ABSTRACT BOOK

27th CONFERENCE OF THE EUROPEAN CETACEAN SOCIETY

INTERDISCIPLINARY APPROACHES IN THE STUDY OF MARINE MAMMALS

8th-10th APRIL, SETÚBAL, PORTUGAL

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European Cetacean Society

Abstract book: 27th Annual Conference of the European Cetacean Society

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Edited by: Escola de Mar, www.escolademar.pt, info@escolademar.pt

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GENERAL

27th CONFERENCE OF THE EUROPEAN CETACEAN SOCIETY

8th-10th April 2013, Setubal, Portugal

THEME

Interdisciplinary approaches in the study of marine mammals

Several centuries ago, when transoceanic travels and exploration were in their infancy, most oceans and water masses experienced a close to pristine situation characterized by an ecological equilibrium. Man itself was barely a part of the equation. Populations of predators and prey were relatively stable and fluctuated naturally. Natural disasters have occurred throughout history but until recently effects were more localised. Climate change also occurred but at a slower rate with gradual impacts. In the past exploitation of marine resources and their ecosystems increased in response to human needs, albeit rather limited by the available technology. However, with the advent of industrialization, and increased technical resources available to man, this has led to a change in equilibrium which was once favourable to the environment. Man is now capable of overfishing, causing direct changes in the environment at spatial and temporal scales never before imagined. As a consequence, the impacts of anthropogenic factors are now more frequent and intense, and have far exceeded the magnitude that the natural world was able to cope with by itself. Undoubtedly at present we are faced with new, diverse and unexpected challenges. Renewable energy is now being produced in the marine environment. There is an increased concern with the effects of climate change, the depletion of natural resources, the potentially irreversible transformation of ecological systems and the loss of traditional economic activities and associated human cultures. Therefore, mankind is now striving for solutions and alternatives. Combining ecological and biological subjects with emerging disciplines such as marine environmental history and historical marine ecology, culture and governance of the sea, marine biodiversity and its economy, it is possible to better understand the evolution of the marine environment as well as our relationship with this ecosystem. It is our expectation that building on innovative data collection and techniques in the context of interdisciplinary research and the application of integrated processes that build on established concepts and current trends, to inform future

prospects. The 27th ECS conference will promote informed insights and perceptions about how to shape a better future for marine mammals, and by extension, a better future for us all.

ORGANIZATION

European Cetacean Society, Escola de Mar, Associação Para as Ciências do Mar, RNES – Instituto da Conservação da Natureza e das Florestas.

CONFERENCE ORGANIZING COMMITTEE

Marina Sequeira (Chair) (RNES – ICNF), Cristina Brito (CHAM – Centre for Overseas History; Escola de Mar), Inês Carvalho (Escola de Mar; APCM), Cristina Picanço (CIUHTC; APCM), Ana Rita Amaral (FCUL; APCM), Tiago Marques (CREEM – University of St. Andrews), Nazaré Rocha (Escola de Mar; APCM), Nina Vieira (Escola de Mar; APCM), Francisco Martinho (Escola de Mar; APCM), Andreia Pereira (Escola de Mar; APCM), Inês Gonçalves (Escola de Mar; APCM), Andreia Sousa (Escola de Mar; APCM), Ana Pinela (University of Barcelona), João Carlos Farinha (RNES – ICNF), José Fernando Gonçalves (Municipality of Setúbal), Lídia Jorge (Municipality of Setúbal), Roland Lick (ECS), Ayaka Öztürk (ECS), Aviad Scheinin (ECS), Toby Oliver (ECS), Hanna Nuuttila (ECS).

CONFERENCE SCIENTIFIC COMITTEE

Cristina Brito (Chair) (CHAM – Centre for Overseas History; Escola de Mar), Marina Sequeira (RNES – ICNF), Inês Carvalho (Escola de Mar; APCM), Ana Rita Amaral (FCUL; APCM), Tiago Marques (CREEM – University of St. Andrews), Graham Pierce (University of Aberdeen), Thierry Jauniaux (ECS), Joanne O'Brien (ECS), Tilen Genov (ECS), Barry McGovern (Scottish Marine Strandings Scheme), Mónica Silva (IMAR, University of Azores), Cristina Picanço (CIUHTC; APCM).

ABSTRACT REVIEWERS

Aleta Hohn, Alexandre Gannier, Ana Cañadas, Ana Pinela, Ana Rita Amaral, Andrew Brownlow, Anneli Englund, Antonio Fernández, Aude Pacini, Aviad Scheinin, Ayaka Öztürk, Barry McGovern, Bayram Öztürk, Begoña Santos Vasquez, Benoit Simon-Bouhet, Boris Culik, Bruno Cozzi, Carl Kinze, Caroline Weir, Christina Lockyer, Colin MacLeod, Conor Ryan, Cristina Brito, Cristina Picanço, Danielle Gibas, Emer Rogan, Giancarlo Lauriano, Giovanni Di Guardo, Graham Pierce, Giuseppe Notarbartolo di Sciara, Hanna Nuuttila, Inês Carvalho, Iwona Pawliczka, Jakob Tougaard, Javier F. Aznar, Jennifer Learmonth, Jeremy Kiszka, Jérôme Spitz, Joanne O'Brien, Juan Antonio Raga, Lee Miller, Manuel Castellote, Manuel Garcia Hartmann, Marina Sequeira, Mercedes Fernández, Mónica Silva, Nick Tregenza, Patrick Pomeroy, Paul Jepson, Paul Natchigall, Pavel Goldin, Peter Evans, Phil Clapham, Philip Hammond, Philippe Verborgh, Roland Lick, Rus Hoelzel, Sara Heimlich, Sarah Canning, Sarah Dolman, Simon Berrow, Simone Panigada, Thierry Jauniaux, Tiago Marques, Tilen Genov, Tiu Similä, Vincent Janik.

STUDENT VOLUNTEERS

Aixa Morata, Ana Mafalda Correia, Ana Melo, Ana Sofia Borges, Ayca Eleman, Aylin Akkaya, Catarina Bôto Machado, Catarina Morgado, Cristina Contreras Olmedo, Dunja Jusufovski, Eleonore Meheust, Elisa Gonzalez Andreo, Esther Brihaye, Ewelina Heil, Harriet Keevil, Inês Cunha, Inger Van den Bosch, Irmina Plichta, Janaina Remor, Jordi Salmona, Lauren Hughes, Maria Loureiro, Maria Teixeira Pinto, Marine Gonzalez Sanchez, Micha Wynne, Miguel Grilo, miriam Paraboschi, Nadia Sofia Morado, Nina Majnari, Raquel Soley, Rebecca Boys, Rita Duarte, Sandra Rybicki, Sofia Esteves da Silva, Sumeyra, Vera Jordão.

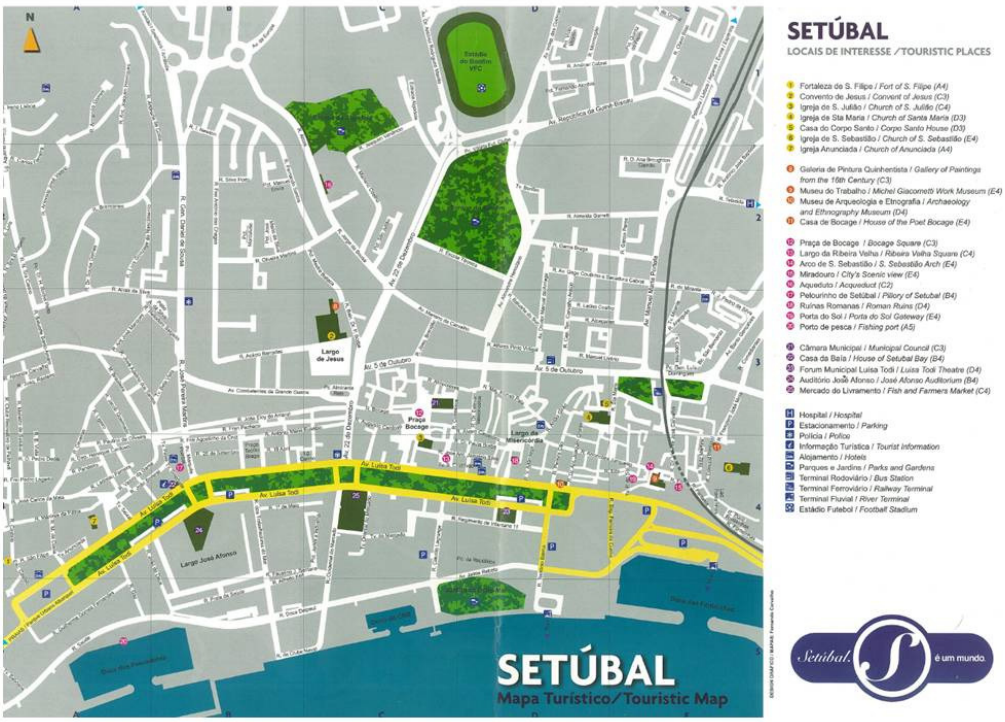
MAIN SPONSOR

SPONSORS

VENUE

The main venue will be in the Luisa Todi Forum in the Luisa Todi Avenue, Setúbal.

Several facilities will also be used in downtown Setúbal, all around Luisa Todi Forum.



GENERAL INFORMATION

Setúbal has a rich and old history and a lot to see and visit. This city is surrounded by the Parque Natural da Arrábida, by the Reserva Natural do estuário do Sado (http://www.icnf.pt/ICNPortal/vEN2007/Homepage.htm), which is member of the most beautiful beaches in the world. This last one presents as a rare catalyst of interests, allying in a unique territory the vitality of an urban center and the nature peace. The gastronomy and wines, without forgetting the Arrábida beaches, are one of the many attractions of the city. Setúbal also promotes a vast program of cultural events that include lyric chants, cinema, experimental music and theatre.

Adding to this wonderful Natural Patrimony, Setúbal has the São Filipe Castle that nowadays holds the Pousada de Setúbal. This castle was built with rocks and bricks and its shape is star like although in an irregular form. Inside you can find São Filipe Chapel, all covered with the typical blue and white tiles reporting some aspects of the life of the saint that gave his name to the chapel. Nearby the chapel, several other churches, important monuments gardens and small parks can be found making this urban area a much more pleasant area to live and visit.

The city of Setúbal has what the Portuguese people like to call "*Bairro*". They are small neighborhoods, and in Setúbal the most traditional ones are the ones where the fishermen used or still live. These are named Bairro do Troino, Bairro das Fontainhas, Bairro Santos Nicolau and Bairro da Fonte Santa. In the downtown is possible to find several restaurants and artisanal shops where you can buy souvenirs from the region. In the river you will find the Maritime Harbor of Setubal, one of the most important in Portugal.

The organization of the conference and its main sponsor, the Municipality fo Setúbal, welcome you all to our town!

http://www.mun-setubal.pt/

Usefull contact numbers

International code for Portugal: + 351

Emergency Number: 112

Health 24 Hours: 808 24 24 24

Hospital São Bernardo: 265 549 000

Police - GNR: 265544516 / 265525141

Police - PSP: 265522011 / 265531510

Fire department: 265739330/265522122

Lisbon Airport: 218413500

Taxi Setúbal: 265522822

Train Station Setúbal: 707127127

Bus Station Setúbal: 211126200

Private Transfer: 265532979

CONFERENCE PROGRAMME

SATURDAY, 6TH APRIL 2013

WORKSHOPS

Towards a conservation strategy for white-beaked dolphins

09:30-13:00 Venue: Casa da Baía Room

Towards a large scale collaboration on sperm whale research

09:30-18:00 Venue: Library Auditorium

Student Workshop: So you want to be a marine mammalogist?

09:30-14:00 Venue: Hotel Esperança Large Room

An Introduction to Density Estimation from Passive Acoustic Data

09:30-18:00 Venue: Luisa Todi Forum

Bottlenose dolphin's conservation: what can we learn from different resident populations?

09:30-18:00 Venue: Aqualuz Troia Resort

Using Collaborative Ocean Geodesign to identify Marine Protected Areas for Cetaceans

09:30-18:00 Venue: Hotel Esperança Small Room

From nature to science: scientific illustration of marine mammals throughout the centuries. Old challenges and new perspectives

14:30-18:00 Venue: Museu do Trabalho

Joint ACCOBAMS/ASCOBANS workshop on cetacean population structure

11:30-19:00 Venue: Casa da Baía Auditorium

SUNDAY, 7TH APRIL 2013

WORKSHOPS

Communicating marine mammal science to the general public

09:30-13:00 Venue: Museu do Trabalho

Introduction to PAMGUARD

09:30-18:00 Venue: Library Auditorium

SAMBAH spring progress meeting 2013

09:30-18:00 Venue: Casa da Baía Room

The challenge of spatially managing cetaceans – A highly mobile animal group

09:30-18:00 Venue: Luisa Todi Forum

Best Practices for the Rescue of Marine Mammals

09:30-18:00 Venue: Hotel Esperança Large Room

Marine mammal morbillivirus

09:30-18:00 Venue: Casa da Baía Auditorium

REGISTRATION

16:00-19:00 Luisa Todi Forum

ICEBREAKER

19:30-21:30 Casa da Baía

MONDAY, 8TH APRIL 2013

REGISTRATION

08:00-9:00 Luisa Todi Forum

OPENING

09:00 Luisa Todi Forum

Please note: Only presenting authors are listed below

KEYNOTE SPEAKER

09:30 **Through a Distorted Glass Darkly: How the Whale of Industry Informed the Whale of Science** – Tim Smith

HUMAN INTERACTIONS I

10:15 **Turning the screw: ship-strike in UK stranded cetaceans** – Rob Deaville

10:30 **Responses of Cuvier's beaked whales to controlled and incidental exposure to mid-frequency active (MFA) sonar sounds** – Stacy DeRuiter

10:45 **Does a Big Bubble Curtain during pile driving minimise negative effects on harbour porpoises?** – Ansgar Diederichs

COFFEE BREAK 11:00-11:30

ABUNDANCE & DISTRIBUTION

11:30 **Satellite tracking of fin whales in the pelagos sanctuary (Western Mediterranean Sea)** – Simone Panigada

11:45 **Explicitly incorporating stochastic availability processes in surveys of marine mammal abundance** – Roland Langrock

12:00 **Modelling preferential habitats and estimating abundances of cetaceans from large scale aerial surveys in French Polynesia** – Sophie Laran

12:15 **A gulf-wide model of bottlenose dolphin abundance reveals patchiness in response to abiotic and anthropogenic factors** – Paula Moreno

12:30 **Using random effects to model heterogeneity in detection probabilities of common dolphin sightings** – Cornelia S. Oedekoven

12:45 **Distribution and satellite tracking of sperm whales in the waters of the Russian far east** – Tatiana Shulezhko

LUNCH BREAK 13:00-14:30

SHORT TALK SESSION 1 - GENETICS, CONSERVATION, ECOLOGY, HUMAN INTERACTIONS

14:30 **Hybridization in a recently rediscovered dolphin species, *Stenella clymene* –** Ana Rita Amaral

14:35 **The Cape Verde Islands are home to a small and genetically distinct humpback whale breeding population** – Martine Bérubé

14:40 **Monitoring juveniles of the endangered Mediterranean monk seal (*Monachus monachus*) at Cabo Blanco peninsula (Mauritania)** – Mercedes Muñoz-Cañas

14:45 **Using collaborative ocean geodesign to identify Marine Protected Areas for cetaceans** – Dylan Walker

14:50 **Improving the estimates of dragonet (*Callionymus lyra*) importance in marine mammal diets using preopercula and other diagnostic bones** – Cian Luck

14:55 **Spiralling trauma? Describing a novel form of pinniped mortality in the United Kingdom** – Andrew Brownlow

15:00 **Reducing the risk of ship strikes and improving the knowledge on cetaceans in the PELAGOS Sanctuary: the REPCET system** – Jérôme Couvat

15:05 **A sociological investigation on the attitude of ferry's passengers towards a cetacean safe maritime mobility: can reduction of vessel speed to reduce the risk of ship strike be a commercially sustainable tool?** – Roberto Crosti

15:10 **Prey preferences of fin and humpback whales occurring sympatrically in the Celtic Sea revealed by stable isotope (δ^{13}C and δ^{15}N) Bayesian mixing models** – Conor Ryan

15:15 **Potential impacts of artisanal fisheries on the bottlenose dolphin population of the Sado estuary, Portugal** – Marina I. Laborde

15:20 **Presence of harbour porpoises (*Phocoena phocoena*) during and after the construction of two gas pipelines in the Pomeranian Bight** – Laura Wollheim

ACOUSTICS I

15:30 **Acoustically invisible blue whales (*Balaenoptera musculus*) during feeding in Northeast Iceland** – Tomonari Akamatsu

15:45 **Humpback whale song characteristics described from subarctic feeding grounds** – Rangyn Lim

16:00 **An overview of LATTE: Linking Acoustic Tests and Tagging using statistical Estimation: Modeling the Behavior of Beaked Whales in Response to Mid-Frequency Active Sonar** – Tiago A. Marques

COFFEE BREAK 16:15-16:45

ECOLOGY I

16:45 **Population structure and parameters of short-finned pilot whales in an oceanic archipelago (Madeira, NE Atlantic): implications for conservation** – Filipe Alves

17:00 **Interspecific antagonistic interaction between two cetacean species** – Renaud de Stephanis

17:15 **Modelling habitat preferences of small cetaceans in southern Chile reveals fine scale habitat partitioning** – Tilen Genov

17:30 **Assessing the feeding ecology of coastal dolphin populations: can you make it with behavioural and biopsy sampling?** – Paula Méndez-Fernandez

POSTER SESSION 1 - Odd numbers

18:00-19:30 Old Shipping Warehouse

OPEN LECTURE – In Portuguese

Integrando Investigação, Conservação e Divulgação sobre Cetáceos: O Museu da Baleia da Madeira, Luís Freitas, Diretor do Museu da Baleia da Madeira.

21:00 – 22:00

TUESDAY, 9TH APRIL 2013

ECOLOGY II

09:00 **On the use of fatty acids and trace elements to delineate a ecological stock of common dolphins (*Delphinus delphis*) in the North-Eastern Atlantic** – Virginie Lahaye

09:15 **Males as infant protectors in common bottlenose dolphins (*Tursiops truncatus*) on the north-eastern coast of Sardinia, Italy** – Bruno Díaz López

09:30 **Maternally directed feeding site fidelity of grey whales in Clayoquot Sound (B.C.) (1998-2012)** – Anna Schleimer

09:45 **Spring density and distribution of Ladoga ringed seals (*Pusa hispida ladogensis*)** – Irina Trukhanova

SHORT TALK SESSION 2 - ACOUSTICS, ABUNDANCE & DISTRIBUTION, BEHAVIOUR

10:00 **A deep-sea neutrino telescope reveals and tracks online the daily behaviour of sperm whales in the Ligurian Sea** – Michel André

10:05 **MobySound.org: An archive of annotated sounds for automated detector and classifier development** – Sara L. Heimlich

10:10 **Detection probability of echolocating cetaceans for acoustic monitoring from playback experiments** – Hanna Nuuttila

10:15 **Geographic, seasonal and diel patterns of Antarctic blue whale calls in the Indian and Southern Oceans** – Flore Samaran

10:20 **Identifying white-beaked dolphins from click characteristics and indications of population structure** – Anja Wittich

10:25 **A decade of acoustic monitoring in the Baltic Sea: Status and area use of two populations of harbour porpoises** – Stefan Bräger

10:30 **Preliminary studies of Blue whale (*Balaenoptera musculus*) movements around Iceland** – Maria Iversen

10:35 **Grey seal (*Halichoerus grypus*) movements and site-use connectivity within the Irish Sea: management implications** – Tobias Oliver

10:40 **Seasonal variability in cetacean presence in the Pelagos Sanctuary: implication for conservation purposes** – Antonella Arcangeli

10:45 **Activities, motivations and disturbance: fitting a state-space model to bottlenose dolphin behavioral data in Doubtful Sound, New Zealand**- Enrico Pirotta

10:50 **Comparisons of the behavioral ecology of risso's (*Grampus griseus*) and common dolphins (*Delphinus delphis* and *D. capensis*): Risks and rewards of group living** – Mari Smultea

COFFEE BREAK 11:00-11:30

CONSERVATION

11:30 **An interdisciplinary research and management approach to assess conservation status and mitigate threats to marine mammals in Zanzibar, East Africa –** Per Berggren

11:45 **Re-evaluating the actual distribution range of the Mediterranean monk seal, *Monachus monachus*** – Luigi Bundone

12:00 **How many disciplines are needed to save the most critically endangered cetacean species: the vaquita?** – Lorenzo Rojas-Bracho

KEYNOTE SPEAKER

12:15 **Protecting the special places where whales and dolphins live: Turning "paper parks" into "oceanic art treasures" worth saving** – Erich Hoyt

LUNCH BREAK 13:00-14:00 (NCP meeting)

GENETICS

14:30 **Historical population dynamics of ringed seals, *Pusa hispida*, of the Svalbard archipelago: predicting the response to climate change** – Andrea Cabrera

14:45 **North Atlantic origin of Gibraltar fin whales** – Pauline Gauffier

15:00 **New molecular biomarkers as indicators for anthropogenic stress in seals** – Kristina Lehnert

15:15 **Population genetics of bottlenose dolphins in the North East Atlantic: a pelagic versus coastal segregation** – Marie Louis

15:30 **Sequence polymorphism and geographical variation at neutral (mitochondrial) and adaptative (MHC) genes in Long-finned pilot whale (*Globicephala melas*) from North Atlantic** – Sílvia Monteiro

15:45 **Remarkably fine-scale population structuring in a widespread marine mammal - Integrating genetic and demographic data for the identification of *Phoca vitulina* populations and management units** – Morten Olsen

COFFEE BREAK 16:00-16:30

BEHAVIOUR

16:30 **Cultural transmission of lobtail feeding in humpback whales** – Jenny Allen

16:45 **Allocare in long-finned pilot whales (*Globicephala melas*), that summer off Cape Breton, NS, Canada** – Joana Augusto

17:00 **Comparing multiple methods for measuring the behaviour of humpback whales (*Megaptera novaeangliae*)** – Elise Godwin

17:15 **Grey seals predating on harbour porpoises: a recent and spreading phenomenon?** – Jan Haelters

17:30 **Silent porpoise: potential sleeping behaviour identified in wild harbour porpoise** – Andrew Wright

POSTER SESSION 2 - Even numbers

18:00-19:30 Old Shipping Warehouse

VIDEO NIGHT

21:00-23:00

WEDNESDAY, 10TH APRIL 2013

HUMAN INTERACTIONS II

09:00 **Testing the effect of pingers on cetacean depredation in the Azorean hand-jig squid fishery** – Maria João Cruz

09:15 **An interdisciplinary approach to measuring behavioural impacts of seismic surveys on humpback whales** – Michael Noad

09:30 **Levels of marine human wildlife conflict: a whaling case study** – Chris Parsons

09:45 **An interdisciplinary approach to studying harbour porpoise-fisheries interactions in the north-west Iberian Peninsula** – Fiona Read

10:00 **Negative long term effects on harbour porpoises from a large scale offshore wind farm in the Baltic - evidence of slow recovery** – Jonas Teilmann

SHORT TALKS SESSION 3 - METHODS, NEW TECHNIQUES, PHYSIOLOGY AND STRANDINGS

10:15 **Modelling harbour porpoise and minke whale distribution in Northern European Waters, using the Joint Cetacean Protocol data resource: a novel spatially adaptive generalised additive model approach** – Lindesay Scott-Hayward

10:20 **Automating the detection of dugongs in aerial imagery captured during trial surveys using Unmanned Aerial Systems** – Gwénaël Duclos

10:25 **New developments in seal aerial surveys** – Patrick Pomeroy

10:30 **Immobilization of Atlantic walrus (*Odobenus rosmarus rosmarus* L.) by etorphine hydrochloride reversed with diprenorphine hydrochloride** – Mario Acquarone

10:35 **First evidence of Brucellosis by *Brucella ceti* in cetaceans from the Western Mediterranean Sea** – Mariano Domingo

10:40 **Brucellosis in two seal pups** – Thierry Jauniaux

10:45 **Patterns of cetacean death locations at sea as new population indicator: the case of common dolphins (*Delphinus delphis*) in the Channel and the Bay of Biscay** – Hélène Peltier

COFFEE BREAK 11:00-11:30

KEYNOTE SPEAKER

11:30 **Interdisciplinary approaches in the study of marine mammals: ecology meets statistics** - Len Thomas

WORKSHOP REPORTS

12:15-13:00

LUNCH BREAK 13:00-15:00

Annual General Meeting 13:00-15:00

ACOUSTICS II

15:00 **Marine mammal research using advanced-technology acoustic sensing platforms and software** – David Mellinger

15:15 **dBs of freedom: how different environmental parameters influence the sound scape of cetacean habitats** – Tanja Pangerc

15:30 **Broadband acoustic/video recordings and localisations of dusky dolphins (*Lagenorhynchus obscurus*) and short-beaked common dolphins (*Delphinus delphis*) in New Zealand** – Michiel Schotten

15:45 **Calls from the depths: assessing pop-ups and pods for monitoring beaked whales in offshore habitats** – Dave Wall

COFFEE BREAK 16:00-16:30

AWARDS AND CONFERENCE CLOSING 16:30-17:30

DINNER 20:00 -22:00 Hotel do Sado

DANCING 22:00 – 00:00 Hotel do Sado

LIST OF POSTERS

ABUNDANCE & DISTRIBUTION

AD01
First Mediterranean record of a free ranging Sowerby's beaked whale (*Mesoplodon bidens*) in a mixed species group with Cuvier's beaked whales (*Ziphius cavirostris*)
Luca Bittau, Valentina Gilioli Mattia Leone, Gabriele Costa, Renata Manconi

AD02
Dwarf sperm whales (*Kogia sima*) sighting on Grande Comore
Marco Bonato, Artadji Attoumane, Irene Piccini, Ouledi Ahmed, Cristina Giacoma

AD03
Density, seasonal distribution and habitat preferences of harbour porpoises from the southern bight of the North Sea and Dover Strait
Thibaut Bouveroux, Jeremy Kiszka, Valentine Simar, Sylvain Pezeril

AD04
Cetacean diversity across the Mediterranean Sea: first results from a new fixed-line transect from Tyrrhenian to Balearic Seas
Ilaria Campana, Antonella Arcangeli, Stefania Carcassi, Elisa Casella, Francesca Cracas

AD05
Sightings Pattern and Distribution of Cetacean Species in the North West of England
Mathew D. Clough, Katrin Lohrengel, Shaun K. Bryan

AD06
Assessing the consistency of data collected using ferries as platforms of opportunity for cetacean monitoring programs
Simone Cominelli, Aurelie Moulins, Valeria Rossi, Antonella Arcangeli, Lea David, Nathalie Di-Meglio, Paola Tepsich

AD07
Cetacean monitoring in Northeastern Atlantic Ocean: Occurrence and distribution of cetacean species in the Canary Basin
Ana Mafalda Correia, Paola Tepsich, Massimiliano Rosso, Rui Caldeira, Isabel Maria Sousa Pinto

AD08
Sighting of a North Pacific Right Whale (*Eubalaena japonica*) in the Piltun Bay area (Northeast Sakhalin) in 2012
Evgeniya Dolgova, Maxim Sidorenko, Alexander Burdin, Oksana Savenko

AD09
Distribution of cetaceans around Bardsey Island, NW Wales, in the late summer/early autumn 2010 - 2012
Sonja M. Eisfeld, Rob Lott, Vicki James

AD10

Population size estimate and level of associations of striped dolphin (*Stenella coeruleoalba*) in the Gulf of Corinth (Ionian Sea, Greece)

Giulia Fedele, Elena Papale, Marianna Anichini, Alice Galli, Melissa Reggente, Nora Arena, Marta Azzolin

AD11

Estimating Cuvier's beaked whale availability bias with conventional boat-based methods

Alexandre Gannier

AD12

Tidal influence on local distribution patterns of Pilot whale (*Globicephala melas*) in the Strait of Gibraltar

Elisa Gonzalez

AD13

A comparison of visual and acoustic survey data assessing harbour porpoise and bottlenose dolphin occurrence in the Cardigan Bay SAC, Wales

Melissa Goulton, Andrew Davies, Hanna Nuuttila, Peter Evans

AD14

North (Summer) and South (Winter) - Harbour Porpoise Migration within the Eastern German Bight

Sophie Hansen, Ansgar Diederichs, Georg Nehls

AD15

Spatial-temporal distribution of minke whales in the Lower St. Lawrence Estuary Quebec, Canada

Aline Sophie Hock

AD16

The site fidelity and abundance of the Grey seal (*Halichoerus grypus*) in North Wales

Lauren Hughes, Toby Oliver, Fiona Read, Jan Hiddink

AD17

Temporal trend and seasonal dynamics of harbour porpoises in Pomeranian Bight (Baltic Sea)

Vladislav Kosarev, Harald Benke, Stefan Bräger, M. Louise Burt, Ansgar Diederichs, Anja Gallus, Anne Herrmann, Jens C. Koblitz, Len Thomas, Ursula K. Verfuß, Laura Wollheim

AD18

New abundance estimates for harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin *(Tursiops truncatus*) in Northern Spanish Cantabrian and adjacent waters of Bay of Biscay (2003-2011)

Alfredo López, José A. Vázquez, José Martínez, Ana Cañadas, Enara Marcos, Iranzu Maestre, Arturo Ruano, Luis Laria, Ángela Llanova, Kelly Macleod, Peter Evans

AD19

Occurrence and distribution of Bottlenose dolphins *Tursiops truncatus* in the coastal area of southwest Portugal

Sara Magalhães, Bruno Claro

AD20

Cruise ships as platforms for opportunity: efficacy for use in wide-scale cetacean monitoring and reporting of conservation status

Stephen Marsh, Richard Bull, Ben Jones, Michael J. Tetley

AD21

Evaluation of abundance and distribution of whales (*Balaenoptera physalus*, *Megaptera novaeangliae*, *Eubalaena glacialis*) in the waters off Bar Harbor, Maine

Anna Michieli, Carlotta Mazzoldi, Sean K. Todd

AD22

Cetacean distribution in the Thracian Sea (North Aegean Sea, Greece) related with fishing activities

Cristina B. Milani, Adriana Vella, Pavlos Vidoris, Aris Christidis, Emmanuil Koutrakis

AD23

Changes in habitat use and distribution of the Galápagos sea lion (*Zalophus wollebaeki*) related to environmental variability

Ignasi Montero-Serra, Diego Páez-Rosas, Juan C. Murillo, Judith Denkinger, Katharina Fietz, Teresa Vegas-Vilarrúbia

AD24

A first assessment of the cetaceans' occurrence and threats in the offshore waters of Madeira

Cátia Nicolau, Filipe Alves, Rita Ferreira, Filipe Henriques, Ana Dinis, Cláudia Ribeiro, Luís Freitas

AD25

The presence of the sperm whale (*Physeter macrocephalus*) around the Azores: A study of re-sightings from 2003-2012

Stella Charlotte Niemeijer, Jennifer Libotte, Karin L Hartman, Lisa Steiner

AD26

Trends of harbour porpoise (*Phocoena phocoena*) occurrence in the southern North Sea

Verena Peschko, Katrin Ronnenberg, Ursula Siebert, Anita Gilles

AD27

Applying distance sampling techniques to estimate bottlenose dolphin abundance in Madeira Island waters: first approach

Cláudia Ribeiro, Adalberto Carvalho, Cátia Nicolau, Filipe Alves, Ana Dinis, Ana Cañadas, Philip Hammond, Luís Freitas

AD28

Results of four years cetacean monitoring using ferries as platform of research in the northern Tyrrhenian Sea: distribution and spatio-temporal variability

Anna Ruvolo, Antonella Arcangeli, Alberto Castelli, Cristina Luperini, Eliza Muzi

AD29

Occurrence of cetaceans in the central coast of mainland Portugal: Six years of data collection towards long term research

Erica Sá, Francisco Martinho, Nina Vieira, Cecília V. Ferreira, Sofia Quaresma, Inês Carvalho, Cristina Brito

AD30

The Sperm Whales (*Physeter macrocephalus*, Linnaeus, 1758) of the South coast of Pico Island, Azores

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The use of computerized tomography to diagnose externally non-detectable cetacean mandible fractures

Josep M. Alonso-Farré, Manuel Gonzalo-Orden, Daniel Barreiro, Andrés Barreiro, María Llarena-Reino, Marisa Ferreira, Eduard Degollada

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Herpesvirus infection associated with tubulo-interstitial nephritis in a Blainville´s beaked whale (*Mesoplodon densirostris*)

Manuel Arbelo, Edwige N. Bellière, Eva Sierra, Simona Sacchini, Fernando Esperón, Marisa Andrada, Antonio Fernández

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Prevalence of *Salmonella enterica* and *Campylobacter* spp. in wild caught and stranded neonatal and juvenile grey seals (*Halichoerus grypus*) in Scotland

Johanna Baily, Geoff Foster, Simon Moss, Eleanor Watson, Kim Willoughby, Ailsa Hall, Mark Dagleish

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Porphyrins levels in feces of free ranging fin whales living in Pelagos Sanctuary (Western Mediterranean Sea) as non-destructive biomarkers for contaminants exposure

Matteo Baini, Daniele Coppola, Matteo Giannetti, Tommaso Campani, Cristina Panti, Silvia Maltese, Silvia Casini, Letizia Marsili, Maria Cristina Fossi

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Craniometry of bottlenose dolphins (*Tursiops truncatus*) from the Croatian Adriatic coast

Dušica Divac Brnić, Ana Galov, Tomislav Gomerčić, Martina Đuras

PPT06

Striped dolphins' (*Stenella coeruleoalba*) unusual mortality in the Adriatic Sea

Cinzia Centelleghe, Giovanni Di Guardo, Cristina E. Di Francesco, Silva Rubini, Nicola Ferri, Gabriella Di Francesco, Daria Di Sabatino, Sandro Mazzariol

PPT07

Supratentorial primitive neuroectodermal tumour (PNET) with features of ependymoma in a striped dolphin (Stenella coeruleoalba)

Mark P. Dagleish, Linda R. Morrison, I. Tony Patterson, Johanna L. Baily

PPT08

First case of meningitis and arthritis associated with *Brucella ceti* in a short-beaked common dolphin (*Delphinus delphis*)

Nick Davison, James Barnett, Lorraine Perrett, Claire Dawson, Matthew Perkins, Rob Deaville, Paul Jepson

PPT09

Biological features families of *Enterobacteriaceae* isolated from the different species of marine mammals

Tatyana Denisenko, Olga Sokolova

PPT10

Mixed testicular neoplasia in a short beaked common dolphin (*Delphinus delphis*)

Josue Diaz-Delgado, António Espinosa de los Monteros, Carolina Fernández-Maldonado, Manuel Arbelo, Oscar Quesada-Canales, Marisa Andrada, Enrique Rodríguez-Grau Bassas, Antonio Fernández

PPT11

Phylogenetic analysis of Herpesvirus in cetaceans stranded at the Portuguese coast line

Carolina Bento, Ana Duarte, Marisa Ferreira, José Vingada, Luis Tavares

PPT12

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Costanza Formigaro, Annalisa Zaccaroni, Sandro Mazzariol

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Anders Galatius, Rossana Bossi, Christian Sonne, Frank Farsø Rigét, Carl Christian Kinze, Christina Lockyer, Jonas Teilmann, Rune Dietz

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Persistent Organic Pollutants (POPs) in the blubber and liver of 27 bottlenose dolphins (*Tursiops truncatus*) stranded along the coasts of Canary Islands from 1997 to 2011

Natalia García-Álvarez, Octavio Pérez Luzardo, Antonio Fernández, Vidal Martín, Manuel Arbelo, Aina Xuriach, María Reyes Suárez Hanna, Marisa Tejedor, Manuel Zumbado, Luis Domínguez Boada

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Ioannis Giovos, Joan Gonzalvo

PPT16

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Anna Maria Meissner, Karen A. Stockin

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Simona Sacchini, Cristiano Bombardi, Manolo Arbelo, Antonio Fernández, Eva Sierra, Miguel Rivero, Pedro Herráez

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Martina Sakač, Sanja Horvat, Mirta Seletković, Korina Šlogar Tomislav Gomerčić, Martina Đuras

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Herpesvirus associated to genital lesions in a stranded striped dolphin (Stenella coeruleoalba) in Canary Islands

Eva Sierra, Manuel Arbelo, Marisa Andrada, Daniele Zucca, Simona Sacchini, Josué Díaz Delgado, Antonio Fernández

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Amélia Viricel, Patricia E. Rosel

PPT32

Is there a connection between pollution, mass-strandings and pilot whales from Australia?

Liesbeth Weijs, Detlef Tibax, Anthony C. Roach, Therese M. Manning, John C. Chapman, Katelyn Edge, Ronny Blust, David Pemberton, Adrian Covaci

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Daniele Zucca, Eva Sierra, Simona Sacchini, Marisa Andrada, Antonio Fernández, Nicola Zizzo

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Sandro Mazzariol, Cinzia Centelleghe, Cristina Casalone, Walter Mignone, Pier Luigi Acutis, Fabio di Nocera, Antonio Pintore, Giovanni Di Guardo

S06
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Lara Mielke, Eileen Heße, Guido Keijl, Mardik Leopold

S07
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Matthew Perkins, Rob Deaville, Andrew Brownlow, Rod Penrose, Brian Smith, Paul Jepson

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Graham J. Pierce, Jennifer A. Learmonth, Sinead Murphy, Fiona L. Read, Maria Begoña Santos, Andrew Brownlow

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Mariano Coscarella, Silvana Dans, Enrique Crespo

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Silvana Dans, Mariana Degrati, Enrique Crespo

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Luis Freitas, Filipe Alves, Ana Dinis, Cátia Nicolau, Cláudia Ribeiro, Adalberto Carvalho, Ana Cañadas, Philip Hammond

ABSTRACTS

TALKS & SHORT TALKS

KEYNOTE SPEAKER

8th April 9:30

Through a distorted glass darkly: How the whale of industry informed the whale of science

Tim Smith

WorldWhalingHistory@gmail.com

People have explored the history of whaling from many perspectives, typically the dangers of the hunt, the economics of the enterprise, the use of the products, the people involved, and the causes of the demise of both whaling and whales. The history of the role of whaling in the scientific study of whales themselves is a less commonly taken perspective. Our understanding of whales was initially based on stranded animals, at best seeing through a glass darkly. We learned the gross anatomy of the different kinds of whales, but little about their lives. By the early 1800s observations aboard whaling vessels were being reported that clarified our looking glass, albeit with distortions due to the choices of the whalers. However, we then learned more about morphology and the habits of right whales and bowheads. By the 1850s information on several other species and their distribution was being obtained from observations made aboard whaling vessels, but still with distortions. By the early 1900s dissections of whales being processed at shore stations further improved our understanding of whale anatomy, reproduction and diet, at least for whales near whaling stations. The development of government and whaling industry supported research programs beginning in the 1920s allowed us to begin to put together the bigger picture about whales, teasing from the whaling data an every improving understanding. In the 1930s methods began to be developed for fishery-independent research, such as sighting surveys and marking. These methods reduced the distortions inherent in whaling data, and by the 1960s an approach for studying the effects of whaling on the whales using a combination of whaling data and whaling-indepentent data had come together. Given the difficulties of learning about whales that are inherent in their size and habitat, without data from whaling and from fishery-

independent studies that have been supported directly or indirectly by the whaling industry, we would know much less than we do. However, what we learned has been heavily influenced by the primary need to understand the effects of whaling. Increasing emphasis on whaling-independent observations in recent years raises the question of what we would know now if whales had not been economically valuable?

8th April 10:15

Turning the screw: Ship-strike in UK stranded cetaceans

Rob Deaville[1], Andrew Brownlow[2], Rod Penrose[3], Brian Smith[4], James Barnett[5], Matthew Perkins[1], Paul Jepson[1]

(1) Institute of Zoology, Zoological Society of London, Regents Park, London, NW1 4RY, UK.
(2) SRUC Veterinary Services, Drummondhill, Inverness, IV2 4JZ, UK
(3) Marine Environmental Monitoring, Penwalk, Llechryd, Cardigan, Ceredigion, SA43 2PS, UK
(4) The Natural History Museum, Cromwell Road, London, SW1 5BD, UK
(5) Animal Health and Veterinary Laboratories Agency, Polwhele, Truro, Cornwall, TR4 9AD, UK

rob.deaville@ioz.ac.uk

Between 1990 and 2011, 10507 stranded cetaceans were reported to the UK Cetacean Strandings Investigation Programme, of which 3044 were necropsied. Of these, 19 were diagnosed as ship-strikes, consisting of harbour porpoise (*Phocoena phocoena*, n=9), short-beaked common dolphin (*Delphinus delphis*, n=6), minke whale (*Balaenoptera acutorostrata*, n=1), fin whale (*Balaenoptera physalus*, n=1), Sowerby's beaked whale (*Mesoplodon bidens*, n=1) and Cuvier's beaked whale (*Ziphius cavirostris*, n=1). Observed pathology was characterised by large areas of dorsal and/or lateral musculature haemorrhage, consistent with blunt impact and/or parallel linear incisions in the body wall, consistent with strike by outboard propeller blades. A proportion of the cases of physical trauma of unknown origin over the same period (n=121) are also likely to be undiagnosed incidences of ship-strike. In addition, harbour porpoise strandings exhibiting atypical anthropogenic trauma have also been found around the UK. Injuries were characterised by numerous sharp edged, linear incisions and stepped cuts and separation of the blubber layer from the underlying skeletal structure. The majority of injuries were cranial rather than caudal, with most carcasses being in apparently good nutritional condition and freshly dead, indicating that trauma had occurred close to shore. The traumatic lesions were also markedly similar to those observed in a number of recent harbour porpoise strandings in the Netherlands and Belgium. Regional hotspots of reported cases in the UK were coincident with areas where seals with characteristic 'corkscrew' injuries, recently linked to impacts from ducted propeller drives, have also been found. The pathology and coincident spatial locations, suggests that a common aetiology may also be responsible for the trauma

observed in the UK stranded harbour porpoise cases. The true figure for incidence of mortality due to ship-strike in UK stranded cetaceans is therefore likely to be higher than that which has been recorded to date.

8th April 10:30

Responses of Cuvier's beaked whales to controlled and incidental exposure to mid-frequency active (MFA) sonar sounds

Stacy DeRuiter[1], Dinara Sadykova[1], Catriona Harris[1], Len Thomas[1], Walter Zimmer[2], John Calambokidis[3], Annie Douglas[3], Erin Falcone[3], Ari Friedlaender[4], Jeremy Goldbogen[3], John Joseph[6], David Moretti[7], Todd Pusser, Greg Schorr[3], Alison Stimpert[6], Peter Tyack[1], Brandon Southall[5]

(1) University of St Andrews
(2) NATO Centre for Maritime Research and Experimentation
(3) Cascadia Research Collective
(4) Duke University
(5) Southall Environmental Associates
(6) Naval Postgraduate School
(7) Naval Undersea Warfare Center Division, Newport

stacy_deruiter@yahoo.com

Understanding cetacean behavioural reactions to anthropogenic sound is vital for designing appropriate management strategies to prevent unusual strandings or other adverse behavioural responses to noise. Here, we present analysis of behaviour changes by two Cuvierâ ™s beaked whales (*Ziphius cavirostris*) in response to simulated and incidental MFA sonar signals. We analyse data from the SoCal Behavioural Response Study (BRS; http://sea-inc.net/socal-brs/), comprising 39.6 hours of DTAG data from two Ziphius tagged in 2010 and 2011 in Southern California waters. Animals were subject to 30-minute playbacks of simulated MFA sonar sounds at ranges of 4-5km and received levels of 84-144 dB re 1 uPa rms. In 2011, before and after the playback, MFA signals from a distant naval exercise were detected on the tag record at range ~120 km and received levels from 78-106 dB re 1uPa rms. Acoustic and animal movement data from the tags indicate that several minutes after the start of the playbacks, when received levels reached ~100-120 dB, both animals initiated strong responses including: energetic fluking, swimming away from the source (average relative speed 2.9 m/sec), silencing of echolocation clicks, extended dive duration, and a long post-exposure surface interval. A similarly strong response to the distant naval sonars is not evident in the data. As part of MOCHA (http://www.creem.st-and.ac.uk/mocha/), a 3-year effort to develop and implement innovative methods for analysis of cetacean BRSs, we devised a statistical model for these data. The model quantifies response intensity as a function of sound exposure

level and source-whale range, and also estimates post-exposure response duration. Additionally, we present results of simulation studies to address potential bias in model parameter estimates, and to assess data needs for differentiating the effects of dose metrics (for example, level and range).

8th April 10:45

Does a big bubble curtain during pile driving minimise negative effects on harbour porpoises?

Ansgar Diederichs[1], Hendrik Pehlke[1], Miriam Brandt[1], Michael Bellmann[2], Jens Oldeland[3], Georg Nehls[1]

(1) BioConsult SH GmbH & Co. KG, Brinckmannstr. 31, 25183 Husum, Germany
(2) itap - Institute for technical and applied Physiks GmbH, Marie-Curie-Straße 8, 26129 Oldenburg, Germany
(3) Eco-Systems, Novalisweg 21, 22303 Hamburg, Germany

a.diederichs@bioconsult-sh.de

In the last years a number of offshore windfarms were constructed along European coastal waters. Most turbines are built on steel foundations rammed into the sea floor, which creates considerable underwater noise during construction. Several studies demonstrated clear avoidance behaviour of harbour porpoises in quite extended areas around such construction sites due to underwater noise. During the construction phase of the offshore windfarm "Borkum West II", located in the German North Sea, a Big Bubble Curtain was regularly used in order to reduce noise levels during pile driving and thereby minimise negative effects on marine mammals. The behaviour of harbour porpoises was investigated by use of 26 passive acoustic data loggers (C-PODs) placed at different distances from the construction area. These devices recorded porpoise echolocation clicks and thus give information on the presence of these animals on a high temporal resolution. Data were analysed with respect to whether the spatial and temporal scale of porpoise avoidance behaviour differed when the bubble curtain was applied as compared to pile driving events without a bubble curtain. Since noise measurements were conducted at several distances behavioural effects could directly be linked to recorded noise levels. Results show that the application of the bubble curtain clearly reduced the temporal and spatial scale of porpoise avoidance behaviour. Minimising impact zones of sound emission during pile driving may be the most successful way to mitigate negative effects of offshore construction on marine mammals. This is particularly relevant with respect to plans of building several windfarms simultaneously in the same area.

8th April 11:30

Satellite tracking of fin whales in the Pelagos sanctuary (Western Mediterranean Sea)

Simone Panigada[1], Giancarlo Lauriano[2], Margherita Zanardelli[1], Nino Pierantonio[1], Greg Donovan[3], Alexandre Zerbini[4,5,6], Ygor Geyer[6], Jean-Noël Druon[7], Maria Cristina Fossi[8], Giuseppe Notarbartolo di Sciara[1]

(1) Tethys Research Institute, Viale G.B. Gadio 2, Milano, Italy
(2) ISPRA, Via V. Brancati 48, 00144 Roma, Italy
(3) International Whaling Commission, Cambridge, U.K.
(4) National Marine Mammal Laboratory, Alaska Fisheries Science Center, NOAA Fisheries, Seattle, WA, USA
(5) Cascadia Research Collective, Olympia, WA, USA
(6) Instituto Aqualie, Rio de Janeiro, Brazil
(7) Joint Research Centre of the European Commission, Maritime Affairs Unit, Institute for the Protection and Security of the Citizen, Via Fermi, TP 051, 21027 Ispra (VA), Italy
(8) Department of Environmental Sciences, University of Siena, Via P.A. Mattioli 4, 53100, Siena, Italy

panigada@inwind.it

In recent decades, several studies have been carried out to describe summer habitat use, 53odeling, distribution and abundance of fin whales in the northwestern Mediterranean. However, knowledge of their distribution and movements during other seasons remains scarce. The present project was funded by the Italian Ministry of the Environment to investigate post-summer fine scale habitat use, movements and migration routes/destinations of fin whales. Location-only satellite transmitters (SPOT5, Wildlife Computers) were attached to eight individuals in the Pelagos Sanctuary (September 2012). Deployments occurred as late in the summer as possible, to 53odeling information outside known summer feeding grounds. Two different models using different attachment mechanisms were used ('LIMPET' n=3 and 'implantable' n=5), *inter alia* to examine potential differences in performance for future fin whales' studies. An important component of the project was to evaluate the strengths and weaknesses of tag designs and deployment to assist worldwide efforts to improve telemetry research programmes. At the time of writing, two implantables are still transmitting; LIMPET tags lasted max=35 days (mean=25) and implantables thus far max=83 days (mean=55.2). Fine scale associations with oceanographic features and potential feeding habitats within the Sanctuary are being investigated. Preliminary results indicate that tagged fin whales remained in the Pelagos Sanctuary feeding ground longer than expected, possibly due to the current

particularly mild climate conditions which allowed prolonged feeding activities in the area. Two individuals left the Pelagos area and moved towards the Balearic Islands, remaining in a defined area (100x100 km) for approximately 20 days before moving towards the Gulf of Lions. Ongoing data collection, coupled with further deployments, could provide insights on small and large scale feeding 54odeling and migratory routes. Alongside information on threats (e.g. vessel traffic), telemetry data are important for helping to develop 54odelin mitigation measures and providing baseline data to measure their effectiveness.

8th April 11:45

Explicitly incorporating stochastic availability processes in surveys of marine mammal abundance

Roland Langrock, David Borchers

Centre for Research into Ecological and Environmental Sciences, University of St Andrews, St Andrews, KY16 9LZ, Scotland, UK

roland@mcs.st-and.ac.uk

Distance sampling refers to a group of methods that aim at estimating animal abundance and/or density. The data collected in distance sampling surveys comprises distances of observed animals to lines along which the survey is conducted. To this data a detection function is fitted, which, if detection of animals that are on the trackline is certain, allows to quantify the number of animals that are missed by the survey. However, in many line transect surveys of marine mammals even on the trackline a substantial proportion of animals are missed because they are underwater, which conventional distance sampling methods fail to acknowledge, resulting in potentially severely biased abundance estimates. In this talk, we discuss approaches that address this issue by simultaneously 55odeling both the animal's availability process and the observer's probability of detecting an animal, given that it is available. In particular, we outline different stochastic models for the animal's availability process, including hidden Markov models, Poisson processes and Markov-modulated Poisson processes. The methods we develop are applicable on any line transect survey in which animals are not continuously available for detection, provided that auxiliary information on the availability process is available (e.g., from tagging data).

8th April 12:00

Modelling preferential habitats and estimating abundances of cetaceans from large scale aerial survey in French Polynesia

Sophie Laran[1], Wendy Massart[1], Olivier Van Canneyt[1], Ghislain Dorémus[1], Laura Mannocci[2], Vincent Ridoux[1,2]

(1) Observatoire PELAGIS, UMS 3462 CNRS/Université de la Rochelle, 5 allées de l'océan, 17000 LaRochelle, France
(2) Littoral Environnement et Sociétés, UMR 6250 CNRS/Université de La Rochelle, 2 rue Olympe de Gouges, 17000 La Rochelle, France

sophie.laran@univ-lr.fr

French Polynesia, except the Marquesas archipelagos, is located in a vast chlorophyll depleted area. Nevertheless establishing an initial assessment of top predator diversity which includes cetaceans and other pelagic megafauna is crucial for the development of a management plan for the recently created cetacean sanctuary of French Polynesia. It was hypothesized that cetacean densities would be low overall, but that heterogeneity would be associated to oceanographic characteristics deemed to determine local productivity. Relative abundance was estimated for the main species groups and predictive models of preferential habitat were obtained to better understand their distribution at the regional scale. A large dedicated aerial survey (98,500km of effort) conducted over the five archipelagos of French Polynesia from January to May 2011, was the third step of the REMMOA project (Census of marine mammals and other pelagic megafauna by aerial survey). Density estimation revealed a strong latitudinal gradient between the Australs and Marquesas archipelagos, with values two times higher in the Marquesas for small Delphininae (0.0124 individuals.km^{-2}, CV=41%) and large Delphininae (0.0137 ind.km^{-2} , CV=40%). Density of large Globicephalinae also peaks in the Marquesas with 0.0135 ind.km^{-2} (CV=32%). Conversely densities of Risso's dolphins and beaked whales were more homogenous among sectors. Densities were in general lower than in other tropical waters in the south-west Indian Ocean and in the wider Caribbean. GAM with 56odeling sensed parameters including Sea Surface Temperature (SST), Chlorophyll or primary production and physiographic indicators as depth, slope and distance to main contours were used to describe spatio-temporal distribution of their densities. Explained deviance varies from 7% for beaked whales to 35% for Globicephalinae. Latitude, chlorophyll heterogeneity and SST represent the most selected predictors. Predicted map of cetacean habitats should be

considered with caution but would represent a valuable tool for the Sanctuary for marine mammals in the area.

8th April 12:15

A gulf-wide model of bottlenose dolphin abundance reveals patchiness in response to abiotic and anthropogenic factors

Paula Moreno[1], Michael Mathews[2]

(1) University of Southern Mississippi, Gulf Coast Research Laboratory, Mississippi, USA
(2) Flat Earth GIS Solutions, Bryan, Texas, USA

Paula.Moreno@usm.edu

Despite being commonly distributed in many habitats worldwide, our ability to tease out the most significant environmental factors driving abundance of bottlenose dolphins (BD) is limited. As a result, environmental factors are generally not incorporated in stock assessment models restraining conservation efforts. This limitation stems in part from a lack of concurrent measurements of environmental conditions and dolphin abundance at proper scales. Our main goals were to use vessel transect data and environmental data to: 1) determine significant environmental predictors of BD abundance in the northern Gulf of Mexico (nGOM) and 2) characterize BD responses to environmental predictors at fine scale. Environmental predictors included: oil/gas rigs; distance to the coast; depth; sea surface temperature; chlorophyll, which was used as an indicator of biological productivity, and several other habitat attributes. We used GIS, density surface and generalized additive modeling techniques (Distance, R mgcv package) to fit the BD habitat-abundance model on the nGOM continental shelf. Total dolphin abundance in the nGOM was estimated as 52,699 (CV = 0.16) yielding higher precision than previous design-based models. Using a 20 km by 20 km prediction grid for summer environmental conditions, our model indicated that BD are patchily distributed. At fine scale, the 25% and 75% quantiles were 3 and 54 dolphins, respectively. Dolphin responses to environmental predictors were non-linear. The largest positive response to depth occurred at 25 meters. Moderate levels of rig density triggered maximum response. Dolphin-rig association is likely to be linked to foraging behavior since rigs aggregate fish. By providing a Gulf-wide abundance-habitat model that captures variation of dolphins at fine scales, this approach is useful to evaluate potential environmental impacts from human activities, such as oil extraction, on BD stocks. This study also demonstrates the importance of incorporating anthropogenic factors in abundance models of species inhabiting human-modified seascapes.

8th April 12:30

Using random effects to model heterogeneity in detection probabilities of common dolphin sightings

Cornelia S. Oedekoven[1], Stephen T. Buckland[1], Monique L. Mackenzie[1], Jeff L. Laake[2], Greg Campbell[3], John Calambokidis[4], John A. Hildebrand[3]

(1) University of St Andrews
(2) National Oceanic and Atmospheric Administration
(3) University of California, San Diego
(4) Cascadia Research Collective

cornelia@mcs.st-and.ac.uk

Line transect sampling is a tool for assessing marine mammal populations that is commonly used when the interest lies in evaluating how many individuals of the species of interest occur in a defined study area. Traditionally, the methods imply that observers based on a ship or airplane travel down lines that were placed throughout the study area according to some design and record the perpendicular distances from the line to each detected school as well as their group sizes. The recorded distances allow estimation of a detection function which is used to adjust counts along the lines for imperfect detection within the search area. Using conventional distance sampling (CDS), one detection function is fitted to all distances from the survey. Recently developed multiple covariate distance sampling (MCDS, Marques and Buckland, 2003) allows heterogeneity in detection probabilities to be 59 odelin by incorporating covariates in the detection function representing e.g. varying sighting conditions or different observers. We present a novel approach for 59odeling heterogeneity in detection probabilities by incorporating random effects in the detection function. These methods modify the MCDS approach: we model the scale parameter of the half-normal key function using a common intercept and random effects coefficients belonging to the different detections. We assume normality for the random effects coefficients which are not estimated individually but integrated out. Additional covariates may be included. Compared to MCDS, this offers a parsimonious approach, providing a flexible detection function at the cost of only one additional parameter, the random effects standard deviation. It allows reliable estimation of abundances without truncating detection distances at which average detection probabilities were too low for reliable fitting using CDS methods. The methods are illustrated with common dolphin sighting data collected off the southern California coast.

8th April 12:45

Distribution and satellite tracking of sperm whales in the waters of the Russian far east

Tatiana Shulezhko[1], Russel Andrews[2], Vladimir Burkanov[3]

(1) Kamchatka Branch of the Pacific Geographical Institute, RAS, Petropavlovsk-Kamchatsky, Russia
(2) School of Fisheries and Ocean Sciences, University of Alaska Fairbanks and the Alaska SeaLife Center, Seward, USA
(3) National Marine Mammal Laboratory, AFSC, NMFS, NOAA, Seattle, USA

T.Shulezhko@gmail.com

Sperm whale is a common species in the waters of the Russian Far East, but its current status, numbers, population dynamics, distribution and migratory behavior remain largely unknown. Therefore, we conducted surveys and satellite tagging to address these data gaps. Sperm whale distribution in the Russian Far East was observed during May-September in the years 2003-2012. Surveys covered the waters of Kamchatka, the Sea of Okhotsk and Bering Sea, Kuril and Commander Islands. In July 2008 three sperm whales were tagged with LIMPET SPOT5 â " type satellite tags (Wildlife Computers, USA). The tags transmitted for 8, 70 and 150 days. Sperm whales were encountered 232 times, in total 299 animals. In summer whales were found from Kunashir Island in the south (Kuril Islands) to Bering Island in the north (Commander Islands) with the majority of whales encountered along the Okhotsk side of the Kuril Islands, in the Kronotzky Gulf of Eastern Kamchatka and in the waters of the Commander Islands. During the first 4-5 weeks after tagging whales stayed within 60 km of the tagging site. In the end of August two whales started migrating to the SSW. On October 6th one of the whales arrived approximately 180 km east of the northern edge of Honshu. The second whale reached a similar location on October 26th. The whale stayed there approximately for a week and then headed SE out into the open Pacific. It followed this direction for about 1000 km before its tag stopped transmitting on December 25th. During the migratory phase both whales travelled up to 104 km per day, but at times they slowed down and spent many days in the same local area, possibly resting or feeding. Continued research could greatly expand our understanding of sperm whale abundance and migrations in the Russian waters.

8th Apri, 14:30

Hybridization in a recently rediscovered dolphin species, *Stenella clymene*

Ana R. Amaral[1,2], Gretchen Lovewell[3], Maria M. Coelho[1], George Amato[2], Howard C. Rosenbaum[2,4]

(1) Centro de Biologia Ambiental, Faculdade de Ciências Universidade de Lisboa, Campo Grande, 1749-016 Portugal
(2) Sackler Institute for Comparative Genomics, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA
(3) Mote Marine Laboratory, 1600 Ken Thompson Pkwy, Sarasota, FL 34236, USA
(4) Ocean Giants Program, Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460-1099, USA

aramaral@fc.ul.pt

The Clymene dolphin, *Stenella clymene*, has only recently been recognized as a valid species. Its cranial features closely resemble those of *Stenella coeruleoalba*, but its external appearance and behaviour are more similar to those of *Stenella longirostris*. These conflicting characteristics, together with its uncertain phylogenetic position within the subfamily Delphininae, have lead to the suggestion that the species could have had a hybrid origin, with *S. coeruleoalba* and *S. longirostris* acting as parental species. With the aim to investigate the evolutionary processes behind the origin of the Clymene dolphin we sequenced the mitochondrial cytochrome b gene and five nuclear loci in several individuals from the three *Stenella* species. We report a putative hybrid dolphin, which stranded along the coast of Florida, and presents morphological features of *S. clymene*, but mitochondrial DNA of S. longirostris. Furthermore, our results show that *S. clymene* is more closely related to *S. coeruleoalba* in the mitochondrial DNA, but in the nuclear DNA, it clusters with *S. longirostris*, although it also shares alleles with *S. coeruleoalba*. These preliminary results suggest that hybridization is occurring among these species and highlights the importance of clarifying the mechanisms behind the origin of one of the least known cetacean species.

