainable development of this activity in the Pelagos Sanctuary.

BE24

What makes harbour porpoises jump – Analysis of 'porpoising behaviour' from D-Tag data of free-ranging harbour porpoises in the Baltic Sea

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Sources of disturbance are numerous for harbour porpoises (*Phocoena phocoena*) in the Baltic Sea, which have been listed on Annex II and IV of the Habitats Directive. The tagging of harbour porpoises in Danish waters with tags (DTAG) enabled us to study their behaviour on individual basis in detail. These sophisticated data loggers gather information on diving depth, tri-axial animal movements and allow for continuous acoustic recordings for up to 2 days. In the wild, dolphins and porpoises leap briefly out of the water to breath, while travelling at high speed. This behaviour is defined as 'porpoising'. According to various hydrodynamic models, this travelling behaviour without reducing speed close to the surface, is supposed to be energetically advantageous. As shown for multiple marine mammal and avian species, this could also be avoidance behaviour to escape from predators. In general, harbour porpoises are inconspicuous at the water surface and porpoising behaviour has not been described during travelling. 'Porpoising behaviour' as a reaction towards a source of disturbance has been observed for animals in human care but could also be related to foraging activity of animals in the wild. D-Tag data of free-ranging harbour porpoises in Danish waters have been analysed in this study to classify and analyse 'porpoising events' with regards to the visited water depth prior to this event, swimming speed, breathing rate, tri-axial accelerometer data, acoustic background and echolocation behaviour. The aim of this study was to find out if 'porpoising' is related to a disturbance or part of natural unaffected behaviour. This study gives first insight into the context in which harbour porpoises show 'porpoising behaviour' and could reveal sources of disturbance which should be considered for an effective management.

ACO25

When do C-PODs detect click trains? Matching harbour porpoise (*Phocoena phocoena*) sightings to their echolocation

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Harbour porpoises (*Phocoena phocoena*) are elusive and difficult to visually study in the field; hence it is favourable that study methods are improved for a better understanding of the species. Passive acoustic devices such as Continuous POrpoise Detectors (C-PODs) are more commonly used for abundance estimates, yet there are limitations to its use as the number of porpoises and distance cannot always be determined. Using passive acoustic methods simultaneous with visual observations has proven successful for abundance estimates. However, previous studies have not comprehensively studied the effect of certain covariates on the detectability of harbour porpoise click trains on C-PODs. Distance of detectability, for instance, is not automatically known, which may skew abundance estimates. This study shows that the furthest 'match' (simultaneous click train to a surfacing 20 seconds before or after) reaches 539m, and that there is no decrease in matches with an increasing distance till the interval 500-600m. Significant covariates affecting the 'matches' positively are foraging porpoises where the Directness Index is low, and the number of porpoises in a pod is high, however these results require some more research. Here, the result shows that the harbour porpoise click trains can be detected further than previously expected between 300-400m, which could indicate previous studies overestimated population density of harbour porpoises. It also confirms visually, that foraging, and more than two porpoises in the vicinity of the C-POD increase probability of detection. The method of combining photogrammetry with video recordings proves accuracy and more elaborate study potential of pods of harbour porpoises, rather than using theodolites.

ACO26

Whistle characteristics of bottlenose dolphins in the Ria of Arousa, Galicia (NW Spain)

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Bioacoustics is a relatively new area of cetacean research. However, due to technical, financial, and logistical issues, it is relatively poorly studied outside of captive animals. This study examined the whistle characteristics of bottlenose dolphins (*Tursiops truncatus*) in Ria de Arousa, Galicia, Spain from April to October 2014. The effects of group size and composition were also examined. A total of 42 recordings were made in the presence of dolphins resulting in 218.9 minutes with 1498 whistles. Of these, there were 472 whistles of good quality that were used in this study. The start, end, minimum, and maximum frequencies for each whistle were noted as well as the shape, duration, and number of inflections. The longer duration of whistles, higher frequencies, and the greater number of inflection points could be as a result of an area with high ambient noise. Whistle rates increased as group size increased up to 15 dolphins, after which there was no relationship. Whistles were most akin to the population in the Sado Estuary, Portugal; a genetically homogenous group and living in a similar coastal ecosystem. Further studies are needed in order to determine if environmental and behavioural states at recording times are responsible for differences and similarities among the studies.

ACO27

The effect of anthropogenic noise on the vocalizations of *Tursiops truncatus*: the Kvarner area case study

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Bottlenose dolphin (*Tursiops truncatus*) is a highly social species and communication among individuals is a fundamental aspect in all species characterized by social behavior. The main communication method in marine mammals is represented by sound. Unfortunately, in the last decades the percentage of sea ambient noise due to human activities has drastically increased, coming to represent a possible growing threat to this species. This study is conducted in Cres-Losinj archipelago, Croatia. These waters are characterized by a massive presence of recreational boats, with an increase of the boat traffic equal to 400%, particularly during summer. The primary aim of this study was to investigate the presence of effects of increased anthropogenic noise related to recreational boating on the acoustic behavior of a resident population of bottlenose dolphins. The sampling campaign took place from May to September 2016. During each sighting, whistles were recorded with the use of hydrophone connected to a recording system and data regarding boat presence, behavior, group dimension and composition as well as environmental conditions (sea state and visibility) were also collected. In total 607 whistles were selected and analyzed. This was the first research within this population in which a meticulous study was made primarily concentrating on the characteristics of the whistles emitted in different conditions in terms of boat presence. The results showed a significant difference in the frequency parameters of the whistles between presence and absence of boats. Increased anthropogenic noise was found to influence the acoustic behavior of this bottlenose dolphin population. The implications of this first study are various and range from further bio-acoustic studies within this population to possible implementations of the current boat traffic regulation in the area of the Cres-Losinj archipelago, now Natura2000 site.