8th April 14:35

The Cape Verde Islands are home to a small and genetically distinct humpback whale breeding population

Martine Bérubé[1], Conor Ryan[2], Simon Berrow[3], Pedron Lopez-Suárez[4], Vanda Monteiro[5], Frederick Wenzel[6], Jooke Robbins[7], David Mattila[7], Gísli Víkingsson[8], Nils Øien[9], Per Palsbøll[1]

(1) Marine Evolution and Conservation, Centre for Ecological and Evolutionary Studies, University of Groningen, The Netherlands
(2) Marine Biodiversity Research Group, Marine & Freshwater Research Centre, Galway, Ireland
(3) Shannon Dolphin and Wildlife Foundation,Ireland
(4) Naturalia Capa Verde Lda, Boavista, Republic of Cape Verde
(5) Instituto Nacional de Desenvolvimento das Pescas, São Vicente, Republic of Cape Verde
(6) Northeast Fisheries Science Center, Woods Hole, MA, USA
(7) Provincetown Center for coastal studies, Provincetown, MA USA
(8) Marine Research Institute, Reykjavík, Iceland
(9) Marine Mammals Research Group, Institute of Marine Research, Bergen, Norway

m.berube@rug.nl

The Cape Verde Islands appear to be winter breeding ground of the smallest humpback whale population yet known. However, it is unclear whether the humpback whales at the Cape Verde Islands interbreed with those in the West Indies. Here we present the results of the genetic analysis of 50 humpback whale samples collected in the Cape Verde. Each sample was genotyped at 20 microsatellite loci, the ZFY/X sex determination locus, and the nucleotide sequence in the mitochondrial control region determined. We then compared our results to similar data from humpback whales in the Barents Sea as well as the central and western North Atlantic. These comparisons revealed that the Cape Verde Islands breeding population has very limited exchange with the West Indies breeding ground. Given that surveys indicate a small number of humpback whales at the Cape Verde Islands breeding ground, this result, along with other work, argue for the implementation of effective conservation measures.

8th April 14:40

Monitoring juveniles of the endangered Mediterranean monk seal (*Monachus monachus*) at Cabo Blanco peninsula (Mauritania)

Mercedes Muñoz-Cañas[1], Moulaye Haya[1], Abba M'Bareck[1], Hamdi M'Bareck[1], Miguel Ángel Cedenilla[1], Luis Mariano González[2], Pablo Fernández de Larrinoa[1]

(1) Fundación CBD-Habitat
(2) Ministerio de Agricultura Alimentación y Medio Ambiente

mercedes.munoz@cbd-habitat.com

Juveniles are the most unknown age category of the critically endangered Mediterranean monk seal populations. In 2009 at Cabo Blanco peninsula, where the largest and most studied colony of the species exists, to obtain more information about juveniles ranging from 2 months and 3 years old became a priority. At present, pups (0-2 months) and subadults and adults (3 years old and over) are very well known with accurate information about their biology and behavior. Annual survival rates for pups, subadults, adult females and adult males are already known from previous studies. So gathering as much information as possible for juveniles is essential in order to identify their importance in the global resilience of the colony, to complete the biological cycle of the species and to know their mortality rate that may be preventing a faster recovery of the Cabo Blanco monk seal colony. Our preliminary results suggest that the higher mortality rate is produced during the first year of age. From the pups that survive to the first molt (2 months old), 52.08% of females and 48.89% of males do not reach the first year of life. This rate percentage is severely reduced for the second (10.42% and 6.67% respectively) and third year (4.17%, 2.22% respectively) of age. Determine which is the age period with higher mortality rate will help us to better understand the population demography in order to implement further actions towards the protection and recovery of the species in the area.

8th April 14:45

Using collaborative ocean geodesign to identify Marine Protected Areas for cetaceans

Dylan Walker

Planet Whale

dylan@planetwhale.com

Although there is an urgent need to expand upon the current number of designated Marine Protected Areas for cetaceans (also referred to as Important Cetacean Areas (ICA's), there are many issues restricting our ability to do so. These include a continued lack of data on the critical habitat for many species, only limited identification of potential ICA's worldwide, and restrictions placed upon managers by out of date legislation. This talk looks at the potential for the scientific community to use collaborative ocean geodesign technology to identify ICA's and develop management plans with the potential for widespread implementation. Collaborative ocean geodesign combines sophisticated online mapping technology with social media such as forums to address site management issues. Specific sites requiring management are drawn by stakeholders who can then make plans to deal with the issues affecting those sites. Those maps and plans are then released to other stakeholders for review. The result is a cost-effective and engaging way to define priority ICA's and develop effective management plans supported by the wider stakeholder community, thereby significantly improving their chances of being designated.

8th April 14:50

Improving the estimates of dragonet (*Callionymus lyra*) importance in marine mammal diets using preopercula and other diagnostic bones

Cian Luck[1,2], Martha Gosch[2], Gema Hernandez[1], Emer Rogan[1] Mark Jessopp[2], Michelle Cronin[1]

(1) School of Biological, Earth and Environmental Science, University College Cork, Ireland
(2) Coastal and Marine Research Centre, University College Cork, Ireland

c.luck@umail.ucc.ie

The identification of diagnostic hard parts from faecal samples and stomach contents is still the most commonly used method of reconstructing the diets of marine mammals. In addition to identifying species, diagnostic hard parts can be used to estimate the biomass of prey consumed by marine mammals. However, this requires accurate back-calculation regressions to estimate fish length and weight based on the hard part measurement. While many studies emphasise the use of otoliths, the exclusive use of otoliths may lead to severe underestimation of prey numbers. Dragonets (*Callionymus lyra*) occur commonly in pinniped diets, but the otoliths of smaller individuals (<15cm total length) are usually underrepresented in faecal remains. This study investigated the bias in estimating dragonet biomass from otoliths alone. The preopercula of dragonets are easily identified, and appear to be more robust than the otoliths. Regression equations for length and weight were calculated based on preopercula measurements as well as other bones; e.g. logW = 3.1426logC – 0.4387, where W is the weight of the fish, C is the height of the third preopercula spine, R^2 = 0.84. In a study of grey seal diet, of a total of 56 dragonets, only 14 were identified by otoliths while 20 individuals were identified by preopercula alone. Using the previously calculated preopercula regressions, the biomass of these 20 dragonets was calculated as 211g, which represented 12% of the total estimated dragonet biomass consumed. The use of a length regression yielded an average fish length of 8.7cm when only preopercula were available, compared to an average length of 19.4cm when otoliths were used. This supports the hypothesis that the otoliths of smaller fish are underrepresented in pinniped faecal remains.

8th April 14:55

Spiralling trauma? Describing a novel form of pinniped mortality in the United Kingdom

Andrew Brownlow[1], Steve Bexton[2], Ryan Milne[3], Ross Culloch[3], Dave Thompson[3]

(1) Scotland Rural College (SRUC), SAC Consulting Veterinary Services Drummondhill, Inverness, UK
(2) Royal Society for the Prevention of Cruelty to Animals (RSPCA) East Winch Wildlife Centre, King's Lynn, Norfolk, UK
(3) Sea Mammal Research Unit (SMRU), University of St Andrews, Fife, UK

andrew.brownlow@gmail.com

Between June 2008 and July 2012, 106 dead pinnipeds were found on the coast of the United Kingdom with similar injuries consisting of a single continuous curvilinear skin laceration spiralling down the body. Characteristic lesion patterns were shearing of skin and blubber from underlying fascia and avulsion of one or both scapula. There was no tissue deficit. Although previously unreported in the UK, similar distinctive lesions had been described in Canadian pinnipeds where they were referred to as corkscrew injuries. In the UK, identical injuries were seen in both native species of pinniped, with 57 harbour seals (*Phoca vitulina*) and 42 grey seals (*Halichoerus grypus*) affected, and seven carcasses for which the species could not be determined. There were two seasonal peaks in incidence; adult harbour seals during the summer and juvenile grey seals during the winter. In 38 cases postmortem examinations were undertaken to assess coexisting causes of morbidity or mortality. Samples were also screened for toxic or infectious processes. In all cases the animals appeared to have been alive and healthy when the injuries were sustained, with no evidence of any underlying disease or disability. Based on the pathological findings, it was concluded that mortality was caused by a sudden traumatic event involving a strong rotational shearing force. The injuries were consistent with the animals being drawn through the ducted propellers of marine vessels. This challenges the conclusions of a previous study in Canada that suggested natural predation by Greenland sharks was likely to be responsible for these injuries. Furthermore, due to likely underreporting and previous misdiagnosis of these cases it is likely that this form of trauma has been responsible for several local and potentially regional population declines. Ongoing work into the mechanism, drivers and extent of this novel form of trauma will be discussed.

8th April 15:00

Reducing the risk of ship strikes and improving the knowledge on cetaceans in the Pelagos Sanctuary: The REPCET system

Jérôme Couvat[1], Pascal Mayol[1], Bertrand Gadaix[2]

(1) Souffleurs d'Ecume, Hôtel de ville, 83170 La Celle, France
(2) Chrisar Software Technologies, Immeuble Espace Vie, 523 Avenue de Rome, 83500 La Seyne-sur-Mer, France

jerome.couvat@hotmail.fr

In the Mediterranean Sea, ship strikes are one of the main threats to fin whale (*Balaenoptera physalus*) and sperm whale (*Physeter macrocephalus*) populations, especially in the PELAGOS Sanctuary where cetacean densities and traffic intensity are highest in summer. To reduce the risk of ship strikes in the Sanctuary, the REPCET (REal-time Plotting of CETaceans) system was created in 2009. It is a collaborative client-server system through which equipped ships can transmit the positions of the whales they encounter to one another via satellite or internet connection. When a whale position is received, a risk zone appears on the screen and grows with time to a certain radius and at a certain speed according to our knowledge of whales' ™ swimming speed in the area. When a ship enters a risk zone a visual or acoustic alarm is triggered and crews are recommended to increase their watch and reduce speed. During the year 2011, this system allowed to record 105 sightings (31% striped *dolphins Stenella coeruleoalba*, 26% fin whales, 10% sperm whales, 23% undetermined, 10% other small cetaceans) of 232 individuals (53% striped dolphins, 21% fin whales, 5% sperm whales, 15% undetermined, 6% other small cetaceans). In 2012, 192 sightings were made (+83%) representing 525 animals (+102%). In this year striped dolphins and fin whales both represented 36% of the sightings and sperm whales 9%, while striped dolphins accounted for two-third of the individuals. These data could potentially be a source of valuable information on these species in the Sanctuary. However, lots of problems are inherent to opportunistic data made from different observers. Any scientific advice, suggestions and collaborations are welcome to improve the system and the analysis of the data in the frame of the PELAGOS Sanctuary research programs.

8th April 15:05

A sociological investigation on the attitude of ferry's passengers towards a cetacean safe maritime mobility: Can reduction of vessel speed to reduce the risk of ship strike be a commercially sustainable tool?

Roberto Crosti[1], Antonella Arcangeli[2,3,], Silvia Bonaventura[4], Stefania Calicchia[4], Cristina Pizzutti[5], Paola Tepsich[6]

(1) c/o MATTM, Rome, Italy
(2) ISPRA, Dip. Difesa della Natura, Rome, Italy
(3) Università Studi Roma 3, Dip. Biologia Ambientale, Rome, Italy
(4) ISPRA, Dip. Attività Bibliotecarie, Documentali e per l'Informazione, Rome, Italy
(5) Corsica-Sardinia Ferries, Genova, Italy
(6) Fondazione CIMA, Savona, Italy

crosti.roberto@minambiente.it

According to several reports, collisions between large vessels and large cetaceans are one of the known main causes of threats to whales. EU-directives and Intergovernmental-Agreements state norms for the conservation of cetacean species present in the Mediterranean Basin. Supported by these norms and in order to reduce the risk of ship strikes many conservation bodies suggested the reduction of vessel speed (reasonably in cetacean high density areas). On the other hand in recent years many shipping companies, often commercially competing with each other, have increased cruise speed with the aim to supply a better service for customers willing to reach the proper destination faster. Within this framework, and following a multidisciplinary approach (combining natural and social science), to investigate the attitude of ferry's passengers towards a cetacean safe maritime mobility a questionnaire on marine environment and cetacean awareness was supplied to a sample of 521 passengers of the Corsica-Sardinia-Ferries travelling along the Bastia-Savona (within the Pelagos-Sanctuary) and the Civitavecchia-G.Aranci routes. Results showed, among the others, that more than 80% of passengers would prefer to use a ferry company more oriented towards the environment more than on customers' needs and that more than 75% of passengers would prefer to choose a company that reduces ferry speed if this would reduce the risk of ship strikes. This multidisciplinary study shows that, according to the investigated sample, creating cetacean safe routes (reducing the speed of the ferries) could find customers favor without being, subsequently, an economical disadvantage (considering also cost of fuel) for the shipping companies. Interestingly the survey (subsample) also showed that only less than 10% of the

passengers on the Bastia-Savona were aware to travel all across a protected-area and that 65% of the passengers on the Civitavecchia-G.Aranci believed, incorrectly, that the crossed region was (even partially) a Protected Area.

8th April 15:10

Prey preferences of fin and humpback whales occurring sympatrically in the Celtic Sea revealed by stable isotope (δ^{13}C and δ^{15}N) Bayesian mixing models

Conor Ryan[1,2], Simon Berrow[1,2], Brendan McHugh[3], Ciarán O'Donnell[3], Clive Trueman[4], Ian O'Connor[1]

(1) Marine Biodiversity Research Group, Department of Life Sciences, Galway-Mayo Institute of Technology, Dublin Road, Galway, Ireland
(2) Irish Whale and Dolphin Group, Merchant's Quay, Kilrush, Co. Clare, Ireland
(3) Marine Institute, Rinville, Oranmore, Co.Galway, Ireland
(4) National Oceanographic Centre, Southampton, University of Southampton Waterfront Campus, European Way, Southampton SO143ZH, UK.

conor.ryan@iwdg.ie

Over-exploitation of top predators and fish stocks has altered ecosystems towards less productive systems with fewer trophic levels. The Celtic Sea (CS) is a case in point, where fish discarding practices and bycatch levels have prompted concern about the sustainability of some fisheries. Fin (*Balaenoptera physalus*) and humpback (*Megaptera novaeangliae*) whales are recovering from centuries of over-exploitation and their conservation is a key concern. The implementation of effective conservation measure however is hindered by a lack of basic information on their ecology, such as their preferred prey. Stable carbon (δ^{13}C) and nitrogen (δ^{15}N) mixing models were used to investigate the diet of fin and humpback whales (mixture) and putative prey items (sources): herring (*Clupea harengus*), sprat (*Sprattus sprattus*) and krill (*Meganyctiphanes norvegica* and *Nyctiphanes couchii*) in the CS. Using a Bayesian framework (SIAR in R), stable δ^{13}C and δ^{15}N isotope values of skin biopsies from fin and humpback whales were used to assign proportionate diet solutions using a Dirichlet prior distribution. Resulting probability distributions indicated that krill was the single most important prey in the diet of fin whales, but one of the least important for humpback whales. Age-0 sprat and herring comprised a large proportion of the diet of both species, followed by older sprat (age-1—2) and older herring (age-2—4). CS herring comprises two spawning stocks subject to an intensive fishery and complex biophysical factors that determine recruitment and the seasonality of spawning components. CS sprat however remain poorly studied and unmanaged but intensively fished. An ecosystem based approach to fisheries management will be required to maintain ecosystem functioning in the CS towards effective conservation of both fin and humpback whales, and sustainable fisheries.

8th April 15:15

Potential impacts of artisanal fisheries on the bottlenose dolphin population of the Sado estuary, Portugal

Marina I. Laborde[1], Rita Gamito[1], Patrícia Ferreira[1], Maria Solanou[1], Henrique N. Cabral[1,2]

(1) Centro de Oceanografia, Faculdade de Ciências, Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal
(2) Departamento de Biologia Animal, Faculdade de Ciências, Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

mlaborde@fc.ul.pt

One of the few resident populations of common bottlenose dolphin (*Tursiops truncatus*) in Europe is found in the Sado estuary, Portugal. In spite of being a protected species, this population is highly threatened and has currently less than 30 individuals. Although most of the estuary is a natural reserve since 1980, it comprises a region with intensive and diverse land use. The main goal of this study was to assess the potential impacts of artisanal fisheries on this bottlenose dolphin population, and to identify mitigation measures. To achieve these objectives: 1) 51 inquiries were conducted to fishers of all five fishing communities of the estuary; 2) monthly boat surveys were undertaken during a 12-month period, where fishing gear deployed and active artisanal fishing vessels were located; 3) researchers accompanied fishers in 15 regular fishing trips to evaluate catch, bycatch and discards. Additionally, literature-based information was collected regarding spatio-temporal patterns of main fishing resources and frequency of occurrence of the dolphins in different zones of the estuary. The results have shown that among the impacts considered, the most critical one was the competition for resources, particularly the cuttlefish (*Sepia officinalis*). The cuttlefish is one of the main prey species composing the diet of this dolphin's population and it is also one of the most profitable resources in the Sado estuary. Limiting the maximum catch could be an option although it would be hard to manage its implementation and control. Alternatively, a restriction of fishing activities was suggested in zones of the estuary where either the abundance of main prey items is high or the frequency of occurrence of dolphins is greater. Finally, a monitoring plan was proposed to gather more detailed information on the ecology and behaviour of the population, and also to better characterise the fishing activity within the estuary.

8th April 15:20

Presence of harbour porpoises (*Phocoena phocoena*) during and after the construction of two gas pipelines in the Pomeranian Bight

Laura Wollheim, Ansgar Diederichs, Christopher Honnef, Georg Nehls

BioConsult SH, Brinckmannstr. 31, 25813 Husum, Germany

l.wollheim@bioconsult-sh.de

Under water constructions works like pile driving or dredging, and even shipping, go along with considerable noise emissions that potentially affect harbour porpoises (*Phocoena phocoena*) in different ways. In order to investigate possible disturbance or displacement effects of porpoises during the construction of the Nord Stream gas pipelines in 2010 and 2011 in the Pomeranian Bight (Baltic Sea), BioConsult SH monitored harbour porpoise presence by means of static acoustic data loggers (C-PODs) from 2010 to 2012 at 13 sampling stations. Six stations were placed in close vicinity of the pipeline route. Overall porpoise abundance was low with only 14 % porpoise positive days per month on average throughout the study period of 2.5 years. A distinct seasonal pattern was observed with most detections during autumn of each year, exactly during pipe-lay activities in 2010 and 2011. Possible construction effects were analysed with regard to increased shipping activity by the pipe-lay fleet and dredgers. Porpoise detections at each C-POD station were analysed together with AIS data of the overall ship traffic and vessels of the Nord Stream fleet within a 600 m radius around each sampling station. Results are given in different time-units (e.g. Porpoise- and vessel positive hours) separated by different years (with and without construction activity). Due to the low overall abundance of porpoises in the Pomeranian Bight it was also determined whether multiple groups of animals used the area at the same time. Porpoise detections at several stations during one day were analysed with regard to the presence of certain individuals/groups by using estimated swim-speed and distance between stations. Results are discussed in the light of a possible effect of construction activities on porpoises.

8th April 15:30

Acoustically invisible blue whales (*Balaenoptera musculus*) during feeding in Northeast Iceland

Tomonari Akamatsu[1,2], Marianne Helene Rasmussen[3], Maria Iversen[3]

(1) National Research Institute of Fisheries Engineering, Fisheries Research Agency, 7620-7 Hasaki, Kamisu, Ibaraki 314-0408, Japan
(2) Japan Science and Technology Agency, CREST, Gobancho, Chiyoda-ku, Tokyo, 102-0075, Japan
(3) Húsavík Research Center, University of Iceland, Hafnarstétt 3, 640 Húsavík, Iceland

akamatsu@affrc.go.jp

Fixed passive acoustic monitoring is efficient for long term observation of vocalizing cetaceans. Not only presence monitoring, but also density estimation of animals has been performed. To complete this, call rate and source level of vocalizations produced by single animal are necessary for calculation. Unlike in breeding ground, individual calls in baleen whales have not been investigated extensively. In this study, blue whale calls was recorded using acoustic biologging systems (AUSOMS-mini, Aqua Sound Inc., Kyoto) in Skjálfandí Bay, off Húsavík, Northeast Iceland in June 2012. An accelerometer (ORI4-D3GT, Little Leonardo, Tokyo) to monitor diving behaviour of individual whale was attached, too. During 21 hours recording of two individuals, 8 h 45 m and 13 h 2 m each, numbers of lunge feeding events were recorded but only four calls were contained. All of them were down-sweep calls ranged from 105 Hz to 48 Hz. Sound duration was 1 s to 2 s. Source level was estimated as 158 to 169 dB re 1µPa rms assuming spherical sound propagation from possible sound source location to the tag. Lunge feeding events with heavy flow noise followed by quick drop of the noise level was observed almost all the time during the observation that was corresponded with the accelerometer records. The tags were retrieved within 6 km from the tagged position that suggest the animals did not move long distance and kept feeding. No behavioural alternations suggest limited initial effect of tagging for these animals. Sound production rate of an individual and source levels of blue whales during feeding seem to be extremely small comparing with those in breeding ground. For passive acoustic monitoring of blue whales in feeding grounds, they are nearly acoustically invisible comparing with breeding area. Function of calls during feeding remained unknown.

8th April 15:45

Humpback whale song characteristics described from subarctic feeding grounds

Rangyn Lim[1,2], Edda E. Magnusdottir[1,2], Marc Lammers[3], Marianne Rasmussen[1]

(1) Húsavík Research Center, University of Iceland, 640 Húsavík, Iceland
(2) School of Life and Environmental Science, University of Iceland, 101 Reykjavík, Iceland
(3) Hawaii Institute of Marine Biology, 96744 Kaneohe, Hawaii

rangyn.lim@gmail.com

Humpback whales (*Megaptera novaeangliae*) are a migratory species known to produce complex and geographically varied songs in breeding grounds during the winter. In the North Atlantic, studies have identified humpback whale songs on their migratory routes and at mid to higher latitude feeding grounds. Studies in 2008 and 2009 detected the first recordings of humpback whale song units from Northeast Iceland, currently the most northerly location of reported humpback whale songs. This study aims to expand the current understanding of songs recorded from NE-Iceland by describing the patterns of themes and phrases observed in this subarctic feeding ground. Songs were recorded during the winter months of January to March, 2011 in NE-Iceland (Skjálfandi Bay at 66°03.070 N, 17°39.811 W). A seabed mounted ecological acoustic recorder (EAR) was deployed to record for longer durations than previously recorded in the area, set at 10 minutes every 5 minute break with a sampling rate of 16kHz. Visual and aural spectrogram analyses were used to identify patterns of themes and phrases observed in high quality song files. Preliminary findings demonstrate that long durations of repetitive, patterned and varied units with harmonics occur throughout the entire 2011 winter recording period. Results show consistent detections of singing humpbacks in 77.5 % of the 4296 recorded sound files. Multiple reoccurring phrases and themes are identified in a number of songs supporting the notion that these are not un-patterned sounds or social sounds typically observed in feeding grounds. Multiple singers chorusing in consecutive sound files also indicate the likelihood of interaction and communication among individuals in the area. This study further supports the reoccurring presence of humpback whale singers in NE-Iceland's subarctic feeding grounds during the winter.

8th April 16:00

An overview of LATTE - Linking Acoustic Tests and Tagging using statistical Estimation: Modeling the behavior of beaked whales in response to mid-frequency active sonar

Tiago A. Marques[1,2], Len Thomas[1], John Harwood[1], Jessica Shaffer[3], David Moretti[3], Ashley Dilley[3], Elena McCarthy[3]

(1) Centre for Research into Ecological and Environmental Modelling, University of St Andrews, The Observatory, Buchanan Gardens, Fife, KY16 9LZ, UK
(2) Centro de Estatística e Aplicações da Universidade de Lisboa, Bloco C6, Piso 4, 1749-016, Lisboa, Portugal
(3) Naval Undersea Warfare Center, 1176 Howell Street, Newport, RI 02841, USA

tiago@mcs.st-and.ac.uk

A suspicion that navy sonar might have an impact in cetacean behaviour has increased over the last few decades, but only recently clear evidence about that impact has been reported. Here we describe LATTE, a research project that aims to use existing tag-based and passive acoustic data to quantify the response of Blainville's beaked whales (*Mesoplodon densirostris*) to military sonar at the Atlantic Undersea Test and Evaluation Center (AUTEC), Bahamas. By combining data collected at multiple temporal and spatial scales we provide additional insight into the impacts of sonar use on beaked whales. We give an overview of LATTE's main results to date. These include (1) the establishment of a dose response curve, relating probability of foraging dives to underwater noise around times of intense range military activity at AUTEC; (2) the modelling of beaked whale dive profiles using hidden Markov models and extensions; and (3) the estimation of 3-dimensional tracks based on DTAG data, aided by independent acoustic localizations on AUTEC bottom mounted hydrophones, using a state space model. An agent-based model to assess impacts of sonar use on beaked whales at AUTEC is developed. This model leverages heavily on additional building blocks derived from closely related projects, regarding beaked whales (1) density and spatio-temporal distribution, (2) sound characteristics, (3) sound production, and (4) sound detectability at AUTEC. Simulations from this model are presented, and future directions in the assessment of these impacts are discussed.

8th April 16:45

Population structure and parameters of short-finned pilot whales in an oceanic archipelago (Madeira, NE Atlantic): Implications for conservation

Filipe Alves[1,2,3], Sophie Quérouil[4], Ana Dinis[1,2,3], Cátia Nicolau[1], Cláudia Ribeiro[1,3], Manfred Kaufmann[2,3], Caterina Fortuna[5], Luís Freitas[1,3]

(1) Madeira Whale Museum, 9200-031 Caniçal, Madeira, Portugal
(2) University of Madeira, Centre of Life Sciences, Marine Biology Station of Funchal, 9000-107 Madeira, Portugal
(3) CIIMAR/CIMAR – Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Rua dos Bragas 289, P 4050-123 Porto, Portugal
(4) Institut des Sciences de l'Evolution de Montpellier, IRD-UMR226, Université Montpellier 2 - CC063, Place Eugène Bataillon, 34095 Montpellier Cedex 5, France
(5) Italian National Institute for Environmental Protection and Research, via Vitaliano Brancati 60, I-00144 Rome, Italy

filipealves@museudabaleia.org

Longitudinal data to infer population structure and to estimate population parameters of short-finned pilot whales (SFPW) are scarce in literature. Using data collected between 2003-2011, we (a) estimated survivorship and abundance using mark-recapture methods, taking unequal capture probabilities into account, and (b) studied the grouping structure of SFPW using photo-identification methods, mtDNA sequences and microsatellite markers. We tested the hypotheses that (1) there is at least one pelagic and one island-associated community, and (2) groups are made of related individuals, with a matrilineal social structure. We estimated an adult survival rate of 0.962 (95% CI: 0.869-0.989; Cormack-Jolly-Seber), and that the less biased abundance for a three month period varied between 249 (202-313; Closed Captures) and 353 animals (277-458; Chao M(th)). We also estimated that 179 island-associated whales (167-193; POPAN) used the area through the course of the study. SFPW demonstrated a large degree of variability in site fidelity, including residents, regular visitors and transients. The social and temporal analyses revealed a well-differentiated society with long-lasting relationships. The genetic analyses suggested that individuals of the three residency patterns may not be genetically isolated, and that small groups are made up of related individuals, suggesting some degree of social philopatry, while large groups are probably temporary associations of smaller groups. We propose that SFPW encountered in Madeira belong to a

single population encompassing several clans, possibly three clans of island-associated whales and others of transients, each containing two to three matrilineal pods, each with a mean of 15 individuals (SD=9, range: 4-29). We suggest that the clans interact for mating purpose when they meet. For management decisions, we consider that the island-associated whales should not be regarded as demographically independent populations, but instead as special social entities to be included in governmental management plans and requiring periodic evaluation of their status.

8th April 17:00

Interspecific antagonistic interaction between two cetacean species

Renaud de Stephanis[1], Philippe Verborgh[2], Joan Giménez Verdugo[1], Ruth Esteban[2], Pauline Gauffier[2], Carolina Jiménez Torres[2]

(1) GEMA, Grupo de Ecología Marina Aplicada, Estación Biológica de Doñana, CSIC. C/ Americo Vespucio, s/n, 41092, Isla de la Cartuja, Sevilla, Spain
(2) CIRCE (Conservation, Information and research on Cetaceans), Cabeza de Manzaneda 3, Pelayo, 11390 Algeciras, Cadiz, Spain

renaud@stephanis.org

Interspecific antagonistic interactions can be due to competition for the resources, or to potential predator-prey response. Long-finned pilot whales have been observed chasing killer whales in the Strait of Gibraltar since 1999. In this study, we try to assess the possible causes of these hostile interactions. First, the isotopic niche of both species was evaluated. Differences in niche position were assessed based on Euclidean distance-based measures of central tendency. Using a permutation procedure we found that Euclidean distance between centroids of each species differed significantly from zero. We also quantified niche widths for pilot and killer whales by calculating Standard Ellipse Areas using Bayesian inference. Relative width of ellipses did not differ among species or between years. Argos satellite tags (SPOT5 with LIMPET attachment design) were deployed simultaneously during 20 days on each species to compare their geographic niche. The tracks were modelled with a SMM first-difference correlated random walk model and showed that killer whales use the western area of the Strait of Gibraltar, while long-finned pilot whales use its eastern part, and that both species were never seen within less than 20 km from each other. These results show that both spatial and isotopic niches seem to be well differentiated for each species. Distinct diets do not support the hypothesis of competition for the resource, but spatial avoidance and chasing behaviour suggest the existence of predator-prey interaction between these species. Although there have been no evidence of killer whales feeding on pilot whales since 1999, this interaction might have existed historically in the area.

8th April 17:15

Modelling habitat preferences of small cetaceans in southern Chile reveals fine scale habitat partitioning

Tilen Genov[1], Philip S. Hammond[1], Marjorie Fuentes Riquelme[2], Sonja Heinrich[1]

(1) Sea Mammal Research Unit, Scottish Oceans Institute, School of Biology, University of St Andrews, St Andrews, Fife KY16 8LB, United Kingdom
(2) Yaqu Pacha Chile, Valencia 2125, Santiago, Chile

tilen.genov@gmail.com

The Chilean dolphin (*Cephalorhynchus eutropia*), Peale's dolphin (*Lagenorhynchus australis*) and Burmeister's porpoise (*Phocoena spinipinnis*) are poorly known species, endemic to South America. They face several actual or potential anthropogenic threats, many of which are poorly understood and unquantified. The Chilean dolphin is listed as 'near threatened' by the International Union for Conservation of Nature (IUCN), while Peale's dolphin and Burmeister's porpoise are listed as 'data deficient'. Obtaining information on distribution, habitat use and conflict with human activities is listed among the priority conservation actions for these species. Their habitat preferences in relation to environmental and anthropogenic variables were modelled using Generalized Additive Models (GAMs), based on a 12-year dataset from southern Chile. Data were collected through systematic boat surveys during austral summers 2001 – 2012. A total of 489 daily surveys were carried out, resulting in 30,736 km covered on effort. A total of 531 sightings of Chilean dolphins, 353 of Peale's dolphins and 67 of Burmeister's porpoises were available for modelling. Despite the overlap in distribution between the three species, the models showed fine scale habitat partitioning between them. Chilean dolphins preferred turbid bays and channels close to rivers, within 500 m from shore and depths of 20 m or less. They were clearly concentrated in three core areas. Peale's dolphins showed a preference for shallow inshore waters along open shores and further from rivers. Burmeister's porpoises showed preference for waters between 500 and 1500 m from shore and depths of 30 – 70 m. The dataset analysed here represents the largest dataset on habitat use for all three species. Moreover, this study is the first attempt to model habitat preference of Burmeister's porpoises. The study has conservation implications, particularly for Chilean dolphins, which show very strong patterns of habitat preference, restricted home range and limited movements.

8th April 17:30

Assessing the feeding ecology of coastal dolphin populations: Can you make it with behavioural and biopsy sampling?

Jeremy J. Kiszka[1,2], **Paula Méndez-Fernandez**[2], Michael R. Heithaus[1], Vincent Ridoux[2]

(1) Florida International University, Marine Sciences Program, North Miami, FL33181, USA.
(2) LIENSs, UMR 7266 Université de La Rochelle-CNRS, 2 Rue Olympe de Gouges, F-17042 La Rochelle Cedex 01, France.

jeremy.kiszka@gmail.com

Assessing the feeding ecology of a top predator is critical to evaluate its role in an ecosystem and to establish criteria on which conservation plans can be based. However, investigating the diet of elusive marine animals is challenging, especially in cetaceans that are wide-ranging, spend most of their time underwater and for which available carcasses (for stomach content analyses) may be unavailable. Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) is the dominant top predator in the remote lagoon of Mayotte (SW Indian Ocean), but no information exists on the feeding ecology of the small population inhabiting these waters. Here, we used behavioural observations collected between 2004 and 2009, together with isotopic mixing models (SIAR) to investigate the diet of bottlenose dolphins. Carbon and nitrogen stable isotope ratios were analysed in skin and blubber samples collected from biopsies (n=30), and in muscle of putative prey species from reef-associated habitats. Focal group follows and independent group sightings allowed documenting a total of 54 feeding events. Bottlenose dolphin prey was identified on 77% of feeding events, and on 67% of them, two species of trevallies (Carangidae) were identified (*Caranx melampygus* and *Gnathanodon speciosus*). Other prey families were also identified, including Hemiramphidae (20%) and Mugilidae (13%). Results from the isotopic mixing models performed using skin and blubber isotopic values agree that *C. melampygus* and *H. far* are those prey species who most contribute to the diet of bottlenose dolphins, with 58% and 36% respectively when skin values are used, and 80% and 12% when blubber values are used. This study showed the value of using multiple independent methods in combination to assessing the prey preferences of this free-ranging top-level predator. Additionally, we highlight the usefulness of biopsies as non-lethal approach for assessing cetaceans feeding ecology when carcasses are unavailable for stomach content analyses.

9th April 09:00

On the use of fatty acids and trace elements to delineate a ecological stock of common dolphins (*Delphinus delphis*) in the North-eastern Atlantic

Virginie Lahaye[1], Jennifer Learmonth[2], Colin Moffat[3], Begonia Santos[4], Paco Bustamante[5], Florence Caurant[5], Willy Dabin[6], Sinead Murphy[7], Emer Rogan[8], Alfredo López[9], Angel Guerra[10], Bob Reid[11], Graham J. Pierce[2]

(1) LOG, Wimereux
(2) University of Aberdeen
(3) Marine Scotland Science, Aberdeen
(4) IEO, Vigo
(5) University of La Rochelle
(6) Observatoire PELAGIS, La Rochelle
(7) Massey University, Auckland
(8) University of Cork
(9) CEMMA, Spain
(10) CSIC, Vigo
(11) Wildlife Unit SAC Consulting, Inverness

v2lahaye@hotmail.fr

This study used ecological tracers in order to provide new information about stock structure and trophic ecology of short-beaked common dolphins (*Delphinus delphis*) in European waters. Ecological tracers can be understood as the signatures of elements and compounds that are ingested through food (eg lipids and contaminants) and then stored in predator tissues. We selected markers with signatures in tissues reflecting different time scales within a dolphin lifespan (ie some weeks, months, and years). Fatty acids (FAs, n= 31) were also analysed from 160 blubber samples, and trace element concentrations (i.e. Cd, Cu, Hg, Se, Zn) were measured from the liver and the kidneys of 213 individuals. Samples were obtained from stranded and by-caught dolphins recovered along and off Atlantic coasts of France, Spain (Galicia), Ireland and Scotland between 1993 and 2005. Results showed that the FA profiles (weeks) in the blubber of common dolphins were mostly related to their age and their geographical origins ($p<0.001$). Redundancy analysis results indicated the existence of a north to south gradient in FA profiles. Temporal (annual and seasonal) variations of diet also occur at local scales and there were differences between genders. In order to help interpreting those data, FAs were also determined in 32 putative prey species (n=360). Preliminary results underlined the

potential of FAs to discriminate prey according to their taxonomy and/or geographical areas. A similar approach was undertaken with trace elements. Cadmium (years) bioaccumulation with age pointed out the existence of (at least) two ecological groups ™ within the area, ie 1) from UK Scottish waters, and 2) from the Bay of Biscay and Galicia ($p<0.001$). Without excluding genetic fluxes between adjacent areas (including offshore waters), the existence of such a long-term population structure in the NE Atlantic is relevant to conservation and management plans in the area.

9th April 09:15

Males as infant protectors in common bottlenose dolphins (*Tursiops truncatus*) on the North-eastern coast of Sardinia, Italy

Bruno Díaz López

Bottlenose Dolphin Research Institute BDRI

bruno@thebdri.com

Protection of infants from conspecifics must be one of the important determinants of those individuals with which females choose to associate with. Losing an offspring prematurely leads to early resumption of cycling and females conceiving sooner. This makes a time gain and with it improved reproductive performance for infanticidal males all the more likely. However, the role of males as infant protectors in dolphins has never been examined. In this 12-yr long-term study I evaluated whether the risk of infanticide contributes to maintaining male-female associations in a resident bottlenose dolphin population off north-eastern Sardinia, Italy. From 696 encounters, I tested whether identified male bottlenose dolphins preferentially associate with females depending on their reproductive status (fertile, pregnant, and with dependent calf) using a combination of behavioural data, social analysis, and habitat use. A total of 49 adult bottlenose dolphins (corresponding with 34 females and 15 males) were identified between 2000 and 2012. lt seems that a resident male or alliance of males that preferentially associate with a fertile female also show preferences for this female during the first years of her calf life. However, during other periods the level of this association is low. Intruder males who immigrated after a female had conceived were infrequently observed in association with the female-offspring pair. I these cases intruder males showed aggressive behaviours towards the calves and resident males. In the light of these results it seems likely that the risk of infanticide is a determinant in female-male associations in bottlenose dolphin groups.

9th April 09:30

Maternally directed feeding site fidelity of grey whales in Clayoquot Sound (B.C.) (1998-2012)

Anna Schleimer[1]; Simon Ingram[1], Dave Duffus[2]

(1) School of Marine Science and Engineering, Plymouth University
(2) Whale Research Laboratory, Department of Geography, University of Victoria

anna.schleimer@students.plymouth.ac.uk

The Eastern Pacific gray whale (*Eschrichtius robustus*) migrates every spring from its breeding lagoons in Baja Mexico to feeding grounds in the Arctic. However, a small number of whales halt their migration to spend their summer feeding in coastal waters from California to Southeast Alaska, described as tertiary foraging areas. The pattern of site fidelity and low, but significant, differences in mitochondrial DNA have suggested that these whales may form a separate group, termed the Pacific Coast Feeding Aggregation (PCFA), distinct from the larger eastern North Pacific (ENP) stock. However, the mechanisms maintaining this segregation are poorly understood. We present an analysis of a long-term photo-identification study (1998-2012) in Clayoquot Sound, British Columbia, a small area within the larger range of the PCFA, focussing on internal recruitment and the resight histories of calves returning to the study area in subsequent years. Nearly 40 % (N = 9) of calves sighted in their first summer in company of a cow in Clayoquot Sound were resighted in later years, providing evidence that internal recruitment could be an important factor in structuring the PCFA. Median age at first resight was 4 years. We compared the return rates of calves with the return rates of adults to investigate whether the site fidelity of immature animals reflected the migratory habits of adults in the PCFA. We also examined the effect of the study area size on resight rates between years with respect to reported ranging patterns of foraging gray whales. Cultural transmission or shared environments could allow calves to imprint on their mother's migratory routes during their first summer and knowledge of only a small subset of all available foraging grounds could influence the animal's decision making process in subsequent years. Our findings underline the importance of understanding this recruitment mechanism for making accurate predictions on the resilience of this population to anthropogenic or environmental threats. The Eastern Pacific gray whales have a high cultural and economic value to local human societies and an understanding of the ecology of these animals is vital for conservation management.

9th April 09:45

Spring density and distribution of Ladoga ringed seals (*Pusa hispida ladogensis*)

Irina S. Trukhanova[1,2], Eliezer Gurarie[3], Rustam A. Sagitov[1,2]

(1) St Petersburg State University, 199034, 7/9 Universitetskaya emb., St Petersburg, Russia
(2) SPbCPO "Biologists for Nature Conservation", 199034, 8/10, Birzhevaya liniya, St Petersburg, Russia
(3) Department of Statistics, University of Washington, 313 Padelford Hall, Seattle, USA

irina_trukhanova@yahoo.com

The spatial distribution and habitat selection of the Ladoga ringed seal (*Pusa hispida ladogensis*), an endangered freshwater seal, is poorly understood, particularly during the ice-covered period. A fixed-wing aerial survey conducted in early April 2012 before the Lake Ladoga break up provided data on seal density and distribution throughout the lake in relation to several environmental covariates, including depth, distance to shore, recreational ice-fishing activity, and habitat types. The total number of seals estimated to be present on ice of Lake Ladoga was 5 068 (95% CI: 4 026-7 086) over an area of 16827 sq. km. Our results show that seal density is highest (>1 seal/sq km) in a relatively shallow area with depth up to 50 m, coinciding with an area of maximum fish biomass (80-140 kg per ha). The average density was lower in fast ice habitats (0.13 seals/sq km, SD=0.047) than in drifting pack ice habitats (0.40 seals/sq km, SD=0.180). In both drifting pack ice and fast ice areas density was greater, on average, nearest the ice edge (0.53 seals/sq km, SD=0.209). The presence of fishermen had a highly significant negative effect ($F=420.82$, $p<2.2E-16$) on seals resulting in a difference in seal density between fishermen free areas and those occupied by the fishermen (0.31 seal per sq km (SD=0.197) and 0.13 seal per sq km (SD=0.044) respectively). Despite revealed positive tendencies in population number the combined effect of poor ice conditions and extensive fisheries activities on the Lake in the winter and spring seasons in a given year makes the population unstable and difficult to control in terms of species management.

9th April 10:00

A deep-sea neutrino telescope reveals and tracks online the daily behaviour of sperm whales in the Ligurian Sea

Michel André, Mike van der Schaar, Ludwig Houégnigan, Serge Zaugg, Ludovic Tenorio, Antonio M. Sánchez, Joan V. Castell

Laboratory of Applied Bioacoustics, Technical University of Catalonia, BarcelonaTech, Spain

michel.andre@upc.edu

The observation of high-energy neutrinos has opened a new window on the universe. ANTARES is currently the largest neutrino telescope operating in the Northern Hemisphere. The AMADEUS (ANTARES Modules for Acoustic Detection Under the Sea) system was designed to perform tests of detection techniques requiring that acoustic sensors were integrated into the existing infrastructure of the experiment. Implemented in the framework of the European Sea-Floor Observatory Network of Excellence (ESONET) in 2007, the "Listen to the Deep Ocean Environment (LIDO)" approach has applied and extended developed techniques for noise measurement and passive acoustic monitoring (PAM) to world-wide cabled deep sea platforms and moored stations, representing the first and only PAM system available online (http://listentothedeep.com). The combination of the real-time data management and passive acoustic monitoring with the use of the latest technological developments in underwater neutrino acoustic detection, has provided the scientific community with an hitherto technology to reveal the daily behaviour of deep-sea marine organisms. Here, we present the statistical analysis of 1 year of uninterrupted acoustic data, directly streamed to shore by the ANTARES telescope and processed in real-time by the LIDO software package, which allowed studying and displaying online the year-round behaviour of one of the most deep-diving cetacean representatives, the sperm whale, in the deep Ligurian Sea. The analysis revealed the resident character of sperm whales in the region as well as showed a rather constant behaviour: sperm whales are mostly present in the area during the day, in particular between 10am and 3pm. When comparing these results to the average RMS level at each hour of the day, they strongly suggest that the sperm whales might be avoiding the area when shipping

noise presents its highest levels, thus presenting interesting ecological implications for the Ligurian Sea.

9th April 10:05

MobySound.org: An archive of annotated sounds for automated detector and classifier development

Sara L. Heimlich, David K. Mellinger

Cooperative Institute for Marine Resources Studies, Oregon State University, and NOAA Pacific Marine Environmental Laboratory, 2030 SE Marine Science Dr., Newport, OR 97365 USA

sara.heimlich@oregonstate.edu

The MobySound archive [Mellinger and Clark, Applied Acoustics 2006] was created to provide open-source sound files for the development of automatic detectors and classifiers for cetacean sounds. MobySound began as an archive for baleen whale vocalizations accessible online through the Internet, but has evolved to include sounds of odontocetes and other marine mammals. Publicly available sound archives like MobySound permit different researchers to train and test their detection methods using the same datasets, thus allowing meaningful comparison between methods. Archives with annotated (labeled) datasets can provide essential factors for evaluating any detection method. Annotations for mysticete sounds include indications where in time and frequency sounds of interest occur (especially useful for long recordings), and a description of the signal-to-noise ratio (SNR) of the target sounds. Developing detectors for odontocete sounds presents unique challenges and requires more inclusive annotations. The non-stereotypical nature of odontocete vocalizations compels accurate visual identification of the sound source. Sound file sizes are commonly very large because odontocete recordings must be made at a high sampling rate to capture the typically high frequencies. The often extremely short sounds, especially clicks, require a different technique for characterizing SNR than that used for the much longer baleen whale sounds: SNR is measured by filtering the recording to retain only the frequency band of interest, then measuring the peak-to-peak click level in the time series. MobySound currently contains several datasets with annotated clicks of Blainville's (*Mesoplodon densirostris*), Cuvier's (*Ziphius cavirostris*) and other beaked whale species, sperm (*Physeter macrocephalus*), pilot (*Globicephala* spp.), and melon-headed whales (*Pepenocephala electra*), Risso's (*Grampus griseus*), spotted (*Stenella* spp.), rough-toothed (*Steno bredanensis*), bottlenose (*Tursiops truncatus*) and northern right whale (*Lissodelphis borealis*) dolphins, and crabeater (*Lobodon carcinophaga*) and leopard (*Hydrurga leptonyx*) seals. The archive and website are updated with new species on a regular basis.

9th April 10:10

Detection probability of echolocating cetaceans for acoustic monitoring from playback experiments

Hanna Nuuttila[1,2], Katharina Brundiers [3], Len Thomas[4], Winnie Courtene-Jones[2], Peter G. H. Evans[1,5], John R. Turner[1],Jim D. Bennell[1], Harald Benke[3], Jan G. Hiddink, Jens Koblitz[3]

(1) School of Ocean Sciences, University of Bangor, Westbury Mount, Menai Bridge, Anglesey, LL59 5A,B Wales
(2) SeaMôr Wildlife Tours, New Quay, SA45 9SF, Wales
(3) German Oceanographic Museum, Stralsund, Germany
(4) Centre for Research into Ecological and Environmental Modelling, The Observatory, University of St Andrews, St Andrews, KY16 9LZ, Scotland
(5) Sea Watch Foundation, Ewyn y Don, Bull Bay, Anglesey, LL68 9SD, Wales

hannanuuttila@gmail.com

Harbour porpoises are frequently monitored using static acoustic data loggers, but few studies have quantified what fraction of animal vocalizations these devices capture and how animal distance and source level affect their detection probability. Here we assessed the effectiveness of the C-POD's hydrophone in detecting porpoise clicks using artificial signals played at varying distances and source levels, and measuring the fraction of detections recorded. To assess the C-POD's performance with wild animal signals, real, recorded porpoise clicks were played at increasing distances from the C-PODs and their detection rate on each device was calculated. Additionally, the performance of the C-POD software in correctly identifying porpoise click trains was examined. Generalized Additive Mixed Models (GAMM) were used to create the detection function and to estimate the effective detection radius (EDR) and effective detection area for each C-POD for both artificial and real porpoise clicks. Both source level and distance from datalogger influenced the detection probability, whilst differences in C-PODs were evident across the study. Maximum distance for detecting real porpoise clicks was 566 m. The mean EDR for artificial porpoise like click at 184 dB re 1 µPa @ 1m (peak-peak) was 187 m (95% CI: 173-200) resulting in an average effective detection area of 0.1098 km^2. The average EDR for the real recorded porpoise sequence using a directional transducer was 188 m (95% CI: 135-241) and the effective detection area 0.111 km^2. For detections which were correctly assigned as harbour porpoise trains, the EDR was reduced to 72 m and the area to 0.016 km^2. Differences between C-PODs were likely due to site specific variation in environmental characteristics. Such differences in detection probability will affect monitoring studies and

specifically the density estimates based on these figures, and estimating an average EDR across several C-PODs for each study site is recommended.

9th April 10:15

Geographic, seasonal and diel patterns of Antarctic blue whales calls in the Indian and Southern Oceans

Flore Samaran[1,6], Kathleen M Stafford[2], Guillaume Pressiat[3], Olivier Adam[3,4], Jean-Yves Royer[5], Christophe Guinet[6]

(1) PELAGIS CNRS – UMS 3462, University of La Rochelle, La Rochelle 17000 – France
(2) Applied Physics Lab University of Washington Seattle WA – USA
(3) Centre de Neurosciences Paris Sud, équipe bioacoustique, CNRS UMR 8195, Université Paris Sud – France
(4) Institut Jean Le Rond d'Alembert, équipe LAM, CNRS UMR 7190, Université Pierre et Marie Curie – France
(5) Laboratoire des Domaines Océaniques CNRS – UMR 6538, University of Brest, Plouzané 29280 – France
(6) Centre d'Etudes Biologiques de Chizé, CNRS – UPR 1934, Villiers en Bois 79360 – France

fsamaran@univ-lr.fr

Understanding Antarctic blue whale (*Balaenoptera musculus intermedia*) distribution and abundance is complicated by the pelagic distribution of the species, the difficulty of working in the Southern Ocean, and the massive population decline due to commercial whaling. After a half-century of protection, little is known about the present-day status of the species. In order to monitor Antarctic blue whales, the use of a network of long-term passive acoustic recorders has been proposed to examine the geographic, seasonal and diel occurrence of calling whales at basin scales. Passive acoustic recordings from one year at three sites located at different latitudes in the Indian Ocean basin were analysed using automated correlation methods to detect stereotyped Antarctic blue whale calls. The time structure of repeated calls was used determine the minimum number of calling whales as either one, or greater than one calling whale in the detection area. Calls were recorded at all three locations and in almost all months of the year, but least often in summer and early autumn months. Results confirmed seasonal movement matches with the known migration pattern of this species. Blue whale seemed to move north and be widely dispersed in mid- and low latitudes of the Indian Ocean during autumn, winter and spring months. However, the year-round presence of calls suggests that some individuals skip a migration to the ice edge and feed in mid-latitude during summer. There was a diel pattern to calls year-round at the southernmost site during autumn and winter for the northernmost sites suggesting a link with foraging behavior at these locations. In the future, acoustic data from a necklace of hydrophones deployed around the Antarctic will

provide a global understanding of acoustic trends in abundance, distribution, seasonal presence and behavior of Antarctic blue whale.

9th April 10:20

Identifying white-beaked dolphins from click characteristics and indications of population structure

Anja Wittich[1], Susannah Calderan[2], Olivia Harries[3], Russell Leaper[4], Jamie Macaulay[5], Jonathan Gordon[1, 5]

(1) Marine Ecological Research Ltd, 7 Beechwood Terrace West, Newport on Tay Fife DD6 8JH, UK
(2) Canal House, Banavie, Fort William, PH33 7LY, UK
(3) Hebridean Whale and Dolphin Trust, 28 Main Street Tobermory, Isle Of Mull PA75 6NU, UK
(4) School of Biological Sciences, University of Aberdeen, Tillydrone Avenue, Aberdeen AB24 2TZ
(5) Sea Mammal Research Unit, Scottish Oceans Institute, University of St. Andrews, St. Andrews, Fife, KY16 9TS, UK

anja_megaptera@yahoo.de

The white-beaked dolphin (*Lagenorhynchus albirostris*) has a restricted range, being endemic to the North Atlantic Ocean. An estimated 80% of the European population is in UK waters, mostly in areas off Scotland and northeast England. Whistles have often been used to monitor and identify dolphin acoustically, but white-beaked dolphins have very low whistle rates. We have therefore been exploring the use of dolphin clicks for species classification. White-beaked dolphin clicks are highly variable and complicated, making acoustic identification from simple spectral parameters challenging. However, their clicks often show a multi-banded spectrum. Broad band recordings of clicks from the east coast of the UK and west coast of Scotland were analysed to assess whether they had sufficiently consistent and characteristic attributes to enable species classification. Banding in frequencies <80 kHz is present in white-beaked dolphins from both the east and west coast of the UK these are consistent over multiple encounters within each region supporting the use of this parameter for species identification and extending the scope of acoustic techniques for survey and population monitoring. However, patterns of banding were also shown to vary between the east and west coasts. Thus, this preliminary analysis provides evidence that sub-populations may be discernible from click structure. This indication of population structure within UK waters is of considerable conservation relevance for a species with such a limited global distribution.

9th April 10:25

A decade of acoustic monitoring in the Baltic Sea: Status and area use of two populations of harbour porpoises

Stefan Bräger[1], Harald Benke[1], Michael Dähne[1,2], Anja Gallus[1], Sophie Hansen[1], Christopher G. Honnef[1], Jens C. Koblitz[1], Kathrin Krügel[1], Alexander Liebschner[3], Ingo Narberhaus[3], Ursula K. Verfuß[1,4]

(*1) German Oceanographic Museum (DMM), Stralsund, Germany*
(2) Present address: Institute for Terrestrial and Aquatic Wildlife Research (ITAW), University of Veterinary Medicine Hannover, Büsum, Germany
(3) Federal Agency for Nature Conservation (BfN), Isle of Vilm, Germany
(4) Present address: Sea Mammal Research Unit Limited (SMRU Ltd.), St. Andrews, UK

stefan.braeger@gmx.net

During recent decades, the two distinct populations of harbour porpoise in the Baltic Sea appear to have decreased sharply in abundance. The Baltic Proper population may be down to a few hundred individuals and is regarded as "critically endangered" whereas the Belt Sea population most probably experienced a drastic decline in recent years. We summarise and interpret the results of a long-term static acoustic monitoring in the German part of the Baltic Sea. We detected seasonal changes in detection rates consistent with possible east-west migrations. Detection rates, and thus presumably porpoise density, decrease from West to East with 94% porpoise-positive days per month (PPD/month) on average (2002-2012) around the island of Fehmarn and 66% PPD/month in Mecklenburg Bight and Kadet Trench to 3.7% PPD/month in Pomeranian Bay as one crosses the putative population boundary. These boundary waters, however, may be used alternating by both populations depending on season as suggested by the presence of registration peaks in the months of July to November (summering Belt Sea porpoises) and of January to March (wintering Baltic Proper animals). The highly critical status of porpoise populations was confirmed by visual and acoustic survey results and highlights the urgent need for protective measures which still await national and international agreement and implementation. Management measures for the "Natura 2000" sites in German waters are currently under development, however, a general management plan for the entire distribution range in German waters is imperative considering the dramatic status of the populations in the Baltic Sea.

9th April 10:30

Preliminary studies of blue whale (*Balaenoptera musculus*) movements around Iceland

Maria Iversen[1,2], Marianne H. Rasmussen[1], Megan Whittaker[3], Maria K. Johansen[1], Steve C. V. Geelhood[1,4], Mads Peter Heide-Jørgensen[5], Gísli A. Víkingsson[6]

(1) Húsavík Research Center, University of Iceland, Hafnarstétt 3, 640 Húsavík, Iceland
(2) Danish Institute for Study Abroad, Science & Health department, Vestergade 4.7, 1456 Copenhagen K, Denmark
(3) Elding Whale Watching, Ægisgardur 5, Reykjavik's Old Harbour, Iceland
(4) IMARES Wageningen UR, Institute for Marine Resource & Ecosystem Studies, Landsdiep 4, 't Horntje, Texel, The Netherlands
(5) Greenland Institute of Natural Resources, c/o Greenland Representation, Strandgade 91, 3, Postboks 2151, DK-1016 Copenhagen K, Denmark
(6) Hafrannsóknastofnunin, Marine Research Institute, Skulagata 4, 121 Reykjavik, Iceland

phocoena@hotmail.com

During the last five years blue whales (*Balaenoptera musculus*) have been studied more intensively than previous in Skjálfandi Bay, Iceland (65°57'N, 017°25'W). Among these studies, a larger photo-identification project was launched and today the photo-identification catalog consists of more than 105 individual blue whales visiting the Bay between 2001 and 2012. In October 2011 and 2012, blue whales were sighted and photographed in the southeast of Iceland at the northern edge of the Mid-Atlantic Ridge (63°46'N, 022°31'W). At least one of these whales was seen and photographed in Skjálfandi Bay in July of the same year. A satellite tag deployed by the Marine Research Institute on a well-known blue whale in Skjálfandi Bay, 2009, revealed that this individual whale swam northwest of Iceland during July, then south through the Denmark Strait and ended up spend some time in the same area in the southwest of the Island in September. This suggest that blue whales visiting Iceland in the summer, visit Skjálfandi- Bay in the North during the early summer May-July and later comes into proximity of land again in the southwest of Iceland in September-October. This supports the idea that blue whales follow the Mid-Atlantic Ridge on their southwards migration. In addition to this, the Reykjanes Ridge is known to be productive area and may provide a good end of the season feast for the whales. Further studies are needed to tell where the whales come from and where they spend the majority of their time; however, the tagged whale and previously whaling records suggests that the Irminger Sea and the Greenland Sea are important feeding ground for these giants.

9th April 10:35

Grey seal (*Halichoerus grypus*) movements and site-use connectivity within the Irish Sea: Management implications

Tobias Oliver, Mandy McMath, Fiona L. Read, Charles Lindenbaum

Countryside Council for Wales

t.oliver@ccw.gov.uk

Grey seals (*Halichoerus grypus*) are highlighted as primary and qualifying features of several Special Areas of Conservation (SAC) in Wales, UK which are designated under the EC Habitats and Species Directive (1992). However, grey seals occur widely between and beyond these SACs in the Irish and Celtic Seas (and further). Grey seal population structure is reflected in the patterns of movement of the individuals. The degree of exchange between these individuals will determine individual stocks and overall metapopulation's vulnerability to change. The Countryside Council for Wales (CCW) is the Welsh Government's statutory advisor on conservation issues and carries out mandatory monitoring of grey seals. Since 1992, CCW and others have undertaken photo-monitoring of grey seals, across Wales including important sites for breeding, moulting and summer haul-outs. This provides greater understanding of seal movements and linkage between sites (connectivity) and is important for assessing site condition. Using the computer-aided matching software ExtractCompare by Conservation Research Ltd, over 3000 individuals have been identified and catalogued. These were analysed by defining the rates of interchange between the main breeding, moulting and summer haul-out areas. A spatially distributed analysis was chosen in order to estimate distribution and movement. Previous studies have shown movements between Wales, east Ireland and northern France. Preliminary results indicate movements to Anglesey (non-SAC area) and Pembrokeshire from outside these areas during the breeding season from summer and moulting haul-outs as well as further a field sites such as Cornwall, south-west UK. Future work will include employing mark-recapture models to derive local population estimates (a UK Common Standards Monitoring attribute) for the main haul-out areas and types. Collaboration with other organisations within the Irish Sea and beyond will greatly facilitate the monitoring of grey seal movements and is highly recommended for future research.

9th April 10:40

Seasonal variability in cetacean presence in the Pelagos Sanctuary: Implication for conservation purposes

Antonella Arcangeli[1], Lea David[2,3], Nathalie Di Meglio[2,3], Luca Marini[4], Mayol P.[5], Aurelie Moulins [6], Massimiliano Rosso[6], Paola Tepsich[6], Cristina Luperini[4], Anna Ruvolo[4], Sandrine Serra[2]

(1) ISPRA, Dip.Difesa dell'ambiente, V.Brancati 60, 00144, Rome, Italy
(2) EcoOcéan Institut, 18 rue des Hospices, 34090 Montpellier, France
(3) GIS3M, Hyères, Castel Sainte-Claire, France
(4) Accademia del Leviatano, V.le Astronomia 19 00144, Rome, Italy
(5) Souffleurs d'Ecume, Hôtel de ville, 83170 La Celle, France
(6) CIMA Research Foundation, Savona, Italy

antonella.arcangeli@isprambiente.it

A synoptic large-scale cetacean monitoring program has been realized within the PELAGOS Sanctuary by a network of research organisms, using ferry as platform of observation. The four sampled transects were regularly distributed over the Sanctuary: Tolon-Ajaccio (TA) in the western part, Nice-Calvi (NC) and Savona-Bastia (SB) in the central area and Livorno-Bastia (LB) in the eastern part. All transects were weekly monitored all year round on TA and SB (February 2011-March 2012) and during summer on NC and SB. Results confirm the high spatio-temporal variability occurring within the PELAGOS Sanctuary both in species presence and relative abundance. The four frequently sighted species were *Stenella coeruleoalba* (Sc), *Balaenoptera physalus* (Bp), *Tursiops truncatus* (Tt), *Physeter macrocephalus* (Pm). *Grampus griseus*, *Delphinus delphis*, *Globicephala melas*, *Ziphius cavirostris* where mainly sighted on the central routes (NC and SB). The effort-weighted species richness varied a lot on inter- and intra-transects levels and by seasons. During summer, the higher Encounter Rates (ER=sightings/100 km on-effort) per species were recorded in the western part of the Sanctuary (ERNC=6,284Â±0,674; ERTA=3,617Â±0,306). Dolphin distributions reflect respective habitat preferences: the higher ER of Sc was recorded during summer on NC while the higher ER of Tt was obtained on LB. ER of Bp showed inverse seasonal line-trends on the two borders of the PELAGOS Sanctuary: the highest ER on TA was obtained during the summer that corresponded to the lowest ER recorded on SB. This trend may point out different uses of these areas. Pm showed a clear preference for the western area (TA) during summer season. The study highlight how different seasons and areas in the PELAGOS Sanctuary are of different

significance in term of species diversity, relative abundance and habitat use. In consequence, a multi-scale and multi-temporal managing approach would be of more valuable effectiveness for species conservation.

9th April 10:45

Activities, motivations and disturbance: Fitting a state-space model to bottlenose dolphin behavioral data in Doubtful Sound, New Zealand

Enrico Pirotta[1], Leslie New[2], John Harwood[3], David Lusseau[1]

(1) Institute of Biological and Environmental Sciences, University of Aberdeen, Aberdeen AB24 2TZ, UK
(2) US Marine Mammal Commission, Bethesda MD, 20814, USA
(3) Scottish Oceans Institute, University of St Andrews, St Andrews KY16 8LB, UK

pirotta.enrico@gmail.com

Animal behavioral processes can be analyzed with state-space models. Such models are used to describe the temporal variation of an individual's hidden motivational states, the way in which these states interact to determine its activity, and the feedback influence of the individual's activity on its motivations and health. In addition, they can account for observer error in recording behavior. This analytical approach can be used to predict the effects of anthropogenic disturbance on individual behavior and health, which may lead to alterations in vital rates and, ultimately, long-term population change. We applied a state-space modeling framework to assess the consequences of tourism interactions on the population of bottlenose dolphins in Doubtful Sound (New Zealand). In addition to tourism effects, we accounted for the spatial heterogeneity in both dolphin activities and shark predation risk. Finally, we developed an independent model of tour boat behavior, which incorporates the influence of key geographical features attracting tourists. The simulation platform underpinning the model generated a realistic representation of the social and behavioral dynamics of the dolphin and boat populations, as well as observed patterns of disturbance. We then tested our ability to parameterize the model in a Bayesian framework. First, we assessed the feasibility of the approach by fitting increasingly complicated versions of the model to data simulated from our platform. Next, we fitted the model to group follow data collected in Doubtful Sound from 2000 to 2002. We obtained good convergence for the temporal changes in motivations and most of the parameters. However, when these parameter estimates were used in the simulation platform, biologically sound representations of the population were not generated. Our results suggest that visual data from group follows are not sufficient to inform such individual-based models. Despite these limitations, boat interactions were consistently estimated to detrimentally affect dolphin activity budget.

9th April 10:50

Comparisons of the Behavioral Ecology of Risso's (*Grampus griseus*) and Common Dolphins (*Delphinus delphis* and *D. capensis*): Risks and Rewards of Group Living

Mari A. Smultea[1,2], Cathy Bacon[1,3], Bernd Würsig[4]

(1) Smultea Environmental Sciences (SES), P.O Box 256, Preston, WA 98027
(2) Marine Interdisciplinary Graduate Program in Marine Biology, Marine Biology Department, Marine Mammal Behavioral Ecology Group, Texas A&M University at Galveston, Pelican Island, Galveston, TX 77553
(3) Marine Science Department, Texas A&M University at Galveston, Pelican Island, Galveston, TX 77553
(4) Marine Mammal Behavioral Ecology Group, Texas A&M University at Galveston, Pelican Island, Galveston, TX 77553

msmultea@gmail.com

Behavioral ecology of pelagic Risso's and short- and long-beaked common dolphins is poorly known. The comparative approach was used to predict group size and behavior relative to risks/rewards of group living in the same eco-region. Risso's were predicted to occur in smaller, less-cohesive groups and mill less/rest more during daytime than common dolphins based on distribution of prey and predation risk. Video and scan sampling documented first-observed group size, behavior state, and individual spacing (in body lengths [BL]) during aerial surveys (72,467 km) off southern California in January-November 2008-2012 for 290 Risso's and 564 common dolphin groups (commons were combined due to small confirmed *D. capensis sample* size). Behavior was significantly influenced by species, calf presence, time of day, and water depth. Group size was significantly smaller for Risso's (18.4) vs. commons (277.1), and higher with calf presence (Risso's: 25 with calf vs. 15 without) (commons: 485 with calf vs. 205 without). Mean spacing was significantly less for commons (5.1 BL) vs. Risso's (6.7) and decreased significantly across the day for both. Risso's were 13 times more likely to rest than commons. Risso's rest increased significantly across the day and over deep water/steep slopes. Both species associated with deep underwater slopes. Smaller group size, looser group spacing, and more daytime resting of Risso's are adapted to nocturnal foraging. Larger group size, tighter cohesion, and frequent daytime foraging of commons matches clumped, high-density daytime distribution of schooling fish and presumed higher predation risk. Larger group size likely benefits calf survival through dilution effects. Results suggest the species have diverged ecologically in the same habitat in response to differences in food resources and

predation pressure as predicted by group-living patterns documented for well-studied terrestrial mammal species. Data lend insight into ecological triggers influencing behavior.

9th April 11:30

An interdisciplinary research and management approach to assess conservation status and mitigate threats to marine mammals in Zanzibar, East Africa

Per Berggren[1], Omar A. Amir[2], Narriman S. Jiddawi[3]

(1) School of Marine Science & Technology, Newcastle University, Newcastle upon Tyne, NE1 7RU, UK
(2) Ministry of Livestock and Fisheries, P. O. Box 159, Zanzibar, Tanzania
(3) Institute of Marine Sciences, University of Dar es Salaam, Zanzibar, P.O. Box 668, Tanzania

per.berggren@ncl.ac.uk

East Africa has a large diversity of marine mammals with 32 recognized species of cetaceans and the dugong. Local populations face threats from hunting, fisheries bycatch, tourism, pollution and oil and gas exploration. For the few populations where records of hunting and fisheries bycatch are available takes are unsustainable. Other threats may also negatively affect recruitment especially when cumulative effects are considered. This study was initiated in 1998 when little information was available for marine mammals in East Africa. We conduct research and capacity building using an interdisciplinary approach to assess conservation status and to mitigate identified threats. The activities focus on Indo-Pacific bottlenose, humpback and spinner dolphins, and humpback whales in two marine conservation areas. Fishers and tour operators participate in the research by reporting and recording real time observations and by carrying observers. A previous dolphin hunt has been replaced by community based dolphin tourism off the south coast of Zanzibar. However, attempts to make this tourism ecologically and socio-economically sustainable, by providing research results on impact, guidelines, training and formation of a stakeholder association, have to date failed. The introduction of gillnets in the area in the 1980's introduced a new threat to marine mammals. We used fisheries beach and onboard observers to demonstrate non-sustainable bycatch levels of >5% per year for Indo-Pacific bottlenose and humpback dolphin populations and occurrence of other odontocete and humpback whale bycatch. An experiment using acoustic alarms demonstrated that dolphin bycatch can be mitigated using this method and trials with weak-links in nets indicate that this may provide a solution for whale bycatch. Due to lack of legislation and economic considerations neither approach has been implemented. A legislated enforceable management plan and full active involvement of stakeholders may

provide for successful conservation and management of marine mammals in Zanzibar and East Africa.

9th April 11:45

Re-evaluating the actual distribution range of the Mediterranean monk seal, *Monachus monachus*

Luigi Bundone[1,2], Aliki Panou[3], Emanuela Molinaroli[2]

(1) Gruppo Foca Monaca, via Carlo Emery 47, 00188 Rome, Italy
(2) Università Ca' Foscari, Dipartimento di Scienze Ambientali Informatica e Statistica, Dorsoduro 2137, 30123 Venice, Italy
(3) Archipelagos - environment and development, Strofiliou str. 26, GR-145 61 Kifissia, Athens, Greece

luigibundone@tiscali.it

In ancient times, the distribution range of the Mediterranean monk seal (*Monachus monachus*) extended all over the coasts of the Mediterranean, the Black Sea and NW Africa up to Madeira and the Azores and as far south as Gambia (Johnson & Lavigne 1999). Nowadays, the species is critically endangered; the current total world population is stated to consist of 500-600 animals (GFCM 2011), though population numbers mainly derive from estimations in countries where actively reproducing populations are systematically monitored (Greece, Cabo Blanco/Western Sahara, Turkey and Desertas islands/Madeira). Distribution patterns in the last decades indicated that the species is extinct in most of its former range. In some countries only few individuals survive and in others the status is considered unknown. However, recent sporadic monk seal sightings indicate that the species may still exist or may have started recolonizing some areas throughout its ancient habitat where it is considered extinct or of unknown status. Studies outlining the species movement ability of hundreds of km within a few months (Adamantopoulou et al. 2011), and substantial changes in the use of its terrestrial habitat (Guçu 2012; Panou et al. 1993) corroborate this suggestion. In the past decade, scientific and conservation communities focused on the importance of such areas as potential recolonization nuclei and on the need for protection measures as well. These "low density areas" are characterized by the potential presence of monk seal populations, recent sightings and habitat availability (UNEP/MAP/RAC-SPA 2003). This paper reviews sporadic seal sightings in low density areas throughout the species' former range. We strongly believe that efforts for the protection of the most endangered marine mammal of Europe should also encompass these areas in order to implement appropriate conservation measures ensuring natural recolonization and guaranteeing genetic flow between distant regions.

9th April 12:00

How many disciplines are needed to save the most critically endangered cetacean species: The vaquita?

Lorenzo Rojas-Bracho, Armando Jaramillo-Legorreta

Instituto Nacional de Ecología y Cambio Climático, Coordinación de Investigación y Conservación de Mamíferos, Ensenada, BC 22860, Mexico

lrojasbracho@gmail.com

In 1999 the International Committee for the Recovery of Vaquita (CIRVA) recommended that vaquita by-catch be reduced to zero as soon as possible by banning all gillnets throughout its range. CIRVA also recommended that research be started immediately to develop and test alternate gear types and techniques to replace gillnets as well as measures be developed to offset the economic hardship imposed by these regulations on residents of the Upper Gulf. Since 2008 the government of Mexico implemented the Programme of Recovery of the Vaquita (PACE) to implement the recommendations of the CIRVA. To execute PACE it was necessary to draw appropriately from multiple disciplines to solve the facing problems of a complex situation. Marine mammal scientists, specialists in different disciplines (e.g. population biology, genetics, acoustics) as well as sociologists, economists, oceanographers and fisheries scientist collaborated to put into practice the PACE. This innovative Programmeme offered a ground-breaking schedule of compensations (e.g. payment-for-conservation programme), technological developments (e.g. alternative fishing gear) and monitoring of vaquita (e.g. acoustic). This effort has been able to reduce fishing effort in 30% and hence slowdown vaquita population decline but has not stopped it. Here we describe the multidisciplinary approach and analyse what has failed and future steps, as discussed by CIRVA in its fourth meeting in 2012.

KEYNOTE SPEAKER

9th April 12:15

Protecting the special places where whales and dolphins live: Turning "paper parks" into "oceanic art treasures" worth saving

Erich Hoyt

Research Fellow, WDC, Whale and Dolphin Conservation. Co-chair, IUCN Marine Mammal Protected Areas Task Force. Co-director, Far East Russia Orca Project and Russian Cetacean Habitat Project. North Berwick, Scotland EH39 4BE United Kingdom

erich.hoyt@mac.com

Protecting habitat for wide-ranging marine mammals and their ecosystems has advanced faster in the past decade than ever before. Between 2004 and 2011, the number of declared protected areas for whales and dolphins rose from 359 to 575 mainly in national waters with a further 175 areas at the proposal stage. However, this effort may be too little too late. Compared to 12% protected areas on land, only 2.3% of the surface of the world ocean is legally protected, with less than 1% on the high seas. Furthermore, the marine protected areas (MPAs) being created are little more than pieces of paper — starting points for conservation. A massive effort needs to be undertaken to fulfill agreed Convention on Biological Diversity (CBD) targets to protect at least 10% of the ocean over the next decade less we face the decline of ocean ecosystems that support biodiversity and ecosystem services, as well as fishing, whale watching and marine tourism and other industries that depend on a healthy ocean. According to the Census on Marine Life, there may be as many as a million marine species in total, ¾ of which are yet to be discovered. We risk a biodiversity crisis not only with known but with unknown species which represent nothing less than our biological capital. More research is needed but this cannot be only a research exercise. How can protection efforts be accelerated and made effective? Besides CBD, UNEP's Convention on Migratory Species (CMS), the IUCN and the governments of the world, pushed by conservation NGOs, are driving top-down approaches, but new bottom-up approaches are needed to match. A bottom-up tool could be adapted from BirdLife International conservation efforts. Their Important Bird Areas (IBAs) approach has succeeded in spearheading bird protection efforts around the world. In 2012, BirdLife International released the first world seabird atlas showing IBAs. With advice from BirdLife, the emerging concept of Important Cetacean Areas (ICAs) or

Important Marine Mammal Areas (IMMAs) could be pursued through CMS, CBD and IUCN, in the context of and working within existing structures in order to provide credibility and to gain support from world governments but it should be developed from the bottom-up. The state of the art in collaborative geo-design technology – one possible tool to involve all stakeholders and the wider public in identifying such ICAs – is the hands-on, accessible SeaSketch software (www.seasketch.org). Yet much more is needed to establish effective MPAs. To obtain the funding necessary to prepare management plans and to pay for management bodies, research, enforcement and monitoring programmes, the full value of MPAs to society must be demonstrated convincingly to stakeholders and the public. This will require collaborations with economists, utilizing the full toolkit of valuing marine nature, including scientific, educational, recreational, heritage, and spiritual values as well as a detailed accounting of the intrinsic benefits from ecosystem services. All marine protected areas start out as “paper parks”. They will stay on paper until it is generally acknowledged that they have precious, high values, that they are in effect “oceanic art treasures” worth saving.

9th April 14:30

Historical population dynamics of ringed seals, *Pusa hispida*, of the Svalbard archipelago: Predicting the response to climate change

Andrea A. Cabrera A.[1], Jurjan P. van der Zee[1], Morten T. Olsen[2], Kit Kovacs[3], Christian Lydersen[3], Jon Aars[3], Lutz Bachmann[4], Øystein Wiig[4], Martine Bérubé[1], Per J. Palsbøll[1]

(1) Marine Evolution and Conservation Group, Centre for Ecological and Evolutionary Studies, University of Groningen, 9747 AG Groningen, the Netherlands
(2) Department of Genetics, Microbiology and Toxicology, Stockholm University, 106 91 Stockholm, Sweden
(3) Norwegian Polar Institute, 9296 Tromsø, Norway
(4) Natural History Museum, University of Oslo, 0318 Oslo, Norway

a.a.cabrera.arreola@rug.nl

The ringed seal (*Pusa hispida*) is a pagophilic seal species with a life cycle closely associated with the sea ice and also the key prey species for the polar bear (*Ursus maritimus*). Global warming is rapidly diminishing the extent of summer sea ice in the Arctic, greatly reducing habitat availability for ringed seals and indirectly influencing the prey availability for polar bears. Predicting the effects of climate change on the abundance of ringed seals is essential for effective long-term management, but is challenging due to the complex relationship between climate change and ecological dynamics. Understanding how the historical population dynamics of ringed seals have responded to past climate may provide insights into the responses to current and future climate changes. In this study we have employed the Bayesian skyline plots, a coalescence-based method for inference of historical population dynamics, using mitochondrial DNA control region nucleotide sequences collected from ringed seals and polar bears at the Svalbard. Our analysis revealed a pattern of population expansion followed by contraction in ringed seals, suggesting a possible correlation with historical sea ice dynamics. Preliminary results from the polar bear suggest a correlation with ringed seal population dynamics. Additional on-going data analyses of a large number of high-resolution SNPs will add further rigor to our study. Our findings have implications for conservation of ringed seal and polar bear, in addition to providing insights into the evolutionary ecology of key polar marine mammals in the Arctic.

9th April 14:45

North Atlantic origin of Gibraltar fin whales

Pauline Gauffier[1], Simone Panigada[2], Alex Aguilar[3], Mónica Almeida e Silva[4], Vidal Martín[5], Simon Berrow[6], Rui Prieto[4], Conor Ryan[6], Jorge Urban[7], Per J Palsbøll[8], Martine Bérubé[8]

(1) CIRCE, Cabeza de Manzaneda nº3, 11390 Pelayo-Algeciras, Spain
(2) Tethys Research Institute, c/o Acquario Civico, Viale G.B. Gadio 2, 20121 Milano, Italy
(3) Department of Animal Biology and IRBIO, University of Barcelona, 08071 Barcelona, Spain
(4) Centro do IMAR da Universidade dos Açores Departamento de Oceanografia e Pescas 9901-862 Horta Portugal
(5) SECAC (Sociedad para el Estudio de los Cetáceos en el Archipiélago Canario), Edificio Antiguo Varadero, 1ª Planta Local 8B, Puerto Calero, 35570 Yaiza, Lanzarote - Islas Canarias, Spain
(6) Irish Whale and Dolphin Group, Merchants Quay, Kilrush, Co Clare, Ireland
(7) Dept. de Biologia Marina, Universidad Autonoma de Baja California Sur, La Paz, 23080 B.C.S., Mexico
(8) Marine Evolution and Conservation, Centre of Evolutionary and Ecological Studies, University of Groningen, PO Box 11103 CC, Groningen, The Netherlands

pauline@circe.info

Fin whales were common in the Strait of Gibraltar before depletion by whaling in the 1920s. Today, sightings are rare suggesting a slow or no recovery. Previous population genetic studies haveinferred that the fin whales that summer in the LigurianSea are genetically distinct from those summering in the North Atlantic. However, recent acoustic surveys of fin whalessuggests that the northeastern North Atlantic fin whales may spend part of the year in the southwest Mediterranean basin (Alboran Sea), but not in the northwest Mediterranean Sea (Ligurian Sea). Here we report on the population geneticanalyses of samples collected from the Strait of Gibraltar and several northeastern North Atlantic locations to assess which North Atlantic fin whale population may be the source of those fin whales observed in the Strait of Gibraltar. A total of 29 fin whale samples collected in the Strait of Gibraltar from 2007 to 2012 were genotyped at 10 microsatellite loci, sexed and the nucleotide sequence of the mitochondrial control region determined. The data was compared to similar data from fin whale samples collected in the Ligurian Sea, the northeastern North Atlantic (Spanish coast), the Azores, the Canary Islands as well as the Sea of Cortez.Preliminary results suggest thatthe Strait of Gibraltar fin whale samples are more similar to the West-Southwest North Atlantic (i.e., the Azores and the Canary Islands), than northeastern North Atlantic areas, such as Atlantic Spain, and Ireland. The overall spatial distribution of genetic variation suggeststhat ocean surface currents are a main determinant for fin whale population structure. Our results support the importance of collecting additional tissue samples in the western Mediterranean Basin (around

the Balearic Islands) as well as the Tyrrhenian Basin; the two areas where fin whales are also common.

9th April 15:00

New molecular biomarkers as indicators for anthropogenic stress in seals

Kristina Lehnert[1,2], Sabine Müller[2], Lina Weirup[2], Tanja Rosenberger[3], Iwona Pawliczka[4], Katrin Ronnenberger[2], Ursula Siebert[2]

(1) Helmholtz-Zentrum Geesthacht, Max-Planck-Str 1, 21502 Geesthacht, Germany
(2) Institut für Terrestrische und Aquatische Wildtierforschung, Stiftung Tieraerztliche Hochschule Hannover, Werftstrasse 6, 25761 Büsum, Germany
(3) Seal Station Friedrichskoog, An der Seeschleuse 4, 25718 Friedrichskoog, Germany
(4) Hel Marine Station, University of Gdansk, Morska 2, 84-150 Hel, Poland

kristina.lehnert@hzg.de

To evaluate anthropogenic impacts on the health status of seals, immuno-relevant and pollutant-induced biomarkers in these indicator organisms for coastal ecosystems were developed. Cytokines (IL2, IL10) and heat shock protein (HSP70) as important cell mediators of the immune system and biomarkers of the xenobiotic metabolism (AHR, ARNT, PPARalpha) were established. Investigated harbour and grey seal pups were rehabilitated at Hel Marine Station and Seal Center Friedrichskoog. Grey seal adults were permanently in human care. Blood samples were stored in RNAlater, RNA isolated and transcribed into cDNA, housekeeping genes were YWHAZ, ß2M and ß-actin. Biomarker transcript copy numbers were measured using RT-qPCR and correlated to haematology results. Significant differences in HSP70, cytokine and xenobiotic biomarker expression levels were found in harbour seal pups between admission, during rehabilitation, and before release. Highest levels at admission show stress during handling, loss of mother, bad health and lactation. The significant decrease is linked to medication, the compensatory milk product pups are fed and adaptation. The increase before release indicates higher infection pressure, stress and contaminant exposure feeding on fish. Significantly higher HSP70 expression was found in harbour seals from the North Sea, while grey seal pups showed lower levels similar in both North and Baltic Sea. Cytokine expression levels were similar between species and region in pups, indicating high exposure to infectious disease in young seals in the North and Baltic Sea. When comparing grey seal pups and adults, significantly higher expression levels of HSP70 and cytokines and more variation was found among adults. Interspecific differences between grey and harbour seals as well as differences between animals from the North and Baltic Sea suggest different contaminant loads and individual variation in adults. Molecular biomarkers prove to be an

important non-invasive tool to evaluate health status and the impact of anthropogenic stressors in seal species.

9th April 15:15

Population genetics of bottlenose dolphins in the North East Atlantic: A pelagic versus coastal segregation

Marie Louis[1,2,3], Christophe Guinet[1], Tamara Lucas[2], Amélia Viricel[2], Hélène Peltier[4], Eric Alfonsi[5,6], Simon Berrow[7,8], Andrew Brownlow[9], Pablo Covelo[10], Willy Dabin[4], Rob Deaville[11], François Gally[3], Pauline Gauffier[12], Rod Penrose[13], Monica A. Silva[14,15], Benoit Simon-Bouhet[2]

(1) Centre d'Etudes Biologiques de Chizé, UPR 1934
(2) LIENSs (Littoral Environnement et Sociétés), UMR CNRS-Université de La Rochelle
(3) GECC (Groupe d'Etude des Cétacés du Cotentin)
(4) Observatoire PELAGIS, UMS 3462 CNRS/Université La Rochelle
(5) Océanopolis
(6) BioGeMME, UFR Sciences et Techniques, Université de Brest
(7) Irish Whale and Dolphin Group (8) Galway-Mayo Institute of Technology, Dublin Road, Galway
(9) SAC Wildlife Unit, Inverness
(10) CEMMA (Coordinadora para o Estudo dos Mamíferos Mariños)
(11) Institute of Zoology, Zoological Society of London
(12) CIRCE (Conservation, Information and Research on Cetaceans)
(13) Marine Environmental Monitoring
(14) Centro do Instituto do Mar (IMAR) da Universidade dos Açores, Departamento de Oceanografia e Pescas
(15) Biology Department, MS#33, Woods Hole Oceanographic Institution

marielouis17@hotmail.com

Genetic stock assessment is needed to define appropriate management units and design protected areas. In Europe, bottlenose dolphins are protected under Habitats Directive where they are listed as a species whose conservation requires the designation of Special Areas of Conservation. Nevertheless, their population structure in the North-East Atlantic is still poorly understood. They are found both in coastal waters where they form either discrete sedentary populations of tens to hundreds of individuals or more mobile groups (e.g., around Ireland), and in pelagic waters particularly along the shelf edge with abundance estimates of thousands of individuals. We investigated bottlenose dolphin genetic structure from Scotland to the Mediterranean Sea through analyses of biopsy samples (n=162) and samples from stranded animals (n=242) using microsatellites markers and a portion of the mitochondrial control region (d-loop). Clustering analyses based on the multilocus genotypes showed a clear separation between coastal and pelagic dolphins, suggesting the existence of two genetically distinct ecotypes as observed in the North-West Atlantic. A second approach of landscape genetics combined multilocus genotypes and the location of individuals to infer population

structure. For stranded individuals, the most likely location of death was inferred using the prediction drift model MOTHY (Peltier et al. 2012). This approach confirmed the differentiation between pelagic vs coastal individuals. Moreover, the pelagic population was divided in two groups with individuals sampled in Gibraltar and the Mediterranean Sea forming a separate group from individuals sampled in pelagic waters of the Celtic Sea, Bay of Biscay and around the Azores. Likewise, coastal dolphins were divided in two clusters: an “Irish-North Seas” cluster and a cluster composed of individuals sampled in the English-Channel and off the western coast of Ireland. Further analyses using additional microsatellite markers will help to better delineate these populations and infer migration rates and dispersal patterns.

9th April 15:30

Sequence polymorphism and geographical variation at neutral (mitochondrial) and adaptative (MHC) genes in Long-finned pilot whale (*Globicephala melas*) from North Atlantic

Sílvia Monteiro[1,2], José V. Vingada[1,2,3], Alfredo López[4], Graham J. Pierce[5], Marisa Ferreira[1,2], Robert J. Reid[6], Nils Øien[7], Bjarni Mikkelsen[8], Stuart Piertney[5]

(1) Sociedade Portuguesa de Vida Selvagem. Departamento de Biologia, Universidade do Minho, Campus de Gualtar, 4720-057 Braga, Portugal
(2) Molecular and Environmental Biology Centre (CBMA) & Department of Biology, Universidade de Minho, Campus de Gualtar, 4710-047 Braga, Portugal
(3) Centre for Environmental and Marine Studies (CESAM) & Department of Biology. University of Aveiro, Campus Universitário de Santiago, 3810-193, Aveiro, Portugal
(4) Coordinadora para o Estudio dos Mamíferos Mariños (CEMMA). P.O. Box 15, 36380 Gondomar, Pontevedra, Spain
(5) School of Biological Sciences (Zoology), University of Aberdeen, Tillydrone Avenue, Aberdeen AB242TZ, UK
(6) Wildlife Unit, SAC Veterinary Science Division, Drummond Hill, Stratherrick Road, Inverness, IV2 4JZ, UK
(7) Marine Mammals Research Group, Institute of Marine Research, P.O.Box 1870 Nordnes, N-5817 Bergen, Norway
(8) Museum of Natural History, Fútalág 40, FO-100 Tórshavn, Faroe Islands

silvia.sm.monteiro@gmail.com

Comparison of the apportionment of genetic diversity among populations at neutral and adaptative markers can provide further insights about the influence of selection vs. other evolutionary forces in population genetic structure. Sequence polymorphism and geographical variation at a neutral (mitochondrial control region) and two adaptative (MHC DRA and DQB) loci was investigated in pilot whales (*Globicephala melas*), from six populations in North Atlantic. For the mtDNA locus, haplotype (0.56±0.04) and nucleotide diversities (0.22% ± 0.18%) were low compared to other abundant widespread cetaceans. In contrast, there was high and significant levels of mtDNA differentiation between almost all populations from North Atlantic (except between UK and USA), indicative of potentially separated populations at both regional and oceanic levels. MHC analysis revealed three alleles for each locus, with a nucleotide diversity of 0.56+/-0.42 and 4.63+/-2.40 and a heterozygoty of 0.39 and 0.36, for DRA and DQB locus, respectively. Although geographical MHC alleles distribution shows that almost all alleles were shared among populations, MHC results confirm Iberian whales as a separate population when compared with remain populations ($0.07<FST<0.18, p<0.05$). While historical positive selection seems to be occurring at DQB locus as the main force generating

sequence diversity, no evidence of selection seems to be acting in DRA. These results suggest that although balancing selection can be a determinant force at maintaining genetic diversity and differentiation of North Atlantic pilot whale populations, its strength can sometimes be sufficiently weak to be outweighed by other evolutionary forces as genetic drift or gene flow.

9th April 15:45

Remarkably fine-scale population structuring in a widespread marine mammal - Integrating genetic and demographic data for the identification of *Phoca vitulina* populations and management units

Morten Tange Olsen[1], Liselotte Wesley Andersen[2], Rune Dietz[1], Jonas Teilmann[1], Tero Härkönen[3], Hans Siegismund[4]

(1) Danish Centre for Environment and Energy, Department of Bioscience, Aarhus University, Frederiksborgvej 399, DK-4000 Roskilde, Denmark
(2) Department of Bioscience, Aarhus University, Grenåvej 12, DK-8410 Rønde, Denmark
(3) Swedish Museum of Natural History, Box 50007, S-10405 Stockholm, Sweden
(4) Department of Biology, University of Copenhagen, Ole Maaløes Vej 5, DK-2200 Copenhagen N, Denmark

mortentolsen@gmail.com

Identification of populations and management units is an essential step in the study of natural systems. Still, there is limited consensus regarding the most appropriate path for such inference. Here we integrated genetic data and demographic simulations to identify populations and management units in a widespread marine mammal, the harbour seal. First, a suite of 15 microsatellite loci and individual-based genetic clustering methods were used to assess genetic structuring and connectivity within a sample of 259 harbour seals from a series of haul-out sites in southern Scandinavia. Then, we performed a series of demographic simulations to determine whether the inferred populations were large enough to be considered demographically independent and consequently could be classified as management units. The genetic analyses revealed remarkable fine-scale population structuring and pointed to the existence of at least four harbour seal populations in southern Scandinavia. Given the assumptions, the demographic simulations indicate that all these populations are demographically independent and can thus be classified as distinct management units. Our study suggests that: i) individual-based population genetic analyses may reveal population structuring at temporal and spatial scales comparable to those inferred from non-genetic studies, and ii) demographic simulations constitute a promising approach for evaluating the management status of such populations.

9th April 16:30

Cultural transmission of lobtail feeding in humpback whales

Jenny Allen[1,2], Mason Weinrich[2], Will Hoppitt[3], Luke Rendell[1,3]

(1) Sea Mammal Research Unit, School of Biology, University of St Andrews, Fife, KY16 8LB, UK
(2) Whale Center of New England, P.O. Box 159, Gloucester, MA 01931-0159, USA
(3) Centre for Social Learning and Cognitive Evolution, School of Biology, University of St Andrews, Fife, KY16 9TS, UK

ja465@st-andrews.ac.uk

Understanding the role of cultural transmission in wild animal populations is challenging, but important for an accurate understanding of its taxonomic distribution. A new method, network-based diffusion analysis (NBDA), quantifies the extent to which social network structure explains the spread of behavior (1). We used NBDA to study the spread of a foraging innovation, lobtail feeding, through a population of humpback whales (*Megaptera novaeangliae*) over 27 years. Support for models with a social transmission component was 6 to 23 orders of magnitude greater than for models without social transmission. We found that the spatial and temporal distribution of sand lance, a prey species, was also important in predicting the rate of acquisition. This is the first time such methods have been used to study the spread of a natural innovation in a wild population. Our results combine with descriptions of culturally-transmitted song (2) to show that this species can maintain multiple independently evolving traditions in its populations.

9th April 16:45

Allocare in long-finned pilot whales (*Globicephala melas*), that summer off Cape Breton, NS, Canada

Joana F. Augusto, Hal Whitehead

Dalhousie University

joana.augusto@dal.ca

Allocare is an interaction or association between a calf and an adult that is not their parent. Although allocare is common in social mammals, its prevalence is difficult to assess in cetaceans, and has not been studied in long-finned pilot whales. The population that summers off Cape Breton has been studied from whale-watching vessels since 1998, during July and August each year. From 2009 to 2011, we collected photoidentifications of calves and the adults accompanying them (closest companions - CCs). Calves were identified using nicks on their dorsal fins and skin patterns. CCs were identified using nicks on their dorsal fins. Only calves that were seen with at least one adult in two different encounters were used for the analysis. Allocare was considered to be occurring when a calf was identified with more than one CC. When a calf was only observed with just one CC, that was considered its mother. When it was observed with multiple CCs we used the z test method described in Grellier et al. (2003) to assign the mother. We also determined whether there was reciprocity in allocare within and between years. By these criterion we have evidence for allocare for 56% of the30 identified calves in 2011 and 75% of the 28 identified calves in 2009. Mothers were difficult to assess when allocare was observed, with a success rate ranging from 8% observed calves with an assigned mother in 2010 to 31% in 2011. There were no instances of within or between year allocaring reciprocity. Although allocare seems to be common in this population, the data reflect the difficulty in describing it for cetaceans. Subsequent research will focus on determining to which social units mothers and CCs belong to, what sex CCs are and how related they are to the mother.

9th April 17:00

Comparing multiple methods for measuring the behaviour of humpback whales (*Megaptera novaeangliae*)

Elise Marie Godwin, Rebecca A. Dunlop, Michael J. Noad

The University of Queensland

elise.godwin11@gmail.com

Measuring the behaviour of marine mammals is challenging due to the fact they are underwater and not observable most of the time. Given the limitations of many sampling methods and the difficulties associated with measuring animal behaviour, it may be more practical to use a combination of methods rather than just one. However, the inherent strengths and limitations of these different methods, as well as the variability in the scale of data captured needs to be correctly accounted for. Little is known on whether data captured from these different methods are similar and therefore comparable, or different and in need of some sort of correction. The experimental design of the Behavioural Response of Australian Humpback whales to Seismic Surveys (BRAHSS) project incorporated a number of different sampling methods; land-based and boat-based visual observations of surface behaviours and movements of humpback whale groups as well as Digital Tags (DTAGs), which recorded ultra-fine scale underwater movements and acoustic behaviour. This study used data from the BRAHSS project to compare measures of behaviour collected using all three sampling methods. Land-based observations tended to underestimate rates of surface behaviour (such as blow rate) compared to boat-based observations (blow rate was not measured from the tags). Broader scale movement variables (course and speed) were measured similarly from land-based and boat-based platforms. Diving behaviour fell into two distinct types ('short' ™ dives <60 seconds and 'long' dives >60 seconds). When compared with dive data obtained from tags, both land-based and boat-based observations were found to reliably estimate the number of long dives however land-based observations underestimated the number of short dives. This study demonstrates that measuring behaviour using different methods produces some discrepancies in data collected; however these discrepancies are more prominent in some measures of behaviour than others.

9th April 17:15

Grey seals predating on harbour porpoises: A recent and spreading phenomenon?

Jan Haelters[1], Mardik Leopold[2], Francis Kerckhof[1], Thierry Jauniaux[3], Steven Degraer[1], Dorien Verheyen[2], Eileen Heße[2], Lara Mielke[2], Martin Baptist[2], Guido Keijl[4], Lineke Begeman[5], Sjoukje Hiemstra[5], Andrea Gröne[5]

(1) Royal Belgian Institute of Natural Sciences (RBINS), Management Unit of the North Sea Mathematical Models (MUMM), Gulledelle 100, B-1200 Brussels and 3e en 23ste Linieregimentsplein, B-8400 Ostend, Belgium
(2) Institute for Marine Resources & Ecosystem Studies (IMARES), P.O. Box 167, NL-1790 AD Den Burg, The Netherlands
(3) Department of Pathology, Veterinary College, Sart Tilman Bat B43, B-4000 Liège, Belgium
(4) Naturalis Biodiversity Center, PO Box 9517, 2300 RA Leiden, The Netherlands
(5) Utrecht University, Faculty of Veterinary Medicine, Department of Pathobiology, P.O.Box 80158, NL-3508 TD Utrecht, the Netherlands

j.haelters@mumm.ac.be

In September 2011, two remarkable harbour porpoise *Phocoena phocoena* carcasses washed ashore in Belgium. They both were very fresh, with death estimated to have occurred only hours before, and they both presented severe lesions. The carcasses were not scavenged upon by gulls, and did not present any typical external bycatch marks. The lesions, described as 'mutilations', were carefully examined and documented, and it was concluded that the animals had been attacked, killed, and partly eaten by a predator. Through exclusion of predators without incisor teeth, and through the examination of almost 140 seal skulls, the predator in both cases was identified as an adult grey seal *Halichoerus grypus*, most probably a bull. Although these were the first cases in which the grey seal could be identified as the predator of the harbour porpoise (and in fact any marine mammal), it became clear that there might have been many more cases in the southern North Sea, and particularly in The Netherlands, since around 2005. Indeed, while many earlier 'mutilated' harbour porpoises were hard to recognise as grey seal victims (due to for instance scavenging or decomposition), the lesions were in many cases very similar to the ones described in the two Belgian cases. A mapping of the stranding locations of 'mutilated' harbour porpoises further revealed a close link with the location of Dutch grey seal haul out sites. Stranded porpoises with massive, yet mysterious mutilations have puzzled scientists, conservationists, fishermen and concerned civil servants for a number of years. Although other actors may also be at work in these parts, at least some

of the mutilations should perhaps be attributed to a natural cause: seal (de)predation. Investigation into this is ongoing.

9th April 17:30

Silent porpoise: Potential sleeping behaviour identified in wild harbour porpoise

Andrew J. Wright[1], Tom Akamatsu[2], Kim Nørgaard Mouritsen[3], Signe Sveegard[1], Rune Dietz[1], Jonas Teilmann[1]

(1) Aarhus University, Department for Bioscience, Frederiksborgvej 399, DK-4000, Roskilde, Denmark
(2) National Research Institute of Fisheries Engineering, Fisheri Research Agency, Kamisu, Hasaki, Kashima, Ibaraki 314-0408, Japan
(3) Aarhus University, Department for Bioscience, Ole Worms Allé 1,DK-8000, C. Aarhus, Denmark

marinebrit@gmail.com

All animal studied to date sleep. However, marine mammals studied thus far engage in the unusual practice of unihemispherical sleep. This is allowing half of their brain to sleep at a time so that they may continue to move and breathe. Most study of sleep in cetaceans has occurred in captivity. However tagging devices deployed on wild animals have now developed to the point where it is possible to investigate sleep in the wild, though the application of published criteria for defining sleep behaviourally. Six acoustic and behavioural logging units were deployed on harbour porpoises in Danish waters between May 2010 and August 2011 for between 53 and 72 h and recording 1882 to 2849 dives per animal. Parabolic dives with significantly reduced bioacoustic activity and a stereotyped behavioural pattern were identified as potential sleeping periods. Only 47.4% of all parabolic dives in this subset were found to contain more than 10 clicks per minute (a rate at which could represent merely noise contamination), significantly and substantially less than found in the other dive types. Of that 47.4% of parabolic dives, the number of clicks was also significantly and substantially lower than detected in other dive types, while in-train inter-click intervals were generally higher. Parabolic dives were also found to have slower vertical descents rates than other dive types, as well as slower estimated absolute speeds on descent. They were also found to contain significantly fewer rolls. If the data is representative, harbour porpoises may spend around 5%, but up to 10%, of their time (near) silent and potentially sleeping. This needs to be considered in studies employing passive acoustic monitoring techniques as well as in efforts reduce incidental bycatch in fisheries, given the associated periods of reduced environmental awareness.

10th April 09:00

Testing the effect of pingers on cetacean depredation in the Azorean hand-jig squid fishery

Maria João Cruz[1], Vera Jordão[1], Giuseppa Buscaino[2], Ricardo Serrão Santos[1], Mónica A. Silva[1,3]

(1) Departamento de Oceanografia e Pescas da Universidade dos Açores & Centro do IMAR da Universidade dos Açores; 9901-862 Horta; Portugal
(2) IAMC-CNR Capo Granitola; Italy
(3) Biology Department, MS#33, Woods Hole Oceanographic Institution; Woods Hole, MA 02543; USA

m.joao83@gmail.com

The artisanal hand-jig squid fishery in the Azores has been regularly subject of cetacean depredation, with Risso´s dolphins (*Grampus griseus*) removing squids from the jigs. These interactions may have serious economic implications for the fishery and for dolphin conservation. Acoustic deterrent devices or pingers, emitting high frequency sounds, may be used to deter cetaceans from the fishing gear. We conducted experimental trials to assess the effect of 3 pinger brands (Fumunda Marine®, AQUAmark300® and Interactive Pinger) on the catch and dolphin depredation. From May 2010 to September 2011, 227 trials were performed during 73 fishing trips by onboard observers. The order of experiments was conducted randomly and fishermen were unaware of whether pingers were active (n=86), inactive (n=82) or controls (n=59). There were no significant changes in the catch per unit effort among trials ($F(6,220) = 1.121$; $p = 0.351$), suggesting that pinger presence or brand had no effect on fishing success. Dolphin depredation was recorded in 27% (n=20) of the fishing trips. Depredation rates were similar for the control (0.16), inactive (0.17) and active (0.17) pinger conditions. There was no statistically significant effect of pinger brand and condition on cetacean depredation ($F_{(6,214)} = 0.534$; $p = 0.782$). Depredation is highly rewarding for dolphins, making it difficult to find ways to mitigate it. Changes to the fishing gear may be the most effective way to reduce the frequency of depredation in this kind of fishery.

10th April 09:15

An interdisciplinary approach to measuring behavioural impacts of seismic surveys on humpback whales

Michael J. Noad[1], Douglas H. Cato[2,3], Rebecca A. Dunlop[1], Robert McCauley[4]

(1) Cetacean Ecology and Acoustics Laboratory, School of Veterinary Science, The University of Queensland, Gatton, QLD 4343, Australia
(2) University of Sydney Institute of Marine Science, University of Sydney, NSW 2006, Australia
(3) Maritime Opertations Division, Defence Science and Technology Organisation, 13 Garden St, Eveleigh, NSW 2015, Australia
(4) Centre for Marine Science and Technology, Curtin University of Technology, GPO Box U1987 Perth,WA 6845, Australia

mnoad@uq.edu.au

Seismic air guns are devices used to find oil and gas deposits under the seafloor. They produce regular loud percussive sounds for extended periods, and there is concern that these sounds may have a negative impact on nearby marine mammals. Determining the impacts of various industrial activities in the marine environment can be very difficult, particularly behavioural effects on marine mammals. We are currently two years into a four to five year behavioural response study exposing humpback whales to the sounds of air guns as they move through our study site on the east coast of Australia. The aims of the study are to record the behavioural responses of the whales to the air guns and determine which factors involved in the interaction are most strongly correlated with the degree of behavioural change (e.g. received level, proximity of the airgun, social behaviour of the whale group), whether or not these behavioural changes are likely to have longer term biological effects, and to test the efficacy of 'ramp up' as a mitigation tool. The whales were followed from three different types of platform: elevated land stations, small boats and using high resolution behavioural tags attached to the whales (Dtags). The study followed a 'before, during, after' design with focal groups of whales observed and tracked as they migrated past a source vessel. Treatments included firing a 20 cubic inch (in3) gun towed on two different paths, firing a 140 in3 array of air guns, and 'ramping up' from 20 to 440 in^3. All active treatments were balanced by controls with the source vessel moving but the air guns not firing. Acoustic loggers, drifting vertical arrays and an array of moored hydrophone buoys were also deployed to measure the acoustic environment. Future experiments will include the use of a full seismic array.

10th April 09:30

Levels of marine human wildlife conflict: A whaling case study

E.C.M. Parsons[1], F. Madden[2], M. Draheim[3], J.B. McCarthy[4], N.A. Rose[5]

(1) Dept. of Environmental Science & Policy, George Mason University, 4400 University Drive, Fairfax, VA, USA
(2) Human-Wildlife Conflict Collaboration, 2020 12th St. NW, Washington DC, USA.
(3) Virginia Tech Center for Leadership in Global Sustainability, Natural Resource Programs, 900 North Glebe Road, Arlington, VA, USA.
(4) Fisheries and Oceans Canada, 200-401 Burrard Street, Vancouver, British Columbia, Canada.
(5) Humane Society International, 2100 L St. NW, Washington DC, USA.

ecm-parsons@earthlink.net

Human/wildlife conflict theory identifies three levels of conflict. We posit that these three levels of conflict are evident at the International Whaling Commission (IWC) over so-called Japanese scientific whaling. The first level of conflict is the dispute: the current, tangible issue or problem that is in contention. For the IWC the dispute is about the validity and value of the scientific research conducted through lethal take. The second level is the underlying conflict; that is, a history of unresolved dispute over what has happened in the past. At the IWC there is a history of long and acrimonious argument and personal attacks from both sides, and of substantial financial and personal investment with unsatisfactory results for all parties. The third level is the identity-level conflict involving prejudices and assumptions about the parties involved. In the IWC context there are assumptions that the parties are irrevocably polarized, and there are gross prejudices; for example, the perception of one side as "heartless whale killers" versus the other as "unrealistic bunny huggers" or "supporters of eco-terrorists". This last level includes assumed offenses to national sovereignty/pride. In 2010 there was an attempt to broker a deal related to scientific whaling at the IWC meeting in Morocco, which, while arguably agreeable in purely scientific terms (that is, proposed catches would be sustainable based on population size), ultimately failed because other levels of conflict were not considered or addressed. The IWC is stalemated due to major issues related to historical conflicts, lack of trust, and assumptions/prejudices above and beyond scientific debate, and thus we must go beyond a purely science-based approach to resolve the conflict.

10th April 09:45

An interdisiplinary approach to studying harbour porpoise-fisheries interactions in the North-west Iberian Peninsula

Fiona L. Read[1,2], Maria Begoña Santos[1,3], Ángel F. González[2], Sabine Goetz[3,4], Alfredo López[5], Marisa Ferreira[6], Graham J. Pierce[1,4]

(1) Oceanlab, University of Aberdeen Main Street, Newburgh, Aberdeenshire, AB41 6AA, U.K.
(2) Instituto de Investigaciones Marinas (C.S.I.C), Eduardo Cabello 6, 36208 Vigo, Spain
(3) Instituto Español de Oceanografía, Centro Oceanográfico de Vigo, PO Box 1552, 36200, Vigo, Spain
(4) Centre for Environmental and Marine Studies (CESAM), Department of Biology, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal
(5) CEMMA, Apdo. 15, 36380, Gondomar, Spain
(6) CBMA/SPVS, Departamento de Biologia, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal

fionaread@iim.csic.es

The Iberian harbour porpoise *Phocoena phocoena* is a genetically isolated population of around 2600 individuals (SCANS-II). The north-west Iberian Peninsula (NWIP) (Galicia and northern Portugal) is one of the world's main fishing areas and around half the porpoise strandings show evidence of fisheries interactions (e.g. net marks), although few porpoise by-catches were reported during interviews with fishers. In the NWIP very limited data exist on life history and diet, which are important for assessing population status and trends. Life history and diet analyses were conducted using standard methods for stranded porpoises from the NWIP 1990-2010. Age, maturity and pregnancy data were used to construct life tables and estimate overall annual mortality and reproductive rates. Diet analysis provides information on both feeding ecology and potential competition with fisheries. Iberian porpoises reach sexual maturity at 4 (males) and 5 (females) years old, and are larger but shorter-lived than other studied populations. Estimated annual pregnancy rate in mature females was 0.53 (calving interval 1.89 years). Life table results indicate an annual population mortality rate of 18%. Combined with information on causes of death, this suggests that 11% of the population dies annually due to fisheries interactions, which would be unsustainable. Survivorship was similar in males and females. The average age of by-caught animals was slightly higher than that of non by-caught animals. The main prey items of porpoises were Trisopterus spp., blue whiting and Trachurus spp., all of which are of commercial importance. Results from statistical modelling results showed significant seasonal patterns in diet and that larger porpoises eat larger prey. No changes in life history parameters and diet were identified over time. Long-

term, interdisciplinary, studies are required to assess the viability of the Iberian harbour porpoise population to fisheries interactions, and ultimately conservation of this population.

10th April 10:00

Negative long term effects on harbour porpoises from a large scale offshore wind farm in the Baltic - Evidence of slow recovery

Jonas Teilmann, Jacob Carstensen

Department of Bioscience, Aarhus University

jte@dmu.dk

Offshore wind farms constitute a new and fast growing industry all over the world. This study investigates the long term impact on harbour porpoises, Phocoena phocoena, for more than 10 years (2001-2012) from the first large scale offshore wind farm in the world, Nysted Offshore Wind Farm, in the Danish western Baltic Sea (72x2.3 MW turbines). The wind farm was brought into full operation in December 2003. At six stations, acoustic porpoise detectors (T-PODs) were placed inside the wind farm area and at a reference area 10 km to the east, to monitor porpoise echolocation activity as a proxy of porpoise presence. A modified BACI design was applied to detect changes in porpoise presence before, during and after construction of the wind farm. The results show that the echolocation activity has significantly declined inside Nysted Offshore Wind Farm since the baseline in 2001-2002 and has not fully recovered yet. The echolocation activity inside the wind farm is gradually increasing (from 11% to 29% of the baseline level) since the construction of the wind farm, possibly due to habituation of the porpoises to the wind farm or enrichment of the environment due to less fishing and artificial reef effects.

10th April 10:15

Modelling harbour porpoise and minke whale distribution in Northern European Waters, using the Joint Cetacean Protocol data resource: A novel spatially adaptive generalised additive model approach

Lindesay Scott-Hayward[1], Monique Mackenzie[1], Charles Paxton[1], Len Thomas[1], Tim Dunn[2]

(1) University of St. Andrews
(2) Joint Nature Conservation Committee

lass@st-and.ac.uk

We used novel methods to model spatial and temporal patterns in the density of seven cetacean species between 1994 and 2010 in a 1.09 million km2 region from 48oN to c. 64oN and from the continental shelf edge west of Ireland to the Kattegat in the east. Input data came from the Joint Cetacean Protocol (JCP) data resource, a collaborative project linking multiple cetacean sightings surveys (both designed surveys and platforms of opportunity), coordinated by the UK Joint Nature Conservation Committee (JNCC). The data came from 38 data sources representing 542 distinct survey platforms (both aerial and shipboard) and over 1.05 million km of effort. Despite this, large parts of the survey region contain little or no effort, particularly in some seasons or years. The first stage of the modelling process combined the data sources for each species, using Distance Sampling, and the second stage modelled the resulting estimates as functions of predictor variables (sea surface temperature, slope, depth, year, day of year, easting, northing). The modelling methods incorporated complex topography (estimates are modelled as the whale swims rather than as the crow flies), were spatially adaptive (allows the smooth surface to be more flexible in some areas over others) and accounted for autocorrelation in the residuals (resulting in wider confidence intervals). We present density surfaces for two of the species, harbour porpoise (Phocoena phocoena) and minke whale (Balaenoptera acutorostrata), and show how their distribution has changed over both time and space. The results produced largely realistic spatial patterns, in keeping with previous studies. In 2010, harbour porpoise density was highest off the coast of East Anglia and around the Hebrides, whilst minke whale density was highest around the northern coast of Great Britain, with an increase in numbers in the summer months.

10th April 10:20

Automating the detection of dugongs in aerial imagery captured during trial surveys using Unmanned Aerial Systems

Gwénaël Duclos[1], Amanda Hodgson[1], Luis Mejias Alvarez[2], Frédéric Maire[3]

(1) Murdoch University Cetacean Research Unit, Murdoch University, Murdoch, WA 6150, Australia
(2) Australian Research Centre for Aerospace Automation, Queensland University of Technology, Brisbane, QLD 4000, Australia
(3) School of Electrical Engineering and Computer Science, Queensland University of Technology, Brisbane, QLD 4000, Australia

gwenael.duclos@gmail.com

The conservation and management of marine mammals relies on population surveys to produce precise estimates of their abundance, distribution and habitat use. Many marine mammals are monitored with on-board observers in small aircraft, but this method is expensive, sometimes dangerous, and limited by weather conditions. Unmanned Aerial Systems (UAS) equipped with digital cameras may improve survey accuracy, decrease cost and eliminate safety concerns. This new technology requires multidisciplinary teams to customise and operate the UAS, develop software for automated data processing, and assess performance from user perspective. Through collaboration between three such teams, we tested a UAS for surveying dugongs in Shark Bay, Western Australia. Here we present our approach to automating the detection of dugongs from the aerial imagery collected. We aimed to achieve true positive detection rates of 90% of those already detected manually. We also required less than 4 false positive detections per picture to ensure a reasonable timeframe for verification of the detections by a biologist. Our algorithm consisted of three stages: 1) 'image segmentation' to separate objects of interest (blobs) from the background, 2) 'blob features extraction' to measure the blobs' size, area and contour characteristics, and 3) 'blob classification' to score blobs according to how much their features deviated from known dugong blobs. We tested the algorithm on a reference set of 28 images, captured under varying wind, turbidity and glare conditions. The algorithm produced a true positive detection rate 54% with an average of 55 false positives per picture, under all conditions. To achieve our desired detection rates we plan to learn from the data to help improve the final classification of blobs using statistical pattern recognition methods. Once this software is capable of detecting dugongs, it can readily be adapted to other taxa such as cetaceans.

10th April 10:25

New developments in seal aerial surveys

Patrick Pomeroy, Luke O'Connor, Callan Duck, Chris Morris

Sea Mammal Research Unit

pp6@st-andrews.ac.uk

Unmanned Aerial Vehicle (UAV) platforms offer remote sensing on intermediate scales and therefore are of particular interest to marine coastal applications. The many platforms available currently can be split into fixed wing and rotor systems. Multirotor helicopter devices carrying imaging equipment have proved very effective aerial surveyors for applications such as archaeology, industrial inspection and aerial observation. Their manoeuvrability and hover capabilities are critical to the task I have identified for them. My particular interest in using this technology is for a very specialized role – surveying and photographing seals from the air. Successful implementation of this technology opens a new avenue of research within my field, where counting, age class and sex determination are achievable and the beginnings of individual identification and photogrammetry are progressing for individual-based and population studies. So far I have been successful in beginning to build up equipment capability. However, it is now clear that while operating this equipment safely is a challenge in itself, this must also be done within the relevant existing law and guidelines. Therefore a guideline standard operating system has been implemented. We will present results of trials being carried out in the run up to the conference.

10th April 10:30

Immobilization of Atlantic Walrus (*Odobenus rosmarus rosmarus* L.) by etorphine hydrochloride reversed with diprenorphine hydrochloride

Mario Acquarone[1], Erik W. Born[2], David Griffits[3], Lars Øyvind Knutsen[4], Øystein Wiig[5], Ian Gjertz[6]

(1) University of Tromsø
(2) Greenland Institute of Natural Resources
(3) Norwegian School of Veterinary Science
(4) Cine-Nature
(5) University of Oslo
(6) The Research Council of Norway

mario.acquarone@gmail.com

In the period 1989-2001 a total of 69 immobilizations with etorphine HCl were performed on 41 individual free-ranging Atlantic walrus (Odobenus rosmarus rosmarus L.) with total body masses between 633 and 1,883 kg. Over the years two walrus were immobilized 6 times, two 5 times, one 4 times, two 3 times and two twice. Full immobilization was achieved in 58 cases (84 %). The animals were not fully immobilized in 6 cases (9 %) and 5 animals died (7 %). At first immobilization the animals were fully immobilized and approachable after an average of 5 min with a dose of etorphine of 6.1 µg/kg. Induction time was negatively correlated to the dosage of etorphine. Etorphine – induced apnea averaged 13.7 min. Immobilization was reversed using multiple doses of the antagonist diprenorphine HCl. The first dose of antagonist was administered an average of 8.4 min after injection of the agonist and amounted to 12.2 mg. Total dose of diprenorphine per animal ranged between 7.7 and 41.7 µg/kg. Following the injection of diprenorphine and regaining of breathing activity the animals experienced increased peripheral temperature. In a small selected sample where this was analysed, low blood pH values (min pH 6.8) were observed close to termination of the apneic period and gradually increased during the recovery period. For animals that were immobilized several times there were no indications of increased sensitivity to etorphine as reflected by unchanged induction times. Mortalities could neither be related to the doses of agonist and antagonist, nor to the times of administration of the drugs. It is concluded that the etorphine – diprenorphine combination is suitable for both single and multiple immobilization of walruses provided that the antagonist diprenorphine is administered fast and well into a tissue with good blood profusion, and not in blubber.

10th April 10:35

First evidence of Brucellosis by *Brucella ceti* in cetaceans from the Western Mediterranean Sea

Mariano Domingo[1,2], Lola Pérez[2], Marc Isidoro[2], Ferran Alegre[3], Marina Andrés[3], Rocío González[4], Pilar María Muñoz[5], Clara María Marín[5], José María Blasco[5]

(1) Centre de Recerca en Sanitat Animal (CReSA), UAB-IRTA, 08193 Bellaterra, Barcelona (Spain)
(2) Departament de Sanitat i Anatomia Animal, Facultat de Veterinària, Universitat Autònoma de Barcelona (UAB), 08193 Bellaterra, Barcelona (Spain),
(3) Centre Fundación para la Conservación y Recuperación de Animales Marinos (CRAM), El Prat de Llobregat, Barcelona Barcelona (Spain)
(4) Área de Patología, LANASEVE, SENASA, Ministerio de Agricultura y Ganadería de Costa Rica (Costa Rica)
(5) Unidad de Sanidad Animal (CITA). Gobierno de Aragón, Zaragoza (Spain)

mariano.domingo@cresa.uab.cat

After the first description of Brucella ceti, there has been an increased recognition of infection by these bacteria in different species and oceans worldwide. Antibodies to Brucella have been detected in as much as 28 out of 42 cetacean species investigated, with successful isolations from at least 10 species. B.ceti may be associated to meningoencephalitis, abortion, discospondylitis, subcutaneous abscesses, endometritis, and other clinicopathological conditions; however, most infected animals overcome clinical disease, possibly becoming carriers and shedders of Brucella. In the Mediterranean Sea, infection has been demonstrated by serology in two striped dolphins and one bottlenose dolphin, but no Brucella-associated disease has been described up to now. We recently included Brucella serum antibody testing in our routine necropsy protocols (Bengal Rose test), allowing us to detect three cases of B.ceti infected dolphins, two of them showing lesions and disease attributable to this bacterium. Case 1 was a striped dolphin showing neurologic signs (uncoordinated swimming, lateralization) that died four days after stranding, in spite of supportive care. Histologically, a non-suppurative meningoencephalitis was the only significant lesion detected. B.ceti was isolated from cerebrospinal fluid. Meningoencephalitis caused by B.ceti was considered the cause of stranding and death in this dolphin. Case 2 was a bottlenose dolphin, found dead and showing vertebral ankylosing spondylitis at the caudal part of the peduncle, and B.ceti was recovered from the spondylitic lesion. In this dolphin, prominent foci of fungal infection were found in the CNS, and this was considered the cause of death. Case 3 was a striped dolphin affected with a chronic form of CeMV infection restricted to the Central Nervous System, and

B.ceti was isolated only from the spleen. This animal was considered asymptomatically infected by B.ceti. Our study describes for the first time disease manifestations associated to B.ceti in the Mediterranean Sea.

10th April 10:40

Brucellosis in two seal pups

Thierry Jauniaux[1,2], Maud Didier[1], David Fretin[3], Jacques Godfroid[4], Emilie Laurent[3], Patrick. Michel[3], Michael Sarlet[1], Jonh Van Gompel[5], Freddy Coignoul[1]

(1) Department of Pathology, Veterinary College, Sart Tilman Bat B43, 4000 Liege, Belgium
(2) Royal Belgian Institute of Natural Sciences, MUMM, Gulledelle 100, 1200 Brussels, Belgium
(3) Veterinary and Agrochemical Research Centre, Groeselenberg 99, 1180 Brussels, Belgium
(4) Section for Arctic Veterinary Medicine, Department of Food Safety and Infection Biology, Norwegian School of Veterinary Science, Stakkevollveien 23, 9010 Tromsø, Norway
(5) Sea Life Blankenberge, Koning Albert-I-laan 116, 8370 Blankenberge, Belgium Belgium

t.jauniaux@ulg.ac.be

Brucella sp. infection has been documented in a wide range of marine mammal species inhabiting a large part of the world's ocean but association between infection and lesion has only been established in cetaceans. A common seal *Phoca vitulina* and a grey seal *Halichoerus grypus* died suddenly in a rehabilitation center in Belgium. Post-mortem investigations revealed lesions such as lymph nodes petechiae or hyperplasia, pneumonia, nephritis, hepatitis and moderate meningitis. Immunohistochemistry investigations revealed positive staining for *Brucella* sp. in different tissues, including cerebral meninge and lung nematodes. *Brucella pinnipedialis* was isolated in different lymph nodes of both seals. In marine mammals, lesions associated with *Brucella* sp. infection have been reported in cetaceans only while for pinnipeds only serological evidences of *Brucella* sp. infection are described. Microscopic descriptions of lesions similar to those reported in the present study have been associated with *Brucella* sp. infections in cetaceans. In the present case, positive staining was observed in the areas of meningitis. Based on our observations, *B. pinnipedialis* can be considered as the cause of the meningitis in an acute stage. The presence of *Brucella* sp. in lungworms has been described previously in cetaceans and in pinnipeds. Lungworms larvae carrying *Brucella* sp. could be one of the routes of infection when eating intermediate host fish species. If such infection can be demonstrated, it will confirm the potential economic impact and public health implications as marine mammals *Brucella* sp. have been demonstrated being zoonotic. Then, all people handling wild or captive seals, alive or dead or samples collected from the animal should be aware of the zoonotic risk and take the necessary precaution.

10th April 10:45

Patterns of cetacean death locations at sea as new population indicator: The case of common dolphins (*Delphinus delphis*) in the Channel and the Bay of Biscay.

Hélène Peltier[1,2], Willy Dabin[2], Pierre Daniel[3], Rob Deaville[4], Paul D. Jepson[4], Olivier Van Canneyt[2], Vincent Ridoux[1,2]

(1) Laboratoire Littoral Environnement et Sociétés, UMR 7266, Université de La Rochelle, 2 rue Olympe de Gouges, 17000 La Rochelle, France
(2) Observatoire PELAGIS, UMS 3462 - Université de La Rochelle-CNRS, Université de La Rochelle, 5 allées de l'océan, 17000 La Rochelle, France
(3) Météo France, Dprevi/MAR, 42 avenue Coriolis, 31057 Toulouse, Cedex, France
(4) Cetacean Strandings Investigation Programme, Institute of Zoology, Zoological Society of London, Regent's Park, London, NW1 4RY, United-Kingdom

hpeltier@univ-lr.fr

Cetacean strandings are an important source of information on cetacean population status and biological samples. Nevertheless, collecting stranding data remains opportunistic and their representativity must be improved. The aim of this study was to improve the ecological significance and statistical credibility of strandings, through the determination of common dolphin death locations found along the Channel and Bay of Biscay coasts, by using the drift prediction model MOTHY. Then, the numbers of dead dolphins per unit area were weighted by the probability that dolphins dying at sea become stranded, in order to map death locations inferred from observed strandings, irrespective of drift conditions. Their sum constituted an estimation of dead dolphin numbers at sea. The difference between death locations of stranded cetaceans and the theoretical distribution of cetaceans predicted to become stranded under the null hypothesis (hypothesis of spatial and temporal uniformity of dead cetaceans) constituted the stranded cetacean death location anomaly. Between 1990 and 2009 6,182 common dolphin strandings were reported by the UK and French stranding networks. It appeared that 58% of stranded dolphins originated from the neretic Bay of Biscay. Death locations inferred from strandings suggested that common dolphins died mostly in the neritic Bay of Biscay (65%). The number of common dolphins dying in the Bay of Biscay and the Channel was estimated between 4,220 dolphins.year-1 and 6,119 dolphins.year-1. The death location anomaly was maximal in the southern Bay of Biscay, highlighted as an area of high abundance or strong mortality for common dolphins. These results were consistent with current knowledge on common dolphin distribution and provide new insight on strandings as

cetacean population indicators. This new approach constituted the first attempt to spatialize and estimate the number of dead dolphins at sea. It will highly improve the relevance of using stranding schemes as monitoring tools.

KEYNOTE SPEAKER

10th April 12:15

Interdisciplinary approaches in the study of marine mammals: Ecology meets statistics

Len Thomas

Centre for Research into Ecological and Environmental Modelling, and School of Mathematics and Statistics, University of St Andrews, Scotland

len@mcs.st-and.ac.uk

Most ecologists get into the business because they are fundamentally interested in the animals they study. It can come as a horrible shock to find out that ecology is, at its heart, a quantitative discipline: we use experimental and observational data to test scientific hypotheses about the links between organisms and their environment. Similarly, in conservation, we require quantitative information to determine the best course of action. Marine mammals are often hard to study: they can occur at low density and range over huge distances in hard-to-reach places; what's more, they spend most of their life underwater, so not immediately accessible to us landlubbers. This often means that the information we can gather on them is limited, indirect, error-prone and expensive. To a statistician, such issues are wonderful challenges. Our business is quantifying uncertainty and helping to find the most cost-efficient ways to reduce it. Hence ecologists and statisticians are natural partners: the former provide interesting research problems and the latter help find new ways to answer the questions. I will illustrate how fruitful the relationship can be through a series of examples that highlight other presentations given at this meeting and ranging from small data problems (e.g., behavioural response studies) to large data problems (e.g., putting together diverse sets of sightings data). I will briefly highlight some useful tools of the modern statistician's trade: Bayesian methods; nonlinear random effects modelling; survey design methods. I'll argue that a basic statistical training is essential to ecologists, and advocate that difficult ecological problems are often best tackled by an interdisciplinary team that includes both ecologists and statisticians.

10th April 15:00

Marine mammal research using advanced-technology acoustic sensing platforms and software

David K. Mellinger, Holger Klinck, Sharon Nieukirk, Sara Heimich, Lu Yang, Jonathan Dodge, Karolin Klinck

Cooperative Institute for Marine Resources Studies, Oregon State Univeristy, 2030 SE Marine Science Dr., Newport, OR 97330 USA

David.Mellinger@oregonstate.edu

The marine bioacoustics laboratory at Oregon State University pursues research in sensor platforms for data collection, algorithms and software for acoustic analysis, and marine mammal studies that use these tools and techniques in locations worldwide. New platforms, developed in collaboration with other groups, include (1) an acoustically-equipped glider capable of missions to detect cetaceans lasting up to three months, (2) an autonomous float that surfaces to report acoustic encounters with marine mammals, (3) an autonomous hydrophone that can internally record ambient sound for up to two years, (4) a robotic sailboat with acoustic surveying capability, and (5) an acoustic tag attachable to seals and other marine mammals capable of producing and recording sound for playback-response studies. Algorithms have been developed for detection and classification of a large number of marine mammal species, particularly cetaceans, using a variety of techniques for (1) tonal sounds such as moans and whistles, (2) impulsive sounds such as grunts and echolocation clicks, (3) broadband sounds such as seal roars, (4) repetitive calls of many types, and (5) combination methods for handling both clicks and whistles. This algorithm work is supported by a large (>40 species), publically-accessible archive of annotated recordings designed for research in detection and classification. After development and testing, algorithms are implemented in user-friendly software for acoustic analysis, including Ishmael, Osprey, and Pamguard. Another line of research involves methods for population density estimation using animal calls received at acoustic sensors. This hardware and software technology has been applied to research projects at many sites around the world, including studies of harbor porpoise occurrence in the Baltic, blue and fin whales in the mid-Atlantic, right whales near

Iceland, fin whales off Portugal, Cuvier's and Blainville's beaked whales at many sites, bowhead whales in the Arctic, and many other projects.

10th April 15:15

dBs of freedom: How different environmental parameters influence the sound scape of cetacean habitats

Tanja Pangerc[1], Pete Theobald[1], Lian Wang[1], Paul Lepper[2], Stephen Robinson[1]

(1) National Physical Laboratory, Hampton Road, Teddington, Middlesex, TW11 0LW, UK
(2) School of Electronic, Electrical and Systems Engineering, Loughborough University, Leicestershire, LE11 3TU, UK

tanja.pangerc@npl.co.uk

Accurate representation of the underwater acoustic environment is one of the most important considerations when conducting passive acoustic monitoring, assessing the impact of anthropogenic noise on marine life, or establishing the range over which acoustic mitigation devices might be effective. How the sound will propagate through the water column depends on its interactions with the seafloor and sea surface, the local bathymetry and the acoustic properties of the water column. The way in which the propagating sound is influenced by this environment also strongly depends on the acoustic characteristics of the source. For the purposes of estimating a received level at a given range, it is important to know both the source level and the acoustic frequency characteristics of the source, and the depth of the receiver or receptor. This study theoretically explores the variation in transmission loss for a number of propagation environments and different sound sources. The results are presented in the context of the monitoring of cetacean vocalisations, acoustic mitigation devices and the assessment of the environmental impact of anthropogenic sound, and the sensitivities of the results to the influence of the environment are identified.

10th April 15:30

Broadband acoustic/video recordings and localisations of dusky dolphins (*Lagenorhynchus obscurus*) and short-beaked common dolphins (*Delphinus delphis*) in New Zealand

Michiel Schotten[1], Bernd Würsig[2], Dara Orbach[2], Ken Sexton[3], Sarah Piwetz[2]

(1) Ocean Ecosystems, University of Groningen, P.O. Box 11103, 9700 CC Groningen, The Netherlands / Dolphin Recording Tools, P.O. Box 27, 1483 ZG De Rijp, The Netherland
(2) Department of Marine Biology, Texas A&M University at Galveston, 200 SeaWolf Pkwy., Bldg. 3029, Galveston, TX 77551, USA
(3) The Sexton Corporation, 2130 Davcor St. SE, Salem, OR 97302, USA

mike_schotten@hotmail.com

The 4-channel UDDAS (Underwater Dolphin Data Acquisition System) is a 4-hydrophone diver-operated video-acoustic recorder, developed to record the echolocation and communication behaviours of wild dolphins, localise the recorded sounds in 3-D using differences in time of arrival from distances up to approx. 15-30 m, assign acoustic recordings up to 240 kHz to individual dolphins visible on video, and thus correlate acoustic signal parameters to different dolphin behaviours. A new upgraded system with faster processing and data storage capabilities is currently available. Using the 4-channel UDDAS, acoustic and video recordings were obtained from dusky dolphins (*Lagenorhynchus obscurus*) in New Zealand, both during the austral summer (Kaikoura) and winter (Admiralty Bay), as well as from short-beaked common dolphins (*Delphinus delphis*) in the austral winter. Echolocation clicks recorded from both species extended in frequency to the upper recording limit of 240 kHz. Additionally, a large portion of the recorded clicks had no energy in the human audio range (i.e., no energy <20 kHz), but these were made audible by slowing them down 10 times. The calculated 3-D positions of recorded clicks corresponded to the positions and movements of different dolphins recorded on video, and were animated into the video as flashing dots on the dolphins' foreheads. In Admiralty Bay, one occasion of coordinated feeding by dusky dolphins was recorded, where dolphins encircled and aggregated fish into a tightly packed stationary bait ball near the water surface. Although complicated due to the quick movements of dolphins and consequential off-axis recordings, analysis of sounds and videos recorded during such encounters may shed light on how dolphins acoustically coordinate such complex cooperative feeding behaviour.

10th April 15:45

Calls from the depths: Assessing pop-ups and pods for monitoring beaked whales in offshore habitats

Dave Wall

Irish Whale and Dolphin Group

dave.wall@wildocean.ie

From January to August 2011 two static acoustic monitoring devices were trialled to assess their effectiveness in monitoring habitat use by beaked whales and other deep diving cetacean species in a subsea canyon system on the east slopes of the Rockall Trough, 160km west of Ireland. The two devices tested were the Marine Autonomous Recording Unit (MARU), produced by the Bioacoustics Research Programme at Cornell University and the Deep C-POD, produced by Chelonia Ltd. Both devices were deployed at depths ranging from 1125m to 2353m via free-fall moorings that were recovered using acoustic releases. A Deep C-POD was also deployed at 500m in 3000m water depth in the Rockall Trough, using an existing weather buoy mooring. A number of limitations were evident in both technologies and areas of possible hardware and analysis software improvement were highlighted. Data from both devices indicated that there was a high level of cetacean activity at the study site with sperm whales, beaked whales and dolphin species recorded throughout the monitoring period. Data from the canyon system indicated that beaked whales and sperm whales were the most frequently detected species at depth whereas data from the weather buoy Deep C-POD indicated that a dolphin species, probably long-finned pilot whales, were the main species detected at that location. Anthropogenic noise levels at depth were extremely low and foraging sperm whales were the major contributing factor in the ambient noise environment. The results indicated that the use of Static Acoustic Monitoring Devices offers a cost-effective method for long-term monitoring of cetacean activity in offshore deep-water habitats which are difficult to access and suffer extreme weather conditions which make other monitoring methods impractical.

ABSTRACTS

POSTERS

Abundance/Distribution

AD01

First Mediterranean record of a free ranging Sowerby's beaked whale (*Mesoplodon bidens*) in a mixed species group with Cuvier's beaked whales (*Ziphius cavirostris*)

Luca Bittau, Valentina Gilioli Mattia Leone, Gabriele Costa, Renata Manconi

Department of Science for Nature and Environmental Resources (DIPNET), University of Sassari, Via Muroni, 25, 07100 Sassari, Italy

lbittau@uniss.it

Species belonging to the genus *Mesoplodon* Gervais, 1850 are among the least known of cetaceans. The genus was recorded in the Mediterranean Sea only for a few strandings. We present the first Mediterranean record of a free ranging *M. bidens* (Sowerby, 1804) during an ongoing project focused on pelagic cetaceans in the central Tyrrhenian Sea. Systematic and opportunistic data were collected from 2010 during at-sea surveys performed also for photo-identification purposes. *Ziphius cavirostris* Cuvier, 1823 regularly occurs in the study area. The Sowerby's beaked whale was recently sighted (June 2012) in proximity of the Caprera Canyon (off NE-Sardinia) in a mixed species group together with 3 Cuvier's beaked whales. All the 4 whales were identified preliminarily as Cuvier's. During the close approach one whale, ca. 5 m in length, displayed however a number of diagnostic morphological and behavioural traits, clearly seen and photographed: long thin beak, melon with prominent bulge, foreheads concave shape, small triangular dorsal fin. The comparative analysis vs other species of the genus highlighted that the beak is too much long to belong to *M. europaeus*, *M. densirostris* (previously stranded in the Mediterranean) or *M. mirus*. The animal surfaced to breathe at a steep angle displaying its beak way out of the water, as clearly shown by the photos. The observed colour pattern and long rake marks may point out a young male. Any presence of teeth on the lower jaw was not recorded but they may not have erupted yet. These traits, diagnostic at the species level, allowed us to ascribe tentatively the mesoplodont to *M. bidens*,

although its N-Atlantic core range is the North Sea, and no populations are known to live in the Mediterranean. All these data suggest that the mesoplodont in the Tyrrhenian Sea could be considered as a stray.

AD02

Dwarf sperm whales (*Kogia sima*) sighting on Grande Comore

Marco Bonato[2], Artadji Attoumane[1], Irene Piccini[2], Ouledi Ahmed[1], Cristina Giacoma[2]

(1) Faculty of Science and Technique, University of Comoros, Rue de la Corniche, Moroni, Comoros
(2) University of Torino, Life Sciences and Systems Biology Department, Via Accademia Albertina 13, 10123 Torino, Italy

marco.bonato@unito.it

The Unions of Comoros is one of the 25 biodiversity hotspot (Biodiversity hotspots for conservation priorities – Myers et all – Nature 2000) and they are characterized by a great species biodiversity with some unique species like the coelacanth (*Latimeria chalumnae*, Smith 1939). From the declaration of the Sanctuary of Cetaceans of the Indian Ocean in 1994, many conservation programs started. However, few information concerning cetaceans present in the Comoros Archipelago are available. Particularly world distribution of Dwarf and Pigmy sperm Whales (*Kogia sima* (Owen, 1866), *Kogia breviceps* (de Blainville, 1838)) is almost unknown and the majority of information recorded derived from stranded animals, also as a consequence of their elusive behaviour. We carried out marine mammals surveys on the west coast of the island with a small boat starting from the villages situated on the coast up to 2.6 miles offshore and we recorded a successful sighting of two Dwarf Sperm Whale (*Kogia sima* (Owen, 1866)) just in front of Grande Comore, the main island of the archipelago of Union of Comoros.

AD03

Density, seasonal distribution and habitat preferences of harbour porpoises from the southern bight of the North Sea and Dover Strait

Thibaut Bouveroux[1], Jeremy Kiszka[2], Valentine Simar[1], Sylvain Pezeril[1]

(1) OCEAMM (Observatoire pour la Conservation et l'Etude des Animaux et Milieux Marins). 51, rue du Général de Gaulle, - 59123 Zuydcoote, France - www.oceamm.org
(2) Marine Science Program, Department of Biological Sciences, Florida International University, 3000 NE 151 St., FL33181, North Miami, USA

tbouveroux@gmail.com

The harbour porpoise (*Phocoena phocoena*) has made a significant return along the coasts of Western Europe due to a shift of its distribution, particularly in the southern North Sea, English Channel and Bay of Biscay. However, very little is known on the seasonal occurrence and habitat preferences of harbour porpoises in these regions, except during summer as ship-based line transect surveys (SCANS-II) and few aerial surveys (PACOMM) were recently conducted. Here, we aimed to assess the seasonal occurrence (or encounter rates) and habitat preferences of harbour porpoises in the Dover Strait and adjacent waters (southern North Sea, eastern English Channel). Dedicated small-boat and ferry-based surveys (DFDS Seaways) were conducted between March 2009 and September 2012. Based on 519 sightings data collected under on-effort conditions, our results revealed significant monthly variations of encounter rates of harbour porpoises, with a peak of sightings between January and March. The lowest encounter rates were recorded in May and June. During summer, harbour porpoises occurred significantly closer to shore (6.5km in summer vs. 10km in winter and early spring), in shallower waters (less than 20m deep, $p<0.0001$). In addition, mother-calf pairs were observed during this season (in 11% of groups). Finally, sighting density was significantly higher off the North Sea coast than along the eastern Channel. The seasonal change of habitat preferences of harbour porpoises may be attributed to a dietary shift or a shift of prey distribution. This first dedicated study highlighted that harbour porpoises are densely distributed in the southern bight of the North Sea (particularly during late winter and early spring), where the maritime traffic is enormous and gillnet fishing effort intense. Given the increasing levels of bycatch recorded during the recent years (primary cause of death) in this region, this study provides strong baseline information to mitigate this threat.

AD04

Cetacean diversity across the Mediterranean Sea: first results from a new fixed-line transect from Tyrrhenian to Balearic Seas

Ilaria Campana[1], Antonella Arcangeli[2,3], Stefania Carcassi[1], Elisa Casella[4], Francesca Cracas[4]

(1) Accademia del Leviatano, Viale Astronomia 19, 00144 Rome, Italy
(2) ISPRA Nat-Bio, Via V. Brancati 48, 00144 Rome, Italy
(3) Università degli studi "Roma3", Via Ostiense 159, 00154, Rome, Italy
(4) Università degli studi"La Sapienza", Piazzale Aldo Moro 5 00185, Rome, Italy

ilariacampana@yahoo.it

Cetacean occurrence and distribution have been investigated in the central-western Mediterranean Sea since 2007, using ferries as observation platforms along fixed-line transects. Nowadays, regular monitoring allows homogeneous and synoptic large scale data collection along 7 inter-regional ferry routes joining the ISPRA network. In summer 2012 a new route between Civitavecchia (Italy) and Barcelona (Spain) was monitored, following the protocol already used in the rest of the network. The transect ran across two basins: the central Tyrrhenian Sea, which is studied since the 90's using the same methodology, and the Western Mediterranean Sea from Bonifacio Strait to Catalonia, where a new insight about cetaceans diversity is given by this research. From June to September 9.033 Km were travelled in 24 line-transects (197 hours on effort in standard conditions), and 199 sightings of almost 1.060 animals were recorded. The most abundant species were *B.physalus* and *S.coeruleoalba*, showing highest encounter rates in June (ER_{Sc} = sightings per hour on effort = 0.35±0.047; ER_{Bp} = 0.81±0.23); *P.macrocephalus* and *Z.cavirostris* were also detected in both basins with lower Encounter Rates (ER_{Pm} = 0.034±0.016; ER_{Zc}= 0.034±0.018); *G.griseus* and *T.truncatus* occurred in few occasions only. Information about animals' distribution in open sea, where other methods are difficult to apply, is provided by this study. Cetaceans sightings seemed quite continuous along the transect, even if an area of scarce presence was recognized in the middle of the Western basin, in correspondence with the Balearic abyssal plain. Special interest is focused on fin whale pattern of distribution, in relation to results coming out from the all monitoring network and to some ecological parameters (SST, Chl). The surveys will be carried out yearly round during the next months in order to enhance the understanding of fin whale movements in the whole Mediterranean basin.

AD05

Sightings pattern and distribution of cetacean species in the North West of England

Mathew D. Clough[1], Katrin Lohrengel[1], Shaun K. Bryan[2]

(1) Sea Watch Foundation, Paragon House, Wellington Place, New Quay, SA45 9NR, UK
(2) Liverpool John Moores University, Rodney House, 70 Mount Pleasant, Liverpool, L3 5UX, UK

matt999@hotmail.com

The North West of England is a highly understudied region of the UK. This area is currently undergoing a large amount of development in the form of offshore wind farms. Using opportunistic sightings data collected between 2006 and 2012 a baseline study was carried out. The sighting rates of bottlenose dolphin (*Tursiops truncatus*) and harbour porpoise (*Phocoena phocoena*) were assessed for their distribution across the counties of Cumbria, Lancashire and Merseyside. The data were then analysed for sighting rates between different years. *T. truncatus* sightings were found to have risen between 2006 and 2012 (R2 = 0.338, F=4.065). Forty-seven percent of all bottlenose sightings occurred around Merseyside. Conversely for *P. phocoena*, the percentage of sightings declined between 2006 and 2012 (R2 = 0.268, F=3.196). The porpoises were distributed primarily between Cumbria (40% of sightings) and Lancashire (40%). However, more recent sightings have increasingly been centred around Merseyside with 33% of the sightings in the region occurring within 2012. This coincides with the increased watch effort in the area but nevertheless highlights the fact that cetaceans occur regularly here. Traditionally, the North West has been regarded as having low numbers of cetaceans but with rising sighting rates and increasing industrial development in Liverpool Bay, there is a need for systematic studies of local cetacean populations to further assess the population status as well as to safeguard against potential detrimental anthropogenic impacts. Historically, other species have been sighted in the region. Minke whales (*Balaenoptera acutorostrata*) are the most commonly sighted of these species and have been sighted in all 3 counties. Other species seen less commonly include risso's dolphin (*Grampus griseus*), common dolphin (*Delphinus delphis*) and pilot whales (*Globicephala melas*). While these are species are likely only vagrants, further study is required ascertain how frequently they enter the regions waters.

AD06

Assessing the consistency of data collected using ferries as plataforms of opportunity for cetacean monitoring programs

Simone Cominelli[1,2], Aurelie Moulins[1], Valeria Rossi[2], Antonella Arcangeli[3], Lea David[4,5], Nathalie Di-Meglio[4,5], Paola Tepsich[1]

(1) CIMA Research Foundation, via Magliotto, 2 – 17100 Savona, Italy
(2) Università degli Studi di Parma, Dipartimento di Scienze Ambientali, Viale Uberti 11/A, 43100 Parma, Italy
(3) ISPRA, Via Vitaliano Brancati 48 - 00144 Roma, Italy
(4) EcoOcéan Institut, 18 rue des Hospices - 34090 Montpellier, France
(5) GIS3M

simone.cominelli@studenti.unipr.it

The aim of this work is to investigate the consistency of data collected using ferries as platform of opportunity, for estimating cetacean distribution and abundance in the Pelagos sanctuary. Distance sampling analysis is aimed to transform line transect data into densities calculated on a strip defined by Effective Strip Width (ESW). During summer 2011, 32 different Marine Mammal Observers (MMO) collected data onboard of 10 different ferries along 4 different routes crossing the Ligurian sea. Each ferry trip was considered as a strip-transect, surveyed once a week, all long the season. The study analyzes the influence of MMO and ferry characteristics (height of bridge and speed) as bias on data. To do so, ESW is estimated along each route as a measure of the effectively surveyed area. GLMs have been applied to verify the effects of the three studied variables (MMO, height of bridge and speed) on the perpendicular distances. Strong differences have been found among ESW along the four different routes with consequences on the estimated sampled strip (which ranged between 0.6 and 2.7 km2 width). Furthermore, we established that the ESW differences are mainly due to differences in species composition per route (e.g. average ESW for fin whales, bp, is 1640 m while average ESW for striped dolphins, sc, is 441 m). Thus, GLMs model have been fitted separately for striped dolphins and fin whales. For both species, the only studied parameter affecting sighting perpendicular distance is the bridge's height (P_value_sc= 1.01E-07; P_value_bp= 8.05E-02), while ferry speed and MMO don't show any significative statistical influence. Regional differences and platform characteristics should then be taken into account when analyzing this kind of dataset for density estimation purposes. Nevertheless, data collected from ferries are a

valuable source for monitoring programs on cetacean presence and distribution within wide areas.

AD07

Cetacean monitoring in Northeastern Atlantic Ocean: Occurrence and distribution of cetacean species in the Canary Basin

Ana Mafalda Correia[1], Paola Tepsich[2], Massimiliano Rosso[2], Rui Caldeira[3], Isabel Maria Sousa Pinto[1,3]

(1) Department of Biology, Faculty of Sciences, University of Porto, R. do Campo Alegre s/n, 4169-007 Porto, Portugal
(2) CIMA Research Foundation, Via Magliotto 2, 17100 Savona, Italy
(3) Interdisciplinary Centre of Marine and Environmental Research – CIIMAR, Rua dos Bragas 289, 4050 – 123 Porto, Portugal

anamafaldacorreia@gmail.com

Cetaceans are ecologically important as storers and transporters of energy in marine ecosystems. They are top-down regulators maintaining the prey-predator balance in complex and dynamic environments. Therefore, the understanding of cetacean distribution and habitat preferences represents a priority issue in marine conservation being a key support for management plans. In the Atlantic Ocean there are, at least, 30 cetacean species, but their distributions are poorly understood. Usual research is focused on few regional areas (e.g. Azores and Madeira) where effort is limited to a few miles from the coast. The present knowledge about cetacean distribution in the Atlantic is thus very localized and cannot be considered representative of the overall Northeastern Atlantic area. In this work, we used cargos as platforms of opportunity to collect data on cetacean occurrence, from July to October, 2012, along the route from continental Portugal (Lisbon and Oporto) to Madeira Island (Caniçal). A total of 131 sightings were recorded, considering on-effort and opportunistic records. A total of 7 species were identified: *Tursiops truncatus*, *Delphinus delphis*, *Balaenoptera acutorostrata, Ziphius cavirostris*, *Physeter catodon*, *Stenella frontalis* and *Globicephala macrorhynchus*. 6 sightings were not identified even at a sub-order level. Dolphin species were the most sighted with 63% of the sightings, followed by toothed and baleen whales with 16% of the sightings. 106 sightings were registered on-effort with an overall encounter rate (ER=sightings/100 nautical miles) of 1.85 on 5737 nm. Dolphins are the most encountered group (ER=1.10), followed by toothed (ER=0.35) and baleen whales (ER=0.31). Spatial analysis highlights that, considering the average length of monitored transects, most sightings concentrate at middle distance between departure and arrival ports. There is a clear

habitat partitioning among groups. These preliminary results confirm that maintaining these surveys can improve the knowledge on cetacean presence and distribution in the NE Atlantic Ocean.

AD08

Sighting of a North Pacific Right Whale (*Eubalaena japonica*) in the Piltun Bay area (Northeast Sakhalin) in 2012

Evgeniya Dolgova[1], Maxim Sidorenko[2], Alexander Burdin[3], Oksana Savenko[4]

(1) Marine Mammal Council, Nakhimovskiy prospect 36, Moscow, 117218, Russia
(2) Pacific Oceanological Institute, Far East Branch, Russian Academy of Sciences, Vladivostok, Russia
(3) Kamchatka Branch of Pacific Institute of Geography, Far East Branch - Russian Academy of Sciences, Petropavlovsk, Kamchatka, Russia
(4) Schmalhausen Institute of Zoology, NAS of Ukraine, Bogdan Khmelnytskyi str. 15, 01601 Kiev, Ukraine

e.dolgova@mail.ru

A western subpopulation of North Pacific right whale (*Eubalaena japonica*) summers in the Sea of Okhotsk between the Kuril Islands and Sakhalin Island, and estimated in the hundreds. Recent surveys encountered relatively few right whales while the basic aspects of the biology and ecology of the North Pacific right whale are poorly understood. The IUCN categorizes the North Pacific right whale as "Endangered". A field research project in the Piltun Bay (the northeast coast of Sakhalin Island) annually has been conducting since 1995, which is specifically focused on the monitoring of the Western Gray Whale. Heretofore during the survey there were registered the following species of cetaceans: gray whales, harbor porpoises, minke whales, killer whales, Beluga whales. Right whales have not been registered in the area before. The data was collected by the boat-based method of photo-identification. During the recent survey on July 06 was recorded one sighting of a North Pacific right whale at the northeast coast of Sakhalin Island (143.34 E, 52.86 N) 1 km offshore and 2.5 km away from the mouth of Piltun Bay, at the depth of 9.1 meters. The right whale was not great size, with distinguishing sloping head covered in callosities. It slowly moved to the south in a group of five adult gray whales. The right whale did not avoid the boat. This observation was the only one during the entire period of survey. Thereby, sightings of the North Pacific right whales in the area of Piltun Bay are of rare occurrence.

AD09

Distribution of cetaceans around Bardsey Island, NW Wales, in the late summer/early autumn 2010 - 2012

Sonja. M. Eisfeld, Rob Lott, Vicki James

Whale and Dolphin Conservation (WDC), Brookfield House, 38 St Paul Street, Chippenham, Wiltshire SN15 1LJ, England, UK

pine@nexgo.de

Information on the distribution and abundance of cetaceans in the waters off the Lleyn Peninsula, northwest Wales, remain fairly scarce, with few detailed studies being conducted on species other than the bottlenose dolphin (*Tursiops truncatus*). Other species might also be of considerable conservation priority due to commitments under the Habitats Directive, the Natural Environment and Rural Communities (NERC) and the Marine and Coastal Access (MCA) Acts. In the present study, three to six week surveys of the animals using the waters between the Lleyn Peninsula and Bardsey Island were carried out in late August, September and October 2010 to 2012. During 247 hours of dedicated land-based surveys from four different observation stations overlooking Bardsey Sound, 482 encounters were recorded with three different species, 44 of which included one or more calves. The most commonly sighted cetacean were harbour porpoises (*Phocoena phocoena*) comprising 97% of all encounters. The two other species recorded were Risso's dolphins (*Grampus griseus*) and bottlenose dolphins. Combined encounter rates (encounters per hour) for the four observation stations ranged from 0.1978 to 7.0633 for porpoise, 0.0253 to 0.0846 for Risso's and 0.0141 to 0.0278 for bottlenose dolphins. All three species are section 42 species of principal importance in Wales under the NERC Act. However, lack of data on porpoises and Risso's hampers the development of effective conservation management strategies for them in the area, and also makes an assessment on whether or not their conservation status can be seen as â favourableâ, as laid out under the Habitats Directive, impossible. The spatial occurrences of the three species are discussed with respect to the complex ecological, biological and anthropogenic factors in this location and the implications for future conservation strategies like Special Areas of Conservation (SACs) or Marine Conservation Zones (MCZs).

AD10

Population size estimate and level of associations of striped dolphin (*Stenella coeruleoalba*) in the Gulf of Corinth (Ionian Sea, Greece)

Giulia Fedele[1,2], Elena Papale[1,2], Marianna Anichini[1], Alice Galli[1], Melissa Reggente[1], Nora Arena[1,2], Marta Azzolin[1,2]

(1) Gaia Reasearch Institute Onlus, Corso Moncalieri 68, 10123 Torino, Italy
(2) University of Torino, Life Sciences and Systems Biology Department, Via Accademia Albertina 13, 10123 Torino, Italy

giulia.fedele@ymail.com

Striped dolphin is considered Vulnerable by IUCN at the Mediterranean level but, despite it, is the most abundant cetacean species in the basin, few studies has been carried out to analyse population size and social structure in the Greek waters. This study aimed to fill this gap focusing on the population living in the Gulf of Corinth using mark-recapture method. Data were collected during the summer period between 2009 and 2011. 78 surveys consisting in 186.41 monitoring hours, along 2114.66 km were carried out, 233 individuals have been photo-identified, 35% of which were sighted more than once. Cormak-Jolly-Seber (CJS) open population model in program MARK was used to estimate population size of marked individuals Nm = 611.81, with an apparent average survival rate of 0.85 (SD = 0.06) and average capture probability of 0.22 (SD = 0.22). Associations among individuals were considered at the pairs and group levels, of photo-identified individuals during 2010 and 2011. 69 couples were sighted twice and 4 couples three times. 14% of couples were observed with annual latence. During this period, 7 groups (composed at least of three individuals) were sighted twice. 46 individuals were sight both years. This study shows a high density of striped dolphins in the area and a complex social structure. Analysis of population trends and further researches on social structure will be useful to assess association stability and residency in coming years.

AD11

Estimating Cuvier's beaked whale availability bias with conventional boat-based methods

Alexandre Gannier[1,2]

(1) Groupe de Recherche sur les Cétacés
(2) Adrien Gannier - Ecole Nationale Vétérinaire de Lyon

a_o.gannier@club-internet.fr

Ziphiids can easily be missed during visual surveys because they spend the majority of their time underwater. It is therefore important to evaluate their surface availability. We studied the surface-dive cycles of Cuvier's beaked whales in the northwestern Mediterranean from 2008 to 2012, using conventional sailboat observation techniques aided with a 32 kHz bandwidth stereo hydrophone recording system. The hydrophone was used to determine when the whales were engaged in a deep feeding dive. The whales were typically observed from a minimal distance of 200m, hence minimizing the risk of natural behaviour disruption. Very good sea conditions were required to carry out this research: only 18 groups could be studied, including 7 studied over a prolonged period (average observation duration = 80 minutes). School size averaged 2.4 (range 1-8). A total of 62 dives and 65 surface sequences were timed. An average of 5.7 non-feeding dives were performed between two feeding dives, as determined on 3 occasions. The non-feeding dives were 12.2 minutes long average (SD = 2.7) and were followed by breathing sequences. The breathing phase lasted 178 sec in average (SD = 89 sec), with one breathing event every 10 sec. Depending on group size and synchrony, whales were not always visible during breathing phases: average Ziphius group was available at the surface for 2 min during every breathing phase (about 2/3 of the duration). Assuming that, and taking average dive durations as determined in our study, ziphius were available at the surface less than 9% of the time during a typical dive-surface cycle in the Mediterranean Sea. This figure is lower than available g(0) estimates published for ziphiid abundance surveys. Based on this preliminary study, Cuvier's beaked whale visual abundance surveys deliver heavily down-biased estimates when the availability bias is not properly accounted for.

AD12

Tidal influence on local distribution patterns of Pilot whale (*Globicephala melas*) in the Strait of Gibraltar

Elisa Gonzalez[1,2]

(1) Universidad de Cordoba, Spain
(2) Turmares Tarifa

eliandreo5@hotmail.com

Strait of Gibraltar is the only connection between the Atlantic Ocean and the Mediterranean Sea. The massive exchange of water occurring between the two basins, due to a difference in their evapotranspiration, facilitate the upwelling of nutrients from the seafloor, which sustains an impressive local biodiversity including seven species of cetaceans. This study aims at determining if currents, produced by tides, influence the patterns of distribution of Pilot whale, (*Globicephala melas),* the most frequently sighted species in this area. Distribution data were collected between 2004 and 2011 from April to October. The GPS positions of Pilot whales were combined with tide level data (low or high) at the time of the sighting. We draw a rectangle including the area with a higher density of sightings and we divided it into an east and west side of equal area. Then we tested if the frequency of sightings in the west and in the east areas deferred under the high or the low tide using a contingency table. The results show that the local distribution patterns of pilot whale, vary with the tides, with more sightings on the west side under the effect of high tide (56.35%) and more observations on the east side under the effect of the low tide (51.06%). Despite the statistic results (P-value<0'05), do not exist biological significance in view of percentages. These distribution patterns could be determined by the variations of the flow of water from the Atlantic Ocean to the Mediterranean Sea, which is more intense if the tide is lowering and less intense when it is increasing. Probably the distribution of Pilot whales follows the availability of food and is less influenced by the tides and the currents in the Strait.

AD13

A comparison of visual and acoustic survey data assessing harbour porpoise and bottlenose dolphin occurrence in the Cardigan Bay SAC, Wales

Melissa Goulton[1], Andrew Davies[1], Hanna Nuuttila[1], Peter Evans[1,2]

(1) School of Ocean Sciences, Bangor University, Menai Bridge, Anglesey, LL59 5AB
(2) Sea Watch Foundation, Paragon House, Wellington Place, New Quay, SA45 9NR

mgoulton@gmail.com

Acoustic techniques have certain advantages over visual survey methods as a means of monitoring the presence of cetaceans, but few studies have determined whether they provide similar detection trends. For the harbour porpoise and bottlenose dolphin, correlation matrices were produced that compared visual data (numbers of cetaceans in circular grid cells of varying area around T-PODs) to acoustic data (median number of detection positive minutes) across 12 sites in the inshore Cardigan Bay SAC during 2005-08. Correlations that compared the annual variation in sightings data around T-PODs in inshore areas to the absolute abundance estimated for the entire SAC, were also carried out. Additionally, for the bottlenose dolphin, data were compared to determine whether acoustic detections occurred within the same hour as visual detections. When data were combined across all years, high correlations were found between the visual and acoustic data across the 12 sites for both harbour porpoise and bottlenose dolphin. Lower, but still significant, correlations were found when the data were separated into years for both species. However, bottlenose dolphin behaviour was found to affect the correspondence between visual and acoustic data. For the harbour porpoise, a significant correlation was found between the absolute abundance estimate for the entire Cardigan Bay SAC and the acoustic data in the inshore area, but no correlation was found for bottlenose dolphin. Overall, the high correspondence between visual and acoustic data suggests that the derivation of quantitative density estimates using passive acoustic monitors has potential, although the behaviour of the bottlenose dolphin requires further consideration. A longer time period of data collection would help verify whether comparable trends exist between absolute abundance estimates and acoustic data collected in the inshore Cardigan Bay SAC.

AD14

North (summer) and South (winter) - Harbour Porpoise Migration within the Eastern German Bight

Sophie Hansen, Ansgar Diederichs, Georg Nehls

BioConsult SH, Brinckmannstrasse 31, Husum, Schleswig-Holstein, 25813, Germany

hansen.sophie@web.de

In the framework of wind park construction, Germany is required to conduct visual and acoustic monitoring of harbour porpoises. In this context we present acoustic data of harbour porpoises gathered from C-PODs within the German EEZ in the North Sea. The illustrated data were collected during several wind farm projects from January to December 2011. 19 different stations distributed all over the German EEZ can roughly be grouped in the two NATURA 2000 sites Sylt Outer Reef and Borkum Reef Ground respectively. Data were analysed on a daily scale with special focus on seasonal patterns in order to test the hypothesis that porpoises do migrate regularly between these two sites. This statement is supported by our acoustic data set showing partly a contra-cyclical seasonal detection rate. For the area Sylt Outer Reef highest detection rates were found during June whereas data from the Borkum Reef Ground area show a minimum for the same month. While, similarly, a higher detection rate can be observed in March/April for the Borkum Reef Ground area, the data of the Sylt area rather indicate a lower echolocation activity for that time period. A possible explanation might be that animals are moving in early spring from the southern into the northern area, and vice versa during autumn, which is also supported by several other datasets on harbour porpoise occurrence within the German Bight and adjacent waters such as the coastal areas of the Netherlands. Static acoustic monitoring data provides valuable information on spatio-temporal distribution patterns of harbour porpoises and can support the identification of certain functions of different areas for harbour porpoises within their annual life cycle. Further investigations on biological factors such as prey distribution might further strengthen our “migration” hypothesis.

AD15

Spatial-temporal distribution of minke whales in the Lower St. Lawrence Estuary Quebec, Canada

Aline Sophie Hock

University of Oldenburg, Germany

aline_hock@yahoo.de

The near shore waters of the St. Lawrence estuary in northeast Canada are characterized by strong tidal and up-welling currents and provide rich feeding grounds, seasonally frequented by minke whales (*Balaenoptera acutorostrata,* Lacépède 1804). To understand habitat selection and movement patterns of minke whale sighting data, taken on platforms of opportunity, was analyzed with respect to seasonal and spatial occurrence and the depth. In total 135 opportunistic minke whale encounters were recorded during 672.33 hours of effort between June and October 2005 to 2007 and in 2011. During the subsequent analysis inter-annual and seasonal variation in number, as well as inhomogeneous depth distribution of recorded sightings were observed. Furthermore three visual line-transect surveys following distance sampling methods after Buckland et al. (2001) were conducted between 15 of August and 22 of September 2011. On the length of 205.7 km (12.48 h) of dedicated survey effort 82 encounters were recorded across four cetacean species and one pinniped species. The most abundant encountered species were harbor porpoise (58% of total sightings) and grey seal (26%), followed by minke whale encounters (8%). The analysis revealed similar depths as the opportunistic data and very high porpoise occurrence compared to the proceeding years. These findings contribute to the knowledge of minke whale occurrence in the Lower St. Lawrence Estuary and can be considered for implication of minke habitat use into regional marine management strategies.

AD16

The site fidelity and abundance of the Grey seal (*Halichoerus grypus*) in North Wales

Lauren Hughes[1], Toby Oliver[2], Fiona Read[2], Jan Hiddink[1]

(1) School of Ocean Sciences, Bangor University, Menai Bridge, Isle of Anglesey, LL59 5AB, UK
(2) Countryside Council for Wales, Maes-y-Ffynnon, Penrhosgarnedd, Bangor, Gwynedd, LL57 2DW, UK

laurenhughes23@hotmail.com

Grey seals (*Halichoerus grypus*) in Britain represent 95% of the European population and are protected under the Conservation of Seals Act 1970. The British seal population has been on the increase, reaching almost 92000 in 2008. The Welsh population is distributed from Ramsey Island in the south to Hilbre Island (Dee Estuary) in the north. Haul-out sites are used by this species daily and multiple seals can be observed on the same site during the breeding, moulting and resting seasons. Abundance counts are needed in order to monitor and help maintain their Favourable Conservation Status (FCS). Site fidelity is defined as the degree to which an animal returns to a specific site. Grey seals in North Wales are thought to show high fidelity to certain sites during their life cycle. The Countryside Council for Wales (CCW) and others have collected data on grey seal abundance and distribution since 1992. Low-tide seal counts and photo-identification mark-recapture methods were conducted at seven sites in North Wales during breeding and moulting seasons from September 2012 to March 2013. Pelage analysis software (ExtractCompare) was used to identify individual seals. The results were incorporated into CCW's existing database to determine site fidelity. Preliminary results show that grey seals in North Wales exhibit high site fidelity during the breeding and moulting seasons. Low-tide counts and the monitoring of grey seals (here as low-tide counts and photo-ID) is needed to provide an up-to-date status of this population. This information is essential for effective conservation management such as Special Areas of Conservation (SAC) within the coastal waters of Wales.

AD17

Temporal trend and seasonal dynamics of harbour porpoises in Pomeranian Bight (Baltic Sea)

Vladislav Kosarev[1], Harald Benke[2], Stefan Bräger[2], M. Louise Burt[3], Ansgar Diederichs[1], Anja Gallus[2], Anne Herrmann[2], Jens C. Koblitz[2], Len Thomas[3], Ursula K. Verfuß[2,4], Laura Wollheim[1]

(1) BioConsult SH GmbH & Co. KG, Brinckmannstr. 31, 25183 Husum, Germany
(2) German Oceanographic Museum Stralsund, Katharinenberg 14-20, 18439 Stralsund, Germany
(3) Centre for Research into Environmental and Ecological Modelling, The Observatory, Buchanan Gardens, University of St. Andrews. St Andrews, Fife, KY16 9LZ, UK
(4) Current address: SMRU Ltd, New Technology Centre, North Haugh, St. Andrews, Fife KY16 9SR, UK

v.kosarev@bioconsult-sh.de

Harbour porpoises (*Phocoena phocoena*) are the only cetacean species regularly occurring and reproducing in the Baltic Sea. Obtaining knowledge about population dynamics of harbour porpoises and its underlying mechanisms is crucial for porpoise conservation. Temporal trends and seasonal dynamics of harbour porpoises inhabiting the Baltic Proper are of particular interest due to its low occurrence and unclear genetic status. The goal of this study is to estimate trends based on passive acoustic monitoring data collected within the Pomeranian Bight in the eastern part of the German Baltic Sea (Baltic Proper). Twenty-six stations of PODs (Porpoise Detectors) were deployed between 2005 and 2012 in an area of approximately 4,500 km2. The data show a clear seasonal pattern of porpoise presence in the study area within the year. There was also a possible general increase of detection rate within the study period from 2005 to 2012. To quantify these patterns, and make inferences about possible factors driving them, Generalized Additive Models (GAMs) of porpoise positive days per months were fitted as a function of several covariates such as water depth, water temperature, distance to coast and others. We discuss our findings, and their implications for Baltic porpoise conservation.

AD18

New abundance estimates for harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin *(Tursiops truncatus*) in Northern Spanish Cantabrian and adjacent waters of Bay of Biscay (2003-2011)

Alfredo López[1], José A. Vázquez[2], José Martínez[1], Ana Cañadas[3], Enara Marcos[4], Iranzu Maestre[5], Arturo Ruano[6], Luis Laria[7], Ángela Llanova[1], Kelly Macleod[8], Peter Evans[9]

(1) CEMMA, C/Camiño do Ceán 2, 36.350, Nigrán (Pontevedra), Spain
(2) SEC, C/Cabeza de Manzaneda 3Algeciras, Pelayo, 11390 (Cadiz), Spain
(3) ALNILAM Research and Conservation, C/ Cándamo 116, CP 28240, Hoyo de Manzanares (Madrid), Spain
(4) EIBE, C/Baserritar etorbidea 6ºD 3º 20280 Hondarribia. (Gupuzcoa), Spain
(5) AMBAR, C/ Blas de Otero, nº 18 5º izq.48014 Deusto (Bilbao), Spain
(6) La Piñera s/n. Villanueba. Eres. 33448. Gozon. (Asturias), Spain
(7) CEPESMA, C/ Muelle 333700 Luarca, (Oviedo), Spain
(8) ORCA, Organisation Cetacea,Brittany Centre, Wharf Road, Portsmouth. PO2 8RU, UK
(9) Sea Watch Foundation, Ewyn y Don, Bull Bay, Isle of Anglesey LL68 9SD, UK

cemma@arrakis.es

Harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*) are two priority cetacean species for European Union countries. Knowledge of the abundance of these species is a key factor for maintaining Favourable Conservation Status. The only survey to estimate abundance in Northern Spanish Cantabrian waters was carried out during the SCANS II project in July 2005. The abundance estimate obtained for bottlenose dolphin was 3,935 (CV=0.38), and 2,646 (CV=0.80) for harbour porpoise. These estimates include Atlantic continental Portuguese and southern French waters. Recently, genetic studies have identified a number of management units for harbour porpoises in the European Atlantic, and these have been broadly accepted by international cetacean working groups such as ASCOBANS and ICES. Those studies highlighted a high level of isolation for the small management unit around the Iberian Peninsula (IBNA) from the others located further north. In the present study, uncorrected abundance estimates for harbour porpoise and bottlenose dolphin were obtained using spatial modelling analysis of effort related visual data derived from both designed and non-designed surveys carried out in northern Spanish Cantabrian continental waters by nine different organisations between 2003 and 2011. The annual uncorrected abundance estimate obtained for harbour porpoise was 1,366 (CV=0.63, 95%CI: 840-1,759, n=40), with a density estimate of 0.0017 animals per square kilometre. The annual uncorrected abundance estimate

for bottlenose dolphin was 10,687 (CV=0.13, 95%CI: 6,566-11,565, n=262) with a density estimate of 0.0162 animals per square kilometre. Ways in which potential violation of some assumptions in the methodology used can affect the estimates, and implications on conservation actions of these results, are discussed.

AD19

Occurrence and distribution of Bottlenose dolphins *Tursiops truncatus* in the coastal area of southwest Portugal

Sara Magalhães, Bruno Claro

Mar Ilimitado, Rua do Poente, 8650-378 Sagres

sara@marilimitado.com

In Portugal mainland, most of the studies of the Bottlenose dolphin (*Tursiops truncatus*) focus on a resident population of Sado estuary in the central region and studies of coastal species are often based on strandings' data. Only more recently systematic surveys are starting to be conducted. This work investigates the occurrence, distribution and population structure of Bottlenose dolphins in the coastal region of southwest Portugal off St. Vincent Cape. Boat-based observations were carried out opportunistically onboard of dolphin watching boats between July 2005 and November 2012 by a qualified observer. A total of 1918 surveys on 942 different days were conducted. Although effort was higher during summer months (67%), trips were carried out throughout the year. Information regarding 152 sightings of the species is analysed. Estimated group size ranged between 1 and 50 animals (average of 14.61 11.59), and changed significantly between seasons. All age classes were observed, but calves and newborns were only present in summer and autumn months. The latter periods also presented higher group sizes. Additionally, GPS tracking was recorded on 1708 of the trips, resulting on 68878.63 km surveyed in a 546km2 area. Of these, 100 bottlenose dolphin sightings were recorded during search effort. Average distance of sightings to the shore was 9947m and average depth was 92m. Encounter rate (average=0.1435), abundance index (average=13.744) and Kernel estimates were calculated in order to investigate seasonality and spatial habitat use within the study area. Seasonal variation in population structure suggests different uses of the area throughout the year. Spatial analyses reveal habitat preferences and higher relative abundance of bottlenose dolphins in areas between 100m and 400m depth. Although studies relying on opportunistic platforms are suboptimal and have inherent procedural limitations, they provide information that would otherwise be unavailable.

AD20

Cruise ships as platforms for opportunity: efficacy for use in wide-scale cetacean monitoring and reporting of conservation status

Stephen Marsh[1], Richard Bull[1], Ben Jones[1], Michael J. Tetley[2]

(1) ORCA, Brittany Centre, Wharf Road, Portsmouth, UK, PO2 8RU
(2) Marine Sciences and Ecology, Montague House, Durham, UK, DH1 2LF

stephen@orcaweb.org.uk

Platforms of opportunity are regularly used to collect data on the distribution and ecology of cetacean species worldwide. Main types utilised include whale-watching boats and commercial passenger ferries covering a repeated transect. Cruise ships also present a potential platform on which to collect wide-scale distribution and life-history information to inform international assessments of cetacean conservation status. Trained ORCA observers collected effort and sightings information from two cruise ship platforms (*Spirit of Adventure* and *Quest for Adventure*) from 2007-2012. In total data was recorded on 19 cruises, throughout 14 EEZs within the North Atlantic, resulting in >30,000 km survey effort, ranging from 15° – 71° Latitude and -66° – 42° Longitude in coverage. ~962 sightings of marine wildlife were collected including cetaceans (21 *sp.*), pinnipeds, sharks and sea turtles. These were mapped across the North Atlantic region of survey coverage using both gridded sightings per unit effort (SPUE) and IUCN presence-only α-hull approaches. Of the species observed the most common included the harbour porpoise *Phocoena phocoena* (n = 271, % of total = 28.1, SPUE = 0.90 km^{-100}), minke whale *Balaenoptera acutorostrata* (n = 266, % of total = 27.7, SPUE = 0.88 km^{-100}), common dolphin *Delphinus delphis* (n = 105, % of total = 10.9, SPUE = 0.35 km^{-100}), fin whale *Balaenoptera physalus* (n = 41, % of total = 4.3, SPUE = 0.14 km^{-100}) and white-beaked dolphin *Lagenorynchus albirostris* (n = 24, % of total = 2.5, SPUE = 0.08 km^{-100}). Although the platforms didn't repeat the same survey tracks across all years, they did perform repeated annual survey coverage to the main regions visited (i.e. Marine Atlantic, Macaronesian, Mediterranean and Scandinavian), therefore providing spatio-temporal snapshots of species distribution, which long-term could provide important reporting of range shifts associated with impacts and climatic change at a regional scale.

AD21

Evaluation of abundance and distribution of whales (*Balaenoptera physalus*, *Megaptera novaeangliae*, *Eubalaena glacialis*) in the waters off Bar Harbor, Maine

Anna Michieli[1,2], Carlotta Mazzoldi[1], Sean K. Todd[2]

(1) Department of Biology, University of Padova, Via U. Bassi 58/B, 35131 Padova, Italy
(2) Allied Whale, College of the Atlantic, 105 Eden Street Bar Harbor, ME 04609, USA

annettem@libero.it

The Inner Schoodic Ridges/Mount Desert Rock Region (off Mount Desert Island, Maine, USA) attracts several species of feeding whales (*Eubalaena glacialis*, *Megaptera novaeangliae, Balaenoptera physalus*) during summertime. The main source of whale abundance and distribution data used was a 21-years (1989 - 2010) whale watching data set. The highest annual mean abundance of *B. physalus* and *M. novaeangliae* was recorded in 1996. The non-parametric Kruskal-Wallis test showed that *B. physalus* and *M. novaeangliae* daily frequency between years was significantly different (H_{20} = 139.59, $p < 0.001$, N = 1485; H_{20} = 132.09, $p < 0.001$, N = 1139, respectively). *B. physalus* was positively correlated with *M. novaeangliae* (r_P = 0.8, $p < 0.0001$, N = 21). The relationship between whale abundance and the North Atlantic Oscillation (NAO) indices was tested. The annual whale mean abundance was related to the winter NAO Index with a lag of 4 years (Spearman's correlation: $r_S = 0.57$, $p = 0.010$; $r_S = 0.64$, $p = 0.004$, for *B. physalus* and *M. novaeangliae*, respectively, N = 21). *E. glacialis* appeared to be positively related to the winter NAO Index with a lag of 2 years, but not significantly after applying the Bonferroni correction ($r_S = 0.47$, $p = 0.032$, N = 21). The different lag time observed was expected as *E. glacialis* – feeding exclusively on copepods – occupies a trophic level below *B. physalus* and *M. novaeangliae*. Zooplankton samples collected during summer 2010 from inshore and offshore sites were analyzed. Zooplankton assemblages inshore and offshore, although both dominated by copepods, differed in abundance and composition. Offshore copepods were generally less abundant, but *C. finmarchicus* (*E. glacialis* prey species) was significantly bigger than in the inshore area. The better quality of food offshore might help to understand the occurrence of *E. glacialis* sightings in that area.

AD22

Cetacean distribution in the Thracian Sea (North Aegean Sea, Greece) related with fishing activities

Cristina B. Milani[1,2,3], Adriana Vella[3], Pavlos Vidoris[1,2], Aris Christidis[1], Emmanuil Koutrakis[1]

(1) FRI- NAGREF Nea Peramos Kavala, Greece
(2) Adamas – marine research and education Skala Potamias Thassos, Greece
(3) Conservation Biology Research Group, University of Malta – Dept. of Biology, Msida, Malta

crismilani13@hotmail.com

Cetacean conservation accorded by ACCOBAMs requires relevant knowledge in the North Aegean Sea. The present study aims at obtaining such relevant data for the Thracian Sea, the northernmost point of the North Aegean Sea. The study area covers about 2000km2 in the Gulf of Kavala and around Thassos Island, in Greece. Dedicated cetacean boat surveys have been conducted since 2006, while opportunistic research platforms, including fishing boats (trawlers, purse seiners and small scale coastal vessels) were in use since autumn 2005. Up to autumn 2012, a total strip transect of 12442,7 km has been covered. *Tursiops truncatus* (Bottlenose dolphin) and *Delphinus delphis* (Common dolphin) commonly occurred in the study area, with an encounter rate (ER) of 0.38 and 0.24 groups/100km respectively. However, during fishing activities, the ERs of the two species were found to be 0.55 and 0.26 groups/100km, respectively. *Stenella coeruleoalba* (Striped dolphin) has also been recorded in few occasions, with ER 0.04 groups/100km, in the southern part of the study area, where the water is deeper. *Grampus griseus* (Risso's dolphin) has been recorded only once during fishing operation outside the study area, close to Lemnos Island. *Phocoena phocoena* (Harbour porpoise) has never been observed during the research period, even if the presence is attested in the Thracian Sea by 7 stranding in the last 10 years and by a single sighting in 1997 during a preliminary study. On going research in the area includes cetacean fisheries-associations, abundance and distribution estimations and stomach-content analyses from stranded specimens.

AD23

Changes in habitat use and distribution of the Galápagos sea lion (*Zalophus wollebaeki*) related to environmental variability

Ignasi Montero-Serra[1,2,3], Diego Páez-Rosas[3], Juan C. Murillo[2], Judith Denkinger[3], Katharina Fietz[3,4], Teresa Vegas-Vilarrúbia[1]

(1) Department of Ecology, Faculty of Biology, University of Barcelona, Spain. 08028
(2) Galápagos National Park Service, Galápagos Islands, Ecuador
(3) Gálapagos Science Center, University San Francisco of Quito, Ecuador
(4) Center for Geogenetics, Natural History Museum of Denmark, Vester Voldgade 5-7, 1350 Copenhagen K, Denmark

monteroserra@gmail.com

Understanding habitat use patterns of marine apex predators is of paramount importance for the effective design of conservation actions. Only then can the viability of their populations and thus the integrity and function of marine ecosystems be guaranteed. Among marine organisms, pinnipeds are especially vulnerable to habitat loss and degradation due to their amphibious life cycle. Habitat use has been broadly investigated in several temperate pinniped species, and has proven that daily and seasonal patterns can vary depending on natural factors and anthropogenic interactions. However, no study has yet incorporated the temporal scale in habitat selection in pinniped species under tropical conditions. In order to fill these knowledge gaps, we investigated the phenology, patterns of haul-out habitat use, and distribution in a tropical otarid, the Galápagos sea lion (*Zalophus wollebaeki*). We used land-based censuses carried out during a five year study period (2008 to 2012) to explore seasonal patterns, and a five month period of regular census (May to October 2011) to analyze haul-out preferences among three habitat types (sandy beaches, rocky areas and artificial structures). A strong seasonality was found in the distribution of animals, with almost six months of aggregation behavior and six months of equal distribution between sites. These patterns were related to sea temperature and the species' breeding seasons. Furthermore, habitat preferences were shown to change daily related to weather conditions. Abundance on sandy beaches showed negative correlation with air temperature with most of the animals found there during cold times, while abundance on rocky areas and artificial structures showed highly positive correlations with air temperature, showing increasing sea lion abundance the higher temperatures. These results suggest that *Z. wollebaeki* has a high degree of plasticity that

allows it to change distributions and habitat preferences depending on the environmental conditions.

AD24

A first assessment of the cetaceans' occurrence and threats in the offshore waters of Madeira

Cátia Nicolau[1], Filipe Alves[1,2], Rita Ferreira[1], Filipe Henriques[1], Ana Dinis[1,2], Cláudia Ribeiro[1,2], Luís Freitas[1,2]

(1) Madeira Whale Museum, 9200-031 Caniçal, Madeira, Portugal
(2) CIMAR/CIIMAR – Centre of Interdisciplinary Marine and Environmental Research, University of Porto, Rua dos Bragas 289, 4050-123 Porto, Portugal

catianicolau@museudabaleia.org

The research of cetacean in the Madeira archipelago has been mainly restricted to the inshore waters. Consequently, there is a lack of knowledge about cetaceans and of the interactions and impacts of human activities in the Madeira offshore waters. Therefore, between 2010 and 2012, studies, within the CETACEOSMADEIRA II project, were conducted in the Madeira offshore waters. Tuna fishing vessels were used as platforms of opportunity to collect data to determine the cetaceans' occurrence, relative frequency, behaviour and group composition, and to identify three potential threats: ship traffic, litter, and interaction between cetaceans and fisheries. One hundred and sixty one days of effort were carried out on board the fishing vessels, covering 50% of the fleet and the whole tuna fish season (March to September). A total of 6632.6km track line were covered on effort with 364 fishing events and 277 cetaceans' sightings recorded. We observed 12 cetacean species. *Delphinus delphis*, *Balaenoptera* sp. and non-identified small Dephinidae were the taxa with the highest encounter rates, 1.55, 1.08 and 0.74 per 100km, respectively. Preliminary data indicates that ship traffic and litter are insignificant, and that there is a low/moderate fishery-cetacean interaction. We observed that in 9 % (31) of the fishing events, cetaceans were present, and in 3% (11) there was a disturbance in the fisheries caused by the cetaceans. No cetacean by catch was register. The methodology used in this study, will be improved and incorporated in the Madeira archipelago Cetacean Monitoring program. A proposal for other type of research tools/platforms of opportunity will be also presented to integrate the program.

AD25

The presence of the sperm whale (*Physeter macrocephalus*) around the Azores: A study of re-sightings from 2003-2012

Stella Charlotte Niemeijer[1], Jennifer Libotte[2], Karin L. Hartman[3,4], Lisa Steiner[5]

(1) University of Applied Sciences 's-Hertogenbosch, onderwijsboulevard 221, 5223 DE, 's Hertogenbosch, Netherlands
(2) University of Rennes 1, campus scientifique et technologique de beaulieu 263 avenue du Général Leclerc, CS 74205 - 35042, RENNES CEDEX, France
(3) University of the Azores, Ladeira da Mãe de Deus, 9501-538 Ponta Delgada, Portugal
(4) Nova Atlantis Foundation, Rua Dr. Freitas Pimeltel 11, Santa Cruz das Ribeiras 9930-309 Pico, Portugal
(5) Whale Watch Azores, Estrada da Caldeira, 2 Horta 9900-089, Faial, Portugal

niemeijersc@live.nl

Sperm whales (*Physeter macrosephalus*) are considered to be a migrant species. In the Azores sperm whales can be seen year round. A catalogue of 295 individuals photographed between 2003 and 2012 was examined to determine if the majority of these animals are usually seen during summer (Jun-Jul-Aug), if animals that were re-sighted had a preference for a particular time of the year and if different animals are present during winter. The majority of whales were sighted during summer. A total of 61 individuals were re-sighted over the 10 years. During winter (Nov-Dec-Jan) 18 individuals were sighted and 4 of these were re-sighted outside of winter (various months and years). Previous research shows that female sperm whales generally stay in low latitudes year round. This new information could mean that some individual females remain in the Azores all year without a seasonal shift in latitude. 234 individuals were not re-sighted which indicates that the Azores also provides feeding grounds for passing groups of sperm whales as well as seasonal residents. Matching individuals to other catalogues could provide information on the movements of these wide-ranging animals. More work needs to be done in the winter to understand how different groups of animals use the Azorean Archipelago. Doing this should lead to a better understanding of the life history and migration patterns of sperm whales.

AD26

Trends of harbour porpoise (Phocoena phocoena) occurrence in the southern North Sea

Verena Peschko, Katrin Ronnenberg, Ursula Siebert, Anita Gilles

Institute for Terrestrial and Aquatic Wildlife Research (ITAW), University of Veterinary Medicine Hannover, Foundation, Werftstr. 6, 25761 Büsum, Germany

verena.peschko@tiho-hannover.de

In the southern North Sea harbour porpoise occurrence increased in recent years after a phase of absence or low abundances during earlier decades. Only very few studies on porpoise presence in the southern German North Sea exist so far. As anthropogenic activities will strongly increase in this part of the North Sea during the next years it is most important to assess population level effects. This study focuses on the analysis of temporal and spatial trends in porpoise density in this area of recent change. Dedicated aerial line-transect distance sampling surveys were conducted between 2002 and 2012 in the southern German North Sea in order to assess harbour porpoise density and distribution. Trends were analysed by applying a zero-inflated mixed model with a Bayesian approach (MCMCglmm, R package MCMCglmm) adding a latent variable for the estimation of the zero inflation process. During 53,350 km of survey effort 4,504 porpoises were recorded. Porpoise density in the western part of the study area was significantly higher than in the eastern part. Between 2002 and 2012 an increasing trend of porpoise occurrence was detected for the western part, density in the eastern part was found to be stable. Seasons were significantly different with highest porpoise density in spring and lower densities in summer and autumn. No winter surveys could be conducted. These findings clearly show that especially the south-western German North Sea serves as habitat of increasing importance for porpoises throughout the last decade. Definite reasons still remain unresolved. Change in prey abundance or less favourable conditions in other areas could be important factors which may also have caused a southward shift from high density areas in northern waters. On this baseline, further integrative approaches might lead to a sound understanding of the effect of anthropogenic activities on the future development of porpoise populations.

AD27

Applying distance sampling techniques to estimate bottlenose dolphin abundance in Madeira Island waters: first approach

Cláudia Ribeiro[1,2], Adalberto Carvalho[1], Cátia Nicolau[1], Filipe Alves[1,2], Ana Dinis[1,2], Ana Cañadas[3], Philip Hammond[4], Luís Freitas[1,2]

(1) Madeira Whale Museum, 9200-031 Caniçal, Madeira, Portugal
(2) CIMAR/CIIMAR – Centre of Interdisciplinary Marine and Environmental Research, University of Porto, Rua dos Bragas 289, 4050-123 Porto, Portugal
(3) Alnilam Research and Conservation,Cándamo 116, 28240 Hoyo de Manzananres, Madrid, Spain
(4) Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, Fife KY16 8LB, Scotland, UK

claudiaribeiro@museudabaleia.org

Assessing the conservation status of the bottlenose dolphin in Madeira waters requires reliable estimates of abundance of the species for the archipelago. This has a particular importance in the context of the establishment of marine Natura 2000 sites and the application of the EU Habitats Directive in Portugal. Information on cetaceans in Madeira waters was limited to species, temporal occurrence and encounter rates, so the Madeira Whale Museum implemented a programme of visual surveys using single platform distance sampling methods along zigzag line transects designed to give equal coverage probability to obtain abundance estimates of cetacean species in Madeira coastal waters. The surveys were carried out between 2007 and 2011; 129 transect lines were surveyed, generating a total of 7384km of effort in sea state < Beaufort 3. From a total of 312 cetacean sightings, the bottlenose dolphin was the second most sighted species, with 51 sightings. Detection probability was estimated using Multiple Covariate Distance Sampling (MCDS) in software DISTANCE. Abundance was estimated as 588 individuals (CV= 23%, 95% CI = 374-924). Nevertheless, data from 2012 have yet to be incorporated in the dataset, thus the estimate presented should be considered preliminary, plus the estimate does not account the visibility bias (perception and animals availability bias). Human activities have been increasing in the area, particularly the whale watching industry that has grown substantially in the last decade in Madeira Island. The abundance estimates obtained will inform management of these activities to maintain favourable conservation status for the bottlenose dolphins.

AD28

Results of four years cetacean monitoring using ferries as platform of research in the northern Tyrrhenian Sea: distribution and spatio-temporal variability

Anna Ruvolo[1,2], Antonella Arcangeli[3], Alberto Castelli[1], Cristina Luperini[1,2], Eliza Muzi[2]

(1) Università di Pisa, Dipartimento di Biologia, via Derna 1, 56126 Pisa, Italy
(2) Accademia del Leviatano, V.le Astronomia 19, 00144 Rome, Italy
(3) ISPRA Nat-Bio, via Brancati 60, 00144 Rome, Italy

stenella_blu@msn.com

Using ferries as a research platform, data from weekly observations were undertaken yearly-round from February 2008 to March 2012 along the fixed transect Livorno-Bastia route (northern Tyrrhenian Sea). In total, 201 cetacean sightings of almost 922 animals were recorded per total effort (239 transects; 22.838 km on effort). The most observed species were striped dolphin (48%), bottlenose dolphin (33%) and fin whale (15%), followed by sperm whale and common dolphin (3% and 1%). Striped dolphin (ER: sight./km±SE = 0.04±0.005) and bottlenose dolphin (ER: sight./km±SE = 0.02±0.004) were sighted regularly year-round, not showing significant differences in presence and seasonality during the four years of the study. Differences were detected in the spatial distribution of sightings, mainly linked to bathymetric characteristics of the area and species specific preferred sources of food. Besides, fin whale (ER: sight./km±SE = 0.01± 0.002) showed an yearly and seasonal variability. Higher presences were detected in autumn and spring (Er 0.013±0.005 and Er 0.021±0.006 respectively), in line with a prevalent use of the area as a path along the migration route to and from the known summer feeding ground (Corso-Ligurian-Provencal basin). Nevertheless, no sightings were recorded during the second and third year of study, demonstrating a high inter-annual variability. Results of the study add important information about cetacean species and long term use of this area within the Pelagos Sanctuary. In particular, outcomes introduce a key piece of knowledge within the puzzle of fin whale migration pattern along Tyrrhenian Sea in the central-western Mediterranean basin.

AD29

Occurrence of cetaceans in the central coast of mainland Portugal: Six years of data collection towards long term research

Erica Sá[1,2], Francisco Martinho[3], Nina Vieira[3,4], Cecília V. Ferreira[2], Sofia Quaresma[3,5], Inês Carvalho[3,4], Cristina Brito[3,4]

(1) Centro de Oceanografia, Faculdade de Ciências da Universidade de Lisboa,Campo Grande, 1749-016 Lisboa, Portugal
(2) AtlanticSafaris, Rua Quinta dos Frades, 904, Alcogulhe, 2400-821 Leiria, Portugal
(3) Escola de Mar, Teclabs, Campus da FCUL, Campo Grande, 1749-016 Lisboa, Portugal
(4) Associação Para as Ciências do Mar,Teclabs, Campus da FCUL, Campo Grande, 1749-016 Lisboa, Portugal
(5) Pelouro do Ambiente-Município de Alcobaça, Rua da Liberdade 2460-501 Alcobaça, Portugal

sa.erica@gmail.com

Details on species occurrence and distribution improve enormously with effort integration and the compilation of data from distinct platforms. The main objectives of this work were to identify the species that can be found in the central coast of Portugal (from Sesimbra to Nazaré), map their occurrence and characterize group types and behaviour observed. Between 2007 and 2012, 234 boat-based visual surveys were conducted, including surveys directed to cetacean research (with and without predefined transects) as well as surveys from platforms of opportunity (whale watching and environmental education surveys). These totals approximately 560 hours spent at sea and a total of 7 cetacean species observed. The species most frequently sighted were the common dolphin (*Delphinus delphis*) followed by the bottlenose dolphin (*Tursiops truncatus*). Mixed groups of common and striped dolphins (*Stenella coeruleoalba*) were occasionally observed. Baleen whales species observed were minke whales (*Balaenoptera acutorostrata*) and common whales (*Balaenoptera physalus*). The estimated sighting rate to the north region (Nazaré to Peniche) was 89% and to Sesimbra was 82%. For common and bottlenose dolphins, the analysis showed year round occurrence in the study area with no significant seasonal preferences ($p>0,05$). The existence of three submarine canyons, Nazaré, Lisbon and Setúbal, provides important upwelling currents that make these regions very rich in nutrients, potentially gathering the optimal conditions for the occurrence of several species of whales and dolphins. Long term studies will allow a characterization of species occurrence, distribution and habitat use, and possible changes over time, contributing as well to continuous conservation efforts.

AD30

The Sperm Whales (*Physeter macrocephalus*, Linnaeus, 1758) of the South coast of Pico Island, Azores

Rui Peres dos Santos[1], João Quaresma[1], Pedro Madruga[1], Serge Viallele[1], Lisa Steiner[2], Marianne Odendahl[1], Britta Adam[1]

(1) Espaço Talassa, Rua dos Baleeiros 9930, Lages do Pico, Pico Island, Azores, Portugal
(2) Whalewatch Azores, Estrada da caldeira nº2 Horta, Faial Island, Azores, Portugal

rpp_santos@hotmail.com

The social organization of Sperm Whales has been studied throughout the oceans by various scientists. Also about the sperm whale population around the archipelago of the Azores results have been published. Since 2008 the whale watching company Espaço Talassa gathers opportunistic Photo-ID data of the sperm whales sighted during their trips off the south coast of Pico Island. A total of 1808 pictures have been taken from 2008 till 2012 within the temporal scale from April till October each year. This study focuses on the group composition and temporal variance in occurrence of different groups using the date, the GPS position, the heading, dive time intervals and distance between individuals. Furthermore, we want to show that using whale watching boats can be a useful platform for research. As a distance between individuals belonging to the same group we handled a 5 nm range. Further, individuals within a range of 30° to both sides of each other's headings were considered to be in the same group. One particular female group with immatures showed a very high presence throughout all the years and throughout the whole seasonal time span. Considering the results whale watching boats can indeed be used as a tool to study cetaceans, although there should be corrected for effort time spend at sea and the area covered.

AD31

Temporal distribution of the most sighted baleen whales in Azores: fin whales (*Balaenoptera physalus*) and sei whales (*Balaenoptera borealis*)

Clara Sardà[1], Laura González[1,2], Miranda van der Linde[1]

(1) Futurismo Azores Whale Watching, Marina Pêro de Teive, 9500-771, Ponta Delgada, São Miguel, Azores
(2) Department of Applied Physics, Vigo University

clarasarda9@gmail.com

Sei whales (*Balaenoptera borealis*) and fin whales (*Balaenoptera physalus*) are migratory baleen whales that pass the Azores archipelago each year. Like other baleen whales they are sighted mostly frequently during the spring months, but generally with a much higher sighting rate than the other species. We analysed data collected along the south coast of São Miguel Island during whale watching tours with Futurismo Azores Whale Watching from 2006 to 2012. Photographs taken during encounters with fin whales were analysed and compiled into a photographic catalogue of individuals. In total, we recorded 131 encounters with fin whales and 130 with sei whales. According to these results they are the most frequently sighted baleen whale species in the Azores. Around 55% of sei whale encounters and 68% of fin whales were in April and May. Both species were sighted less frequently during the winter months (November-February), making up only the 3% of the total encounters. We photographically identified 45 different fin whales, mostly from encounters in the past three years, as photographic effort was very low in previous years. This fact may contribute to the absence of resightings of individuals, highlighting the importance of ongoing research in order to gain a better understanding of fin whales and other baleen whale species in this area.

AD32

Cetacean Distribution in Skjálfandi Bay, North East Iceland during the feeding season (May-September)

Ann Carole Vallejo[1], Ruth Fernandez[2], Marianne Helen Rasmussen[1]

(1) The University of Iceland research center in Húsavík, Hafnarstétt 3, 640 Húsavík, Iceland
(2) Centre for GeoGenetics, University of Copenhagen,Øster Voldgade 5-7 Copenhagen, Denmark

carola_vo@yahoo.ca

Iceland represents a hotspot for cetacean diversity, especially during the feeding season (May-September). Cetacean distribution patterns in Skjálfandi Bay were investigated by analyzing cetacean sightings data collected onboard whale watching platforms between 2001-2002 and 2004-2008. The species included in this study comprise Minke Whales (*Balaenoptera acutorostrata, N*=593), White Beaked Dolphins (*Lagenorhynchus albirostris, N*=281), Humpback Whales (*Megaptera novaeangliae, N*=363) and Porpoises (*Phocoena phocoena, N*=89). Cetacean presences and survey effort were incorporated into a Geographical Information System (GIS) and relationships between environmental variables and cetacean presences/absences were determined using General Additive Models (GAMS). To build the models, the presence/absence of each cetacean species were considered a response variable while at set of eco-geographical variables (depth, distance to coast, slope, standard deviation of slope) were considered as explanatory variables together with month and year. The distribution of all the species was influenced by depth. Minke whales and humpback whales presence show a strong tendency to deeper waters approximately between 200 - 350m depth and at larger distance to coast (>10Km) especially minke whales; while white beaked dolphin and harbor porpoises presence was distributed from deep to shallower waters (300-100m). Minke whales, humpback whales and harbour porpoises presence was related to seabed slope, depth and distance to coast; these models were explained with 33.3%, 15.1% and 28.3% respectively; white beaked dolphin presence had a variation in depth which explained 35%. Month was significant with a slightly difference in *p*-values specifically for minke whales, humpback whales and harbor porpoises. The results from this study will be essential for conservation and management purposes if we are to understand local and temporal patterns of cetacean distribution and ecology in an area widely used by whale watching platforms such as Skjálfandi Bay.

AD33

Baleen whales sighted occasionally in the Azores: Bryde's whale, minke whale and humpback whale

Miranda van der Linde, Laura González, Clara Sardà

Vigo University

miranda.vanderlinde@gmail.com

Around the archipelago of the Azores it is possible to see more than 24 species of whales and dolphins. These species can be divided into three groups according to the period and frequency of sightings: residents that are sighted throughout the whole year; seasonal species that occur during specific time periods; and occasional species that are sighted only rarely. We found that Bryde's whales (*Balaenoptera edeni*), minke whales (*Balaenoptera acutorostrata*) and humpback whales (*Megaptera novanglieae*) belong to the latter group. In order to assess the occurrence of these three species we analysed data collected during commercial whale watching tours with Futurismo Azores Whale Watching. The data we analysed were from encounters between 2006 and 2012 off the south coast of São Miguel Island (Azores). Bryde's whales were seen only at the end of August of 2009 during five encounters on four different days. Minke whales were encountered on 15 occasions, mostly in March-April of 2010, 2011 and 2012, although in 2006 they were sighted in November and in 2009 in August. Humpback whales were also sighted on 15 occasions, but with a larger temporal distribution as they were sighted across all seasons of the year. Humpback whales sighted during the last three years were photographically identified to make up a catalogue of 11 different individuals. One whale was resighted after only seven days, but there were no other resightings between seasons or years. Being baleen whales it is likely that they are passing the Azores during their migrations between their breeding grounds and the North Atlantic feeding grounds. However, more studies are required to better understand the occurrence of this species in the Azores, as we did not detect any patterns in the temporal distribution of our sightings.

AD34

Model selection for estimating population abundance of Risso's dolphins (*Grampus griseus*) off the south coast of Pico, Azores

Tim C.A. van der Stap[1], Karin L. Hartman[2,3], Anja Wittich[3], Ignas M.A. Heitkönig[4]

(1) Wageningen University and Research Centre (WUR), Wageningen Campus, Droevendaalsesteeg 4, 6708 PB, Wageningen, the Netherlands
(2) Department of Biology, University of the Azores, Rua Mãe de Deus 13, 9501-801, Ponta Delgada, Azores, Portugal
(3) Nova Atlantis Foundation, Risso's Dolphin Research Center, Rua Dr. Freitas Pimentel 11, 9930-309, Santa Cruz das Ribeiras, Lajes do Pico, Azores, Portugal
(4)Wageningen University and Research Centre (WUR), Resource Ecology Group, Droevendaalsesteeg 3A, 6708 PD, Wageningen, the Netherlands

tim.vanderstap@wur.nl

Estimating abundance of cetaceans is challenging given their open population structure. The accuracy and precision of population size estimates depend on the sample size, the model used, and on the assumptions made by different analyses. Photo-identification of individual animals enables multiple photographic recaptures over time. The objective of this study is to establish to what extent various abundance models converge in their open population of dolphin abundance, applying the MARK package. We used high quality dorsal fin photo-identification data collected on 670 Risso's dolphins over a four year period during summer (June-September, 2004-2007) off the south coast of Pico, Azores. Each individual was "marked" (= photo-identified) once, and usually re-sighted and photo-identified in the four consecutive summers of the study. Individuals were differentiated into six age classes and into three residency classes (119 resident = re-sighted every year, 272 partially resident = re-sighted in at least two out of three years, and 279 transient = sighted in only one year). We applied three main analyses, POPAN (= robust parameterization of Jolly Seber, open population model), closed population models with heterogeneity, and Pollock's robust design (mixed). The main analyses show broadly converging results, with the lowest abundance in 2007 and a peak abundance in 2006. POPAN estimated the total population size to be between 313 [236-390] and 417 [348-485]. Closed population models gave estimates between 360 [304-457] and 483 [408-607]. Pollock's robust design estimates varied between 387 [345-429] and 518 [470-567]. Even though population estimates under the different models co-vary with the years, there appears to be a stable population in the area. Conservation measurements should be taken to protect this population against anthropogenic whale-watching pressure.

Validation of the assumptions made with the analyses indicate that POPAN has high potential to be used for cetacean abundance estimation.

AD35

Model based uncorrected abundance estimates for fin whale (*Balaenoptera physalus*) and sperm whale (*Physeter macrocephalus*) in Northern Spanish Cantabrian and adjacent waters of Bay of Biscay (2003-2011)

José A. Vázquez[1], José Martínez-Cedeira[2], Alfredo López[2], Ana Cañadas[3], Enara Marcos[4], Iranzu Maestre[5], Arturo Ruano[6], Luis Laria[7], Kelly Macleod[8], Peter Evans[9]

(1) SEC, C/Cabeza de Manzaneda 3Algeciras, Pelayo, 11390 (Cadiz), Spain
(2) CEMMA, C/Camiño do Ceán 2, 36.350, Nigrán (Pontevedra), Spain
(3) ALNILAM Research and Conservation, C/ Cándamo 116, CP 28240, Hoyo de Manzanares (Madrid), Spain
(4) EIBE, C/Baserritar etorbidea 6ºD 3º 20280 Hondarribia. (Guipúzcoa), Spain
(5) AMBAR, C/ Blas de Otero, nº 18 5º izq.48014 Deusto (Bilbao), Spain
(6) Arturo Ruanao, La Piñera s/n. Villanueba. Eres. 33448. Gozon. (Asturias), Spain
(7) CEPESMA, C/ Muelle 333700 Luarca, (Oviedo), Spain
(8) ORCA, Organisation Cetacea,Brittany Centre, Wharf Road, Portsmouth, UK. PO2 8RU, UK
(9) Sea Watch Foundation, Ewyn y Don, Bull Bay, Isle of Anglesey LL68 9SD, UK

ggbvaboj@yahoo.es

The project "*Basis for development of conservation plans for cetacean species protected in the North Atlantic Marine Boundary*" is a conservation research project directed by CEMMA in collaboration with AMBAR, EIBE, CEPESMA and other European cetacean organisations and specialists as a contribution to the transposition of the Marine Strategy Framework Directive (Directive 2008/56/EC, of 17 June 2008) into the Spanish regulatory system by means of the law on the Protection of the Marine Environment (41/2010 of 29 December 2010). The main objective of the project is to contribute to the development of Conservation Plans for cetacean species included in the Spanish Catalogue of Endangered Species (Royal Decree 556/2011, of 20 April 2011) for northern Spanish Cantabrian and adjacent waters of the Bay of Biscay, by collecting and assessing scientific information available in the area, and identifying criteria and guidelines to contribute to the development of conservation strategies. Uncorrected abundance estimates for the two main large cetacean species present in the area, fin whale (*Balaenoptera physalus*) and sperm whale (*Physeter macrocephalus*), were obtained using spatial modelling analysis of effort related visual data from designed and non-designed surveys carried out in the area by nine different organisations between 2003 and 2011. During the study period, 64,323 km on effort, 895 fin whale and 74 sperm whale sightings were considered for analysis. The summer uncorrected abundance estimate and density obtained

for fin whale was 10,267 (CV=0.048, 95%CI: 9,507-11,101) with a density of 0.0155 animals per square kilometre, and 865 (CV=0.12, 95%CI: 767-1,041) and a density of 0.0013 animals per square kilometre for sperm whale. Different sources of bias having potential positive or negative effects, are discussed.

AD 36

Cetaceans in coastal waters of the Southern Crimea

Evgeny Gol'din

Southern Branch of the National University of Biological Resources and Environmental Management-Crimean Agricultural and Technological University, PB 2223, Simferopol, Crimea, 95043, Ukraine

evgeny_goldin@mail.ru

Crimean coastline between Ulu Uzen River mouth in Alushta and Sarych Cape is the most popular and haunted part of the Northern Black Sea region. Sub-Mediterranean landscapes, natural reserves, high level of biodiversity and fish-cetacean migration paths are found side by side with architectural and cultural monuments, developed touristic and recreational industry, intensive fishery and boat traffic. We analyzed the materials obtained from polling of 3259 university students, local people and volunteers (194 of respondents are residents of the Southern Coast of the Crimea, the others visit this area regularly) and field excursions in 2002-12; 720 sightings and 187 strandings were reported. Harbour porpoises, bottlenose and common dolphins were observed in the different parts of coastal zone, but the most of sightings/strandings were recorded in Yalta (25.6%/18.2%), Alushta (24.3%/16.6%), Foros (6.8%/8.0%), Partenit (5.3%/4.8%), Gurzuf (5.0%/6.4%), Alupka (4.6%/8.6%), Simeiz (4.3%/8.0%), Ay-Todor Cape (3.5%/3.7%), Placa Cape (3.7%/6.9%), Katsiveli (1.7%/7.0%). Cetaceans escorted fishing or cruise boats and ships in 22.9% cases of sightings. Bottlenose dolphins dominated in sightings (42.9%), while harbour porpoises dominated in strandings (54.0%). Cetaceans occurred all the year round; meanwhile sightings/strandings were registered mainly in summer (65.4%/58.3%), but also in spring (15.7%/18.7%), autumn (9.7%/7.5%) and winter (5.0%/5.3%). Winter occurrence was described in Yalta, Alushta, Partenit, Foros, Gurzuf, Simeiz, etc. Annual dynamics of sightings and strandings demonstrate some fluctuations. The highest rates of sightings were observed in 2003 (10.7%), 2004 (11.1%) and 2006 (10.0%)., and peaks of strandings – in 2003 (11.8%) and 2011 (9.1%). Findings of disarticulated animals were recorded (at least, 43 cases). Cases of by-catch and illegal direct taking were reported by anonymous local people, as well as cases of food consumption of carcasses by coastal residents and tourists, feeding of domestic and agricultural animals, and using in restaurant service.

AD37

Preliminary abundance and distribution of cetacean in Grande Comore

Artadji Attoumane[1], Marco Bonato[2], Irene Piccini[2], Ouledi Ahmed[1], Cristina Giacoma[2]

(1) Faculty of Science and Technique, University of Comoros, Rue de la Corniche, Moroni, Comoros,
(2) University of Torino, Life Sciences and Systems Biology Department, Via Accademia Albertina 13, 10123 Torino, Italy

artadjiattoumane@yahoo.fr

The Union of Comoros is located in the northern Mozambique Channel and is part of the Sanctuary of Cetaceans of the Indian Ocean. Since 2002, many research programs concerning marine mammals biodiversity and distribution are started. However, still few information about cetaceans present in the Comoros Archipelago are available. Aim of the present research is to describe the distribution and the abundance of marine mammals species on the west coast of Grande Comore particularly in the in the coelacanth area. Small-boat survey was carried out from the villages situated on the coast up to 2.6 miles offshore using the method of photo-identification covering over 65 miles square. The three more frequent sightings concerned: Spinner dolphins (*Stenella longirostris)*, pantropical spotted dolphin (*Stenella attenuata)* and bottlenose dolphin (*Tursiops sp*.). Other species less sighted are: short-finned pilot whale *(Globicephala macrorhynchus*), and sperm whales (*Physeter macrocephalus*). These shows a great abundance of marine mammals and potential key-sites for cetacean observation in order to prepare a conservation plan for the foreseen inclusion of these areas in the Comoros Marine National Park.

AD38

The Marine Strategy Framework Directive abundance and distribution indicators: a case study for the common bottlenose dolphin (*Tursiops truncatus*) in the central Mediterranean Sea based on aerial survey data

Giancarlo Lauriano[1], Simone Panigada[2,1], Nino Pierantonio[2], Greg Donovan[3]

(1) ISPRA, Via V. Brancati 60, 00144 Rome, Italy
(2) Tethys Research Institute, c/o Acquario Civico, Viale G.B. Gadio 2, 20121 Milan, Italy
(3) International Whaling Commission, Cambridge, U.K

giancarlo.lauriano@isprambiente.it

Knowledge of baseline parameters for a given population is fundamental to address many questions of ecological importance and for the implementation of conservation measures and an assessment of their effectiveness. Under the pillar of the European Habitat Directives, monitoring the status of species of community interest represents a legal obligation for the Member States. Recently, the Marine Strategy Framework Directive (MSFD), which is aimed at achieving or maintaining a "good environmental status", has requested regular reports on the population dynamics, range and status of species in Europe's waters. The Mediterranean Sea common bottlenose dolphin sub-population is included in international agreements and conventions and it has been assessed as *Vulnerable* according to the IUCN Red List Criteria. In 2010, line transect aerial surveys were conducted in a wide area included in the Western Mediterranean Sea Assessment Area (the Pelagos Sanctuary, the Central and the south Tyrrhenian Seas and the Seas of Corsica and Sardinia). Overall, 165 parallel transects, 15 km apart and totaling 21,189 km, were designed providing homogeneous coverage probability. In total, 21,090 km were flown on effort and 16 bottlenose dolphin sightings were recorded and used for abundance and density estimates. Differences were detected across the study area. The uncorrected (for availability and detection bias) abundance for the whole study area was 1,676 (CV= 38.25; 95% CI= 804 - 3492) with a density of 0.005 (CV=38.25%) and an encounter rate of 0.000758 groups/km (CV=27.5%). These first estimates for this species over such a wide area represent a useful baseline dataset to provide information following the requisites of the MSFD requirements and to inform conservation measures on both national and international levels. Aerial surveys, in conjunction with other studies (e.g. photo-identification) can provide a cost-effective means of fulfilling requirements under the MSFD and provide a valuable contribution to conservation efforts.

Acoustics

AC01

Assessment and Monitoring of Ocean Noise in Irish Waters

Suzanne Beck, Joanne O'Brien, Simon Berrow, Ian O'Connor

Marine Biodiversity Research Group, Galway-Mayo Institute of Technology, Dublin Road, Galway, Ireland

suuz_beck@hotmail.com

Anthropogenic noise is now recognised as a significant pollutant in the marine environment, and the EU Marine Strategy Framework Directive aims to address this. At present two indicators are set out under MSFD to assess ocean noise; 11.1.1) low and mid frequency impulsive sound and 11.2.1) low frequency continuous sound. Seismic surveying has been highlighted as Irelands main source of low and mid frequency impulsive noise and this study generated noise maps of the Irish EEZ illustrating areas of high pressure from seismic surveying through the calculation of 'bang days'. There is particular concern of the effects of anthropogenic noise on marine mammals because they have a highly developed auditory system and use sound actively for orientation, feeding and communication. Noise from shipping dominates anthropogenic noise levels at low frequencies and it is suspected that cetaceans using these frequencies, namely baleen whales, are at a higher risk of being significantly affected. This project aimed to estimate an approximate disturbance area for baleen whales though data gathered from ship AIS and VMS. This work, funded by the Environmental Protection Agency serves to inform management on how to meet requirements under MSFD.

AC02

Geographic variation in the whistle characteristics of bottlenose dolphins (*Tursiops truncatus*) between four locations in the North Atlantic Ocean

Anna Bird[1], Peter G H Evans[2]

(1) Bangor University
(2) Sea Watch Foundation/Bangor University

annabird12@gmail.com

The whistles of bottlenose dolphins (*Tursiops truncatus*) can differ between geographic locations, but the reasons behind these variations remain unclear. They could be reflective of cultural or genetic differences between populations. In this study, the characteristics of bottlenose dolphin whistles were compared between four locations in the North Atlantic Ocean (Cardigan Bay, Wales; the Shannon Estuary, Ireland; the Molène archipelago, France; and the Sado Estuary, Portugal). It was predicted that variation between populations would be greater than that within populations, due to the believed genetic distinction between the four populations, as well as probable differences between environmental variables. Recordings from the four locations were collected using either hydrophones or bottom-moored autonomous recorders between 2001 and 2012. Whistles were extracted from the recordings, and nine whistle characteristics were measured from each whistle. One-way ANOVAs and Kruskal- Wallis tests were undertaken on each of the nine whistle characteristics to determine the ways in which whistles varied between locations. The frequency and intensity variables of whistles from the Sado Estuary were significantly higher than the whistles from other areas. This variation could be due to differences in background noise levels, genetic differences, the openness of populations, or differences in body size. However, it seems most likely that differences in background noise levels between populations would explain the variation due to the high levels of large vessel traffic in the Sado Estuary. Future studies should focus on the full range of potential environmental correlates behind the existing variation between these four populations of bottlenose dolphins.

AC03

Impact of mooring designs on the receptivity of C-PODs

Anja Brandecker[1], Pia Anderwald[1], Kathrin Kruegel[2], Damien Haberlin[1]

(1) Coastal and Marine Research Centre, University College Cork, Irish Naval Base, Haulbowline, Cobh, Co. Cork, Ireland
(2) German Oceanographic Museum, Katharinenberg 14 - 20, 18439 Stralsund, Germany

Anja.Brandecker@gmx.de

A passive acoustic monitoring project of cetaceans has been running since 2002 to date in Broadhaven Bay, Co Mayo, Ireland. Over this period different mooring designs have been used. In order to test the impact of float proximity and net covering on the receptivity of C-PODs (acoustic data loggers), detection positive minutes (DPM) in the species category "Narrow-Band High Frequency" (NBHF, indicating harbour porpoise) gained from three C-PODs were compared. Beforehand the C-PODs had been calibrated at the German Oceanographic Museum to ascertain their sensitivity. A frame containing the C-PODs (triangle, 30cm apart) was deployed for 73 days at 11m water depth. While C-POD A (least sensitive) was uncovered, C-POD B (intermediate sensitivity) and C-POD C (most sensitive) were covered by a net and a float was attached at a distance of 1m (C-POD B) and 30cm (C-POD C), respectively. The software CPOD.exe (version 2.021) was used to download the data and to create CP3-files (classified positive events, e.g. DPM). The results show that the uncovered and least sensitive C-POD A had logged significantly more DPM than the covered but more sensitive C-POD B (Wilcoxon-test $p<0.01$). However, there was no significant difference between C-POD A and C, although the float was even closer to the hydrophone in comparison to C-POD B which is supposed to have a stronger negative effect (shadow) on the receptivity. The reason for this is most likely the higher sensitivity of C-POD C. Also no significant difference was found between C-POD C and B. The difference in sensitivity between these two C-PODs may have masked the influence caused by the proximity of the float. This study demonstrates that mooring designs can have a significant effect on the number of detections of cetaceans, but it is also important to consider the sensitivity of each C-POD.

AC04

Which one is the best? Comparing four different static acoustic monitoring devices

Katharina Brundiers[1], Katrin Schmuck[1], Mario Kost[1], Martin Jabbusch[1], Len Thomas[2], Harald Benke[1], Jens C. Koblitz[1]

(1) German Oceanographic Museum, Katharinenberg 14-20, 18439 Stralsund, Germany
(2) Centre for Research into Ecological and Environmental Modelling, The Observatory, Buchanan Gardens, University of St Andrews, St Andrews, Fife, Scotland, KY16 9LZ, UK

keybi_two@live.de

As the Baltic Sea harbour porpoise (*Phocoena phocoena*) is critically endangered, it is necessary to study its spatial distribution and seasonal occurrence to define marine protected areas. Experience has shown that the most suitable method for low density areas is acoustic monitoring using click detectors. The T-POD and its successor, the C-POD, are the acoustic monitoring devices that are commonly used. Other acoustic monitoring devices are also available, although less commonly deployed, namely the A-Tag (fixed stereo passive acoustic monitoring system) and the PCL (porpoise click logger); both have been used to conduct different studies. We determined the acoustic detection functions of the four acoustic monitoring devices by playing synthetic porpoise-like clicks at varying source levels and distances from 0 to 500 m. The maximum detection distances ranged from 62 m for the A-Tag (n=2), 91 m for the PCL (n=2), 174 m for the T-POD (n=3) to 258 m for the C-POD (n=7). In addition we investigated the user friendliness, the recorded parameters and the post processing of the recorded parameters and other factors of the different acoustic monitoring devices. Considering all aspects, the C-POD is the most suitable click detector for acoustic long term monitoring in low density areas. However, the individual advantages of the other acoustic monitoring devices should be taken into consideration while planning future monitoring projects.

AC05

SAMBAH - Static Acoustic Monitoring of the Baltic Sea Harbour Porpoise

Julia Carlström[1], Mats Amundin[2], Len Thomas[3], Jakob Tougaard[4], Jonas Teilmann[4], Jens Koblitz[5], Nick Tregenza[6], Ida Carlén[1], Line Kyhn[4], Daniel Wennerberg[2], Olli Loisa[7], Iwona Pawliczka[8], Anda Ikauniece[9], Ivar Jüssi[10], Šaškov Aleksej[11]

(1) AquaBiota Water Research, Löjtnantsgatan 25 7tr, Stockholm, SE-11550, Sweden
(2) Kolmården Wildlife Park, Kolmården, SE-61892, Sweden
(3) Centre for Research into Ecological and Environmental Modelling, The Observatory, Buchanan Gardens, University of St Andrews, St Andrews, Fife, Scotland, KY16 9LZ, UK
(4) Department of Bioscience, Aarhus University, Frederiksborgvej 399, Roskilde, DK-4000, Denmark
(5) German Oceanographic Museum, Stiftung des bürgerlichen Rechts, Katharinenberg 14 – 20, 18439 Stralsund, Germany
(6) Chelonia Limited, Beach Cottage, 5 Beach Terrace, Long Rock, Cornwall, TR20 8JE, UK
(7) Turku University of Applied Sciences, Joukahaisenkatu 3 A, Turku, 20520, Finland
(8) University of Gdansk, Bazynskiego 1a, Gdansk, 80-952, Poland
(9) Latvian Institute of Aquatic Ecology, Daugavgrivas 8, Riga, LV-1048, Latvia
(10) ProMare NPO, Vintriku Saula küla, Kose vald, Harjumaa, 75121, Estonia
(11) Coastal Reserach and Planning Institute, Klaipeda University, Herkaus Manto 84, Klaipeda, LT-92294, Lithuania

julia.carlstrom@aquabiota.se

The Baltic harbour porpoise (*Phocoena phocoena*) population is listed as critically endangered by IUCN and in Annex II and IV of the EU Habitat's Directive. There is considerable uncertainty about population size, important areas are essentially unknown, and NATURA 2000 areas have only been designated or proposed in two of eight EU Member States bordering the Baltic Sea. To provide reliable assessments of abundance and distribution and to identify habitat preferences and important areas, the trans-Baltic EU-funded project SAMBAH (2010-2014) deploys 300 click detectors (C-PODs) at 5-80m depth in the Baltic Proper from May 2011 to April 2013. Density and abundance estimation relies on C-POD data as well as supplementary data, such as echolocation rate, group size and C-POD detection function. Echolocation rate is being investigated by placing acoustic tags on wild porpoises, group size by spatial modelling of sightings and C-POD detection function by a set of experiments within or in cooperation with SAMBAH. Detection function experiments include concurrent visual and acoustic tracking of porpoises, playback experiments, triangulation by hydrophone arrays, and acoustic observations of porpoises swimming in pound nets. Habitat preferences and important areas are being identified by spatial habitat modelling based on density estimates by C-POD sites, satellite positions from tagged animals, and environmental data layers (e.g. bathymetry,

bottom substrate, oceanographic parameters, oxygen concentration, secchi depth, ecological features and vessel traffic). Preliminary findings on C-POD retrieval and logging rate and harbour porpoise detections will be presented. In addition to the scientific aspects of the project, large efforts are put into dissemination actions increasing the knowledge and awareness of the Baltic harbour porpoise among policymakers, managers, stakeholders and the public. Overall, the project is expected to provide a reliable abundance estimate and basis for designations of protected areas and other mitigation measures.

AC06

Automatic measurement of sperm whales size: cepstrum analysis through the clicks acoustic energy

Francesco Caruso[1,2,3], Sciacca Virginia[1,2], Pavan Gianni[2,3], SMO Collaboration[3]

(1) Department of Biological and Environmental Sciences, University of Messina, viale Ferdinando Stagno d'Alcontres, 31, 98166 Messina, Italy
(2) CIBRA (Interdisciplinary Center for Bioacoustics and Environmental Research), Università degli Studi di Pavia, via Taramelli 24, 27100 Pavia, Italy
(3) INFN – LNS (Istituto Nazionale di Fisica Nucleare – Laboratori Nazionali del Sud), via Santa Sofia 62, 95125 Catania, Italy

fcaruso@unime.it

The Sperm whale produces continuously short sound signals, called clicks, to recognize the environment and for the intraspecies communication. Each click has a multipulse structure. The Inter Pulse Intervals (IPIs) represent the travel time of the sound between the air sacs present inside the sperm whale's head. This characteristic offers the possibility to estimate acoustically the sperm whale size, by measuring the stable delay between the pulses (Nominal IPI). We started from the idea to estimate dimensions through the average of cepstrum analysis for a large number of clicks and we introduced a new method, considering the acoustic energy of the clicks. The script was developed in MATLAB platform. The user must set the analysis parameters, select the numbers of sperm whales recorded, the audio channel, the type of frequency filter and the threshold level to find clicks. The script allows to identify clicks by their acoustic energy, to extract the corresponding time intervals and to carry out a cepstrum analysis, both in waveform and in energy. Finally, it elaborates the average of cepstrum results for all clicks extracted and selects the more representative delays. The goal is the choice of the Nominal IPI values comparing waveform and energy results, with an automatic evaluation of reliability. First tests of this software were realized with the NEMO OvDE station dataset, which is an INFN-LNS project developed in the Mediterranean Ionian Sea. We have chosen the period with more sperm whales recordings and we compared the results with the manual cepstrum analysis, using SeaPro software developed by CIBRA. For the estimation of the animals' sizes we used different formulas in bibliography. This work has allowed us to analyse the sperm whales population structure in a strategic area. During the months of October 2005 and 2006 we found only adult animals.

AC07

Characterization and comparisons of click trains of *Tursiops truncatus* and *Stenella coeruleoalba* in the Central Mediterranean Sea

Maria Ceraulo[1], Marta Azzolin[2], Marianna Anichini[2], Ginevra Boldrocchi[1], Gaspare Buffa[1], Francesco Filiciotto[1], Maximiliano Giacalone[1], Cristina Giacoma[2], Vincenzo Maccarone[1], Elena Papale[2], Melissa Reggente[2], Giuseppa Buscaino[1]

(1) Istituto per l'Ambiente Marino Costiero U.O. di Capo Granitola – Consiglio Nazionale delle Ricerche, Via del Faro n° 3, 91021 Granitola, TP, Italy
(2) University of Torino, Life Sciences and Systems Biology Department, Via Accademia Albertina 13, 10123 Torino, Italy

ceraulo.maria@gmail.com

The present work focused on the characterization and comparison of click trains recorded from two Mediterranean odontocetes species: *Stenella ceruleoalba* and *Tursiops truncatus*. Acoustic data were recorded in two different areas of the central Mediterranean: the strait of Sicily and the Ionian sea. Two different acquisition systems were employed: a) recording in a band from 100 to 150.000 Hz, b) recording in a band from 0 to 48000 Hz. Acoustic data were analyzed by using the Avisoft SASLab Pro software, applying a high-pass filter of 3 KHz. The identification and the selection of individual click train were made manually, then the software measured automatically the following temporal parameters: number of pulses, duration of click train (ms), and relative pulse rate (Hz). In total we analyzed 349 click trains. Because data were not normally distributed, the Mann-Whitney U Test was carried out in order to compare: 1) the two areas, for each species; 2) the two species; 3) the two species for each area. For *Tursiops truncatus* the number of pulses and the duration were greater in the Ionian sea while the pulse rate were greater in the Strait of Sicily. For *Stenella ceruleoalba* the duration was grater in the Ionian sea. If we pool together data from the two sites, *Tursiops truncatus* showed an higer pulse rate than *Stenella ceruleoalba*. This result is consistent if we consider only the data of the Sicilian channel. In the Ionian sea, pulse rate didn't show any difference among species, while the duration and the number of pulses were higher for *Tursiops truncatus*. The results of this study show that it is possible to identify acoustically the two studied species by analyzing their click trains, considering also the location were the recordings were made.

AC08

Comparison of wild bottlenose dolphin (*Tursiops truncatus*) echolocation clicks recorded with a broadband hydrophone and C-POD dataloggers in Cardigan Bay, Wales

Winnie Courtene-Jones[1], Hanna Nuuttila[1,2], Jens Koblitz[3], Katharina Brundiers[3]

(1) SeaMôr Wildlife Tours, New Quay, SA45 9SF, Wales
(2) School of Ocean Sciences, University of Bangor, Westbury Mount, Menai Bridge, Anglesey, Wales, LL59 5AB
(3) German Oceanographic Museum, Stralsund, Germany

winniecj.1@gmail.com

In this study, bottlenose dolphin echolocations were recorded simultaneously with a C-POD and a broadband hydrophone, being used to assess the proportion and characteristics of clicks detected by each method. A Matlab script with an observer controlled amplitude threshold was used to detect dolphin clicks from the hydrophone data; whereas C-POD data was acquired using the automated train detection algorithm. Significantly fewer clicks (85%) were attained with the C-POD's train classification method compared to the hydrophone data, although there was a significant and strong positive correlation in the number of clicks recorded between the two methods (s = 409.7962, p-value <0.001, ρ = 0.7338). Contrary to expectations, the inter-click interval (ICI) characteristics of the C-POD data did not differ considerably from the hydrophone recordings. Of the inter-click interval parameters assessed, only maximum ICI was significantly different between the two datasets (at P<0.05). Based on an earlier analysis of C-POD recordings of dolphin and porpoise we hypothesized that the C-POD would miss some of the shortest ICIs, and expected the hydrophone to record a wider range of ICIs than the C-POD. In fact, the opposite was found from the data: the C-POD recorded shorter ICI values down to 6 ms in duration whereas the shortest ICIs recorded by the hydrophone were 20 ms long.

AC09

Estimating hearing thresholds of Harbor Porpoises (*Phocoena phocoena*) in the wild

Michael Dähne[1], Andreas Ruser[1], Janne Sundermeyer[1,2], Klaus Lucke[1,3], Dorian Houser[4], Jonas Teilmann[5], Ursula Siebert[1]

(1) Institute for Terrestrial and Aquatic Wildlife research, University of Veterinary Medicine Hannover, Foundation, Werftstraße 6, 25761 Büsum, Germany
(2) Seal Center Friedrichskoog, 25718 Friedrichskoog, Germany
(3) IMARES Wageningen UR, P.O. Box 167, 1790AD Den Burg, the Netherlands
(4) National Marine Mammal Foundation, Suite 200, 2240 Shelter Island Drive, San Diego CA 92106, USA
(5) Department of Bioscience, Aarhus University, Frederiksborgvej 399, DK-4000 Roskilde, Denmark

michael.daehne@gmx.com

Knowledge about hearing abilities of marine mammals is mostly based on studies on animals in captivity. Low sample sizes and the possibility to assess hearing sensitivities of a species from singular animals is one major caveat of these studies. We measured auditory evoked potentials for rapidly estimating hearing thresholds of harbor porpoises using the EVREST system to overcome low sample sizes on animals in the wild. Porpoises were reported from Danish fishermen when incidentally caught in pound nets and within the next 24 hours a hearing test was carried out using a floating platform to test the animal at the water surface. Thresholds from 4 to 160 kHz were estimated using amplitude modulated sine wave signals at up to 4 frequencies simultaneously to save valuable time during field work and keep the additional stress due to the hearing test at a minimum level. Four animals were tested in 2011 and one in 2012. Results of those hearing tests show highest sensitivities between 16 and 140 kHz with a sharp drop off towards 4 and 160 kHz. These results compare well to previously measured audiograms from the literature, as well as to audiograms measured on animals in rehabilitation. They furthermore provide a good estimate about the natural variability of hearing abilities in harbor porpoises. The study will continue with the ultimate goal to test free-ranging harbor porpoises for a temporary threshold shift using an airgun as a sound source.

AC10

Static acoustic monitoring of dolphins and harbour porpoises off NE Isle of Lewis, Scotland

Sarah Jayne Dolman, Nicola K. Hodgins

Whale and Dolphin Conservation

sarah.dolman@wdcs.org

Passive acoustic data were collected along the north-east coast of the Isle of Lewis in the Western Isles, Scotland. Data presented are from three CPODs in 2011 (from Bayble, Braighe and Kebboch Head) and from four CPODs in 2012 (from Broad Bay, Bayble, Braighe and Loch Erisort). Our aim was to record dolphin and porpoise vocalisations to understand their presence, and help to assess which areas and which times of year are important for the animals. Frequency of dolphin and porpoise detections per hour per day (DPH per day), or the detection rate, on each POD is presented. Both dolphins and porpoises were detected on all PODS during their deployments, but the number of days on which they were detected varied considerably from site to site. Given the number of dolphin species encountered visually in the survey area, it is likely that detections represent different species. Recommendations towards further investigation of click characteristics to determine species of dolphins detected are made. It is especially important to differentiate Risso's dolphin recordings from those of other dolphin species found in the region due to the Scottish marine protected area (MPA) Project.

AC11

Similarity patterns in syllables of killer whale calls do not correspond with the random evolution model

Olga Filatova[1], Mikhail Guzeev[2], Ivan Fedutin[1], Alexander Burdin[3], Erich Hoyt[4]

(1) Faculty of Biology, Moscow State University, Vorobyovy gory 119992, Moscow, Russia
(2) Faculty of Biology and Soil Sciences, St. Petersburg State University, St. Petersburg, Russia
(3) Kamchatka Branch of Pacific Institute of Geography DVO RAS, Petropavlovsk-Kamchatsky, Russia
(4) Whale and Dolphin Conservation Society, UK

alazor@rambler.ru

Killer whale groups have unique repertoires of stereotyped calls â vocal dialects, which are transmitted by vocal learning rather than genetically. It is generally accepted that the dialects pass mostly vertically from mother to offspring and change with time due to accumulation of random errors. To test this assumption, we compared the similarity of 10 syllables in 3 call types (K1, K5 and K7) across 14 families of resident killer whales from Avacha Gulf, Kamchatka, Russian Far East. The similarity was calculated using dynamic time warping algorithm in MATLAB. We found that similarity patterns varied for different syllables even within the same call type, and correlations of distance matrices in most cases were non-significant. We created the random evolution model in MATLAB to test if these patterns corresponded with this model. The model simulated the evolution of dialects of three groups. On the first stage, one group evolved independently and two evolved together. On the second stage, all three groups evolved independently. If the duration ratio of both stages was 1:1, the two related groups were more similar to each other than to the third group in 46% of cases (random 33,3%). If the duration of the second stage decreased related to the first stage, this percent increased, e.g. it was 54% when the ratio was 2:1 and 80% when the ratio was 20:1. However, the percent decreased if the variability of the simulated call traits was limited. Our results suggest that the observed correlation between similarity patterns of syllables is lower than predicted by the random evolution model, but this can be caused by different reasons, including the structural limitation of call variability.

AC12

Comparison of diverse classifiers of C-POD software and their applicability to low porpoise density area

Kathrin Krügel, Anja Brandecker Harald Benke, Anja Gallus

German Oceanographic Museum, Stralsund, Germany

anja.gallus@meeresmuseum.de

C-PODs are acoustic data loggers, which record tonal signals and clicks of cetaceans. The software C-POD.exe contains different train detection classifiers. The KERNO classifier, which is basic for every analysis, seeks click trains of different sources (e.g. “NBHF”, Narrow-Band High Frequency, indicating harbour porpoise) and classifies them to different likelihood-levels. This classifier is not adapted to distinctive features of areas, such as noise or simultaneous presence of different cetacean species. Hence, a further encounter classifier, called Hel1, was developed, which has been adjusted to areas of low harbour porpoise density. The aim of this study is to verify Hel1 and its applicability to the Pomeranian Bay (Baltic Sea) as such an area of low density and therefore to estimate whether the visual screening of results gained by KERNO can be avoided. For this purpose the data sets of three positions (s1, s2, s3) over a period of two years from the Pomeranian Bay (Baltic Sea) have been automatically analysed by KERNO and Hel1 (C-POD.exe version 2.033) and were exported in 10 detection positive minutes (dp10m) units. Assuming that detections classified by KERNO represent the main unit, all dp10m were visually verified to determine possible false-positive detections. The results show that at two stations KERNO fitted better to our visual screening than Hel1 (normalized correlation for s1: 0.853 and s2: 0.823). At station 3 the Hel1 classifier fitted better (normalized correlation 0.838). 28-48% of all KERNO detections were false-positive and 2-5 % false-negative. For Hel1 we calculate a false-positive rate between 3 and 21 % and a false-negative rate of 22-26%. That implies no advanced in Hel1 as an encounter classifier for our study area. Therefore Hel1 doesn’t seem to be an adequate solution to avoid the visual screening. Further investigations are necessary to confirm this result.

AC13

Whales and earthquakes: monitoring fin whales (*Balaenoptera physalus*) off the southern Portuguese coast using seismometers

Danielle Harris[1,2], Luis Matias[3], David K. Mellinger[4], Len Thomas[1,2]

(1) Centre for Research into Ecological and Environmental Modelling, The Observatory, Buchanan Gardens, University of St. Andrews, St. Andrews, Fife, KY16 9LZ, UK
(2) Scottish Oceans Institute, East Sands, St. Andrews, Fife, KY16 8LB, UK
(3) Instituto Dom Luiz, Campo Grande, Ed. C8, Piso 3, 1749-016 Lisboa, Portugal
(4) Cooperative Institute for Marine Resources Studies, Oregon State University, Hatfield Marine Science Center, 2030 SE Marine Science Drive, Newport, Oregon 97365, USA

dh17@st-andrews.ac.uk

Monitoring marine mammals using static acoustic sensors is becoming an increasingly popular survey technique. In several cases, instruments deployed for other purposes (e.g., military activities) provide extremely useful opportunistic datasets. Here we present an analysis of fin whale (*Balaenoptera physalus*) calls recorded on an array of 24 ocean bottom seismometers (OBSs). The array was deployed off the south coast of Portugal between 2007 and 2008. Each OBS had a hydrophone and a 3-component seismometer. Automatic detection methods were used to detect fin whale calls. The detection process was evaluated and the rate of false detections was estimated. Ranges to detected calls were estimated from the seismometers using a standard seismological method usually used to estimate earthquake locations. Point transect sampling, a form of distance sampling (a popular wildlife abundance estimation method), was then used to calculate the average probability of detecting a call, which allowed undetected calls to be accounted for. This is a key step towards estimating animal density from acoustic data (though it was not possible to convert call density into animal density because the appropriate average fin whale call rate was unknown). Statistical modelling techniques were used to test the effects of ambient noise levels and the location of each OBS on the call detection probability. Additionally, mark-recapture methods were used to investigate differences in call detection probability between the hydrophones and the seismometers. Finally, links between calling activity and oceanographic processes were explored using a generalised additive model (GAM) that incorporated environmental covariates (e.g., chlorophyll concentration and sea surface temperature). Using the results from the GAM, combined with the detection probability information, a call density surface was fitted across the study area, depicting the spatial patterns of fin whale calling in this region.

AC14

On the way to long-term acoustic monitoring: How to compare C-POD and T-POD data from a low-density area

Anne Herrmann[1], Vlad Kosarev[2], Stefan Bräger[1], Laura Wollheim[2], Anja Gallus[1], Ansgar Diederichs[2], Len Thomas[3], M. Louise Burt[3], Harald Benke[1], Jens C. Koblitz[1]

(1) German Oceanographic Museum Stralsund, Katharinenberg 14-20, 18439 Stralsund, Germany
(2) BioConsult SH GmbH & Co. KG, Brinckmannstr. 31, 25183 Husum, Germany
(3) Centre for Research into Environmental and Ecological Modelling, The Observatory, Buchanan Gardens, University of St Andrews. St Andrews, Fife, KY169LZ, UK

AH2205@gmx.de

PODs (Porpoise Detectors) are a common research tool for the static acoustic monitoring of porpoises and dolphins. In 2008, the C-POD replaced the formerly used T-POD. The aim of this study was to create direct comparability of data gathered with these two autonomous data loggers. Twin-packs of C-PODs and T-PODs were deployed over 2.75 years (July 2009 to March 2012) at 12 stations in the eastern part of the German Baltic Sea (Pomeranian Bay), a low-density area for harbour porpoises. Each twin-pack was exchanged every 2-3 month with a new combination of C-/T-POD. The registration rates were analysed for every station and every twin-pack. On average, T-PODs appeared to be more sensitive than C-PODs and detected more harbour porpoises. Only few harbour porpoise registrations occurred simultaneously on C-PODs and T-PODs. The performance of both devices, however, differed among stations and deployment periods. Recording rates were aggregated and analysed in a Generalised Additive Model (GAM) that considered date, station, POD type and POD-ID as explanatory variables. For most of the stations, the model predicted a higher count of porpoise positive days per month (ppd/m) for the T-PODs than for the C-PODs. Furthermore, a temporal and a spatial autocorrelation of registrations was found. A correction factor was calculated as the weighted mean of the counts per sample. This study shows that although both click detectors differ from each other in their performance to register harbour porpoises, the data can be made comparable by converting registration rates from C-POD to T-POD and vice versa.

AC15

Quantitative species identification between Phocoenidae and Delphinidae using simple two-band ratio comparison

Saho Kameyama[1], Tomonari Akamatsu[2,3], Ayaka Amaha Öztürk[4], Ayhan Dede[4], Nobuaki Arai[1]

(1) Graduate School of Informatics, Kyoto University, 606-8501 Kyoto, Japan
(2) National Research Institute of Fisheries Engineering, Fisheries Research Agency, 314-0408 Ibaraki, Japan
(3) Japan Science and Technology Agency, CREST, Sanbancho, Chiyoda-ku, Tokyo, 102-0075, Japan
(4) Faculty of Fisheries, Istanbul University / Turkish Marine Research Foundation

kamesaho@bre.soc.i.kyoto-u.ac.jp

Passive acoustic monitoring system has been used for the presence and density monitoring of cetaceans. However, the acoustic identification method of species is not fully established yet. Previous studies used the difference in acoustic characteristics of the biosonar sounds to identify Phocoenidae out of Delphinidae. However, correct detection and false alarm ratio of this method was not well documented so far. In this study, we used a simple comparison to identify Phocoenidae using two-band spectrum ratio at 130 kHz and 70 kHz in the Istanbul Strait, Turkey, where one phocoenid species, harbor porpoise (*Phocoena phocoena*), and two delphinid species, short-beaked common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncatus*) have been observed. An acoustic event recorder (A-tag) with two hydrophones, which are most sensitive at 130 kHz and 70 kHz, respectively, was fixed at the middle of the Strait from 12 April to 1 June 2012. The visual observation was conducted simultaneously to obtain ground truth. We obtained 639 click trains of delphinids, 104 click trains of harbor porpoise confirmed by the visual observation. We calculated the average two-band ratio for each click train. A fixed threshold of the ratio to divide families, provided >80% correct detection and <20% of false alarm for both Phocoenidae and Delphinidae in the case that the mixed ratio of two families between 0.72 and 2.18. We introduced dynamic threshold depending on the mixed ratio of two families to maximize the accuracy of identification. The same identification performance above could be provided between 0.55 and 2.66 of mixed ratio, which is wider than previous range using fixed threshold. Proposed dynamic threshold using mixed family ratio had better identification performance than using fixed threshold for species discrimination.

AC16

Acoustic data reveal the seasonal occurrence of harbour porpoise in the Puck Bay, Southern Baltic

Monika Kosecka[1], Krzysztof E. Skóra[1], Iwona Pawliczka[1], Radomil Koza[1], Ursula Verfuß[1], Nick Tregenza[2]

(1) Hel Marine Station of the Institute of Oceanography, University of Gdansk, Morska 2, 84-150 Hel, Poland
(2) Centre for Ecology and Conservation, University of Exeter, Falmouth, UK

ocemkosecka@ug.edu.pl

Harbour porpoise is the only cetacean species present in the Baltic Sea. Although it is common throughout Northern hemisphere, the Baltic population is considered critically endangered. Knowledge of harbour porpoise presence in Polish waters comes from opportunistic sightings, strandings and voluntarily reported bycatch. The region with the highest number of bycatch reports is Puck Bay. To verify seasonality of porpoise occurrence derived from bycatch data in Puck Bay, static acoustic monitoring using C-PODs was conducted 2009-2011. The devices were placed in two parallel lines that porpoises had to cross to enter or leave the Bay. Taking into account the low density of harbour porpoises, the two lines had C-PODs spaced at a distance of around 700m. Since this area is heavily used by a small boat fishery which can, together with sediment transport noise, generate significant numbers of false positive porpoise detections, a new classifier, based on the acoustic characteristic of false positives recorded in Puck Bay, was designed to reduce those errors. During 1099 days of acoustic monitoring 98 days had porpoise detection and contained 2476 porpoise click trains. Porpoise presence was detected throughout the whole study period, with the highest level occurring during winter months (January - March), giving a positive correlation with low water temperature in the Bay. Those results are in line with seasonality of harbour porpoise bycatch in the Puck Bay region. The seasonal pattern is compared with the Helcom - Ascobans Baltic Sea porpoise database and the results of German acoustic monitoring.

AC17

How whistles recognition in Bottlenose dolphins (*Tursiops truncatus*) can help to protect a wild population?

Didier Mauuary[1], Fabrice Schnoller[1], Fabienne Delfour[3]

(1) Cyberio, 6bis chemin des prés, 38240 Meylan, France
(2) Click'Research, 6 chemin de Manes, 97410 La Montagne, La Réunion, France
(3) Animaux et Compagnie, www.animauxetcompagnie.com

didier.mauuary@cyberio-dsi.com

Due to difficult visual observations and rare encounters, the population of bottlenose dolphins (*Tursiops truncatus*) faces a data deficient status in Reunion Island (IUCN, 2010). Here we propose an innovative and easy-to-use method to complement visual observations for population monitoring. The procedure is based on "signature whistle" identification. For four years, the Abyss Ngo has regularly observed groups of common bottlenose dolphins (*Tursiops truncatus*) off the coasts of Reunion Island. Scientists used underwater HD video cameras for visual and stereo acoustic recordings; their quality is high enough to allow a spectral analysis of the dolphins' vocalisations. 750 hours of survey and 18 sightings/encounters with bottlenose dolphins provide a database with more than 1800 narrow-band frequency-modulated signals. The signature database is tagged according to 40 models of potential signature whistles (Kappa test: 81). The video database is also tagged according visual identification marks. The analysis shows a strong correlation between visual observations and the recorded potential signature whistles (Monte-Carlo test: $p<0.0001$ and coefficient of contingency 0,969). We discuss in the paper the result interpretation and the benefits of using this procedure to assess the size of a bottlenose dolphins population and to get knowledge on its structure. We argue that this finding also brings valuable information on the context of emission of whistles by wild dolphins in interspecific encounters.

AC18

An automatic skeleton-based method for extracting dolphin whistles from spectrogram. A case study: Short-beaked common dolphin

Medjber Bouzidi[1], Alessio Maglio[2], Yanis Souami[2], Alain Loussert[3], Gilles Keryer[3]

(1) SINAY and ISEN de Brest
(2) SINAY
(3) ISEN de Brest

medjber.bouzidi@sinay.fr

Acoustic monitoring is one of the most powerful methods used for marine mammal conservation purposes. Whistles emitted by several species of toothed whales allow detection, identification and density estimation of these populations. Worldwide monitoring projects using acoustic methodologies generate huge amounts of data that need to be treated through automated and real time processing systems. In this work, we present an automated method to detect and extract dolphin whistles from spectrogram of recorded underwater signals. For this purpose, an algorithm was developed in MATLAB and applied to short-beaked common dolphin records belonging to MobySound Library. It deals with the challenge of extracting whistles simultaneously emitted by several individuals as they swim in group. The algorithm is composed of three steps. First, a binary image is obtained through a local thresholding of the raw spectrogram. Then, the skeleton of this image is extracted and decomposed into separated segments by cutting the nodes where a whistle crosses another one. Finally, a criterion based on the Euclidean distance between segments and their orientation was defined in order to correctly reconnect the extracted segments. We tested the efficiency of proposed method on more than six hundreds whistles of common dolphins. Our method detects 77% of whistles with only 11.2% of false positive rate and the coverage rate of detected whistles is 80.51%. Additionally, the good quality of extraction is also measured by the low fragmentation rate (the number of detected whistles divided by the real number in the ground truth data) which is 1.2. The results given by this method show that this algorithm can be efficiently used to automatically extract and classify whistles from underwater acoustic data. This algorithm is currently being implemented on a satellite buoy for acoustic monitoring of underwater noise and marine mammals.

AC19

Nonlinear phenomena in the underwater sounds of belugas (*Delphinapterus leucas*)

Elena Panova, Roman Belikov, Alexander Agafonov

P.P. Shirshov Institute of Oceanology

baralginsp@yandex.ru

Recent bioacoustic research has noted such nonlinear phenomena in animal and human sounds as subharmonics, sidebands, deterministic chaos, frequency jumps and biphonations. Nonlinear phenomena are usually found in vocalizations of mammals and birds, but there is practically no data about the presence of nonlinear phenomena in cetacean acoustic signals (with the exception of biphonical calls of resident killer whales). The present work describes nonlinear phenomena in belugas' vocalizations. The audio records were collected during June-July 2008 in the White Sea, Russia (41 hours of sound recording; 2747 signals were analyzed). It turned out that biphonations are widespread in belugas' vocal repertoire, and they always consist of tonal and pulse components. Thus, many high-frequency whistles are produced together with broadband click series, and short "vowel-like" pulsed tones – with short whistles. These types of signals can also be produced as independent sounds. Frequency jumps and sidebands are typical for many whistles (6 and 5 types of 47 respectively), which helps to distinguish such types among others. Finally, some types of signals were described both in the "native," undistorted, condition and with nonlinear phenomena. The following types of structural distortion were revealed: the signal fragmentation (4.6% of all the whistles), the sidebands (3.7%), the turbulence noise (3.6%), and the subharmonics (0.6%). In pulsed-tone calls, the deterministic chaos was noted (4.2%). The rate of the nonlinear phenomena depends on the behavioral context. During social interactions, when the acoustic production is the highest, the portion of nonlinear phenomena increases up to 38%. In the situations when the acoustic activity is low (resting, travelling, and individual hunting) the nonlinear phenomena make up no more than 5%. The increased portion of signals with the nonlinear phenomena during social interactions may indicate a higher emotional excitement of belugas.

AC20

Chorusing underwater: Atlantic spotted dolphin's acoustic activity during feeding

Elena Papale[1], Monica Perez-Gil[2], Juliana P. Castrillon[2], Enrique Perez-Gil[2], Leire Ruiz[2], Marisa Tejedor[2], Cristina Giacoma[1], Vidal Martin[2]

(1) University of Torino, Life Sciences and Systems Biology Department, Via Accademia Albertina 13, 10123 Torino, Italy
(2) Society for the Study of Cetaceans in the Canary Archipelago (SECAC). Edif. Antiguo Varadero 1ª planta Local 8 B, Urb. Puerto Calero, 35571 Yaiza, Isla de Lanzarote

elena.papale@unito.it

Chorusing is commonly considered a coordinated acoustic behaviour by two or more individuals so that their unison vocalizations overlap with a high degree of temporal precision (Voigt et al 2006). Different evolutionary functions has been advanced, including reproduction and social facilitation in the form of anti-predatory response or cooperative aspect (Brook et al 2000). An increase in acoustic activity with overlapped sounds was proposed by Norris et al. (1994) and Lammers (2004) for spinner dolphins, with the function to alert all members of the group's intentions and readiness of the "acoustic community" for a hunt. Here we report the use of chorusing in a population of Atlantic spotted dolphins around the Eastern Islands of the Canary archipelago. We recorded 55 sightings, consisting in 9.56 hours of acoustic and behavioural data, with a towed array composed by 2 medium- and 2 high-frequency hydrophones. Observations were attributed to the following contexts: 19 travelling (mean duration=0.18 hours (sd=0.13), 13 feeding (0.27 (sd=0.21), 9 milling (0.08 (sd=0.05), 7 socializing (0.18 (sd=0.12), and 7 resting (0.13 (sd=0.09). Chorusing activity was present only during feeding in 3 sightings recorded during daylight hours. Stereotyped sequences of overlapped whistles were composed by groups of vocalizations separated by a silence period of 0.5-1.5 seconds. We performed a randomization test in order to assess if the probability of observing a sequence of 2 repetitions during feeding was higher than chance ($P < 0.001$). Repetition rate (number of repetition/duration of the sighting) was not correlated with the group size and with the weather conditions. The coordination of this acoustic behaviour supports the hypothesis of a social facilitation function in cooperation among individuals of a species, already known to forage in coordinated movements (Fertl et al 1995). A comparison with congenerics could assess if this acoustic behaviour is peculiar of the species.

AC21

Validation of species classification of deep diving odontocetes echolocation clicks in Hawaii

Giulia Raponi[1], Giacomo Giorli[2], Whitlow Au[2]

(1) Università Politecnica delle Marche, Ancona Italy
(2) University of Hawaii at Manoa, HI, USA

giulia.raponi87@gmail.com

Odontocetes use a variety of sounds for a lot of purposes. One of these is echolocation. Echolocation clicks can be used to monitor the presence of some deep diving odontocetes species with recorders on the ocean bottom at depths greater than 450 m using passive acoustic techniques. For this reason a correct classification of clicks is important. A series of recording data were collected around the island of Kauai, in Hawaii, with the ecological acoustic recorder (EAR) sampling at 80 kHz. The recordings were made every 5 minutes for 30 seconds, and they have been analyzed with Marine Mammal Monitoring on Navy Ranges (M3R) program. M3R can classify clicks from Risso's dolphins (*Grampus griseus*), Pilot whales (*Globicephala melas*), Sperm whales (*Physeter macrocephalus*) and Cuvier's (Ziphius cavirostris) and Blainsville's (*Mesoplodon densirostris*) beaked whales. M3R results have been independently checked using a custom Matlab program. For each click, the program plots in Matlab the waveforms, the spectrum and Wigner-ville distribution and the species is visually validated by inspecting the results. The results show that there is 85% of success for Rissoâ ™s dolphins, 97% of success for Pilot whales, 100% of success for sperm whales and 90% of success for beaked whales. The criteria for validation of species, which is independent of the M3R classification algorithm, will be discussed.

AC22

Evoked potential audiograms of grey seals (*Halichoerusgrypus*) from the North and Baltic Seas

Andreas Ruser[1], Michael Dähne[1], Janne Sundermeyer[1*], Klaus Lucke[2], Dorian Houser[3], Jörg Driver[4], Iwona Kuklik[5], Tanja Rosenberger[6], Ursula Siebert[1]

(1) Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, Foundation, Werftstraße. 6, 25761 Büsum, Germany
(2) IMARES, University of Wageningen, Institute for Marine Resources & Ecosystem Studies, 1790 AD Den Burg, the Netherlands
(3) National Marine Mammal Foundation, Suite 200, 2240 Shelter Island Drive, San DiegoCA92106, USA
(4) Veterinary Clinic, Bosselweg 10, 25764 Reinsbüttel, Germany
(5) Marine Station Hel, University Gdansk, 84150 Hel, Poland
(6) Seal CenterFriedrichskoog, 25718 Friedrichskoog, Germany

andreas.ruser@tiho-hannover.de

Grey seals use acoustic signals for communication both in air and underwater. However data on their hearing abilities is only available from an invasive study using cortical evoked potentials. The determination of the hearing sensitivity of grey seals is on one hand a time consuming task if the measurements have to be carried out on trained animals for behavioural audiograms. One major obstacle during the measurement of Auditory Evoked Potentials (AEPs) in grey seals on the other hand is that they often close their outer ear canal. In this study a new method was developed using in-ear headphones with adapted ear inserts for the measurement of AEPs on sedated grey seals. In-air audiograms on 6 grey seals were collected using this non-invasive technique. AEP responses were analysed visually and also with a statistical approach (single point F-test). The comparison suggested a good agreement between both methods. The auditory thresholds for grey seals are below 30 dB re 20 ÂµPa SPL (rms) within the frequency range from 4 to 12 kHz and show strong similarities to in-air behavioural hearing tests of other true and eared seals above 3 kHz. Below 3 kHz a gradual reduction in hearing sensitivity was found, while behavioural studies showed lower thresholds at these frequencies. The presented results and methodology are a major step towards more refined research on the auditory abilities and sensitivities of grey seals.

AC23

The dolphin spoken language

Vyacheslav Ryabov

Karadag Natural Reserve of NAS of Ukraine

ryaboff@ukr.net

Acoustical signals of two quasi-stationary dolphins have been registered by two-channel recording system (Ryabov 2011) for the first time. Owing to this procedure the signals have been correlated to the dolphins, and it has been shown that the dolphins produced packets of mutually coherent pulses (CP) and packets of mutually non-coherent pulses (NP), along with whistles. The form and spectrum of CPs are constant within the limits of a packet, but from a packet to a packet vary. The form and spectrum of NPs vary from a pulse to a pulse, and the main thing is that dolphins produce the packets by turns, not interrupting each other. In this connection I have assumed, that the set of spectral components of every of NP represents a phoneme (or a word) of a dolphin spoken language, whereas a NPs packet is a word (or a sentence). Therefore, the studying of the dolphin spoken language has been continued. With this aim it is analyzed the 50 NP. The form of each pulse is complex, and from a pulse to a pulse varies, in each packet. In this connection, the spectrum of each pulse also varies from a pulse to a pulse. The quantity of spectral extremums differing more than 3dB by level reaches 20-30. The dolphins, apparently, easily distinguish these spectral distinctions of pulses, considering the differential thresholds of their hearing, - nearby 1dB on a level and of 0.2 % - 0.8 % on frequency. However, identical pulses were not revealed, that apparently can point out that every of NP is a word of a dolphin spoken language. The dolphin spoken language, in general, directly or indirectly agree with all the design features of human language, shown by Hockett (Hockett, 1960), and, apparently, it may be considered as the highly-developed spoken language.

AC24

Underwater bow-radiated noise characteristics of three types of ferries: implications for vessel-whale collisions in the Canary Islands, Spain

Michael Scheer[1], Fabian Ritter[2]

(1) pilot-whales.org, Brunnenstr. 15-16, 28203 Bremen, Germany
(2) M.E.E.R. e.V., Bundesallee 123, 12161 Berlin, Germany

michaelscheer@t-online.de

Lethal collisions of ships with whales are increasing worldwide. Often whales do not appear to move out of the path of approaching ships to avoid a collision but the reasons for this are unclear. Likewise, the underwater acoustics of ferries remain largely unknown until today. In the Canary Islands a large number of stranded cetacean carcasses showed injuries typically attributed to ship strikes. To further investigate the processes leading to vessel-whale collisions, the underwater radiated noise of regular, fast and high-speed ferries was recorded during passages south of La Gomera in September 2012. Acoustic recordings and ferry tracking was realised from a research vessel using a single calibrated hydrophone suspended to 15 m and Automatic Identification System (AIS) signals. Ferries were recorded in their forward-projected track at +/-3% maximum speeds from a 4 km distance to the closest point of approach (CPA). For each ferry type, the passage with the nearest CPA was chosen for a detailed analysis. Received levels (RLs) of ten frequency bands in the range of 0.5 – 90 kHz were spectrographically analysed and correlated with distances to the ferries. Spectral analysis of RL measurements were reduced by corresponding RLs of ambient noise. By applying a critical ratio of 10 dB, results showed that the fast ferry was detectable at 1.67 km, the regular ferry at 1.61 km and the high-speed ferry at 1.37 km. Given the speed of the ferries, a whale would potentially have 2.53 min, 3.5 min and 1.38 min, respectively, to swim out of the ship's path. While these time frames appear to be long enough to initiate an avoidance reaction, we suspect that the shortest time frame together with the highest velocity given in the high-speed ferry, this ferry type has the greatest risk for collisions with cetaceans.

AC25

A novel method for automatic detection of marine mammal vocalizations

Alexander Shatravin[1], Oleg Kochetov[1]

P.P.Shirshov Institute of Oceanology, 36 Nahimovsky prospect, Moscow, Russia, 117997

ashatravin@ocean.ru

The problem of real-time automatic detection and classification of marine mammal sounds requires an algorithm for registering transient acoustic events in the incoming audio stream (a detector). A proper algorithm must preserve segments that are likely to contain a marine mammal signal and on the other hand discard as much data as possible. Most of the detectors involved in widely used software packages are based on evaluation of positions and the intensity of peaks of energy in a number of frequency bands. An important disadvantage of such algorithms is the influence of background noise on their performance. We propose a new detector, which is less dependent on the noise conditions and therefore is more suitable for hydroacoustic systems with long time of autonomous work. The algorithm is based on evaluation of position and shape of connected components in the binarized spectrogram. Each time bin is assigned a value which can be interpreted as the likelihood of existence of a marine mammal sound in the incoming signal at that moment. The output of the algorithm contains time of the beginning and the end of detected segments. We present the results of testing of the performance which are promising even if we use very simple spectrogram binarization algorithms.

AC26

Does the depth of the C-POD mooring affect the detectability of bottlenose dolphins and harbour porpoises?

Marta Sostres Alonso[1], Hanna Nuuttila[2]

(1) University of Barcelona, Spain
(2) School of Ocean Sciences, University of Bangor, Menai Bridge, Anglesey, Wales

tuchyi@hotmail.com

The C-POD is an effective tool for monitoring echolocating cetaceans. However, few studies have assessed the effect of data logger's depth to wild animal detections. We examined if the position of the C-POD in the water column affects the detections of harbour porpoises (*Phocoena phocoena*) and bottlenose dolphins (*Tursiops truncatus*). Eight pairs of C-PODs were deployed, positioned 4 and 14 m from the seabed, off New Quay, Wales. Minutes with cetacean detection or 'detection positive minutes' (DPM) and the number of detected click trains were explored for both surface and bottom deployed C-PODs using time of day (24 hr cycle), tidal cycle and month as variables. A clear contrasting seasonal trend for the two species was apparent. For both species, the daily and tidal pattern was very similar in the surface and bottom but the quantity of DPMs varied with mooring depth. Significantly more porpoise detections were recorded near the surface ($w = 172387993$, $p < 2.2e\text{-}16$). In contrast there was little difference in dolphin detections between the two mooring positions. We suggest that porpoises spend proportionally more time echolocating in the water column, rather than in the bottom. However, many of the surface detections for dolphins may originate from echoes reflected from the surface, as the relative source pressure level of their surface clicks was lower than those recorded in the bottom moorings. We propose that dolphins might be spending more time, or vocalizing more nearer to the bottom. Thence, the deployment depth of the C-PODs in the water column may affect the detections recorded and the consequent assessment of presence and absence. Furthermore the optimal deployment depth seems to depend on the target species. Deploying C-PODs at different positions in the water column allows assessment of movement patterns and can reveal interesting variation in fine scale habitat use.

AC27

Seasonal occurrence of two unidentified acoustic signals in the Indian Ocean - are these baleen whale calls?

Andreia Sousa, Danielle Harris

University of St. Andrews

andreiagss@gmail.com

The use of passive acoustics to monitor marine mammals is becoming increasingly popular. A fundamental requirement of this approach is having a good understanding of the acoustic repertoire of a given species of interest. However, unidentified acoustic signals suspected to originate from marine mammals are still being recorded, suggesting that the library of known marine mammal sounds is incomplete. By describing suspected marine mammal sounds and making the data available to other researchers, the source of these signals may be identified more quickly. In this study, we describe two such signals. The sounds were recorded at Diego Garcia, part of the Chagos Archipelago in the northern Indian Ocean, an area known to support a wide range of cetacean species. There are two hydrophones arrays at Diego Garcia; one placed to the north of the island and one placed to the south. Data were available between January 2002 and December 2003. The signals were detected manually by visually scanning long-term spectral average plots. Time and frequency measurements were taken from a sample of both signals and the occurrence of both signals was logged. The first unidentified signal (UI1) consisted of two components. The first component had a mean frequency range of 26.4 Hz - 45.0 Hz. The second component had a mean frequency range of 19.3 Hz - 20.9 Hz. The mean duration of the whole signal was 35.5 s. Detections of UI1 at the northern array peaked in the austral summer, though at the southern array detections peaked during winter and spring. The second unidentified signal (UI2) consisted of one component with a mean frequency range of 16.9 Hz - 49.6 Hz. The mean duration of the signal was 12.9 s. Detections of UI2 did not follow a clear seasonal pattern.

AC28

Acoustic assessment at sea of the 'Banana Pinger'

Nick Tregenza, Ruth Williams, Abby Crosby

Cornwall Wildlife Trust, Allet,TR9 4DJ, UK

n.tregenza@btinternet.com

In Europe the regulation requiring pingers to be used on specified nets set by fishing boats over 12m long has been widely rejected by fishers on grounds of the safety, practicality and cost of the pingers. Here we report on at-sea trials by the Cornwall Wildlife Trust of a new pinger, the 'Banana Pinger' that seeks to overcome all these objections. The fishery trials aim to discover any problems with handling or deployment of these pingers, and to test whether a response by porpoises can be demonstrated by monitoring their echo-location activity. Banana Pingers were provided to three vessels under 12m long with skippers who were interested in using a satisfactory pinger. Half the nets carried these pingers and half were controls. Both sets were monitored with C-POD porpoise detectors. Comparison of data from pingered and non-pingered nets set at the same time showed a much lower rate, on pingered nets, of detection of typical porpoise clicks. In a separate part of the study a solitary pinger that had been adapted to run for approximately 24 hours and then stay off for a similar period was moored near to a C-POD at 30m depth. The relative fall in detections when the pinger was ON was significant but was significantly smaller than that seen in the comparison of nets with and without pingers. No fading of the effect was seen over 3 months, but a trend towards less effect was seen during each ON period. The results showed that the Banana Pinger produced a strong pinger effect, but may also provide some evidence that pingers elicit both aversive and alerting responses. This opens a possibly that they could usefully be combined with other acoustic modifications of nets to enhance the behavioural response of porpoises.

Behaviour

B01

Using behavioral data for the selection of critical habitats of small cetaceans in the Istanbul Strait

Aylin Akkaya Bas[1,2], Ayaka Amaha Öztürk[1,2], Mehmet Akif Erdoğan[3], Elizabeth Atchoi[4], João Lagoa[4]

(1) Istanbul University, Faculty of Fisheries, Ordu Cad. No:200, Laleli
(2) Turkish Marine Research Foundation (TUDAV) PO. Box:10 Beykoz, Istanbul, Turkey
(3) Istanbul Technical University, Graduate School of Science Engineering and Technology, Landscape Architecture Programme, Taşkışla Taksim 34437, Istanbul, Turkey
(4) Algarve University, Faculty of Science, 8005-139 Faro, Portugal

akkayaaylin@yahoo.com

The Istanbul Strait is a passage both for dolphins and marine vessels alike. As it is a very confined space, their routes often coincide. A major concern is the effect that marine traffic might have on the energy budget of the dolphins. Therefore, in order to determine the critical habitats and to investigate the potential effects of marine traffic on three cetaceans species found in the Strait, namely, bottlenose dolphins, common dolphins and harbour porpoises, habitat use patterns were assessed in relation to their behavior. Subsequently, critical habitats of dolphins and marine vessels' routes have been mapped and overlaid in order to clarify the vessel disturbance. Land and boat based surveys were carried out to collect data on behavior between August 2011 and October 2012, in total 955 hours of survey effort. Dolphin encounters were 72% during the land and 81% during the boat surveys. Photo-ID was performed throughout the study. 125 individuals of bottlenose dolphins were identified and 23 of them seen more than three times thus while some individuals showed site fidelity others were photograped only once. Observed behaviours were classified according to their energy-spend scale and their vulnerability to the vessel disturbance. Esrı® ArcGIS™ software was used to create a GIS environment that included the distribution of dolphin sightings according to their behaviour and marine vessel presence in the area. Both entrances of the Istanbul Strait were found as the core areas for dolphins. The dolphins have shown to be more affected by vessel disturbance while resting, socialising and surface feeding than the other behaviours. Thus the habitats where dolphins show such vulnerable behaviours should be the target

critical habitats which will bring greater conservation benefit than just protecting general habitats of dolphins.

B02

Self-rubbing behaviour on gorgonians (*Rumphella* sp.) in Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) off Hurghada, Northern Red Sea, Egypt

Angela Ziltener[1,2], Sina Kreicker[1,2]

(1) Dolphin Watch Alliance
(2) Anthropological Institute and Museum, University of Zurich, Winterthurerstr. 190, 8057 Zurich, Switzerland

a.ziltener@aim.uzh.ch

Several hypotheses have been proposed concerning the functional role of self-rubbing or object rubbing in odontocetes. These include hygiene (e.g ectoparasite removal), sensual pleasure, play and socializing activity. Systematic observations around the Hurghada area, Northern Egyptian Red Sea, revealed that Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) regularly rubbed on gorgonians (*Rumphella* sp.). Event sampling from video recordings obtained while scuba diving showed dolphins approaching gorgonians and then rubbing their body into it while rolling on the side, back and belly. This behaviour is often repeated and individuals queue up behind each other to wait for their next approach. We hypothesize that gorgonian-rubbing (hereafter gorgoning) represents prophylactic or even therapeutic self-medication. Previous studies show that gorgonians possess antibacterial and antifungal properties. In the upcoming months we aim to analyze *Rumphella* sp. for its biologically active compounds. Furthermore, the group- and age structure of gorgoning dolphins will be examined. Further work is needed to confirm whether gorgoning qualifies as the first documented case of zoopharmacognosy in any cetacean.

B03

Synchronous surfacing of wild bottlenose dolphin female-calf pairs in the north-eastern coast of Sardinia, Italy

Selma Bajraktarevic, Bruno Díaz López

The Bottlenose Dolphin Research Institute – BDRI – V. Diaz 4, Golfo Aranci 07020, Italy

selma@thebdri.com

Bottlenose dolphins express affiliation by proximity, physical contact and synchronous movement. The aim of this study was to investigate variables that could be related to female-calf synchronous surfacing's. The data were collected as a part of an on-going long-term study off the north-eastern coast of Sardinia Island, Italy. Boat based observations were performed between January 2011 and November 2012, where 8 individually identified female bottlenose dolphins and their calves (between 3 and 38 months of age) were observed through continuous focal follows. Synchronous surfacing was defined by the mother and the calf breaking the water surface simultaneously to breathe. Our hypothesis were that the synchronous surfacing's would decrease with increasing age of the calf as a sign of the calf gaining independence of the mother. Correlations between synchronous mother-calf surfacing's and group size, group composition, age of the calf, and behaviour were performed. The results showed that approximately 50% of the mother and calf ventilations were synchronous. This study showed that the age of the calf did not play a significant role in synchronous surfacing between the mother and the calf. No relationship was observed between the synchronous surfacing's and group size or composition. Correspondingly, the observed behaviour did not alter the mother-calf synchronous surfacing's. Hence, the importance of synchronous surfacing's as a tool in the study of bottlenose dolphin mother-calf social relationships is questioned and needs to be addressed further in future studies.

B04

Cetacean Emotional States, Associated Behaviour and Context

Tamzin Barber

Talking Animals Research. PO Box 672 Sandgate, Queensland, 4017, Australia

writingwebwords@hotmail.com

Emotions evolved within social species to help survival, build relationships and bind communities. While the study of emotion can be difficult, it can reveal important information about how social species interact and exist. Many cetaceans live in dynamic social groups where accurate interpretation, processing and communication of emotional states would be highly advantageous. Investigation into how, when and why cetaceans use emotion would not only increase knowledge of these animals, but also contribute towards improving management and welfare of both wild and captive cetaceans. This study will investigate and compile information on many cetaceans' expression of emotional states, associated behaviour and context. Data will be collected in three ways; 1. Review of literature, species of cetacean, emotional state inferred and behaviour and contexts associated; 2. Via questionnaire given to individuals and groups who are or have been studying various species of cetaceans for 12 months or more; 3. Observations (undertaken in Queensland, Australia) of both Indo-Pacific humpback dolphins (*Sousa chinensis*) located in Tin Can Bay, and humpback whales (*Megaptera novaeangliae*) and bottlenose dolphins (*Tusiops truncates* and *aduncas)* in Hervey Bay. The outcome of this research will be a validated, reliable description of various behaviour (how) and contexts (why and when) related to possible emotional states in many cetaceans worldwide. This Cetacean Emotions Index can then be used to make comparisons between cetacean species as well as within species and to contribute to the welfare management of all cetaceans.

B05

Killer whales *(Orcinus orca)* interaction with long line fisheries in Russian Far East

Olga Belonovich[1,2], Vladimir Burkanov[3,4]

(1) Kamchatka Research Institute of Fisheries and Oceanography, Russia
(2) Komandorsky State Natural Biosphere Reserve, Russia
(3) Kamchatka Branch of the Pacific Geographical Institute, Russia
(4) National Marine Mammal Laboratory, AFSC, NMFS, NOAA, Seattle, USA

aizberg@gmail.com

Fishermen faced the problem of killer whales (KW) depredation on long-line fisheries in Russian Far East relatively recently about 10-15 years ago. But even during this period KW heavily affected long-line fisheries. At the same time, there are very few field studies of KW effect on long-line fisheries has been conducted in Russian Far East. The goal of the current study was to determine the impact of KW on the long-line fisheries of Greenland halibut (GH, *Reinhardtius hippoglossoides*) in the Sea of Okhotsk. Observations of the appearance and activity of KW were conducted daily during the daylight hours from the deck or bridge of the bottom hook long-line fishing vessel between February 29 and April 14, 2012. From 540 hours of observation, KW were present near vessel for 65 hours (12%). During the study period a total of 21,414 GH were caught (≈ 33,000 kg). On days without KW the average catch per line was 248±155 GH (378±238 kg). When KW were present, the average catch per line was significantly lower ($p<0.001$;48±155ps). From 88 soaked lines KW ate fish from 18 lines (20.4%). At least 9 KW groups with 1-10 individuals in a group were identified and all of them were preying on fish from the long-lines. KW were observed only during gear hauling. Overall, during the study period KW consumed about 5000 ps. of GH (8,000 kg; ≈ 20% of total catch). KW more often approached the boat ($Z=-4.3$, $p<0.0001$, $n=38$) when the weather was good (≈ 0-4 ball), compared to when the weather was stormy (>4 ball). Fishermen also confirmed that KW never attacked long-lines during stormy weather. This feature of KW behavior can be the key factor in finding a solution to reduce KW depredation.

B06

Characterizing fin whales' (*Balaenoptera physalus*) behavioural patterns at the Saint Lawrence estuary (Quebec - CA) feeding ground and the strait of Gibraltar (Andalusia - ESP) migratory path

Ambra Blasi[1], Cristiane C. A. Martins[2], Pauline Gauffier[1]

(1) CIRCE (Conservation, Information and Research on Cetaceans)
(2) Complex Systems Laboratory, Department of Geography, University of Montréal, Canada

mymegaptera@yahoo.it

Fin whale is a migratory species present in temperate zones of the main oceanic basins. It presents a pelagic distribution and fast swimming ability that make it particularly hard to study. Knowledge about its behaviour is scarce in the literature to date. They are considered to move in and out of high-latitude feeding grounds seasonally but the general movement pattern is complex and an exhaustive knowledge about their migratory paths is still lacking. Fin whales were tracked from shore-based stations in the St. Lawrence Estuary and in the Strait of Gibraltar. Theodolite tracking and focal-follow sampling have been used to position the animals and record behaviour events. A total of 34 tracks were kept for analysis, 22 from Canada and 12 from Spain. Breathing and movement parameters have been calculated for each group category (single, dyads and TRIO+) and four behavioural states were identified (intensive foraging, foraging, travelling, milling-resting). The "intensive foraging" was characterized by the highest blow-rate (81.1 blows/h) and very convoluted paths within restricted areas; whereas the "foraging" was defined by higher mean dive interval (6.94 min) and lower time spent at the surface (8.25%). "Travelling" was characterized by linear paths and the lowest mean blow-rate (36.9 blows/h); and "milling-resting" presented intermediary values for all variables. Breathing and movement parameters between the two study areas have been compared to assess differences in the behaviour patterns. Fin whales observed in Spain showed only the "travelling" state, and the average values of speed and linearity index were similar to travelling animals observed in the St Lawrence Estuary. Gathered results demonstrate that shore-based stations represent an appropriate platform to study fin whales behaviour, allowing to track animals without disturbing their vital activities. The continuity of such studies might support conservation actions.

B07

Influence of whale-watching on the behaviour of pilot whale (*Globicephala melas*) and bottlenose dolphin (*Tursiops truncatus*) in the Strait of Gibraltar

Cristina Contreras[1], Eva Carpinelli[2], Ezequiel Andréu[2]

(1) Universidad de Córdoba
(2)Turmares Tarifa

ccontrerasolmedo@gmail.com

The pilot whale and the bottlenose dolphin are the most frequently sighted cetaceans in the Strait of Gibraltar and therefore the usual target of whale watching operators. This study aims at understanding how the presence of whale watching boats affects the behavior of these species. This study was performed between 2003 and 2011 from April to October. Activity data were collected all the sighting long, following the protocols of the -Sociedad Española de Cetáceos. Both species were initially indifferent to the boat, usually continuing to travel, but when the distance were reduced, the animals often changed their behavior. In particular this depends on the duration of the sightings: when the sighting were longer then about 10 minutes, a representative percentage of individuals changed their activities, usually shifting ti milling or socializing behavior. Moreover the response of individuals to the boats was modified depending on their initial activity, on the size of their social group and on the presence of newborns or calves (p-value<0,05). On the basis of the obtained results we recommend to study in more detail the behavioral response of Pilot whale and bottlenose dolphin to the presence of whale watching boats and possibly shorten to less than 10 minutes the observation, in order to interfere as little as possible in their natural activities.

B08

Norwegian killer whales (*Orcinus orca*) feeding on harbor porpoise (*Phocoena phocoena*) off Andenes, Northern Norway

Andrea Cosentino[1,2], Marta Acosta Plata[2,3]

(1) Institute of Biological and Environmental Sciences, University of Aberdeen, School of Biological Sciences, Tillydrone Avenue, Aberdeen, AB24 2TZ, UK
(2) Marine Research and Education Fund of Andenes (MAREFA), Hamnegata 1/C, 8480 Andenes, Norway
(3) Universidad Rey Juan Carlos, C/Tulipán s/n. 28933 Móstoles. Madrid, Spain

orcinus.orca.1758@gmail.com

Orcinus orca is a cosmopolitan and the most widely distributed marine mammal. Its diet includes over 140 species of fish, cephalopods, sea birds and mammals. Many populations are specialized on certain prey items. Three genetically distinct populations have been identified in the North Atlantic. Norwegian killer whales belong to the fish-eating population A that follows the Norwegian Spring-Spawning herring stock, though they have been observed predating on seals occasionally. This population has been studied both in the Lofoten islands and, less extensively, off Andenes. Killer whale predation on other cetaceans is known for more than 20 species, being the Northern bottlenose whale (*Hyperoodon ampullatus*) the only species recorded for Norwegian killer whales. Several land-based surveys are carried out on a daily basis from Andenes lighthouse using BigEyes binoculars (25X, 80mm). The study area is divided into 2 contiguous areas (120º each): Bleik Canyon on the west side and Andfjord on the east side. Such surveys consist on scanning one of the areas during 2 out of 5 min, for a period of one hour (i.e. 12 scans per hour). Thanks to an internal reticule system and a graduated wheel it is possible to collect information about the coordinates of the individuals/groups at sea. On 24 June 2012 at 3.12am, a group of 11 killer whales, including 4 adult males and 1 calf, were seen less than 2000 m Northeast of Andenes harbor, in a 20 m deep reef area hunting and eating a harbor porpoise (*Phocoena phocoena*). This species is included in killer whale's diet elsewhere and both species have overlapping distributions in Norwegian waters; however, this is the first time it is described in the literature.

B09

Feeding behaviour of Black sea cetaceans interacting with fishing gears

Elena V. Gladilina

V.I. Vernadsky Taurida National University, 4, Vernadsky Avenue, Simferopol. Crimea, 95007, Ukraine

gladilina88@mail.ru

Observations of feeding behaviour of cetaceans in the Black Sea coastal waters, including their interactions with fishing gears, were conducted in 2009–2012. Bottlenose dolphins (*Tursiops truncatus*) most often use stationary pound nets, as well as trawl nets, as a source of prey. They aggregate near trawl ships involved in sprat fisheries, tending to particular coastal sites. Groups of more than 60 individuals were recorded near Novy Svet (Crimea): adult females with calves and newborns contained more than a half of the group. The dolphins usually take the injured fish having been fallen out of the trawl. Sometimes dolphins press a trawl or pull a splitting strap to get more fish. Black Sea common dolphins (*Delphinus delphis*) were observed to feed near the trawler ships in mixed aggregations with bottlenose dolphins. Also a common dolphin feeding in pound nets was recorded near Utrish (Russia). This is an unusual case for the Black sea, since Black Sea common dolphins prefer offshore and deepwater areas and rarely approach a coastline. An extremely unusual feeding behaviour was observed for Black sea harbour porpoises (*Phocoena phocoena relicta*) in coastal waters of Balaklava (Crimea): depredation in the stationary pound nets and interactions with fishermen with spinning rods. Adult and juvenile porpoises were foragingin the pound nets for whiting, horse mackerel and picarel. Unlike reported from other regions of the world, Black Sea harbour porpoises easily found the way in and out of a net, so they were not entrapped and got free from a net. Also harbour porpoises were observed to take horse mackerel from spinning rod hooks. Thus, all three species of Black Sea cetaceans were observed to actively interact with various fishing gears and demonstrate diverse and unusual feeding behaviour.

B10

Steller sea lion (*Eumetopias jubatus*): are there any difference in copulation behaviour between two endangered rookeries in Russia?

Yulia Godyashcheva[1], Alexey Altukhov[2], Sergey Ryazanov[3,2], Alexander Belyachenko[1], Vladimir Burkanov[2,4]

(1) Saratov State University named after N.G. Chernishevsky, 83 Astrakhanskaya St., building 5, Biology department, Saratov, Russia, 410026
(2) Pacific Institute of Geography, Kamcatka Branch, FEB RAS, 6 Partizanskaya St., Petropavlovsk-Kamchatsky, Russia, 683000
(3) V.I. Il'echov Pacific Oceanological Institute, FEB RAS, 43, Baltiyskaya Street, Vladivostok, Russia, 690041
(4) National Marine Mammal Laboratory Alaska Fisheries Science Center/NOAA, 7600 Sand Point Way N.E. F/AKC3 Seattle, WA 98115-6349

isl-alex@yandex.ru

Steller sea lion (SSL) is the largest representative of eared seal family. SSL population has recently significantly decline. Demography and reproduction success probably are key factors in SSL population welfare and required science attention. Goal of this work was to compare the behavioural patterns of CB between two endangered rookeries: Kozlova Cape (KC) (Kamchatka peninsula) and Medny Island (MI) (Commander Islands). Methods of our researches included, but were not limited by: direct visual observation, video recording and photo id. There were no time shifts in reproductive (e.g. copulation) periods between rookeries and years as well as there were no differences in copulation duration itself. General levels of female activity prior to mating increased in most cases (33 of 41). Females started to interact with other females (22 times), move around the rookery or go back and force in water (6 times), interact with other males (2 times) and demonstrate protective behaviour (similar to pups protection behaviour) (3 times). In 5 cases male was attracted by female's smell. Other cases remained unclear. Before the copulation, female usually (29 of 41) was present on mate territory. Post copulation behaviour of females depended on pup presence, but all females tend to stay at territory of her mate. When female does not have pup, there is more chance that she left male territory. The probability that females stay at their mates after copulation is higher in both cases for MI than for KC. On KC most females that do not have pup went to the sea after copulation, at the same time on MI this type of behavior does not depend on presence or absence of pup. Copulation patterns between two sights are similar. The observed

differences probably can be explained by different habitat and difference in male territory organization.

B11

Calf's behavior of Guiana dolphin (*Sotalia guianensis*) in a tropical estuary at South-Eastern Brazilian coast

Inês Guedes[1,2], Fernando Morgado[1], Letícia Quito[2]

(1) CESAM & Departamento de Biologia, Universidade de Aveiro, Portugal
(2) Instituto de Pesquisas de Cananéia

inesferreiraguedes@gmail.com

The behavior and interactions between cetaceans become more complex with the increasing age and are extremely important to their development. Calf's behavior can also vary with morphological characteristics of the area. Thus, the aim of the present study was to compare frequencies of calf's behavior of the Guiana dolphin (*Sotalia guianensis*) in different ages at the Cananéia Estuarine Complex, Sao Paulo State, Brazil, and to evaluate possible variations of behaviors related to geomorphologic characteristics of four distinct sectors of the Complex. Observations were made from January to May 2012, totalizing 203 hours and four minutes of effective observation effort. A total of 1213 calves' behavior events were recorded using Focal sampling and Behavior sampling methods with Continuous recording. The most frequent events were Milling/Spyhopping (M/S) and Echelon swimming (ES) that were frequent in all calves' development categories and in all sectors. The frequencies of all events summed together do not varied in relation to the different sectors (X2=2,903; gl=3; p=0,4069). However, significant differences were found when considering the frequency of each behavior separately between sectors (X2ES=19,555; gl=3; p=0,0002; X2PC=107,367; gl=3; p=0,0001; X2BE=27,512; gl=3; p=0,0001; X2P=10,303; gl=3; p=0,0162; X2M/S=8,756; gl=3; p=0,0327; X2PF=60,793; gl=3; p=0,0001; X2AF=85,655; gl=3; p=0,0001). There were differences in the frequencies of Echelon swimming (ES) and Body exposures (BE) when the frequencies where compared between calves' development categories (X2ES=19,604; gl=3; p=0,0002; X2PC=2,328; gl=2; p=0,3122; X2BE=18,476; gl=2; p=0,0001; X2P=4,029; gl=2; p=0,1334; X2M/S=2,176; gl=2; p=0,5367; X2PF=5,379; gl=2; p=0,0679). We concluded that calves' behavior varies with the development category and with characteristics of the different areas of the Cananéia Estuarine Complex. Also, calves' behavior and its variation do not only depend on the location and ontogenetic development of individuals, but also on the social context they belong, including the activities performed by the group.

B12

Biennial cycle of the salmon population determines the behavior of fish-eating killer whales

Mikhail Nagaylik[1], Tatiana Ivkovich[2], Olga Filatova[1], Alexander Burdin[3]

(1) Department of Vertebrate Zoology, Faculty of Biology, Moscow State University, Vorobiovy gory, 1/12, Moscow 119992, Russia
(2) Department of Vertebrate Zoology, Faculty of Biology, St. Peterburg State University, Universitetsklaya nab., 7/9, St. Peterburg 199034, Russia
(3) Kamchatka Branch of Pacific Institute of Geography, Far East Division of Russian Academy of Sciences, Petropavlovsk-Kamchatsky, Russia

nagaylik@yandex.ru

In Eastern Pacific fish-eating Killer whales choose the largest and fattest species of the genus Oncorhynchus - chinook (British Columbia) and coho (Prince William Sound). But in Western Pacific other species of salmon are dominant: pink and chum. These species are the least valuable prey for killer whales in terms of energy value. Do killer whales hunt for these salmonids? Cyclical fluctuations in the number of pink salmon allow us to test the dependence of killer whales from salmon, and specifically from pink salmon. If the salmon is an important food resource, in the "fishy" (odd) years orcas will spend less time hunting. The aim of our study was to evaluate changes in the behavior of killer whales depending on biennial fluctuations in pink salmon abundance. Observations were made from an inflatable motor boat in July-August 2007-2012 in the southern part of Avacha Gulf and in June-September 2008-2012 in coastal waters of Bering Island (Eastern Kamchatka). Behavior of killer whales was estimated for the entire aggregation by three parameters: type of activity ("hunting", "travelling", "resting", "social"), speed ("milling", "slow", "fast"), groups structure ("tight", "dispersed"). While foraging for salmon killer whales spend much time in dispersed groups moving slowly. Such activity is typical for Avacha killer whales but near Bering Island, we have rarely observed this behaviour. We found that in Avacha Gulf in odd-numbered years, when the abundance of pink salmon reached a maximum, killer whales rested more often and foraged less often, aggregations often consisted of tight groups, frequency of slow movement, characteristic of searching and hunting activity of killer whales while feeding on salmon, was reduced. In waters of Bering Island in odd- numbered years killer whales were less mobile: proportion of milling and slow travelling was higher. Thus, we believe that killer whales in Northwest Pacific actively use the least valuable, but the most abundant species of salmon - pink.

B13

Behavioral responses of Guiana dolphin, *Sotalia guianensis*, to tourist activities in an estuarine beach at South-Eastern Brazilian coast

Sara Pedro[1], Fernando Morgado[1], Letícia Quito[2]

(1) CESAM & Departamento de Biologia, Universidade de Aveiro, Portugal
(2) IPeC, Instituto de pesquisas de Cananéia, Brasil

saralmondega@gmail.com

Whale-watching tourism increased largely over the last years, occurring in different ways, from boat observation to feeding and swimming-with activities. In the Itacuruça Beach, Sao Paulo State, Brazil, it is possible to have very close encounters with the Guiana dolphin (*Sotalia guianensis*). Due to the declivity of this beach, the dolphins use it to fish and develop hunting strategies, approaching to the same area used by the tourists for swimming and leisure. To understand if the presence of tourists on the water influences Guiana dolphin's behavior, observations were made between January and March of 2012, from a stationary point using the sequential sampling and focal group methods with continuous recording. Also, the frequencies of foraging events were compared in the presence or absence of swimmers in the area. In 6.94% from 148 hours and 45 minutes of effective observation effort, it was possible to collect data related to dolphin-swimmers interactions. Significant differences were detected from all the behavioral responses registered: 80% were positive, 6% negative and 14% neutral ($H=16.7129$, $DF=2$, $p=0.0002$). There were more positive responses when the swimmers' behavior was passive than when it was active ($U=2068.50$, $p=0.0003$).In this case, no negative response was observed. It was verified that the presence/absence of swimmers influenced three of five foraging events registered. Rest followed by chasing (RC) activity increased when the swimmers were present ($U_{CR}=6038.50$, $p=0.0165$), whereas Beach hunting (BH) and Deep diving (DD) events decreased with the presence of tourists on the water ($U_{BH}=5100.50$, $p<0.0001$; $U_{DD}=5143.50$, $p<0.0001$). The interactions with swimmers are probably not causing impact on the dolphin's behavior, but it is very important to continue monitoring this activity to detect possible long term effects and develop Environmental Education activities to inform tourists about how to behave in the presence of dolphins.

B14

Spinner dolphin's (*Stenella longirostris*) ethogram on Grande Comore

Irene Piccini[1], Artadji Attoumane[2], Marco Bonato[1], Ouledi Ahmed[2], Cristina Giacoma[1]

(1) University of Torino, Life Sciences and Systems Biology Department, Via Accademia Albertina 13, 10123 Torino, Italy
(2) Faculty of Science and Technique, University of Comoros, Rue de la Corniche, Moroni, Comoros

irene.piccini@studenti.unito.it

The Unions of Comoros is characterized by a great species biodiversity (Biodiversity hotspots for conservation priorities – Myers et all – Nature 2000) with some unique species like the coelacanth (*Latimeria chalumnae*, Smith 1939). Nowadays still few information concerning cetaceans present in the Comoros Archipelago are available. In this context we focus our research on studying spinner dolphins (*Stenella longirostris*, Gray 1828) behaviour. We made surveys along the coast to find possible discover keynote sites through the west coast of Grande Comore starting from the villages of Itzounzou, coelacanth marine protected area, to Djomani where there are high concentration of animals. Then we record simultaneously surface and underwater video in order to elaborate a specific ethogram. Moreover we are trying to find a possible correlation between sound emissions and particular behaviour. These particular observations in the area need to improve the knowledge of spinner dolphins along the coasts of Grand Comore.

B15

Detailed Analysis of Bottlenose Dolphin Behavior and Brain Activity Throughout the Wake/Sleep Cycle

Patrícia Rachinas-Lopes[1,2], Vítor B. Paixão[1], Manuel E. dos Santos[2], Rui M. Costa[1]

(1) Champalimaud Center for the Unknown, Neurobiology of Action Lab., Avenida Brasília, Doca de Pedrouços, 1400-038 Lisbon, Portugal
(2) ISPA – Instituto Universitário, Eco-Ethology Research Unit, Rua Jardim do Tabaco, 34, 1149-041, Lisbon, Portugal

patricia.lopes@neuro.fchampalimaud.org

The adaptation of dolphins to their aquatic environment required that their behavior was adjusted to the new gravitational and viscosity conditions, and changes also occurred in their wake-sleep cycle patterns. To better study these new adaptations, a detailed, quantitative ethogram of captive but unrestrained bottlenose dolphins (*Tursiops truncatus*) has been constructed using a pattern recognition algorithm to classify behavior using acceleration data obtained from a triaxial inertial sensor. A waterproof box containing the accelerometer has been fixed with suction cups near the dorsal fin of a young adult male at Zoomarine, Portugal. Three video cameras have been positioned inside and out of the pool to subsequently correlate the behavior recorded by the cameras and the accelerometer data. An underwater sound recording system extends the behavior measurements to determine periods of activity/inactivity of the animal, and it will allow the detailed analysis of the dolphin's vocalizations. This suite of behavior recording methods will be expanded to a number of other captive but unrestrained dolphins, of various sex- and age classes. Non-invasive electroencephalography methods are being developed, in association with those here described, to increase our understanding of how the dolphin's brain operates throughout the wake/sleep cycles; how behavior transitions occur; and how these transitions are associated with movements, sound production and brain activity.

B16

Boat traffic effects on the social behaviour of bottlenose dolphins in Cardigan Bay, Wales

Heidi Richardson[1], Katrin Lohrengel[2], Daphna Feingold[2], Peter Evans[3]

(1) University College London, Gower Street, London, WC1E 6BT, England, UK
(2) Sea Watch Foundation, Paragon House, Wellington Place, New Quay, Ceredigion SA45 9NR, Wales, UK
(3) Sea Watch Foundation, Ewyn y Don, Bull Bay, Amlwch, Isle of Anglesey LL68 9SD, Wales, UK

Heidi.Richardson18@gmail.com

Bottlenose dolphins are protected under the EU Habitats Directive as a species of 'Community Interest'. As such, governments are required to limit factors that could be detrimental to a population's survival. Boat traffic has increasingly been implicated as a significant factor negatively impacting the distribution and behaviour of coastal cetaceans. Within Cardigan Bay, two Special Areas of Conservation (SACs) are designated and protect the local semi-resident population of bottlenose dolphins: Pen Llyn a'r Sarnau SAC in the north and Cardigan Bay SAC in the south. Additionally, a compulsory code of conduct regulates boat behaviour in the presence of cetaceans, limiting speed and distance of boats to cetaceans within the Cardigan Bay SAC. This study aimed to assess the impacts of boat traffic on the social behaviour of the Cardigan Bay bottlenose dolphins. We found marked differences through social network analysis between areas of low and high boat traffic, as well as significant differences in group size. Groups were smaller in both regulated and unregulated areas of high boat traffic (Paired t-test: $p<0.001$ and $p<0.05$ respectively). Areas of regulated and unregulated high traffic showed similar characteristics; there was no significant difference in either boat traffic rates (Mann-Whitney U test: W=19, p=0.937), the proportion of motorised vessels (Mann-Whitney U test; W=7, p=0.093) or bottlenose dolphin sighting rates (Welch 2 sample t-test; df=7.36, p=0.358) between regulated and unregulated areas of high traffic. The similar values suggest that the Cardigan Bay Boat Management Plan has had limited success in decreasing the impacts of leisure boat activity on bottlenose dolphin behaviour and while a code of conduct may moderate some of the negative impacts of high level boat traffic, it is currently not effective at neutralising the effect of the sheer number of boats found in high traffic areas.

B17

Interaction between sperm whale (*Physeter macrocephalus*) and killer whale (*Orcinus orca*) in the canyon of Bleik: A study on killer whale`s biting marks on the fluke of large sperm whale males

Luca Tassara[1], Tore Haug[2], Iva Kovacic[3], Marta Acosta Plata[3]

(1) Department of Arctic and Marine Biology, Universitetet i Tromsø, 970 422 528 Tromsø, Norway
(2) Institute of Marine Research, Sykehusveien 23, 9019 Tromsø, Norway
(3) Marefa Foundation, Hamnegata 1/C, 8480 Andenes, Norway

Till873@gmail.com

This study investigates the interaction between two apex predators: the sperm whale (*Physeter macrocephalus*) and the killer whale (*Orcinus orca)* occurring in the same area in North of Norway. The study examines the toothmarks of the killer whales on the fluke of the sperm whale in the area of the submarine canyon of Bleik, situated along the shore of the Vesterålen archipelago. I use sighting data collected between 2009 and 2012 from two opportunistic platforms (whale-watching vessels). The pictures, from the "Hvalsafari AS" catalogue of sperm whales, are selected based on their quality. Only high resolution pictures in terms of focus, contrast, size and orientation showing the entire ventral part of the fluke are analysed. A significant number of pictures present fresh scars of killer whales and/or missing portion in the tips of the fluke of the sperm whales suggesting that there has been a recent interaction between these two species. This in accordance with studies reporting attacks of killer whales on sperm whales in the tropical area, or toothmarks on the fluke of big males in the Antarctic area do seem to support the hypothesis of interaction. Furthermore this study shows that the distribution of killer whales and the movements of Norwegian herring should be taken in consideration when assessing the interaction between this two apex predators in the area of the canyon of Bleik.

B18

Bottlenose dolphin infanticide in the Strait of Gibraltar

Philippe Verborgh, Pauline Gauffier, Joan Giménez, Carolina Jiménez, Ruth Esteban, Renaud de Stephanis

CIRCE (Conservation, Information and Research on Cetaceans)

philippeverborgh@yahoo.fr

Bottlenose dolphins are known for practicing infanticide in the Northern Atlantic with evidence from both stranding and observations at sea. The Strait of Gibraltar has a resident population of around 300 bottlenose dolphin individuals that have been studied since 1999 with a stable population growth rate around 1. In summer 2011 a group of 7 individuals (3 adults and 4 juveniles) were observed travelling fast toward a trio of two adults and a newborn. After joining the trio, the group started ramming the newborn dolphin in a coordinated manner during 5 minutes until its death, then left rapidly. The mother was observed drifting for 4 hours holding the dead calf by its pectoral fin and the other adult stayed within a few meters the whole time ("associated" adult). The aim of this study was to look at past social interactions between the individuals that killed the newborn and the mother and the associated adult. Out of the seven "killers", only four had been photo-identified before the event and are all known resident individuals since at least 2003. The mother has been observed in the company of one or several "killers" on 9 occasions during previous years and only on 5 occasions with the "associated" adult. These results further support the hypothesis that infanticide could be practiced within populations to either control the population size in case of being close to the carrying capacity or to increase the genetic reproductive success of certain male individuals of the population considering that bottlenose dolphin females could conceive within weeks of having lost their calves. This parameter is important to take into consideration as it could reduce the survival of newborns in the population and therefore decrease the recruitment of future generations.

B19

Humpback whale *(Megaptera novaeangliae)* surface feeding behaviours at Jeffreys Ledge, Gulf of Maine

Dominique Weilermann[1,2], Katie Conroy[1], Ingrid Van Baarlen[3], Dianna Schulte[1]

(1) Blue Ocean Society for Marine Conservation, Portsmouth, New Hampshire, USA
(2) Scottish Marine Institute, Oban, Argyll PA37 1QAT, Scotland, UK
(3) Van Hall Larenstein University, Leeuwarden, the Netherlands

D.Weilermann@live.de

Every summer, a proportion of the Gulf of Maine Humpback whale population seek. Jeffreys Ledge as their primarily feeding ground. Jeffreys Ledge is a 54-km-long glacial deposit off the coast of northern Massachusetts, New Hampshire and Maine and is situated north of Stellwagen Bank Marine Sanctuary. Most research on humpback whale feeding behaviour has been conducted at Stellwagen Bank where whales mainly feed on American sand lance whereas at Jeffreys Ledge, main prey is Atlantic herring *(Clupea harengus).* During the years 2007 to 2011, opportunistic humpback whale sightings were recorded at Jeffreys Ledge from four whale watching vessels in New Hampshire and Massachusetts and individual feeding behaviour was documented. A total of 2038 sightings were recorded between the months of May and October. Most surface behaviours were observed during 2011 (31%) whereas the least surface behaviour was seen in 2008 (7%). Main surface feeding techniques observed each year included lunges (n = 477, 39%) and bubble clouds (n = 627, 51%). In all years except 2007, lobtail feeding, which is usually used when feeding on sand lance, was observed in 11 individuals (n = 130, 10%). In 2008, only five lunges were observed and defecation indicated that whales were mainly feeding on krill. Group size of feeding Humpback whales ranged from 1 to 4 individuals, however it was strongly skewed towards singletons (n = 188, 72%), followed by pairs (n = 64, 24%), trios (n = 9, 3%) and four associated individuals (n = 2, 1%). These results indicate that humpback whales at Jeffreys Ledge feed on a variety of prey including schooling herring, krill and occasionally sand lance. Humpback whales are quite flexible in choosing and switching between food sources to increase their energy intake.

B20

The Oosterschelde estuary as a perfect aquarium for harbour porpoise research

Frank Zanderink, Nynke Osinga

Stichting Rugvin, Jeruzalem 31 A, Velp, the Netherlands

rugvin@planet.nl

The south-western coast of the Netherlands comprises several estuaries. One of the estuaries, National Park the Oosterschelde (35.000 ha), is separated from the North Sea by a 9 km long storm-surge barrier. This barrier with large gates limits the flow of water and sediments from the North Sea and closes in case of severe weather conditions. The National Park has a relatively large (semi-permanent) population of harbour porpoises. Since the early 90's harbour porpoises are incidentally observed. In 2011, at least 61 harbour porpoises were observed during our third porpoise scan. This relatively high density of porpoises makes it possible to find out more on this species than when the same research would be carried out at full sea. We notified for the first time ever calves to be born in these Dutch waters and it even enabled us to identify individual animals. The dead stranded porpoises provide information on the diet, the sex rate and the causes of mortality. These data can be combined with details about the estuary such as the presence of fish and the geographical and sea water conditions. Also, it is possible to study feeding patterns in relation to tidal patterns. We have placed C-pods near the barrier to study movements through the barrier and proved the influence of the underwater noise on the migration pattern. To conclude, the Oosterschelde provides a unique research area for the study of harbour porpoises which is even of high interest for the National Park and its recreational, touristic and educational activities.

Conservation

C01

A proposed unified methodology for the designation of cetacean marine protected areas

Peter Robert Cosgrove

University of Southampton

petecosgrove@live.co.uk

The heterogeneity of the oceans often acts to concentrate multiple ocean users into relatively dense aggregations that tend to exacerbate user conflicts. Conservation aims often compound such conflicts, due to incompatibility with other uses. There is a requirement to conserve marine ecosystems to ensure provision of ecosystem services that are of significant value to modern society while allowing scope for continued growth of marine industry and use. Cetaceans provide a charismatic link to the oceans and have previously been used as a flagship for ocean conservation. They have increasingly been provided protection through marine protected areas (MPAs), albeit in an *ad-hoc* manner. Producing coherence in MPA designation is known to improve overall performance and efficiency. Applying coherence to MPAs for cetaceans has the potential to act provide a stimulus for preliminary spatial planning tool that is seen as the next step in marine management. This work considers the designation of marine protected areas for cetaceans through a comprehensive review process of the constituents of best practice. It proposes a methodology for the designation of cetacean marine protected areas based on established ecological criteria and the precautionary principle. It is constructed to encourage its application, regardless of data availability yet yields better results where data is available. The proposal builds on previous works on protected areas, and advocates a networked approach to counter the movements of cetaceans that have previously hindered MPA application. It offers a relative assessment of potential performance of a designation, based on the ecological criteria that define design, while incorporating guidelines and structure that have traditionally been advocated as key to the designation process. The proposal remains in its infancy and would benefit from peer review and parameterisation refinement prior to *in situ* testing, thus must be considered a draft.

C02

Stables isotopes in the fin whale from the Mediterranean Sea: implication for management and conservation

Krishna Das[1], Gilles Lepoint[1], Loïc Michel[2], Denis Ody[3], Aurélie Tasciotti[3]

(1) Laboratory for Oceanology, University of Liege, Belgium
(2) STARESO, Calvi, Corsica France (3) WWF-France, 6 Rue des Fabres, 13001 Marseille

krishna.das@ulg.ac.be

The fin whale (*Balaenoptera physalus*) is the commonest large whale species in the Mediterranean Sea, found mostly over deep, offshore waters of the western and central portion of the region. This whale is known to feed mainly on krill in contrast to its Atlantic counterpart, displaying a more diversified diet. Genetic structure of the Mediterranean population revealed sub-groups and question arises about inter-individuals feeding strategy and trophic ecology. $\delta^{13}C$ and $\delta^{15}N$ values were analysed by IR-MS (Isoprime 100) coupled to an N-C-S elemental analyser (Vario MICRO Cube, Elementar) in 113 skin biopsies from Mediterranean fin whales sampled in 2010 and 2011 during WWF campaign at sea. A lipid normalization equation was applied (adapted from Post al. 2007) because the measured C:N ratio was > 3.5. Normalized $\delta^{13}C$ and $\delta^{15}N$ values ranged from -20.3 to -17.3 ‰ and from 5.9 to 8.9 ‰, respectively. These values are in good agreement with those collected previously on baleen plates from Mediterranean fin whales (Bentaleb et al., 2011). A mean enrichment of 3.4 ‰ was observed between $\delta^{15}N$ values measured in fin whale skin biopsies and Mediterranean krill (*Meganyctiphanes norvegica*) confirming the importance of the krill as a major food source. The narrow width of the isotopic niche of the Mediterranean fin whale (evaluated by SIBER Stable Isotope Bayesian Ellipses) compared to the Atlantic fin whale raises many concerns in the context of global changes and long-term consequences. One could expect that species displaying narrow niches would be more susceptible to ecosystem fragmentation and other anthropogenic impacts.

C03

Valuing Whale Watching and Seabird Watching in Peniche Important Bird Area (Portugal)

Inês Taveira Gonçalves[1,2], Cristina Brito[2], José Benedicto[1], Nuno Oliveira[1]

(1) Sociedade Portuguesa para o Estudo das Aves, Avenida João Crisóstomo N18 4D, 1000-179 Lisboa, Portugal
(2) Escola de Mar, Tec Labs, Campus da FCUL, Campo Grande, 1749-016 Lisboa, Portugal

inestg88@gmail.com

Ecosystem services, such as whale and seabird watching, can have components with pricing and others without price but with value. The marine Important Bird Area (IBA) of Peniche complements the current existing terrestrial IBA and includes the coastal areas of Peniche and cape Carvoeiro. Despite IBA have no legal enforcement, often is the first step to designate a Special Protection Area and put forward conservation of all ecosystem components, including cetaceans. Our main goal is to assess the socioeconomic viability of the IBA of Peniche through the identification of economic (benefits), social (tourist motivation) and ecological (ratio of total of species in the IBA and in Portugal) values for whale and seabird watching. A total of 45 boat-based surveys with ESAS methodology were conducted between February 2005 to May 2011. Also, 45 land-based surveys occurred between October 2008 to October 2012. Between December 2011 to August 2012, 683 online questionnaires were used to determine people willingness to pay for this tourism and their motivation to perform it. Also, data from touristic operators of Peniche were collected. Both for whale and seabird watching, people would be willing to pay less than 35 euros (48% and 67%, respectively). The operators can make between 400 to 6000 euros with the trips per year (gross). The main motivation to do the activity was to see the animals and to do natural travelling. The third choice was different for potential whale-watchers (photography) and potential bird-watchers (conservation). Cetaceans ratio for the IBA of Peniche was of 16% and for seabirds of 46,77%. The presence of important species and the tourist willingness to perform tourism indicates the potentiality of developing these activities in Peniche. The valuation of ecosystem services may be a way to drive decision makers to support conservation of ecosystems and associated species.

C04

Education for Conservation

Antonieta Costa, Sónia Matias, Arlete Sogorb

Jardim Zoologico de Lisboa, Estrada de Benfica, 158,1549-004, Lisboa, Portugal

acosta@zoolisboa.pt

Implementing and conceiving new pedagogical-didactic strategies are valuable to the effectiveness of conservation education programs. To achieve these goals the educational programs have to emphasis three aspects that complete the knowledge process: to learn by doing (hands-on), by thinking (minds-on) and by involving oneself (hearts-on) where each visitor / participant is an active agent of his own knowledge. Lisbon Zoo (LZ) educational proposal achieves to involve 800.000 visitors/ year and offers formal programs to 73.000 students. In 2009 our Educational program was recognised by the Portuguese Ministry of Education. Our Education policy is based in four objectives (1) Emotional - contributes to people's emotional connections to conservation (2) Cognitive - contributes to people's understanding and perceptions of wildlife and their conservation (3) Behavioural - contributes toward new respectful behaviours of the environment (4) Evaluation - establishes quality framework that helps planning for the future and illustrates the effectiveness of the Zoo as a centre of conservation education. Lisbon Zoo also recognizes the conservation of certain species as a strategy for the conservation of biodiversity. LZ dolphinarium educational programs are a tremendous opportunity for inspiring children and adults to care about marine mammals and translate into changes in conservation-related behaviour. LZ is a stakeholder at "Action Plan for the Safeguard and Monitoring of the Resident Population of Bottlenose Dolphins from the Sado Estuary". In a time where people are more and more disengaged from nature, Zoos and Aquariums have the potential to be a life force to improve effective learning about wildlife and its ecosystems and encourage positive behavioural change.

C05

Bottlenose dolphins (*Tursiops truncatus*) off Rovinj archipelago (Istria, Croatia). A mosaic Stone to a picture in North-East Adriatic

Darja Ribaric

Vivamar Society, Klavciceva 2, 1241 Kamnik, Slovenia

info@vivamar.org

Bottlenose dolphins (*Tursiops truncatus*) are the last constantly present marine mammals in the East Northern Adriatic Sea. Years of work is done by different research groups: in Slovenia, Lošinj Archipelago, as well as studies were done off Kamenjak, tip of Istria. Compared data from Slovenian research group and that one from Lošinj revealed no matches between the animals. It is not yet evident where an overlap of (sub)populations happens and how far the fluctuation of individuals is present. Such answer would reveal better understanding of the (sub)population dynamics, animal distribution and site fidelity along West Istria. Therefore it is reasonable to compare areas closer together. It is known that Dolphins are frequently present between Poreč and Rovinj, which is geographically about in the middle of both mentioned areas and where Photo IDs were not yet performed up to now. Rovinj is 31 NM south from Slovenia and 22 NM North of Kamenjak and the later is 35NM NW from Lošinj. Dedicated boat surveys were performed in the summer 2012. The area off Rovinj Archipelago seems to be an important feeding ground for Dolphins and is their transient area between North and South. Although in summer months the area is very burdened by touristic boats, animals seem to use it at different time of the day. When fishermen were navigating out to fishing areas, notable negative behaviour was observed towards dolphins. This was even more evident, as three human related deaths were reported from the area, just after our research was concluded for the season. More data are needed to compare them within all existent catalogues. Such results would contribute to better implement conservation measures. Management actions are needed already now to stop competitive perception of fishermen and to make sustainable co-existence of Dolphins and humans revive in this area.

C06

Defining hotspots for toothed cetaceans involved in pelagic long-line fishery depredation in the western Indian Ocean

Michael J. Tetley[1], Jeremy J. Kiszka[2], Erich Hoyt[1]

(1) Whale and Dolphin Conservation (WDC) Critical Habitat and MPA Programme, Brookfield House, Chippenham, Wiltshire, UK, SN15 1LJ
(2) Marine Science Program, Department of Biological Sciences, Florida International University, North Miami, FL 33181, USA

m.j.tetley@univ.bangor.ac.uk

Depredation of bait and catch (from gears and hooks) by certain cetacean species is a worldwide problem. It is receiving increasing levels of attention due to the detrimental effects on the fishing industry and potential impacts on cetacean populations. In particular, false killer whale (*Pseudorca crassidens*), short-finned pilot whale (*Globicephala macrorhynchus*), and Risso's dolphin (*Grampus griseus*) are species known to be prevalent in pelagic long-line depredation within the tropical and subtropical waters of the western Indian Ocean. To better assess interactions between these cetaceans and fisheries, it is crucial to understand the spatial distribution, density, and habitat preference of cetacean populations. However, for this data-poor region, it has been difficult to gain a comprehensive picture. Therefore a literature review covering material published from 1973 to 2011 and a meta-analysis was undertaken of some 500 presence sightings (*P.crassidens* 219, *G.macrorhynchus* 108, *G.griseus* 173), resulting from ~1,991,112 km of survey effort. Data were compiled for the western Indian Ocean region using two approaches: the presence-only IUCN α-hull method and the widely used density kernel method. The study observed that although methods utilised fundamentally different approaches, significant correlations were observed between increasing mean regional density and mean-ranked occurrence for species presence within the region. Spatial patterns of distribution between species distributions and long-line fishing effort were found. The main hotspots for the three species investigated were located around the Seychelles and in the Mozambique Channel (between Madagascar and the African mainland). Areas of potential overlap with fishers included the high seas north of the Seychelles and throughout the Mascarene Islands. It is suggested that initial assessments of cetacean and fisheries conflicts could employ similar robust methods using existing data (including sparse data) to highlight

areas of concern, ground-truthing and if necessary lead to precautionary spatial planning, management and further monitoring of these sites.

C07

Long-term Field Research on Cetacean, Turtle and Pelagic Species Associations in the Central-Southern Mediterranean Sea: Implications for Conservation Action from Coast to Offshore

Adriana Vella

Conservation Biology Research Group, Department of Biology, University of Malta, Msida, Malta

avel@cis.um.edu.mt

A research area of about 120,000km^2 around the Maltese Islands has been the subject of year-round research on cetacean, turtle and pelagic species (CTPS) since 1997. This presentation will focus on research results for Bottlenose (*Tursiops truncatus*), Striped (*Stenella coeruleoalba*), Common (*Delphinus delphis*) and Risso's dolphins (*Grampus griseus*), Sperm (*Physeter macrocephalus*) and Fin (*Balaenoptera physalus*) whales and associated turtle and pelagic species in this Central-southern Mediterranean region. Scientific field transect survey techniques have been used, including both boat and plane surveys which allowed for various aspects of CTPS distribution, abundance and activities to be studied year-round. This research project is a long-term effort which has been designed to allow for: the knowledge-gap on CTPS to be filled; to expand and allow for better comparisons with works undertaken in the same period elsewhere in the Mediterranean; to serve as a solid basis on which to implement conservation actions and monitoring. Complementary research on turtle, seabird and large pelagic species in the same research area was undertaken too, taking into account seasonal fishing and maritime activities in the region. Results obtained from field research show that this part of the Mediterranean is increasingly suffering from human activities, unsustainable development and exploitation of marine resources with increasing impacts on CTPS: Decreasing prey species in these waters; sound, chemical and waste pollution; increasing traffic of larger vessels, military surveillance, and tankers; intense fishing activities both close to coast but also in offshore waters demand such long-term and detailed research efforts. With upcoming plans for possible disturbance due to oil drilling; wind farming; and deep sea or seabed explorations and related seabed developments, it is becoming increasingly important to enhance monitoring and develop recommendations and regulations, as part of maritime policies, that really allow CTPS to survive in a rapidly changing Central-Southern Mediterranean Sea.

Ecology

E01

PROMETEOS Project: Evidence of seamount and submarine canyons effects on cetacean aggregation in the central Mediterranean Sea

Mehdi Aïssi[1], Jessica Alessi[2], Cristina Fiori[1]

(1) MENKAB:il respiro del mare
(2) University of Genoa

mehdi.aissi@gmail.com

Seamounts and submarine canyons are considered fundamental features for the Mediterranean marine ecosystem functioning. They affect the general circulation of the water masses and generate favourable conditions for higher productivity and biodiversity. They are stepping-stones for feeding and reproduction of many pelagic top predators. A long-time series of data issued from visual and acoustic surveys established inside the Pelagos Sanctuary over the eight consecutive years (2004-2011) have been analysed. The spatial distribution of marine mammals was reflected in three dissimilar morphological regions: submarine canyons (region 1), inter-canyons (region 2) and seamount areas (region 3). Results pointed out a seamount association for striped dolphins. This specie was significantly more abundant in the vicinity of some seamount summits (maximum effect at 20 nautical miles) than in other locations further away from these features. However sperm whales were significantly more abundant in the vicinity of some canyon areas than seamount areas. Indeed, a relevant distinction of encounter rates was registered between these three zones characterized by different topography. Sightings were greater in region 1 (n=63/113), to a lesser extent in region 2 (n=41/113), and even lower in region 3 (n=9/113). Moreover, the simulation of sperm whale distribution using Artificial Neural Network Model pointed out a relatively high predictive occurrence of sperm whales in the Tyrrhenian Sea beyond the borders of the Pelagos sanctuary (Eastern Sardinia). This spatial distribution is thought to be related to the special topographical bottom profile characterised by the presence of seamounts and submarine canyons. The main objective of the PROMETEOS project is to “quantify” the seamounts influences on top predator distribution in the central Mediterranean Sea. This purpose was included in the wider perspective of maintaining high biodiversity of

Mediterranean pelagic ecosystem. Priority was given to identify all ‘‘active’’ seamounts where biodiversity occurred at significantly greater frequencies than expected.

E02

First record of anomalously white pigmentation in a striped dolphin (*Stenella coeruleoalba*) in the strait of Gibraltar

Ezequiel Andréu[1], Carolina Fernández[2], Joan Llinas[1]

(1) Turmares Research Department, C/ Alcalde Juan Núñez, Nº3, 11380 Tarifa, Cádiz, Spain
(2) Unit of Veterinary Histology and Pathology, Institute of Animal Health (IUSA), Veterinary School, University of Las Palmas de Gran Canaria. Trasmontaña s/n, Arucas 35413, Canary Islands, Spain

eandreu@turmares.com

Anomalously white pigmentation is unusual in cetaceans and it has not been reported in striped dolphins (*Stenella coureoalba*). This uncommon coloration pattern has been identified as leucism or albinism, also vitiligo has not been described previously in this species. We report the first case of anomalously white pigmentation in striped dolphin and we summarize all white anomalouslies records in cetaceans available in the scientific literature and new recent unpublished cases. The animal was observed using opportunistic platforms during the whale watching cruises in summer 2012 in the strait of Gibraltar. The hypopigmented dolphin was observed twice in the center of the area and it was observed feeding and travelling towards the Atlantic ocean; the dolphin did not present any reaction to the boat and maintain its behaviour during the sighting. This unusual pigmentation combined with dark spots in the body suggested that the animal could be suffer a leucistic condition, possibly due of a pathologic condition of a genetic origin as described in other cetacean species. However, we should not rule out other possibilities like vitiligo (disease which causes depigmentation and irregular light pattern through the body). Further studies should be conducted to confirm the origin of this unusual pigmentation.

E03

Bottlenose dolphin (*Tursiops truncatus*) presence and site fidelity in the Ionian Sea (Greece)

Nora Arena[1,2], Elena Papale[2,3], Marianna Anichini[2], Alice Galli[2], Melissa Reggente[2], Giulia Fedele[2], Francesco Dessì[1], Marta Azzolin[2,3]

(1) *University of Florence, DIP Biologia Animale, via Romana, 17, 50125 (FI,) ITALY*
(2) Gaia Research Institute ONLUS, Corso Moncalieri, 68, 10123 (TO), ITALY
(3) University of Torino, Life Sciences and Systems Biology Department, Via Accademia Albertina 13, 10123 Torino, Italy

hurricanenora@hotmail.it

The Mediterranean population of *Tursiops truncatus* is classified as *Vulnerable* by IUCN experts (2006). Nevertheless few information are available for most of the sub-populations inhabiting the basin. Data on bottlenose dolphin presence abundance and site fidelity were collected during each summer from 2008 to 2010, in the Ionian Sea (Greece). The aim of this study was to assess the residency and the evolution in time of bottlenose dolphin population in an area involved in intensive anthropogenic exploitation, especially during the summer season. About 540 survey hours were carried out, and 6500 km were covered surveying an area of about 600 km^2. 99 individuals were encountered during monitoring activity, and 39 individuals were identified based on presence of natural *markers*. 69% of them (27 individuals) were sighted only once, 20% (8 individuals) were sighted twice, 5% (2 individuals) three times, 3% (1 individual) four times and another 3% (1 individual) five times. Individuals sighted several times have been recorded all the three years, suggesting a seasonal *site fidelity* for the area. Eight of them were found to be strictly associated. The cumulative curve of photo-identified individuals, shows that each year new animals added to the community, suggesting the presence of an open population. Extending surveys area and compare catalogues with adjacent areas will improve knowledge about spatial movements and residency of the investigated population.

E04

Interspecific interactions: northern fur seal (Callorhinus ursinus) pups nursed by Steller sea lions (Eumetopias jubatus) and Steller sea lion pups nursed by northern fur seal females

Svetlana Artemyeva[1], Peter Permyakov[2], Sergey Ryazanov[2,3], Elena Kruchenkova[1], Vladimir Burkanov[3,4]

(1) Federal State Educational Institution of Higher Professional Education M.V.Lomonosov Moscow State University, Leninskie Gory 1/12, Moscow, 119991, Russia
(2) V.I.Ilichov Pacific Institute of Oceanology, Vladivostok, Russia
(3) Kamchatka Branch of the Pacific Geographical Institute, RAS, 6 Partizanskaya Street, Petropavlovsk-Kamchatsky, 683000, Russia
(4) National Marine Mammal Laboratory, AFSC,NMFS, NOAA, 7600 Sand Point Way, NE, Seattle, WA, 98115, USA

artemieva.svetlana@gmail.com

The interspecific interactions between Steller sea lions (SSL) and northern fur seals (NFS) were always interesting for scientists, because these two species often share common rookeries. At the same time, most of studies were concerned aggressive interactions between adult animals. During our work in SSL monitoring program in Russian FarEast several cases of NFS pups nursing by SSL females and one case of SSL pup nursing by NFS females were observed. Between 2008 and 2010 there were 4 cases of "adoption" and continues nursing of NFS pups by SSL females were observed: 1 on Medny Island (the Commander Islands) in 2008 and 3 on Tuleny Island in 2009-2010. All these pairs were formed after disturbance: NFS males often disturb females with new born pups, therefore pups lost mums and imprint the nearest SSL females. In all observed cases, SSL females had their own pups and they "fully adopted" the NFS pups too: nurse, call, and protect from juvenile NFS. Unfortunately, all 4 NFS pups did not survive in observed cases because SSL females left the rookeries before the NFS pups can swim and forage on their own. SSL female from Medny Island during 2 days after she left the rookery came back on the site where she nursed NFS pup and called it. The unique case of SSL pup nursing by NFS females has been observed in 2012 on Tuleny Island. SSL females did not appear at least about a month on the rookery site where the SSL pup was observed. The SSL pup daily sucked at least 5 NFS females. Duration of each nursing fluctuated from 1 to 20 minutes. The SSL pup was active: played with NFS, swam, contacted other SSLs and survived at least to the end of the field season.

E05

Assessing the effectiveness of long-term tour boat and research vessel data for monitoring bottlenose dolphins in the Shannon Estuary, Ireland

Isabel Baker, Simon Berrow, Joanne O'Brien

Shannon Dolphin and Wildlife Foundation, Merchants Quay, Kilrush, Co. Clare, Ireland

izzybaker17@gmail.com

The Shannon estuary is the most important site for bottlenose dolphins in Ireland. Since 2000, the estuary has been designated as a candidate Special Area of Conservation (SAC) for bottlenose dolphins and is the only one in Ireland. This requires that the dolphins and their habitat are maintained at Favourable Conservation Status. Although it is of high conservation importance, the estuary is also a busy industrial waterway and under increased pressure from regional development. A photo-id study of the bottlenose dolphins started in 1993. The population is genetically discrete, relatively stable and is confined to the Shannon estuary and adjacent Tralee Bay. Over the past 20 years a catalogue of around 45,000 images has been created, involving images of approximately 250 individual dolphins. A major update of this catalogue was carried out in 2012. Over 80% of the catalogue images were taken from commercial dolphin-watching tour boats as part of monitoring obligations for operating within an SAC. Two boats operate from two different ports from April to October and dolphin-watch in around half of the SAC, but especially in the middle and outer sections. We assessed the use of tour boats for collecting photo-id data and for monitoring this population by exploring the long-term dataset. We generated discovery curves for both ports and examined recapture rates, associations, calving rates and patterns of movement in the estuary. These data were compared to similar information collected from dedicated transects to assess the efficiency of both platforms for monitoring important dolphin life history parameters and ecology. This study will provide information and guidance to managers and decision-makers who wish to develop the estuary, and to those who are responsible for conservation of the dolphin population and its habitat.

E06

Opportunistic feeding in trammel nets can affect bottlenose dolphin (*Tursiops truncatus*) group size in Aeolian Archipelago (Southern Italy)

Monica Francesca Blasi[1], Luigi Boitani[2]

(1) Filicudi WildLife Conservation, Stimpagnato Filicudi 98055 Lipari (ME), Italy
(2) Department of Biology and Biotechnologies, University "La Sapienza", Viale dell'Università 32, 00185 Roma, Italy

blasimf@yahoo.com

Although opportunistic feeding have been find to affect dolphin habitat use, few studies has measured how this factor influences dolphin group size in the Mediterranean Sea. We studied this effect on a bottlenose dolphin (*Tursiops truncatus*) population in the Aeolian Archipelago (Southern Italy) from 2005 to 2011. Bottlenose dolphins were sampled using a combination of focal group observations with instantaneous data sampling and photo-identification techniques. Trammel nets were measured at *ten-minute* intervals by boat surveys. A behavioural catalogue containing seven behavioural modes was used to sample dolphin behaviour (Altmann 1974, Shane 1990). While the encounter rate decreased yearly and seasonally and it was highest on shallow habitats, the dolphin groups size did not vary yearly and seasonally. Groups size varied from 1 to 18 individuals and an average group size of 5.4 (± 3.8) was recorded. The 64% of dolphins were adults, the 27% juveniles and only the 9% calves dolphins (n=33). Adults were preferentially sighted in smaller groups while juveniles and calves in larger groups. Different distribution patterns were observed for groups with and without calves. Group size increased according to distance from the nearest coast but a decreased group size was observed where trammel nets were more abundant. The feeding activities were significantly highest on the areas with trammel nets but different habitat types were correlated to the behavioural pattern. According to the distribution model results (Blasi and Boitani 2011) these data suggest a trade-off between opportunistic food resources and calving/resting areas. This study suggests that it is important to consider the group size and composition context in studies of habitat use.

E07

Evaluation of the use of the Sado estuary (Setúbal, Portugal) by the resident bottlenose dolphin population. Results from a new goniometric method

Inês Brito[1], Rute Portugal[2], Carina Silva[2], Francisco Andrade[1]

(1) Faculdade de Ciências da Universidade de Lisboa, Centro de Oceanografia – Laboratório Marítimo da Guia, Av. Nª.Srª. do Cabo, 939, 2750-374 Cascais, Portugal
(2) Instituto do Mar, Laboratório Marítimo da Guia, Av. Nª Srª do Cabo, 939, 2750-374 Cascais, Portugal

ines_m_brito@yahoo.com

Knowledge about the use of the Sado estuary by the resident population of bottlenose dolphins is relatively limited mainly because of the methods that have been used until now: sectors, regular or irregular, have been delimited with a resolution too low to allow, *e.g*. for the study of major routes used by the animals or interactions with navigation in the estuary; GPS positions taken from nearby boats are themselves affected by the presence of the vessel used. We present a new non-disturbing method, based on the simultaneous measurement of the horizontal viewing angles taken from two elevated points on land, whose interception allows for the accurate positioning and follow-up of any target in the estuary, namely a group of dolphins or a vessel. Use of this method in the Sado estuary is fairly straightforward due, both to the existence of high points of observation in both margins, and to the high probability of dolphin sightings. With the setup we developed, using two 20-60 x telescopes fitted with a goniometer with a ± 0,5^{o} resolution, and readings synchronized using GSM mobile phones, the method yield observation errors lower than 80 m for an observation distance of 9000 m and proved simple to learn and use, which should allow for anyone to use it. Results show that the resident population of bottlenose dolphins uses mainly the South Channel of the Sado estuary, from the outer sand banks of Cambalhão up to c. 10 km upstream. The mouth of the estuary is mostly used during tide slack when the absence of tidal currents favors the transposition between the estuary and the open sea.

E08

Social structure changes of bottlenose dolphins in the Alboran Sea

Ana Cañadas[1], Andrea Cosentino[1], Ruth Esteban[2], Renaud de Stephanis[3]

(1) Alnilam Research and Conservation, Cándamo 116, 28240 Hoyo de Manzanares,Madrid, Spain
(2) CIRCÉ Cabeza de Manzaneda 3, Pelayo, 11390 Algeciras, Cadiz, Spain
(3) GEMA, Grupo de Ecología Marina Aplicada, Estación Biológica de Doñana, CSIC. C/ Americo Vespucio, s/n, 41092, Isla de la Cartuja, Sevilla, Spain

anacanadas@alnilam.com.es

Bottlenose dolphins have been suggested as being a species with a fusion-fission social system. In the northern Alboran Sea, a long term research program has been carried out since 1992, and showed how a community of around 1,161 (95%CI 961-1420) bottlenose dolphins live in the deepest and sloppiest areas of the northern Alboran Sea. A previous published study showed an increase of dolphins in the area of Almeria from 1997 to 2001 when a new decrease in numbers was observed until 2003. Field observations suggested a new increase in numbers between 2004 and 2006 with a subsequent decrease after that. The hypothesis of the new growth of the abundance of the species in the area was attributed to the income of an immigrant group between 2004 and 2006. In this study we evaluate the social structure of the bottlenose dolphins in the area of Almeria, before the presence of the immigrants, during the presence of the immigrants, and after the departure of the immigrants. A total of 15678 images of dorsal fins have been taken for photo-identification purposes. During the photo-id sessions (a total of 188), group structure was noted, and then, the catalogue was analyzed with the socal-programme. The social system was close to a system based in rapid disassociations and casual acquaintances. The social structure showed significant differences when we compared the three periods with a partial mantel test. This strongly confirms the presence of an immigrant group that interacted during 3 years with the local bottlenose dolphins of Almería. From a management point of view, this results are interesting, and put in evidence the needs of long term monitoring programs in the area.

E09

The value of integrating whale watching data in scientific research: the example of the Sperm whale (*Physeter macrocephalus*) photo –ID catalogue in the Strait of Gibraltar

Eva Carpinelli[1,2,3], Ezequiel Andréu[1], Pauline Gauffier[2], Philippe Verborgh[2], Ruth Esteban[2], Renaud de Stephanis[4]

(1) Turmares Tarifa, C/ Alcalde Juan Nuñez S/N, Tarifa, 11380, Spain
(2) CIRCE (Conservation, Information and Research on Cetaceans) Cabeza de Manzaneda 3, Pelayo, 11390 Algeciras, Cadiz, Spain
(3) Centro Interdisciplinare di Bioacustica e Ricerche Ambientali, University of Pavia, Italy
(4) Department of Conservation Biology, Estación Biológica de Doñana (CSIC), 41013 Sevilla, Spain

evapazaura@yahoo.it

Field studies are costly but essentials for the conservation of cetaceans. Therefore the use of opportunistic platforms, such as ferries and whale watching boats, should be considered as a good compromise between the costs of sailing and the scientific objectives. This study reports some of the results obtained via a collaboration between a scientific group (CIRCE) and a whale watching company (Turmares) - both operating in the Strait of Gibraltar - as an example of how the presence of scientists on whale watching boats can improve the quantity and quality of collected data. Between March and October 2012, photo identification data of Sperm whales (*Physeter macrocephalus*) were taken from two Turmares' boats and from CIRCE's boat. Turmares guaranteed a continuous, daily monitoring of the Strait for the entirety of the study period (except on days with extreme weather conditions). In comparison, due to a larger study area (comprising all of the gulf of Cadiz), CIRCE had a discontinuous monitoring effort in the Strait. Such a different effort lead to the collection of 189 sightings from the Turmares' boats, and 33 sightings from CIRCE's boat in the same period. Thanks to the collaboration between Turmares and CIRCE important sperm whale records were not lost and we added new photos and individuals to the sperm whale photo-ID catalogue of the Strait of Gibraltar. Moreover, the advantages connected to the presence of scientists on board of whale watching boats, for example tourists awareness should also be considered. We therefore encourage this kind of collaboration as a good opportunity to cope with limited resources, and to encourage and facilitate a good culture of the conservation of cetaceans.

E10

Algarve region as a potential breeding ground for common dolphins in Portugal

Joana Castro[1], André Cid[1], Catarina Fonseca[1], Sara Galego[1,2], Marina Laborde[1,3]

(1) AIMM – Associação para a Investigação do Meio Marinho, Lisboa, Portugal
(2) Faculdade de Ciências e Tecnologia, Universidade do Algarve, Faro, Portugal
(3) Centro de Oceanografia, Faculdade de Ciências, Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

jmadeiracastro@gmail.com

A research project has been conducted over the summers of 2010, 2011 and 2012 (May to October) to study the distribution of cetacean species, analyse its group composition and define their habitat use in the South coast of mainland Portugal. Surveys were carried out onboard opportunistic platforms, corresponding to a total of 3768 hours of effort and 1466 encounters with cetaceans. Several species were described in the area, being the short-beaked common dolphin, *Delphinus delphis* Linnaeus, 1758, the most abundant one. Common dolphins accounted for nearly 70% of the total number of sightings. The average group size for this species was 28 individuals. A significance occurrence of calves and newborns was recorded for this species. 52% of the groups had newborns and calves, 32% had juveniles and adults and only 27% had exclusively adults. These results strongly suggest the importance of this area as a potential breeding ground for common dolphins. Nevertheless, the Algarve region is the most popular area for whale watching activities in mainland Portugal, which may pose important threats to these populations. Fifteen companies are authorised to operate in algarvian waters; however, there are a large number of boats and companies operating without the appropriate permit. Therefore, special efforts should be undertaken to limit anthropogenic pressures, particularly those resulting from whale watching activities. Further studies on behaviour and habitat use are essential to better understand the importance of this area to the species.

E11

Estimating bottlenose dolphin (*Tursiops truncatus*) survival off NE Scotland using robust design models

Mònica Arso Civil[1], Barbara Cheney[2], Nicola Quick[1], Valentina Islas[1], Stephanie King[1], Vincent Janik[1], Paul Thompson[2], Philip Hammond[1]

(1) Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, Fife KY16 8LB, UK
(2) University of Aberdeen, Institute of Biological and Environmental Science, Lighthouse Field Station, Cromarty IV11 8YJ, UK

monica.arso@gmail.com

Knowledge of demographic parameters is essential to understand the conservation status of a species but such information is scarce for most cetacean populations because of difficulties in obtaining adequate data. This study used data from individually marked bottlenose dolphins from research conducted along the NE coast of Scotland over 23 years (1989-2011). Photo-identification effort was mainly concentrated in the Moray Firth until 1996 and gradually extended south along the coast to St Andrews Bay. Robust design models to estimate apparent survival and temporary emigration probabilities were fitted to capture histories of 180 marked individuals that met the photographic quality and individual distinctiveness criteria for analysis. The same models were also applied to a subset of the capture histories from sexed animals (50 females and 44 males). For both datasets, model selection favoured models that included Markovian temporary emigration. The estimated probability of apparent survival was 0.944 (SE=0.006) for all individuals. Estimates for females (0.975, SE=0.006) and for males (0.980, SE=0.007) are believed to be biased by methods used to determine sex that typically require more than average numbers of recaptures; further work is required to account for this bias. Estimated temporary emigration/immigration rates were generally low but varied inter-annually, reflecting variation in the spatial distribution of sampling a population that expanded its range over the study period. Failure to account for temporary emigration in the model caused a small negative bias in survival probability (0.940 SE=0.006). The survival rates estimated in this analysis are similar to previous estimates for this population and are at the lower end of the range reported for other populations of bottlenose dolphins.

E12

Sex, scars and photography: Cuvier's beaked whale sexing from scarring patterns

Frazer Coomber, Paola Tepsich, Aurelie Moulins, Massimiliano Rosso

Fondazione CIMA, Centro Internazionale in Monitoraggio Ambientale, Campus Universitario, Via Magliotto, 2 17100 Savona, Italy

frazercoomber@yahoo.co.uk

Sex determination in cetaceans is an important variable that is essential in studies relating to their behaviour, population dynamics and demographics. However, many species have no obvious sexual dimorphism and thus present difficulties in reliable sexing. A non-invasive robust sexing tool would therefore be invaluable for furthering cetacean research. Cuvier's beaked whale (*Ziphius cavirostris*) is a squid eating species with reduced dentation. It has two conical teeth usually visible only in adult males which are believed to play a role in male-male interactions. As such it has been demonstrated that males have a higher amount of scarring compared to females. However, this information itself is not enough for sexing the animals because the amount of scarring is both sex and age dependent (i.e. an old female may be more marked than a young adult male). In this study, we analysed the distribution and relative density of intra-specific scarring in order to quantitatively identify possible differences between the sexes. We used photographs from a photo-ID dataset containing more than 600 photographic capture events of Cuvier's beaked whales from the Ligurian Sea (Northwest Mediterranean). We used the photographic software Image J, threshold and freehand techniques to calculate the density of scarred and unscarred pixels within the visible body area of each whale's sequence of photographs. Dividing the visible body into sub-areas allows for the application of an ANOVA, to compare both the different sub-areas of the same gender and the same sub-area of the two sexes. Method reliability would be measured by repeating the process on a random selection of photographs from the dataset and measuring the range and variance of the measured pixels. The differences found could then be used to create a model with validation applied to a sub-set of the data to test the robustness of the sexing methodology.

E13

Size and seasonal influences on the foraging range of female grey seals in the northeast Atlantic

Michelle Cronin[1], Paddy Pomeroy[2], Mark Jessopp[1]

(1) Coastal & Marine Research Centre, University College Cork, Irish Naval Base, Haulbowline, Cork, Ireland
(2) Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, Fife KY16 8LB, UK

michelle.cronin@ucc.ie

Evidence of segregation in foraging habitat has been demonstrated in some top marine predators, including cetaceans, pinnipeds and seabirds. However, most data are not adequate to assess differences relating to body size or seasonal influences. This has implications for quantitative modelling of population-level predator–prey interactions and ecosystem structure. We examined potential influence of body size and 'fatness' on the foraging trip characteristics of a top marine predator, the Atlantic grey seal (*Halichoerus grypus),* in southwest Ireland within the framework of optimal foraging theory to examine how female grey seals foraging behaviour varied with size, and across the period between moult and breeding. Larger seals undertook trips of significantly greater duration and travelled further from haul-out sites than smaller seals. However, body fat was negatively associated with trip duration and extent, suggesting that fatter individuals may be more efficient foragers. Alternatively they could be avoiding negative consequences that may result from becoming fatter than an optimal value, as excess storage of fat can result in increased cost of transport due to increases in buoyancy. This study was the first to provide evidence of body size influence on foraging behaviour of grey seals, irrespective of age or gender, by studying only adult females. The extent of foraging trips varied significantly across seasons ($p<0.001$). Seals spent more time at sea during the summer, but trips were shorter in extent, suggesting more localized foraging during this season. If the behaviour of the tagged sample is representative of other seals in the colony, it suggests predation pressure on local fish stocks as well as depredation by seals at fishing nets in southwest Ireland will be higher during the summer period, when the seals spend more time at sea in the inshore waters.

E14

Social stability of Risso's dolphin in the Mediterranean Sea as inferred by photo-ID analysis

Sylvie Delrocq[1], Séverine Guérin[2], Alexandre Gannier[1]

(1) GREC
(2) University of Poitiers

s.delrocq@laposte.net

Risso's dolphin (*Grampus griseus*) is a resident species in the Mediterranean Sea, however many aspects of its socio-ecology remain poorly known. For example, it is not clear wether schools structure is stable over the long term or not. We used our photo-identification catalogue to study the social stability of Grampus: a total of about 700 pictures collected from 1988 to 2012 were used to identify 383 individuals (left or right side, or both). Data were collected in various areas, although the Ligurian Sea represented 66% of captures. Metadata and pictures were organized into a catalogue following Europhlukes methodology, and recaptures were seeked primarily by using a database query method, and secondarily by visual matching of dorsal fins. From a total of 31 recaptures, a total of 17 individuals were photographed more than one year after initial contact. One individual was recaptured 15 years apart, showing the long term stability of scaring. A maximum of 5 individuals were captured together in different groups, and the longest interval of joint recapture for a pair of individuals is 10 years. A female was captured 4 times with a different calf, with a mean interval of 4 years, between 1989 and 2001, giving an information of possible calving interval. A combinatory analysis indicated that multiple recaptures occurred more than randomly, suggesting some degree of medium to long term stability exists in the Mediterranean Risso's dolphin population. A trend showed that fewer individuals were recaptured together for longer interval between encounters. On another hand, no recapture was obtained between distinct areas, such as Ligurian, Tyrrhenian and Balearic Sea. Our study is still preliminary and shows that photo-Id techniques could deliver other results useful for Grampus conservation in the Mediterranean Sea. Large scale collaboration should be encouraged to provide significant management elements in the near future.

E15

Evaluation of some ecological parameters of the bottlenose dolphin (*Tursiops truncatus*) in Madeira archipelago: implications for its conservation

Ana Dinis[1,2,3], Luís Freitas[1,3], Cláudia Ribeiro[1,3], Adalberto Carvalho[1], Filipe Alves[1,2,3], Cátia Nicolau[1], Philip S. Hammond[4], Manfred Kaufmann[2,3], Ana Cañadas[5]

(1) Madeira Whale Museum, 9200-031 Caniçal, Madeira, Portugal
(2) University of Madeira, Centre of Life Sciences, Marine Biology Station of Funchal, 9000-107 Madeira, Portugal
(3) CIMAR/CIIMAR – Centre of Interdisciplinary Marine and Environmental Research, University of Porto, Rua dos Bragas 289, 4050-123 Porto, Portugal
(4) Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, St Andrews, Fife KY16 8LB, Scotland, UK
(5) ALNILAM, Research and Conservation, Cándamo 116, 28240 Hoyo de Manzanares, Madrid, Spain

anadinis@museudabaleia.org

Bottlenose dolphins are listed in Annex II of the EU's Habitats Directive, requiring Member states to propose key areas for designation as Special Areas of Conservation (SACs). The success of such designated areas depends upon the quality of available information to understand how these areas are used by the animals and what factors affect their distribution and abundance. In order to improve our understanding of ecology of bottlenose dolphins in Madeira archipelago, we initiated an extensive study to investigate the following population parameters: 1) abundance; 2) survival rates; 3) site-fidelity and seasonality; 4) home range; 5) spatial and temporal distribution related to environmental parameters; 6) identification of areas that are more sensitive to human activities and might need protection and management. Line transect surveys were conducted throughout the Madeira archipelago from 2007 to 2012; spatial modeling of these 6 years of data are being used to address points 1, 5 and 6. Eleven years of photo-identification data from these surveys and also from additional effort on waters south of Madeira Island are being analysed using mark-recapture methods to address points 1-4. Spatial modelling first analysis revealed areas of higher density around Madeira Island with an estimated abundance of 633 (CV=0,22; 95% CI = 425-759), and an estimated average density of 0,1435 dolphins per Km^2. Photographic identification data analysis resulted in a photo-id catalogue holding 420 individuals. Some individuals were re-sighted in two (56) and three (21) sampling occasions respectively, showing some degree of site fidelity for at least part of the population. The main goal of the present study is to obtain information about the ecology and distribution of bottlenose dolphins in the region that can be used by

governmental authorities in the management of areas for the conservation of bottlenose dolphin in Madeira archipelago.

E16

Prey consumption of harbour seals in baie de Somme, France

Laetitia Dupuis[1], Jérôme Spitz[2], Cecile Vincent[2], Antoine Meirland[3], Caroline Normand[1], Clementine Brevart[1]

(1) Picardie Nature, 1 rue de Croy – BP 70010 – 80 097 Amiens cedex 3, France
(2) LIENSs, CNRS/Universite de La Rochelle, 2 rue Olympe de Gouges, 17 000 La Rochelle, France
(3) GEMEL, 115 quai Jeanne D'Arc 80 230 Saint-Valery-sur-Somme, France

laetitia.dupuis@picardie-nature.org

Harbour seals (*Phoca vitulina*) in France are at the southern limit of the species range. The largest colony is located in the baie de Somme, north-eastern Channel, with 60% of harbour seal numbers counted along the French coast. This estuarine bay, 70 square km wide, shows large sand banks at low tide that are used by the seals to haul-out, while it is fully submerged by the sea at high tide. The number of seals counted on these haul-out sites since 1986 has steadily increased, with a peak number of 370 seals observed in August 2012. A telemetry study conducted in 2008-2009 on 10 individuals showed that their foraging areas were mainly located within the bay or nearby offshore. The objectives of this study was to estimated their diet and quantify their prey consumption in order to better assess interactions with local fisheries. From 2008 to 2011 91 scat samples were collected, mainly during summer. Four models were used to estimate the prey consumption from diet analysis and seal counts. The total annual food consumption by the seals varied according to the model from 210 to 480 tons, with 87% of juvenile flatfish (70% of solenoids and 17% of pleuronectids) and 10% of dragonets. This study shows little direct interaction between seals and commercial fisheries (in terms of targeted prey species and sizes) but highlights the importance of fish nursery in the baie de Somme for the local seal population.

E17

Traumatic body markings in Baird's beaked whales (*Berardius bairdii*) in the waters of the Commander Islands, Far East Russia

Ivan Fedutin[1], Olga Filatova[1], Evgeniy Mamaev[2], Alexander Burdin[3], Erich Hoyt[4]

(1) Faculty of Biology, Moscow State University, Vorobyovy gory 119992, Moscow, Russia
(2) FSBA State Nature Biosphere Reserve, "Komandorskiy", Russia
(3) Kamchatka Branch of Pacific Institute of Geography DVO RAS, Petropavlovsk-Kamchatsky, Russia
(4) Whale and Dolphin Conservation Society, UK

fedutin@gmail.com

Little is known about the ecology of Baird's beaked whales. We analyzed the photo-ID data from 20 encounters during four field seasons (2008-2011) in the waters off western Bering Island. We identified 78 individual animals. While analyzing the photographs, we noted specific scars on beaked whale bodies. All these marks were different from species-specific scars from the conspecific teeth. The careful analysis of these scars can contribute to our understanding of migration patterns and the impacts of parasites, predators, and anthropogenic factors on these animals. Marks from probably the drift nets were found in 56% of animals (36 of 64 total). In most cases the marks from the nets represent regular scars behind the dorsal fin and on the ridge of the caudal peduncle. There are few reports of Baird's beaked whales bycatch in drift nets. Therefore, we can suppose that Baird's beaked whales have regular contact with nets, but usually manage to avoid or break out of them. Scars from killer whale teeth were found on 15% of the whales (20 of 75 total). The appearance and degree of healing of these scars suggest that both juvenile and adult animals experience killer whale attacks. Three whales (4% of the total 75 animals) had other (most likely anthropogenic) scars. In one case it looked like a wound from the unsuccessful harpooning of an animal. We also recorded many scars from lampreys and one case of lamprey attachment. Scars from the cookie-cutter shark (*Isistius brasiliensis*) bites were found in 97% of whales (73 of 75 whales) and were absent only in two calves. Cookie-cutter sharks occur in the North Pacific to the south of 38°N, so the scars from their bites suggest that Baird's beaked whales from the waters of the Commander Islands perform long migrations to warm subtropical waters.

E18

A comparative analysis of mother-calf bottlenose dolphin home ranges in Welsh Waters

Daphna Feingold[1], Peter G.H Evans[2]

(1) Sea Watch Foundation, Paragon House, Wellington Place, New Quay, Ceredigion, SA45 9NR
(2) Sea Watch Foundation, Ewyn y Don, Bull Bay, Amlwch, Isle of Anglesey LL68 9SD, Wales, UK

daphna.feingold@seawatchfoundation.org.uk

Home range is an important ecological aspect of an animal population, and is a leading factor to consider when implementing conservation and management efforts. Home ranges of females with and without calves derived from the bottlenose dolphin population occupying Welsh waters were estimated and compared. The results highlight the importance of Cardigan Bay Special Area of Conservation (SAC) as a calving ground. However, this SAC does not encompass the full geographical range of mothers and calves in Welsh waters. Our analyses include at least two more significant areas – northern Cardigan Bay including Pen Llŷn a'r Sarnau SAC, and around the Isle of Anglesey, North Wales. Data were collected during standardised line-transect and *ad-libitum* boat-based surveys from 2007 to 2012. Photo ID sightings data from 21 known females with at least ten re-sightings and at least five sightings with calves, were used for analysis. Mean overall home range areas were calculated by the Minimum Convex Polygon method (MCP) and estimating 'Utilization Distribution' (UD) using the kernel estimator (95% and 50% UD). No significant differences were observed in calf sightings, corrected for effort, between the three areas (Cardigan Bay SAC, Pen Llŷn SAC and Anglesey) strengthening the hypothesis that various locations within Welsh waters are serving as calving grounds. MCP's and UD analyses show no significant differences in home ranges of females with or without calves suggesting that females do not change their home range location or size while travelling with calves. However, spatial coverage was not identical in all years and therefore may present some bias. Calving grounds are vitally important for cetaceans and should play an important role in conservation management plans. Although some calving areas in the present study are within designated SAC's, others, mainly around the Isle of Anglesey, have little protection.

E19

Prey diversity of transient killer whales *(Orcinus orca)* off the Commander Islands, Russia

Sergey V. Fomin[1], Olga A. Belonovich[2,3], Sergey D. Ryazanov[1,4], Vladimir N. Burkanov[1,5]

(1) Kamchatka Branch of the Pacific Geographical Institute, Russia
(2) Kamchatka Research Institute of Fisheries and Oceanography, Russia
(3) Komandorsky State Natural Biosphere Reserve, Russia
(4) V.I. Il`ichov Pacific Institute of Oceanology, FEB RAS, Russia
(5) National Marine Mammal Laboratory, AFSC, NMFS, NOAA, Seattle, USA

kalan_87@mail.ru

The Commander Islands (Russia) are the western most islands of the Aleutian Chain. The waters surrounding the Commander Islands inhabited by about 20 species of cetaceans, 4 species of pinnipeds and sea otters, *Enhidra lutris*. The main purpose of this study was investigation abundance and feeding behavior of transient killer whales off the Commander Islands. Methods included visual observations of coastal waters from high shore cliffs and inspection of shoreline along the islands. At least 6 different groups of transient killer whales have been identified in the area during last 12 years. All groups were observed preying exclusively on northern fur seals during summer and fall. At the same time, at least three fragments of cetacean carcasses has been found washed off on shores in 2002 and 2008 (2 in December 2002, 2008 and 1 in August 2008) with the evidence of killer whale predation. One of these fragments belonged to Baird's beaked whale *(Berardius bairdi)*, 2 others were not identified. All three findings were about 0.5-1 m long pieces of cetaceans back with a dorsal fin and have scars and bites most likely from killer whale teeth. It is remain unknown whether these cetaceans were hunted by killer whales, or killer whales preyed on carcasses. The visual observations of killer whales activity and findings of carcass fragments imply that killer whales off the Commander Islands prey on both: cetaceans and pinnipeds. Future researches are necessary to better understand ecology of transient killer whales off the Commander Islands. We are very grateful to many colleagues who helped with data collection.

E20

Sado bottlenose dolphins are becoming younger: a long-term overview on the age distribution of the adult class

Raquel Gaspar[1], Maria João Fonseca[2]

(1) Associação Viver a Ciência, Av. da República, nº34, 1º, 1050-193 Lisboa
(2) Vertigem Azul, Rua Praia da Saúde, 11 - 2900 Setubal

rgaspar@viveraciencia.org

The Sado estuary bottlenose dolphin resident population is very small. During the 80s, 90s and early 2000s (decade), population size has been decreasing from 40 to less than 25 animals. This decline was mainly due to a low and chronic subadult survival. In the absence of immigration, this poor recruitment of young animals led to the ageing of the adult class so that the great majority were middle aged and old animals. This work reports a long-term overview on the demographic behaviour of this population and presents a recent change in its past trend. Demographic parameters (population size, age class, birth rate, survival and age at weaning) were calculated from annual photo-id population catalogs over 26 years (1986 to 2012). Nowadays, population size continues to be small but 50% of the adults are young animals. This is a result of a higher proportion of subadults surviving to the adult class. Also, one young coastal bottlenose dolphin immigrated to the resident group. Both young and old females have been reproducing but he age at weaning from calves of older females has increased from around 3 years to 4 to 6 years.

E21

Insights on Mediterranean fin whales feeding ecology through stable isotope analysis from skin biopsies

Michelle Gelippi[1], Simone Panigada[1], Susana Garcìa Tiscar[2], Maria Cristina Fossi[3]

(1) Tethys Research Institute, c/o Acquario Civico, Viale G.B. Gadio 2, 20121 Milan, Italy
(2) Department of Ecology, Universidad Autonòma de Madrid, Biology Building, C. Darwin, 2, 28049, Madrid, Spain
(3) Department of Environmental Sciences, University of Siena, Via P.A. Mattioli 4, 53100, Siena, Italy

michelle_6@hotmail.it

In this study we evaluate the spatial presence, the diet composition and the trophic level of fin whales (*Balaenoptera physalus)* in the Pelagos Sanctuary (Western Mediterranean Sea) combining the use of carbon and nitrogen stable isotopes. We analyzed 9 fin whale skin biopsy samples, collected in 2004 and in 2006, and zooplankton samples collected between 1999 and 2000. In particular, we compared fin whales stable isotopes with those of the 3 euphausiids species: *Meganictiphanes norvegica*, *Euphasia krohni* and *Nematoscelis megalops*. Variation in $\delta^{13}C$ among all sampled species suggested the presence of two principal C inputs: one from the off-shore waters (lower $\delta^{13}C$) and the other from the coastal-benthic environment (higher $\delta^{13}C$). Fin whales and their main known prey, *Meganictiphanes norvegica*, were related to the ^{13}C depleted group, as the other euphausiid *Euphasia khroni*. The similar$\delta^{13}C$ in these euphauisiids suggested that more krill species could be part of the fin whale's diet, all sustained by a phytoplanctonic C source. Considering $\delta^{15}N$ values, in the pelagic environment fin whales lie at the same trophic position of larval fishes and decapods, which reflects their zooplanktonic diet composition. Euphausiids $\delta^{15}N$ values confirm that they occupy the preceding trophic level of fin whales. Furthermore, Δ_n is 1.2 to 1.5‰, supporting a low ^{15}N enrichment hypothesis for cetaceans. Among sampled fin whales, gender seems to influence $\delta^{13}C$ values (Mann-Whitney U test, $p = 0.0201$): males were more ^{13}C enriched than females. This could be related to different feeding habits, to a different C metabolic pathway or to intra-specific variability; the low sample size precluded further inference on this aspects. This kind of analyses provides a valid non-lethal alternative to examination of stomach-contents to delineate diet habits, allowing to identifying feeding areas and migration routes that need to be protect with stringent conservation measures.

E22

Blue whales passing around Azores

Laura González[1,2], Clara Sardà[1], Miranda van der Linde[1]

(1) Futurismo Azores Whale Watching, Marina Pêro de Teive, 9500-771, Ponta Delgada, São Miguel, Azores
(2) Department of Applied Physics, Vigo University

lauragonzalez1986@hotmail.es

Blue whales *(Balaenoptera musculus)* are an endangered species that are seen every year around Azores. They pass the archipelago during their spring migration as they are headed to their feeding grounds in the North Atlantic. We have analysed blue whale sighting data registered between 2006 and 2012 off the south coast of São Miguel (Azores) during commercial whale watching tours with Futurismo Azores Whale Watching. From 2009 onwards, records are more continuous and more complete than in previous years. In total we registered 76 encounters with blue whales, of which 30% were in 2010 and 40% in 2012. Our sightings were mostly between March and June, although one encounter was registered in July 2006 and another in September 2012. Individuals were photographically identified, resulting in 45 different whales over the 7 year study period. Eight whales were resighted in the area over a maximum period of five consecutive days, but there were no resightings over longer time periods. The number of blue whale sightings varied between years so it would be interesting to study this temporal distribution related to oceanographic features, like upwelling events, chlorophyll or sea temperature. Looking forward, it would be also appealing to compare our blue whale catalogue to others of the Atlantic, in to try to reveal more about their migrations and to check for individual matches since we did not find any between years.

E23

Recolonisation of the southern Baltic Sea by the grey seal (*Halichoerus grypus balticus*)

Klaus Harder[1], Katharina Maschner[1], Benke Harald[1], Christof Herrmann[2], Anders Galatius[3], Olle Karlson[4]

(1) German Oceanographic Museum Stralsund,
(2) Agency for Environment, Nature Conservation Geology MV,
(3) Department of Bioscience, Aarhus University,
(4) Swedish Museum of Natural History Stockholm

klaus.harder@meeresmuseum.de

During the 20th century, grey seals were hunted almost to extinction in the southern Baltic Sea. Since the 1960s, the Baltic grey seal population has suffered from anthropogenic impacts such as persistent organic pollutants (e.g., PCBs and DDT), progressive habitat destruction. Since end of the 1990s, the stock of the grey seals in the Baltic Sea has increased from 10.000 animals to more than 24.000 (2011). Today, after a period of about 100 years of absence, the grey seal is observed again in the southern parts of the Baltic Sea. In Mecklenburg-Western Pomeranian the sightings of seals are monitored since 2007 by the Agency for Environment, Nature Conservation and Geology. In January 2012, a ranger counted 25 individuals in the Greifswald Lagoon, 16 grey seals on the island “Greifswalder Oie” and 10 grey seals on Kap Arkona/North Rügen. During late winter and early spring grey seals are feeding on herring in the eastern waters of the island of Rügen. During the last years an important new haul-out site was established around Erholmene in the Danish Baltic. The number of animals at this location during the moulting season has increased from 3 in 2007 to 250 grey seals in 2011. Further important haul-out sites are located at Rödsand near Gedser/Denmark, where up to 67 grey seals have been recorded, Måkläppen (460 grey seals) in Skåne and Utklippan (382 animals) in Blekinge/Sweden. The number of grey seals breeding in the southern Baltic is still very limited, although pupping has been documented every year since 2003 at Rødsand and Måkläppen with 1 to 5 pups each year at both locations.

E24

Food consumption by coastal marine mammals in Irish waters

Gema Hernandez-Milian[1], Martha Gosch[2], Ailbhe Kavanagh[3], Alice Doyle[4], Mark Jessopp[2], Michelle Cronin[2], David Reid[5], Emer Rogan[1]

(1) School of Biological, Earth & Environmental Sciences, University College Cork
(2) Coastal & Marine Research Centre, University College Cork
(3) Cetacean Ecology and Acoustic Laboratory, The University of Queensland
(4) Stirling University
(5) Marine Institute, Ireland

g.hemandezmilian@ucc.ie

Diet studies of top predators allow us to investigate their role in themarine ecosystem and contribute to formulating an Ecosystem Approach to Fisheries Management (EAFM). The availability of cetacean abundance data (SCANS II) and seal abundance data (from recent assessments in Ireland), together with diet data provides a good opportunity to estimate marine mammal food consumption in the coastal waters around Ireland. A total of 5402 prey items from stomach contents of bottlenose dolphins (*Tursiops truncatus,* n=10) and harbour porpoises (*Phocoena phocoena*, n=108) from the early 1990s, and grey seal (*Halichoerus grypus*, n=194) and harbour seal (*Phoca vitulina*, n=102) scats from 2006-2010 have been identified. Hard structures (otoliths, bones and beaks) were used to identify their prey and obtain an overview of diet preferences.Important prey of these predators include Clupeids, *Trisopterus* spp., saithe, pollack, whiting, blue whiting, horse mackerel, and sandeels. Some of these species are valuable commercial species; however we identified other species that might become of commercial interest in the future such as saithe and *Trisopterus* spp. We present the diet of these four marine mammal species their diet preferences in the area of study and the overlap between them using multivariate analysis (e.g. Redundancy Analysis and Discriminant Analysis). Food consumption of the four marine species was estimating using the information available. We also discuss the potential interaction with fisheries.

E25

To be or not to be a Risso's – that is the question!

Nicola K. Hodgins, Sarah J. Dolman

Whale and Dolphin Conservation

nicola.hodgins@whales.org

Although globally, Risso's dolphins (*Grampus griseus*) have been observed with a variety of species, records of inter-specific interactions between Risso's and bottlenose dolphins (*Tursiops truncatus)* are limited. In August 2011, whilst undertaking land and boat based surveys along the north-east coast of the Isle of Lewis in the Western Isles, Scotland, the authors documented three unusual-looking dolphins. Although infrequently observed and therefore difficult to document in the wild, hybrids between various delphinids species have been observed both in the wild and in captivity. Noting that morphological analyses of captive-born hybrid dolphins show consistently intermediate characters of both parents, and photographic evidence shows that the Isle of Lewis atypical dolphins shared characteristics of *Grampus* and *Tursiops*, it is proposed by the authors that at least one, if not more than one, of the Isle of Lewis anomalous dolphins is a wild hybrid of *Grampus griseus* and *Tursiops truncatus*. Two of the anomalous dolphins were resighted in the same area in August 2012. The conservation implications of this discovery are unknown.

E26

The significance of associations between killer whale (*Orcinus orca*) matrilineal units depending on type of activity

Tatiana Ivkovich[1], Mikhail Nagaylik[2], Alexander Burdin[3], Erich Hoyt[4]

(1) Dept. Vertebrate Zoology, Faculty of Biology and Soil Sciences, Universitetskayaemb., 7/9, St. Petersburg State University, 199034, St. Petersburg, Russia
(2) Dept. Vertebrate Zoology, Faculty of Biology, Moscow State University, Moscow, Russia
(3) Kamchatka Branch of Pacific Institute of Geography of Russian Academy of Sciences, Petropavlovsk-Kamchatsky, Russia
(4) Whale and Dolphin Conservation, 29A Dirleton Avenue, North Berwick, Scotland, UK EH39 4BE

tatiana.ivkovich@gmail.com

Killer whales form units comprised of maternal relatives which spend most of their time together (matrilines). Some units also form stable long-term associations but these associations vary during short-time periods (1-2 years). The aim of our work was to reveal factors that influence associations between units. This study investigated whether the stability of social contacts between killer whale units varies depending on the type of activity. Using photo-identification data collected during the summer seasons 2005-2011in Avacha Gulf (eastern Kamchatka, northwest Pacific Ocean), we distinguished killer whale groups (N=2863) and aggregations (N=233). A group was defined as a set of individuals within less than ten body lengths moving in one direction and displaying the same type of activity. Aggregation was defined as killer whale groups within visual range which act in a similar manner. Each individual in each group was photographed to reveal the group composition. The type of activity (traveling, foraging, resting and socializing) of the focal group and other groups in the aggregation was sampled every five minutes. An analysis of social contacts at the group level showed the presence of significant long-term preferential associations between killer whale units (N=32) during travelling ($p<0,001$, Test for Avoided/Preferred Associations, SOCPROG 2.4) and no significant associations between units during foraging ($p>0,5$) and socializing ($p>0,5$).The proportion of time killer whales spend engaged in different types of activities is correlated with prey abundance. The short-term variation in associations between killer whale units could be explained by the dynamics in salmon numbers.

E27

Analysis of 23 years of Risso's dolphin's photo-identification in North-Western Mediterranean Sea, first results on movements and site fidelity

Hélène Labach[1,3], Frank Dhermain[1,3], Jean-Michel Bompar[1], Franck Dupraz[1,3], Jérôme Couvat[1], Léa David[2,3], Nathalie Di-Méglio[2,3]

(1) GECEM Groupe d'Eutde des Cétacés en Méditerranée, clinique vétérinaire du redon, 13 boulevard du redon, 13009 Marseille, France
(2) EcoOcéan Institut, 18 rue des Hospices, 34090 Montpellier, France
(3) GIS3M Groupement d'Intérêt Scientifique pour les Mammifères Marins de Méditerranée, Parc national de Port-Cros, allée du castel Sainte Claire, BP70220, 83406 Hyères cedex, France

labach@gecem.org

In partnership with the PELAGOS Sanctuary for the Research program 2010-2012, the GIS3M conducted a study on Risso's dolphin population in North-Western Mediterranean Sea. This study allowed collecting new photo-ID data and comparing two catalogues of photo-ID aggregated by the GECEM since 1989 and EcoOcean Institut since 1994. The matching revealed the presence of 754 individuals and 179 recaptures (20% of the 896 identifications). 68% of the 122 dolphins recaptured have been observed only twice and only 7% have been observed at least 4 times. 16% of the recaptures occurred during the same year and 84% occurred in different years distant from 1 to 18 years. Most of the sightings have been realized on the continental slope in the west of Provence. The mean distance between intra-annual recaptures is 33 km (EC=38) and the maximum is 132 km between south of Nice and south of Cap Sicié. The distance between two intra-annual sightings is independent of the time, the maximum speed of movement is 7km a day. The frequenting of the West Provence continental slope seems to occur mostly during the end of summer and beginning of autumn. The mean distance between two inter-annual sightings is 59 km (EC=61; min=2; max=309). 75% of the recaptures occur within 100 km from the other sightings of the individual and 63% within 50 km. Two individuals show long distance movements (more than 200 km) between the East and the West of the North-Western Mediterranean basin. A fidelity rate calculated for different areas show a high fidelity for the West Provence continental slope and a transient use of the offshore area. This study, gathering for the first time so many data on this population, comfort the hypothesis of a seasonal and regular use of the West Provence continental slope as a foraging area.

E28

Who's visiting New Quay, Ceredigion? - Temporal changes in site use by bottlenose dolphins (*Tursiops truncatus*) around New Quay harbour and headland

Rachel Lambert[1], Daphna Feingold[1], Danielle Gibas[1], Peter G.H. Evans[2]

(1) Sea Watch Foundation, Paragon House, Wellington Place, New Quay, Ceredigion, SA45 9NR
(2) Sea Watch Foundation, Ewyn y Don, Bull Bay, Amlwch, Isle of Anglesey LL68 9SD, Wales, UK

rachel.m.lambert@googlemail.com

Cardigan Bay hosts a semi-resident population of bottlenose dolphins *(Tursiops truncatus)*, one of only two major ones to be found within UK coastal waters. Due to their afforded protection under the EU Species and Habitats Directive, two Special Areas of Conservation (SACs) have been designated within Cardigan Bay. Using land-based, boat-based survey and photo-identification methods, the Sea Watch Foundation has been monitoring the Cardigan Bay bottlenose dolphin population since 2001. Using land-based surveys from New Quay pier, dating back to 2006, and photo-identification surveys conducted from land and from boat surveys within 1.5 km of New Quay harbour and headland since 2001, the changes in bottlenose dolphin presence over time has been investigated. Two-hour long land-based watches were conducted daily from 7am to 9pm between April and October, with a total of 463 watches in 2006, 453 in 2007, 553 in 2008, 564 in 2009, 414 in 2010, 416 in 2011, and 343 in 2012. The percentage of land watches recording bottlenose dolphins was consistent across years: 41% (2006), 62% (2007), 65%, (2008), 63% (2009), 68%, (2010), 69% (2011) and 72% (2012). There has been a general increase in dolphin presence within watches since 2006, with ANOVA results indicating that both year ($F_{6,33}$=4.37, p=0.002) and month ($F_{6,33}$=5.75, p<0.001) have a significant influence. The photo-identification results were used to establish temporal changes in site usage for individual bottlenose dolphins. From 2001 to 2012, a total of 147 individuals have been identified using the New Quay area, although year was found to be significant in determining which individuals were observed there ($F_{11,373}$=3.10, p=0.001). The continued annual summer presence of bottlenose dolphins within the New Quay area highlights this as an important site for supporting the population, which should therefore be considered in future management plans for the conservation of the species.

E29

Humpback whales in summer feeding areas in the Russian Far East

Evgenya Lazareva[1], Alexander Burdin[2], Maria Shevchenko[3], Erich Hoyt[4]

(1) Lazareva E., Zoological museum of Moscow State University, Russia
(2) Kamchatka Branch of Pacific Institute of Geography, Far East Division of Russian Academy Of Science, Russia; Alaska SeaLife Center, Seward, USA
(3) Department of Zoology, Moscow State University, Russia
(4)Whale and Dolphin Conservation Society, North Berwick, Scotland

lazareva.evgenya@mail.ru

Our data was collected at three known North Pacific humpback whale (*Megaptera novaeangliae*) feeding areas in Russia, but the main data was collected near the Commander Islands water area. We started to collect fluke photographs during the (SPLASH) project. We use over 1,500 fluke identification photographs collected in 2004-2011 to estimate the abundance of humpback whales in the Commander Islands water area. Here, we summarize the photo-identification results from the study's seasons 2004-2011, which after matching of all fluke photographs yielded 852 unique individuals. Site fidelity is the trend for individuals to return to the same area over and over. Humpback whales have exhibited fidelity to specific foraging areas in Russia such as Commander and Karaginsky Islands. To investigate if site fidelity exists in the Commander island summer feeding ground an identity matrix was created. We also compared our data with catalogues from Okinawa and Ogasawara Islands and as a result almost 30 migrations were documented between these areas.

E30

Photo-identification of grey seals (*Halichoerus grypus*) on Helgoland, Germany

Stefanie Mahal[1], Tanja Rosenberger[1], Dieter Mahsberg[2], Ursula Siebert[3]

(1) Seal Center Friedrichskoog, 25718 Friedrichskoog, Germany
(2) Theodor-Boveri-Institute, Dep. Of Animal Ecology & Tropical Biology (Zoology III), Julius-Maximilians Universität Würzburg, Am Hubland, 97074 Würzburg, Germany
(3) Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, Foundation, Werftstraße 6, 25761 Büsum, Germany

s.mahal@seehundstation-friedrichkoog.de

The grey seal (*Halichoerus grypus*) is a homecoming species in the Wadden Sea. Regular reproduction in the German Wadden Sea area has been observed since 1983 and re-establishment presumably started only a few years beforehand. The number of grey seals in the Wadden Sea is still increasing. Another indicator of successful re-establishment is the continuous increase of pups born each year. The dimension of this increase suggests a persistent immigration of individuals from other colonies such as Great Britain. Since the grey seal colony on Helgoland is the fastest growing and the most important breeding colony in German waters to date, a long-term monitoring project was started in 2008. Using mark-recapture analysis based on photo-identification (Photo-ID) of individuals, it is possible to study the grey seals with a reliable, land-based method. The Photo-ID allows the identification of seals, especially female seals that choose Helgoland for puppying, over the years. Re-sighting rates help to identify chore members of the colony and give insight in the seasonal dynamics of the German population. Recording and keeping track of the pups born at Helgoland furthermore helps to gain knowledge of the degree of site-fidelity and philopatric behavior of grey seals towards Helgoland. Therefor, flipper-tagging of pups is used as an auxiliary method to the photo-ID. Among others, results indicate a high site-fidelity in female grey seals to breed at Helgoland. For the North Sea and adjacent waters, Helgoland seems to be a hot spot for migrating grey seals. Operating at this major site may also allow collecting data on migration dynamics between the different populations of the east-Atlantic grey seal population. In the long term, this study will provide additional results that broaden the knowledge on the biology and social behavior of the grey seal colony of Helgoland.

E31

Feeding humpback whales (*Megaptera novaeangliae*) in Northern Norway during the winter

Nina Majnarić[1,2], Iñaki Aizpurua Quiroga[2], Fredrik Broms, Marta Acosta Plata[2,3], Andrea Cosentino[2,4], Heike Vester [5], Iva Kovacic[1,2]

(1) University of Zagreb, Department of Genetics and breeding animals, Svetošimuska cesta 25, 10000 Zagreb, Croatia
(2) Marine Research and Education Fund of Andenes (MAREFA), Hamnegata 1/C, 8480 Andenes, Norway
(3) Universidad Rey Juan Carlos, C/Tulipán s/n. 28933 Móstoles. Madrid, Spain
(4) Institute of Biological and Environmental Sciences, University of Aberdeen, School of Biological Sciences, Tillydrone Avenue, Aberdeen, AB24 2TZ, UK
(5) Ocean Sounds, Hjellskjæret c/o Bryggerhotell, 8312 Henningsvær, Norway
(6) University of Zagreb, Rooseveltov trg 6,10000 Zagreb, Croatia

nmajnaric@gmail.com

Current knowledge on *Megaptera novaeangliae* suggests a migration from productive high-latitude summer feeding grounds to lower latitude breeding grounds, going through a fasting period. Over the last two winters, humpback whales have been present in Northern Norway (From Lofoten to Finnmark area) and seen feeding on Norwegian Spring Spawning herring (NSSH). The Lofoten area was the NSSH wintering ground until the year 2000, when it started shifting Northwards until its current distribution. Humpback whales were not present in that area during the winter. This study will help understand the temporal and spatial distribution of humpback whales in Northern Norway during the winter. During the winters of 2011/12 and 2012/13 land-based surveys from Andenes and opportunistic sighting data collection on the species, from Lofoten to Finnmark, were performed. In addition, photo-ID images were collected whenever possible. These results will be presented during the conference. The continuation of the present study in the long term will allow a better understanding the long distance migration of the species as well as the feeding behavior and social structure in Northern Norway during the winter.

E32

Variability in the diet of common dolphins (*Delphinus delphis*) and prey availability along the Portuguese continental coast

Ana Marçalo[1,2], Lidia Nicolau[1,2], Marisa Ferreira[1,3], José Vingada[1,2,3], Alexandra Silva[4], Graham J. Pierce[5]

(1) Sociedade Portuguesa de Vida Selvagem, Universidade do Minho, Departamento de Biologia, Campus de Gualtar, 4710-057, Braga, Portugal
(2) Centre for Environmental and Marine Studies (CESAM), Department of Biology, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal
(3) CBMA/Dep Biologia, Universidade do Minho, Campus de Gualtar, 4710-057, Braga, Portugal
(4) IPMA-Instituto Português do Mar e da Atmosfera, Avenida De Brasília, 1449-006, Lisboa, Portugal
(5) University of Aberdeen, Ocean Lab, Main Street, Newburgh, Aberdeenshire, , AB41 6AA, UK

amarcalo@gmail.com

To date, only one study is available on common dolphin, *Delphinus delphis*, diet along the Portuguese mainland coast, which indicated that sardine, *Sardina pilchardus,* was the most important prey species. Recent biomass assessments indicate a decrease in sardine abundance off Portugal, which triggered the adoption of regulatory measures especially for the purse-seining fishery that targets the species. We describe the diet of common dolphins in Portuguese waters, based on 92 non-empty stomachs recovered and analyzed from stranded animals from the northwestern and southern coasts, from 2010-2012. Interannual, regional, sex, size and cause of death-related variation in the diet was quantified. Fish were numerically the most important prey group (64.1%) and cephalopods comprised 35.8%. Fish and cephalopods were equally important in the North (50.4% and 49.4% respectively), although in the south, fish accounted for 97.7% and cephalopods only 2.3%. The most important prey species in terms of numerical importance was a sepiolid (Sepiolidae), a noncommercial species, followed by adult sardine (164-243mm). There is evidence that the importance of sardine in the diet has decreased in recent years (especially in the Northwestern coast) and smaller sardines disappeared from the diet, which correlates with decreasing spawning stock biomass and recruitment estimates. Chub mackerel (137–306mm) and scad (65-256mm) in the south, and noncommercial benthonic fish and cephalopods such as Gobiidae, Sepiolidae and Loliginidae (*Alloteuthis sps*.) species in the north, seem to have compensated for food requirements. Dolphins with evidence of incidental capture in seine nets (both purse-seine and beach-seine) have a higher proportion of sardines in their stomachs. Females take more

benthonic prey than males, as did younger dolphins compared to older animals. Our results suggest that common dolphin diet has changed in response to changes in the pelagic fish community, particularly the decline of sardine and the increase of chub mackerel.

E33

Residency patterns and social structure of coastal bottlenose dolphins in the Arrábida and Tróia Shores (Portugal)

Francisco Martinho[1,2], Andreia Pereira[1,2], Raquel Gaspar[3], Inês Carvalho[1,5], Cristina Brito[1,4,5]

(1) Escola de Mar, Edifício ICAT, Campus da FCUL, Campo Grande 1749-016 Lisboa, Portugal
(2) Centro de Biologia Ambiental, Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal
(3) Associação Viver a Ciência, Av. República, nº. 34, 1º andar 1050 - 193 Lisboa, Portugal
(4) CHAM (Centre for Overseas History), Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa e Universidade dos Açores, 1069-061 Lisbon, Portugal
(5) Associação para as Ciências do Mar, Edifício ICAT, Campus da FCUL, Campo Grande 1749-016 Lisboa, Portugal

francisco.marinho@golfinhos.net

Recent studies indicate that coastal bottlenose dolphins occurring in the Arrábida's coast are not part of the Sado estuary resident population. Moreover, in 2011, preliminary data indicated that some coastal individuals were seen more than once over the years, which suggested some level of residency. Considering these aspects, as well as the proximity (and possible interactions) to the small resident population of the Sado estuary, we aimed to characterize the coastal bottlenose dolphin population, in terms of their effective level of residency, population size, social structure and behavioural patterns, using two distinct time separated datasets, one from 1998-2001 (dataset 1) and a second from 2007-2011 (dataset 2). The photo-identification analysis showed two different groups for the dataset 2 while for the dataset 1 there was no division, representing a whole group, that do not interact with the two in dataset 2. Using SOCPROG 2.4 it was estimated that in both datasets the dolphin population occurring in the Arrábida's coast had a size around 100 individuals, showing some level of residency. The social analysis showed that individuals from the earlier dataset formed a very cohesive group, while the present dataset showed to be constituted by two cohesive main groups with low interaction between each order. Further research effort is needed in order to repeatedly photograph more animals in the study area in order to assess the seasonality of the transient groups (semi-resident) and have more support for the year-round residency of the 'resident group'. Also is needed more effort in the area where both Sado Estuary's and coastal groups may encounter, in order to assess the nature of these interactions.

E34

Anomalies in fin whale presence in the Pelagos sanctuary: how many or where? New insights from a long term monitoring project

Ana Catarina Morgado[1,2], Paola Tepsich[1], Ana Martins[2,3], Massimiliano Rosso[1], Igor Bashmachnikov[4], Aurelie Moulins[1]

(1) CIMA Research Foundation, via Magliotto 2, 17100 Savona (SV), Italy
(2) Department of Oceanography and Fisheries, University of Azores, Rua Professor Doutor Frederico Machado, 9901-862 Horta, Faial, Azores, Portugal
(3) CIBIO, Investigation Center on Biodiversity and Genetic Resources, InBIO Associated Laboratory, Azores
(4) Institute of Oceanography, Faculty of Sciences, Lisbon University (IO-FCUL), Campo Grande, 1749-016, Lisbon, Portugal

catarina_4_22@hotmail.com

The Pelagos Sanctuary is a summer feeding ground for fin whales, being a key area for this species in the Mediterranean Sea. Several studies have been published addressing fin whale abundance estimations in the area. Unfortunately, most of them use diverse datasets with various spatial and temporal resolutions, rendering it difficult to establish comparisons and/or infer species trends. To overcome this issue, a systematic and consistent sampling procedure was organized using ferries during a four-year period, allowing estimation of inter-annual trends. Data were collected weekly from June to September (2009-2012) along two routes that cross the Ligurian Sea (Nice-Calvi, Savona-Bastia). Inter-annual anomalies were analyzed by comparing yearly Encounter Rates (ER=sightings.km-1) to a 'climatological' ER (computed using a four-year dataset), at two different scales (the two routes together and the two separately as Western and Eastern, respectively). Four-km resolution MODIS/AQUA-derived near-surface chlorophyll-a (CHL [mg.m-3]) images were used to compute chlorophyll anomalies as a proxy of habitat variability at the same spatial and temporal scales. Fin whale presence in the Pelagos Sanctuary is characterized by a periodicity of negative (ER_an09=-0.013; ER_an11=-0.004) against positive years (ER_an10=0.001; ER_an12=0.012). On a regional scale, these analyses highlight that in the Western area only 2012 has been a positive year with a regular constant increase in fin whale ER along the whole period of study (ER_anW09=-0.016; ER_anW10=-0.005; ER_anW11=-0.002; ER_anW12=0.019) while the Eastern region exhibits the same opposite fluctuations as the basin scale (ER_anE09=-0.005 ER_anE10=0.006; ER_anE11=-0.004; ER_anE12=0.004). Sanctuary chlorophyll analyses mirrors the eastern region indicating the last

to be a pattern-establisher. This study suggests that yearly chlorophyll-a bloom anomalies trigger fin whale aggregation variations on the Pelagos Sanctuary, with consequences on yearly abundance estimates. Future studies of fin whales in the Mediterranean should provide integrated marine information, essential for a better evaluation of this species conservation status.

E35

Social structure of coastal bottlenose dolphins (*Tursiops truncatus*) in Donegal, Mayo and Galway, western Ireland

Milaja Nykanen[1], Emer Rogan[1], Simon Ingram[2], Anneli Englund[1]

(1) School of Biological, Earth & Environmental Sciences, University College Cork, Distillery Fields, North Mall, Cork, Ireland
(2) School of Marine Science and Engineering, Plymouth University, Drake Circus, Plymouth, Devon PL4 8AA, United Kingdom

milaja.ny@gmail.com

Past research effort on bottlenose dolphins (*Tursiops truncatus*) in Ireland has largely concentrated on animals occupying the Shannon estuary, but less is known about other populations in western Ireland. In this study, photo identification was used to analyse the social structure and associations of bottlenose dolphins encountered in coastal areas of Counties Donegal, Mayo and Galway. The data were collected between August and October in 2001-2003 and June-October in 2009-2010 during dedicated boat-based surveys. Only well marked animals that were encountered at least three times (42 dolphins) were included in the analysis. All tests were run in SOCPROG, and the data were visually inspected using NetDraw. The CV of true association indices was 0.630 (±0.182) indicating a well differentiated social system. The mean association index was 0.260 (±0.060), and the CV of association indices (real data=1.219, random data=0.788, $p>0.990$) was significantly higher than expected, indicating the occurrence of preferred and avoided associations. Hierarchial Cluster Analysis (with cophenetic correlation coefficient of 0.969) divided the dolphins into three different clusters with 20, 4 and 18 individuals. This division is more likely to be caused by social or ecological (e.g. resource partitioning) factors rather than geographical factors since the distances between the study sites are within a few hundred kilometers of each other and thus relatively easily accessible to bottlenose dolphins. However, visual inspection of the association indices showed that all of the encountered dolphins belong to a wider interlinked population with associations between clusters via certain “key” individuals. Social network analysis is a valuable tool that can help us to understand complex population structures and movements; it can be used alongside genetic studies in population management and thus in the conservation of species.

E36

Analysis of residence patterns of Sperm whales (*Physeter macrocephalus)* in Azores Islands using opportunistic data

Beatriz Olveira[1], Marc Fernandez[1,2], José Azevedo[1,2]

(1) Department of Biology, University of the Azores, Rua Mãe de Deus 13, 9501-801, Ponta Delgada, Azores, Portugal
(2) Centro de Investigação de Recursos Naturais(CIRN)/ Universidade dos Açores

olveira.bea@gmail.com

Sperm whales are one of the main targets of the whale watching operations on the Azores archipelago. Observations made from commercial platforms, many of which collected in the context of the MONICET project, provide a low-cost and large dataset from which to study this species. The aim of this study is to analyze the residence patterns of sperm whales in selected areas of the Azores archipelago. Data was collected from 2005 to 2012 and comprises two different geographic areas (the islands of Pico Island and of Sao Miguel). A total of 1133 photographs were obtained from different opportunistic platforms and pooled together in a common database. Animals were individually identified using photo-identification methods. Residence times were analyzed by plotting lagged identification rates against time lag and fitting a series of population models implemented in Socprog 2.4 program. Selection of the best fitting models was determined using the lowest Quasi Akaike Information Criterion (QAIC) value. A total of 391 animals were identified in Pico (resighting rate of 27%) and 199 animals were identified in Sao Miguel (resighting rate of 23%). Some of the individuals have been resighted in both islands suggesting the existence of movements between islands. Preliminary results show that sperm whales spend 14.13 days around Sao Miguel Island and 4.12 days around Pico Island. Expected results will elucidate if there is a meaningful population exchange between islands.

E37

Historic demography and connectivity between Southern and Nothern Right whales

Angeliki Paspati[1], Peter Best[2], Cathy Schaeff[3], Martine Bérubé[1], Pauline Kamath[4], Claudia Silva[5], Per J.Palsbøll[1]

(1) Marine Evolution and Conservation, University of Groningen, Groningen, the Netherlands
(2) Department of Zoology & Entomology, University of Pretoria, Pretoria, South Africa
(3) College of Arts and Sciences, American University, Washington DC, USA
(4) Northern Rocky Mountain Science Center, USA
(5) Ecosystem Sciences Division-ESPM, Hilgard #3110, Berkeley, California 94720, USA

apaspati@gmail.com

During the 18th and 19th century right whales (*Eubalaena* spp.) went through severe bottlenecks worldwide due to intensive whaling. Currently, there are three recognized right whale species: the North Atlantic right whale, *E. glacialis*, the southern right whale, *E. australis* (South Atlantic, Indo-Pacific), as well as the North Pacific right whale, *E. japonica*. As a result, all three species are classified as either endangered, or vulnerable. Right whales have been hypothesized to originate in the Southern Hemisphere from where they dispersed into the Northern Hemisphere approx. 6 Mya, during a glacial maximum, to establish the new populations. Subsequent temperature increases formed an equatorial barrier to gene flow, leading to reproductive isolation and the present anti-Tropical distribution. In this study we employ genetic data to estimate past demographic changes as well as the degree of isolation between *E. glacialis* and *E. australis* through time. To this end we applied maximum likelihood and Bayesian coalescent inference methods implemented in the software IMa2 and MIGRATION to mitochondrial control region nucleotide sequences and genotypes from nuclear microsatellite loci in 600 to 1200 individuals sampled from the extant populations of *E. australis* and *E. glacialis*.

E38

Relative abundance, residency patterns and social structure of bottlenose dolphin in São Tomé (São Tomé and Príncipe, West Africa)

Andreia Pereira[1,2], Cristina Brito[1,3,4], Francisco Martinho[1,2], Inês Carvalho[1,4]

(1) Escola de Mar, Edifício ICAT - Campus da FCUL, Campo Grande 1749-016 Lisboa, Portugal
(2) Centro de Biologia Ambiental, Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa
(3) CHAM (Centre for Overseas History), Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa e Universidade dos Açores, 1069-061 Lisbon, Portugal
(4)Associação para as Ciências do Mar, Edifício ICAT - Campus da FCUL, Campo Grande 1749-016 Lisboa, Portugal

andreiafspereira@gmail.com

West African waters have a diverse cetacean fauna but they are also one of the most poorly studied areas worldwide. São Tomé and Príncipe, a volcanic archipelago, located near the equator, seems to be an important marine area for small cetaceans probably due to prey abundance and the existence of shallow and protected bays. However, research in this area has been focused specially on humpback whales. The aim of this study was to estimate the relative abundance, social structure, residency patterns and site fidelity of the bottlenose dolphin (*Tursiops truncatus*) around São Tomé Island, using photo-identification. Surveys were conducted from 2002 to 2006, and in 2012. A total of 226 surveys were conducted, during which 51 bottlenose dolphin sightings were registered. Overall, 140 individuals were identified. Population around São Tomé Island appear to be a part of an open population, with an estimate of 268 individuals (95% CI = 130.6 – 537.9) with a migration rate of 13%. Lagged identification rate estimated 34 resident individuals that remained in the study area an average of 1046.4 days. Re-sighted individuals demonstrated low association values, with an average of 0.18, best described by a model of casual acquaintances, with long-term associations (~627.8 days). Cluster analysis did not allow for a division of individuals into units and instead they seem to form a single group with a fluid structure. There is an increasing need to assess the status of small cetaceans and the anthropogenic factors that threaten them in the West coast of Africa. São Tomé and Príncipe is a developing country where human impacts such as by-catch, direct hunting and habitat degradation may pose a special threat to the more coastal species, as the bottlenose dolphin. This study represents the first attempt to obtain baseline knowledge about bottlenose dolphins in these waters.

E39

Seasonal migration patterns for harbor porpoises

Christian Riisager-Pedersen[1], Sveegaard Signe[2], Jonas Teilmann[2], John Fleng Steffensen[1]

(1) Marine Biological Section, University of Copenhagen, Strandpromenaden 5, DK-3000 Helsingør, Denmark
(2) Department of Bioscience, Aarhus University, Frederiksborgvej 399, DK-4000 Roskilde, Denmark

riisager-pedersen@hotmail.com

Between 1997 and 2012, 95 harbour porpoises *Phocoena phocoena* have been tagged with satellite transmitters in Danish waters. This telemetri data has together with acoustic and visual surveys been used to identify high density areas and designate marine protected areas for harbour porpoises. In this study, individual movement patterns for 26 of these harbour porpoises, all deployed for more than 180 days, have been assessed in detail. Of the 26 animals, 6 were sexually mature and 20 juvenile. All sexually mature harbour porpoises showed a northern and, or western migration pattern into the northern part of Kattegat, Skagerrak and the North Sea during winter months. Only 71% of juveniles made a similar migration pattern. Average travelling speed and distance between positions also increased during winter months and decreased again in spring. Juveniles generally showed more diverse patterns and three animals tagged in Skagerrak travelled even north of the Shetland Islands, Great Britain. Time spent and distance travelled on migration was highly variable. Abiotic conditions at migration start was also assessed but with variable results. The driving force behind the tendency towards northern or western migration out of Inner Danish Waters into Skagerrak and the North Sea in winter months thus stands unclear. We advise that seasonal distribution changes should be taken into account when planning future surveys in the Baltic and Inner Danish Waters.

E40

Correcting positional errors in shore-based theodolite measurements of animals at sea: importance of theodolite calibration

Ophélie Sagnol[1], Femke Reitsma[2], Christoph Richter[3]

(1) University of Canterbury-New Zealand
(2) University of Canterbury-New Zealand
(3) University of Toronto-Canada

ophelie.sagnol@hotmail.fr

Knowing the accurate geographical position of animals at sea is essential for understanding why those animals are where they are. Accurate positional data answers a wide range of biological questions related to cetacean movement patterns, habitat use, and the effects of human activities. In this study we describe a correction method by comparing positional information of the same objects using two independent techniques: a theodolite station and GPS. The objective of this research is to improve the distance accuracy of theodolite data and it was developed for a study of sperm whale (*Physeter macrocephalus*) habitat used within the Kaikoura submarine canyon in New Zealand. Observations were made on 66 days (April 2010 to March 2012) with a total of 347 theodolite fixes of vessels recorded (2km to 26 km from theodolite station). The geographical position (theodolite fixes and onboard GPS) were converted to a Cartesian system for trigonometry analyzes purposes. Linear regression of longitude/ latitude and distance of the position recorded with the theodolite varied significantly from the position extracted from the GPS. As expected we observed that the accuracy fell rapidly with an increase of range from the theodolite station and also that the theodolite fixes overestimated the position with an increased in range. Analysis showed that the horizontal angle is determined very accurately with the theodolite which is not the case concerning the vertical angle. The results showed the presence of a non linear relationship between distance from shore station and difference in vertical angle between simultaneously recorded theodolite fixes and GPS positions. By correcting the theodolite fixes with the best model to fit this relation, longitude/latitude and distance no longer displayed a significant difference between both methods. This study enlightened the necessity to calibrate theodolite measurements with object of known GPS positions when tracking animals at sea.

E41

Different levels of residency of killer whales (*Orcinus orca*) in two regions of the Russian Far East

Anastasia Shabalina[1], Olga Filatova[2], Alexander Burdin[3,4]

(1) Dept. Vertebrate Zoology, Faculty of Biology, Lomonosov Moscow State University 119991, Leninskie gory, 1, Moscow, Russia
(2) Dept. Vertebrate Zoology, Faculty of Biology, Lomonosov Moscow State University Moscow, Russia
(3) Kamchatka Branch of Pacific Institute of Geography, Far East Division of Russian Academy of Sciences, Petropavlovsk-Kamchatsky, Russia Centre for Research into Environmental and Ecological Modelling, The Observatory, Buchanan Gardens, University of St Andrews. St Andrews, Fife, KY169LZ, UK
(4) Alaska Sealife Center, Seward, Alaska, USA

arabica1903@rambler.ru

Patterns of residency may indicate the importance of a particular habitat for the population. We study killer whales in Avacha Gulf (South-Eastern Kamchatka) from 2002 and in the waters near the Commander Islands from 2006. Currently there are about 640 animals identified in Avacha Gulf and about 800 animals in waters of the Commander Islands. Most animals were encountered either in Avacha Gulf or in Commander Islands, but some were observed in both regions. In Commander Islands more animals were identified in a shorter study period. In this study we tested if it could be the result of differences in their residency levels. We compared the regions on how often new individuals and individuals that had been seen in previous seasons were observed there. First, for each area we plotted the cumulative number of identified individuals against the cumulative number of working days. Second, we estimated the rate of identifications of individuals seen in previous seasons for all seasons in both regions. Dynamics of identification of new killer whales in waters of the Commander Islands was uniform through the whole period of study (4-10 animals per day). In Avacha Gulf, rate of identification of new animals is higher than in the Commander Islands waters from first to 27th encounter. But then, identification rate substantially decreased, and after 65th encounter became lower than in the Commander Islands area. On the other hand, in Avacha Gulf, the rate of identifications of familiar animals from all identifications, taken through the season, was higher than 55% in all seasons. And in the Commander Islands that rate was lower than 10% in 2009-2010 seasons, and reached 38% in 2011. Our results suggest that residency of killer whales is higher in Avacha Gulf than in the Commander Islands.

E42

Distribution of mother-calf pairs of Gray whale *(Eschrichtius robustus)* in the Piltun Lagoon area (Sakhalin Is., Russia) in 2010-2012

Maxim Sidorenko[1], Evgeniya Dolgova[2], Alexander Burdin[3]

(1) Pacific Oceanological Institute, Far East Branch, Russian Academy of Sciences, Vladivostok, Russia
(2) Lomonosov Moscow State University, Moscow, Russia
(3) Kamchatka Branch of Pacific Institute of Geography, Far East Branch - Russian Academy of Sciences, Petropavlovsk Kamchatka, Russia

tek_max@list.ru

Annually gray whale females with calves migrate to the Piltun feeding grounds. Particular attention has been focused on gray whales in the area due to potential anthropogenic threats from oil and gas activities of the north-eastern coast of Sakhalin. High environmental risks associated with oil exploration impact may cause habitat disturbance and therefore may directly affect the whales. Data on distribution of mother-calf pairs was obtained during the photo-identification surveys in the mouth of Piltun Bay, the area of shallow waters and high tidal waves. Identification of animals was performed by the standard method for photo-ID: pictures of whales taken in the sea were compared to the catalog images, therefore calves were recognized by small size and an accompanying adult whale. A total of three calves were identified in 2010, twelve in 2011 and five in 2012. During the surveys there were 37 sightings of whale groups containing mother-calf pairs. With the exception of one pair all of them preferred staying in the area close to the mouth of Piltun Bay, at distances of up to 5.5 km from shore. The area of 20 square kilometers where 97% of mother-calf pairs were sighted amounts to 10% of the territory surveyed. Pairs were recorded in a distance of 50 - 2700 meters offshore, 69% of which were registered in a distance not further than 1 km offshore. The average distance from shore was 893.8 ± 96.09 SE. The pairs were sighted in shallow waters at depths of 3.2 - 17.4 km, the average 6.8 ± 0.49 SE. Therefore, apparently, the distribution over periods of surveys is characterized by the concentration of mother-calf family groups near the mouth of Piltun Bay. Pairs use shallow waters with high tidal waves for frolicking, meanwhile females teach their calves to feed.

E43

Correlation between the seasonal distribution of harbour porpoises and their prey in the Sound, Baltic Sea

Signe Sveegaard[1], Heidi Andreasen[2,3], Kim N. Mouritsen[4], Jens Peder Jeppesen[5], Jonas Teilmann[1], Carl C. Kinze[6]

(1) Department of Bioscience, Aarhus University, Frederiksborgvej 399, 4000 Roskilde, Denmark
(2) DTU Aqua, National Institute of Aquatic Resources, Technical University of Denmark, Charlottenlund Slot, Jægersborg Allé 1, 2920 Charlottenlund, Denmark
(3) Institute for Terrestrial and Aquatic Wildlife (TiHo),Werftstraße 6, 25761 Büsum, Germany
(4) Department of Bioscience, Aarhus University, Ole Worms Allé 1, 8000 Aarhus C, Denmark
(5) The Øresund Aquarium, Copenhagen University, Strandpromenaden 5, 3000 Helsingør, Denmark
(6) CCKonsult, Rosenørns Allé 55 2. tv., 1970 Frederiksberg C, Denmark

sign@dmu.dk

Low densities of harbour porpoises in winter (November–March) and high densities in summer (April–October) were found in the Sound, connecting the Baltic Sea and Kattegat. Due to their high energy requirements, it is hypothesized that the density of harbour porpoises is related to local prey abundance. This was tested by examining the stomach content of 53 harbour porpoises collected between 1987 and 2010 in the Sound (high season, 34 porpoises; low season, 19 porpoises). A total of 1,442 individual fish specimens from thirteen species were identified. Twelve of these were present in the high–porpoise density season and seven in the low-density season. The distribution of occurrence and the distribution of number of fish species were different between seasons, indicating a shift in prey intake between seasons. Furthermore, during the high-density season, the mean and total prey weight per stomach as well as the prey species diversity was higher. However, no difference was found in the number of prey species between the two seasons, indicating a higher quality of prey in the high-density season. Atlantic cod was found to be the main prey species in terms of weight in the high-density season while Atlantic herring and Atlantic cod were equally important during the low-density season. Prey availability and predictability are suggested as the main drivers for harbour porpoise distribution, and this could be caused by the formation of frontal zones in spring in the northern part of the Sound, leading to prey concentrations in predictable areas.

E44

Photoidentification as a non-invasive tool for the assessment of the white whale population health

Karina Tarasyan[1], Olga Russkova[2], Tatyana Shulezhko[3], Dmitriy Glazov[1], Vyacheslav Rozhnov[1]

(1) White Whale Program, A.N. Severtsov Institute of Ecology and Evolution, RAS; Leninskiy prospect 33, 119071 Moscow, Russia
(2) Utrish Dolphinarium, LTD; Leninskiy prospect 33, 119071 Moscow, Russia
(3) Kamchatka Branch of the Pacific Geographical Institute, RAS; Rybakov Ave, 19a, Petropavlovsk-Kamchatsky, 683024, Russia

tarasyan_k@mail.ru

White whales attract scientific attention as a high-level predator of the marine ecosystems. Up to date the data on the white whale normal and pathological physiology have been collected and methods of infectious and non-infectious diseases detection for the species in captivity have been developed. Nevertheless these findings cannot be completely extrapolated to wild populations. In most cases it is not appropriate to use invasive sample collection techniques which increase disturbance of the animals and photoidentification is an acceptable compromise. A good quality photo makes possible not only identification of the whale, but detection of its' dermal disease signs as well. In our research we tried to describe a health status of the beluga whale population summering in the coastal waters of the Kamchatka Peninsula (the Sea of Okhotsk, Russia) in 2010-2011. Images of 173 and 152 individual animals from the estuaries of the Khayrusova and Moroshechnaya Rivers, respectively, were analyzed. Analysis of the photos revealed symptoms of papillomavirus-, herpes- and candida-like lesions in 10 adult animals. Two young immature animals had moult abnormalities: clearly visible different epidermis layers were found on their images. In addition they had symptoms of other infections, possibly, pox- and gerpes-like and fungus infections (e.g. Fusarium type). In contrast to the belugas of the White Sea (Northern Russia), we did not find any signs of pseudomonosis in the Kamchatka whales. A total amount of animals with dermal abnormalities were less than 4% of identified animals, and this ratio is even less in a whole population due to the underestimation of animals with clear white skin. The obtained results revealed a satisfactory health status of the population of beluga whales summering in the Kamchatka coastal waters.

E45

Exploring site fidelity of humpback whales in the waters of the Commander Islands

Olga Titova[1], Alexander Burdin[2], Erich Hoyt[3]

(1)State Nature Reserve "Komandorsky", Nikolskoye, Kamchatsky krai, Russia
(2)Kamchatka Branch of Pacific Institute of Geography DVO RAS, Petropavlovsk-Kamchatsky, Russia
(3)Whale and Dolphin Conservation Society, UK

arizona_sunset@mail.ru

The Commander Islands are one of the main feeding grounds of humpback whales in the Russian waters. The regular photo-identification of animals in this area near Bering Island has been carried out since 2008, and few photos were taken earlier in frames of other projects. In total, 1060 individual whales were identified in the waters of Bering Island. In this study we analyzed these data to investigate the level of site fidelity of the identified animals in the Commander Islands. We compared the number of years each animal was encountered in research area and number of encounters per year for each animal to evaluate if there are animals which visit the area regularly across the years and also stay for a long periods during each year. We found the significant correlation between these parameters (Spearman's rank correlation: $r = 0.27$, $p < 0.0001$). Whales encountered for two and three years had significantly more encounters per year, than whales encountered for one year (Mann-Whitney test, $p < 0.0001$). However, there was no significant difference in number of encounters per year between whales encountered for two and for three years. This indicate that there are some whales which regularly come to the waters of the Commander Islands and stay for prolonged periods, and other whales which occasionally visit the area for short periods probably on their way to other feeding grounds.

E46

Variability in the diet of common dolphin (*Delphinus delphis*) over the last two decades and its relationship with change in prey abundance

Maria Begoña Santos[1], Imogen German[1,2], Diana Correia[1,3], Fiona L. Read[2], Jose Martinez Cedeira[4], Mara Caldas[5], Juan I. Diaz da Silva[4], Alfredo López[4], Francisco Velasco[5], Graham J. Pierce[2]

(1) Instituto Español de Oceanografía, Centro Oceanográfico de Vigo, P.O. Box 1552, 36200 Vigo, Spain
(2) Oceanlab, University of Aberdeen, Aberdeenshire, AB41 6AA, UK
(3) University of Algarve, 8005-139, Faro, Portugal
(4) CEMMA, P.O. Box 15, 36380 Gondomar, Spain
(5) Investigación Planificación y Dessarrollo S.A., Paseo Imperial 10 -12, Bajo, 28005 Madrid
(6) Instituto Español de Oceanografía, Centro Oceanográfico de Santander, Promontorio San Martín, s/n. PO Box 240, 39080 Santander, Spain

m.b.santos@vi.ieo.es

Understanding responses of predators to change in prey abundance is an essential prerequisite for predicting the responses of marine ecosystems to perturbation and ensuring sustainable fishing. As an abundant top predator which feeds largely on commercially exploited fish, common dolphin is expected to be impacted by fluctuations in fish abundance. Previous studies variously suggest a preference for energy-rich species or that common dolphins are opportunistic predators. In the latter case, the intensity of predation on all prey species would be expected to vary in proportion to their (relative) abundances. If such relationships are seen for only a few prey species, and the importance of other species varies inversely with abundance of these "preferred" prey, this would indicate selective feeding. We analyse common dolphin diet in Galicia (NW Spain), based on stomach contents from 514 stranded and by-caught individuals collected over two decades. Using Zero-inflated Poisson or negative binomial Generalised Additive Models to deal with the high number of zeros present in prey numbers, we tested for evidence of "preference" for the main prey species, as well as investigating the existence of ontogenetic, spatial and seasonal variation in diet. The most important prey were sardine, blue whiting and hake, all species of high commercial value. Our results also demonstrated spatio-temporal and ontogenetic variability in diet. Relationships between diet and annual indices of prey abundance do not conclusively confirm either opportunistic or selective predation, but there is more evidence for the former. Lack of

evidence for selective predation on energy-rich sardine could be due to current low stock levels.

E47

Investigating population heterogeneity in the right whale (*Eubalaena australis*) population off the South American Atlantic coasts by means of stable isotope analysis

Morgana Vighi[1], Asunción Borrell[1], Enrique Crespo[2], Larissa de Oliveira[3], Paulo César Simões Lopes[4], Paulo A. C. Flores[5], Néstor García[2], Alejandro Aguilar[1]

(1) Department of Animal Biology, Faculty of Biology, University of Barcelona, Spain
(2) Laboratory of Marine Mammals, Centro Nacional Patagónico (CENPAT-CONICET), National University of Patagonia, Argentina
(3) Study Group of Aquatic Mammals of Rio Grande do Sul (GEMARS), Brazil
(4) Universidade Federal de Santa Catarina, Centro de Ciências Biológicas, Departamento de Ecologia e Zoologia. Trindade, 88010-970 - Florianopolis, SC – Brasil
(5) Instituto Chico Mendes de Conservação da Biodiversidade, Centro Nacional de Pesquisa, Conservação e Manejo de Mamíferos Aquáticos. Jurerê, 88053-700 - Florianopolis, SC - Brasil

morgana.vighi@gmail.com

Along the Atlantic coasts of South America, right whales were subject to intense exploitation from the late 18th century to the early 1970s. Despite recorded catches by whalers originally formed a continuum from southern Brazil to Tierra del Fuego, the recovery of the population has apparently occurred in a fragmented manner, with two main areas of concentration, one off Southern Brazil and another off Peninsula Valdés (Argentina). This pattern suggests some level of heterogeneity in the population, which is apparently contradicted by recorded movements of individuals throughout the whole geographical range occupied by the species in the southern Atlantic. To test the hypothesis of the potential occurrence of discrete subpopulations exploiting specific habitats, we investigated isotopic profiles (N, C and O) in 125 bone samples obtained from archaeological sites and from modern strandings occurring both in southern Brazil (n=72) and Peninsula Valdes (n=53).

E48

A visual health assessment of a resident community of bottlenose dolphins in the Strait of Gibraltar

Carolina Jiménez-Torres[1], Philippe Verborgh[1], Renaud de Stephanis[2], Pauline Gauffier[1], Ruth Esteban[1], Joan Giménez[2], Marie-Francoise Van Bressem[3]

(1) CIRCE (Conservation, Information and Research on Cetaceans), Cabeza de Manzaneda 3, Pelayo, 11390 Algeciras, CADIZ, Spain
(2) GEMA, Grupo de Ecología Marina Aplicada, Estación Biológica de Doñana, CSIC, C/ Americo Vespucio, s/n, 41092 Isla de la Cartuja, Sevilla, Spain
(3) Cetacean Conservation Medicine Group-CMED, Berlin, Germany; Peruvian Centre for Cetacean Research-CEPEC, Lima Peru

caro_linajt@hotmail.com

The bottlenose dolphin (*Tursiops truncatus*) is the cetacean species most commonly encountered in the Strait of Gibraltar. A community of about 300 *T. truncatus* resides year round in the central and deeper part of the Strait. It is exposed to stressful anthropogenic factors including a very high maritime traffic and commercial whale watching activities. In an attempt to assess the health of this community we thoroughly examined the left upper body of 334 dolphins for evidence of skin lesions, physical deformations and other conditions using 13,763 images taken for photo-identification studies in 2004-2007. Emaciation was not observed. Deformation of the dorsal fin associated with a very large scar was seen in an adult female. Tattoo skin disease (TSD) was detected in 4,5% of the dolphins. Prevalence was significantly (Ï‡2 = 6,62, df = 1, P = 0,01) higher in juveniles (12,5%, n= 40) than in adults (3,4%, n= 290). None of the four calves were affected by TSD. This holo-endemic epidemiological pattern is typical of the disease in healthy populations of odontocetes. Other cutaneous disorders included orange blotches (n= 1), pale dermatitis (n= 2), punctiform marks (n= 3), expansive annular skin lesions (n= 1), nodules (n= 3) and patchy depigmentation (n=1). The occurrence of pale dermatitis and expansive annular disease may be indicative of a deteriorating coastal water environment and should be further investigated.

E49

Mammal-Eating Killer Whales (*Orcinus orca*) of the western part of the Okhotsk Sea and their prey

Olga Shpak, Alexey Paramonov

A.N. Severtsov Institute of Ecology and Evolution of Russian Academy of Sciences (SIEE RAS), 33 Leninsky Prospect, 119071Moscow, Russia

ovshpak@gmail.com

Killer whales (*Orcinus orca*, KW) of mammal-eating ecotype are rarely observed in the Russian Far East. To date, no reliable observations have been made in the western Okhotsk Sea (OS). We have collected interview data and incidental observations during 5 years, and conducted boat and land-based studies for 2 years. We mapped KW sightings and KW harassment/attacks/kills of belugas, bowhead whales, bearded, ringed (or spotted) seals. In 2011-2012, we observed, photographed and biopsied KW in the western arm of Academy Bay – Ulbansky Bay. Six sightings were made in 2011, and 4 – in 2012, including 1 sighting in Nikolaya Bay, the eastern arm of Academy Bay. The largest group was observed on August 6, 2011, and visually estimated as 30-32 individuals. This group was observed 3 times (number of individuals, probably, varied). Photo-identification showed that the size of this group (3 sightings combined) exceeded visual estimate. To our knowledge, this is the largest group of mammal-eating KW ever observed. In 2012, we observed 6 KW in Ulbansky Bay: 3 whales photo-matched with the individuals identified in 2011. In Nikolaya Bay, we observed 10 KW, no matches with previously identified whales found. All KW morphologically and genetically proved to be of mammal-eating ecotype. In Ulbansky Bay, KW consuming bearded seals were observed twice. One stranded bowhead was lacking a lower jaw and tongue; another floating corpse bore the scars from supposedly killer whale teeth. Several photographed alive bowheads also bore similar scars, particularly on the fluke and pectoral fins. According to our data, KW of mammal-eating ecotype, although not numerous, are predominant in the western OS and may form large groups, presumably, for attacking bowheads. The OS bowhead population is endangered and comprises few hundreds. The KW predation on bowheads may significantly influence recovery rate of this population.

EH01

Whales, dolphins and "other fishes" in the Southeast Atlantic: Data combination to analyze historical cetaceans' biodiversity in the Gulf of Guinea

Cristina Brito[1,3], Cristina Picanço[2,3], Inês Carvalho[3]

(1) CHAM, FCSH-UNL, Avenida de Berna 26C, 1069-061 Lisboa, Portugal
(2) CIUHCT, FCUL, Edificio C4, piso 3, gab. 15, Campo Grande, 1749-016 Lisboa, Portugal
(3) Escola de Mar, Edifício ICAT, Campus de FCUL, Campo Grande, 1749-016 Lisboa, Portugal

cristina.brito@escolademar.pt

Information from past events and historical biological occurrences of whales and dolphins may contribute to support current knowledge about cetaceans' presence and distribution. Also, may contribute to the regulation of present day human activities, such as whale watching and fishing, as well as to local marine conservation. Early modern reports of Portuguese Atlantic journeys contain information about natural elements and marine megafauna. These descriptions are based on empirical knowledge accumulated in successive maritime routes and indicate species or animal groups' occurrence. Navigators recorded the presence of typical animals to estimate their localization and whatever seemed new and intriguing. So, in addition to fish and birds, there are other reports to unusual or strange marine animals most of them unknown to Europe. In these descriptions for the Southeastern Atlantic Ocean we found 14 detailed accounts of cetaceans, between the 15th and 17th centuries, and identify oceanic dolphins, porpoises, killer whales and baleen whales. Much more recently whaling accounts as well as dolphin captures for some regions in the Gulf of Guinea were also encountered. For instance, references to the capture of *toninhas* (small delphinids such as common dolphins) are part of the 20th century fishing statistics of Angola (West Africa). Fishing books where consulted and, between 1940 and 1969, an estimation of between 320 and 650 individuals was obtained. Similarly, regular accounts for industrial captures of large whales in the Gulf of Guinea are available from the end of the 19th century to the middle 20th century. So, this work is a relevant contribution to the knowledge on cetaceans' historical occurrence and biodiversity in this geographical region. It gives a good perspective of the importance of data combination to evaluate long term cetacean biodiversity especially in regions where these aspects are still being assessed.

EH02

Whalers' stories (19th century) and ship surgeons' accounts

Odile Gannier[1], Alexandre Gannier[2]

(1) Université de Nice-Sophia Antipolis, France/ GREC, Groupe de recherche sur les Cétacés, Antibes, France
(2) GREC, Groupe de recherche sur les Cétacés, Antibes, France

gannier@unice.fr

Ship surgeons were supposed to look after the crew during long term travels. They were not specifically in charge of zoological observations, unless they were enlisted both as doctors and naturalists. However, since the seventeenth century each British whaling boat had to carry a surgeon, as well a each French vessel with more than 50 people aboard, they were obliged to keep carefully at least their medical diary. Due to their scientific training as botanists or zoologists, and being experienced in observing men and animals, ship surgeons had also opportunities to collect interesting data on whales. During the 19th century, some surgeons recorded their observations concerning whales: for example, Quoy and Gaimard under the command of Freycinet, Lesson (Duperrey's travel), Thomas Beale, Frederick Bennett, Felix Maynard and Charles Frouin. They were not so much concerned with catch statistics and results of the campaign, even if they could get a share of the benefits. But they observed, measured, dissected, recorded, and generally synthesized their observations by gathering data about the animals they saw, for science's sake. Moreover, they happened to read previous scientific reports and quote their accounts to increase knowledge about animals. To some extent they were among the first true field biologists.

EH03

Representation of cetaceans in old maps: myth, decorative elements or reality?

Cristina Picanço

CIUHCT, FCUL, Edificio C4, piso 3, gab. 15, Campo Grande, 1749-016 Lisboa, Portugal

cristina.picanco@gmail.com

Before naturalists became familiar with the great marine animals that inhabited the seas, there were many encounters of fishermen and sailors with these mysterious unknown beings. This led to legends and myths that have fed generations of men at sea, also resulting from fear and hallucinations. In the Middle Ages, the unexplored sea was above all an imaginary and fantastic world inhabited by monsters and a series of fabulous creatures. A topic that stimulated much curiosity was the description of different monsters and creatures, and stories of sea monsters which were a feature of almost all the cultures that have had contact with the sea. Consequently, the use of drawings of sea monsters became frequent to illustrate maps, a practice that fell into disuse with the advent of modern cartography. Both in the Middle Ages and at the beginning of the Renaissance, people were convinced that terrible monsters, whales, sea serpents, giant lobsters, fabulous beasts with strong sharp teeth inhabited the North Atlantic. From the fifteenth century onwards, the sailors opened new maritime paths and proved that the ocean was not so terrible by means of a progressive accumulation of knowledge about the natural reality of the sea. This led to the demystification of some marine fauna. However, sea monsters were present in marine cartography until the middle of the seventeenth century. With this presentation we intend to give an overview of the importance and significance of the representation of marine animals in medieval and Renaissance maps, taking as an example some of the most popular maps dating back to these times and about their authors. We will also try to present a possible explanation for the representation of these animals, by combining information from that time with some current biological knowledge on cetaceans and other marine mammals.

EH04

The Sirenia extinction from the Euro-North African shores: a link between climate and Supernovae

Gonçalo Prista[1], Mário Estevens[2], Mário Cachão[1], Rui Jorge Agostinho[3]

(1) Departamento de Geologia e Centro de Geologia da Faculdade de Ciências da Universidade de Lisboa
(2) Câmara Municipal de Almada
(3) Centro de Astronomia e Astrofísica da Universidade de Lisboa

goncaloprista@gmail.com

We tested the possible relation of the extinction of the Sirenia in Europe with climate variations during the Cenozoic, and these with variations on the energy flux that reaches the Earth generated by its galactic environment. The Sirenia, an Order of marine mammals with extant and extinct species, currently occur in tropical and subtropical waters of the Atlantic (manatees) and Indo-Pacific (dugong). Between the Eocene and the Pliocene (55.8 Ma to 2.7 Ma) its paleobiogeographic distribution included also the coastal marine environments of Europe and amphi-Mediterranean coastal seas. The Sirenia fossil record (more than 400 references) from Europe and North Africa was matched against the Cenozoic (last 65 Ma) climate evolution, which degradation led to a loss of paleobiodiversity in this Order and to its disappearance from the Euro-North African shores. Although Cenozoic climate is reasonably understood, the mechanisms that force climate evolution are still in great debate. To test a forcing mechanism capable of generating long term climate trends a mathematical model was developed to study the variations on the energy flux from Supernovae that reached Earth over the last 100 Ma. There seems to be a relation between the Supernovae flux variation and the climate evolution on Earth over the last 65 Ma, due to its direct influence on cloud production by atmospheric ionization. Data indicates that the disappearance of sirenia from European and Mediterranean coastal waters is intimately connected to the onset of the Northern Hemisphere glaciations and these can also be connected to the intensity on stellar events, an additional long-term climate forcing mechanism.

EH05

On whales and historical whaling activities in Portugal (West Iberia)

António Teixeira[1], Cristina Brito[2]

(1) ICNF (Institute for Conservation of Nature and Forests), Rua de Santa Marta, 55, 1150-294 Lisbon, Portugal
(2) CHAM (Centre for Overseas History), Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa and Universidade dos Açores, 1069-061 Lisbon, Portugal

antoniomteixeira@icnf.pt

Eight species of large cetaceans (7 Mysticetes and 1 Odontocete) are usually reported from Portuguese waters in western Iberia and some have been harvested by man in historical times. The whaling activities were important to the local economy and have contributed to the folklore of communities in the area. Industrial whaling was carried out twice in the 20th century but only for short periods following the closure of hostilities in WWI and WWII. Catcher boats equipped with harpoon guns operated at sea and captures were processed ashore at Setúbal. Fin whale (*Balaenoptera physalus*) was the most frequent quarry and catch statistics mention just another three species captured in the area (*B. musculus*, *Megaptera novaeangliae* and *Physeter macrocephalus*). Contrasting sharply to this brief surge of modern activity, there was intense Middle Age whaling on the shores of western Iberia and this had major economic significance. While it has been generally admitted that the Northern Right Whale *Eubalaena glacialis* was the main prey there is limited evidence suggesting that possibly this whaling was polyspecific and may have included also smaller odontocetes. Occasional stranding of large cetaceans on the Portuguese coast has been documented and the species involved are often *B. physalus* and *P. macrocephalus*. These events would eventually provide valuable resources to the populations living in the vicinity and may be regarded as a form of "opportunistic whaling". It is worth noting that skeletal remains of fin whales washed ashore before the onset of industrial whaling are often oversize by current standards and may provide evidence to the former presence of very large adults in the population. Our study aims to update current information on species composition and provide insight on the dynamics of former cetacean populations in West Iberia.

Genetics

G01

Genetic analysis of population structure of killer whales (*Orcinus orca*) from Russian Far East

Ekaterina Borisova[1], Olga Shpak[2,3], Ilya Meschersky[2], Alexander Burdin[4]

(1) Faculty of Biology, Moscow State University, Moscow, Russia
(2) A.N. Severtsov Institute of Ecology and Evolution of Russian Academy of Sciences (IPEE RAS), Moscow
(3) "Dolphin and I", Ltd., Moscow
(4) Kamchatka Branch of Pacific Institute of Geography DVO RAS, Petropavlovsk-Kamchatsky, Russia

amiaki@rambler.ru

Two ecotypes of killer whales (*Orcinus orca*) of the Far East Russia are known - mammal-eating and fish-eating. In this study we assess if fish-eating and mammal-eating killer whales belong to one or different populations, and estimate the degree of genetic heterogeneity within ecotypes. For this we analyzed the allele frequency of nine nuclear DNA microsatellite loci in skin samples from Avacha and Karaginsky Gulf of Kamchatka peninsula, waters of Bering Island (Commander Islands) and from the western Okhotsk Sea (total 67 samples). Cluster analysis (program Structure 2.3.3) shows that the samples were more likely to be divided into two groups, rather than the other number of groups (1, 3-6). Significant difference was observed between killer whales of different ecotypes. However, the genetic isolation of communities from each other within each of the ecotypes was not observed. Average allelic diversity of killer whales from mammal-eating ecotype was much higher than those values for fish-eating killer whales, which may indicate that mammal-eating animals belong to several communities, but clearly distinguishes them from fish-eating whales. A certain degree of reproductive isolation of individuals between different ecotypes was also confirmed by further analysis of data from nine loci. Differences of fish-eating killer whales from the Commander Islands and Avacha Gulf from mammal-eating whales were statistically significant and relatively high (fish-eating killer whales from Karaginsky Gulf were excluded from the analysis due to the small sample size). In the same time, we found no significant differences in allele frequencies between groups of killer whales within each ecotype. We conclude that killer whales of different ecotypes – fish-eating and mammal-eating - found in the study areas, most likely represent different reproductive groups (populations). Fish-eating killer whales from Avacha Gulf and the Commander Islands, probably, belong to a single population.

G02

Genetic characterisation of bottlenose dolphins (*Tursiops truncatus*) in the Balearics islands

José M. Brotons[1], Valentina Islas-Villanueva[2]

(1)Direcció General de Medi Rural i Marí, Govern de les Ills Balears, Foners 10, 07006, Palma, Balearic Islands, Spain.
(2)Sea Mammal Research Unit, Scottish Oceans Institute, University of St. Andrews, St. Andrews, Fife, KY16 8LB, UK

jmbrotons@dgpesca.caib.es

Little is known about bottlenose dolphins in the Mediterranean (Notarbartolo-di-Sciara & Bearzi, 2005). The present intermittent distribution in the basin is probably due to the joint effect of past extermination campaigns (Bearzi et al., 2004) and the current variety of threats. Indirect evidence suggests that the population is declining (Bearzi et al., 2004, Bearzi & Fortuna, 2006, Blanco & González, 1992, Borrell et al., 2000). Mitochondrial and nuclear DNA analysis has differentiated several populations between the Black Sea and the Mediterranean (Natoli et al., 2005) and it was concluded that the boundaries for each population coincided with the submarine topography, superficial salinity, productivity and temperature. Differences in the DDT/PCB ratio and other PCB profiles between the Balearics animals in relation with the Iberian Mediterranean indicate that deep waters between the archipelago and the peninsula could represent and effective barrier for the movement of the species (Borrell et al., 2006), this could suggest isolation not only between the Balearics animals and the Iberian Peninsula, but also between islands due to their physical and oceanographic characteristics a very important fact in the conservation of the species in the Mediterranean. This study tries to evaluate the effectivity of these barriers to gene flow between the Balearics and the Iberian Peninsula as well as between the islands that form the archipelago through the analysis of 9 microsatellites and a fragment of mtDNA d-loop. A total of 57 biopsy samples were obtained from three main areas: Gimnèsies (Majorca and Minorca), Pitiuses (Ibiza and Formentera) and Valencia. Clustering analysis performed with Structure 2.3.X show no differentiation, but population differentiation indeces FST and RST between Pitiuses and Valencia are significant, indicating a lower level of geneflow between them possibly driven by a marine barrier.

G03

Fine-scale population structure of humpback whales in South Africa coast, based on mitochondrial DNA and microsatellite variation

Inês Carvalho[1,2,3], Jaco Barendse[4, 5], Peter B. Best[4], Cristina Pomilla[2,6], Matthew S. Leslie[2,7], Ken Findlay[8], Mike A. Meyer[9], Howard C. Rosenbaum[2,3]

(1) Faculdade de Ciências e Tecnologia – Universidade do Algarve, Campus Gambelas, 8000-139 Faro, Portugal
(2) Sackler Institute for Comparative Genomics, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA
(3) Ocean Giants Program, Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460-1099, USA
(4) Mammal Research Institute, University of Pretoria, c/o Iziko South African Museum, P.O. Box 61, Cape Town, 8000 South Africa
(5) Sustainability Research Unit / SANParks, Nelson Mandela Metropolitan University, Private Bag X6530, George, 6530, South Africa
(6) Department of Public Health and Primary Care, University of Cambridge, 2 Worts Causeway, Cambridge CB1 8RN, UK
(7) Scripps Institution of Oceanography, University of California San Diego, 9500 Gilman Dr. Mailcode 0202, La Jolla CA 92038
(8) Department of Oceanography, University of Cape Town, Private Bag, Rondebosch, 7701, South Africa
(9) Oceans and Coasts, Department of Environmental Affairs, Private Bag X2, Rogge Bay, 8012, South Africa

carvalho.inesc@gmail.com

On South African coast two distinct migratory corridors of humpback whales (*Megaptera novaeangliae*) are present. One takes humpback whales past the west coast of South Africa in autumn, en route to breeding grounds (breeding stock B) off Gabon, Congo, Angola and possible other coastal and offshore areas in Gulf of Guinea. And the other takes them past the east coast of South Africa, en route to coastal waters of Mozambique and Madagascar - breeding stock C. In the present work a first attempt to assess a fine-scale population structure of humpback whales on the two migratory paths in the South African coast, combining mitochondrial DNA (mtDNA) and microsatellites markers was made in order to characterize individual and population levels of genetic structure variation in this region. It was amplified, sexed, genotyped and sequenced a total of 484 samples from west and east coast. The results revealed population differentiation and restricted connectivity of humpback whales from west and east coast of South Africa. Differences on fidelity and seasonality to each region were found, humpback whales from west coast showed high levels of fidelity to the area and broader seasonality with several animals been sighted and resighted in summer months

suggesting that this region besides functioning as a migratory corridor serve as a feeding ground to some animals of the population.

G04

Genetic insights into the local extinction and re-colonization of grey seals (*Halichoerus grypus*) in Denmark

Katharina Fietz[1], Jeff A. Graves[2], Rune Dietz[3], Jonas Teilmann[3], Anders Galatius[3], Lasse F. Jensen[4], Ailsa Hall[5], Bernie McConnell[5], M. Thomas P. Gilbert[1], Morten T. Olsen[1,3]

(1) Center for Geogenetics, Natural History Museum of Denmark, , Vester Voldgade 5-7, 1350 København K, Denmark
(2) School of Biology, University of St Andrews, Harold Mitchell Building, St Andrews, Fife, KY16 9TH, UK
(3) Department of Bioscience, Aarhus University, Frederiksborgvej 399, 4000 Roskilde, Denmark
(4) Fisheries and Maritime Museum Esbjerg, Tarphagevej 2, 6710 Esbjerg V, Denmark
(5) Scottish Oceans Institute, East Sands, University of St Andrews, St Andrews, Fife, KY16 8LB, UK

Katharina.Fietz@sharksavers.org

Previously the most common seal in Denmark, the grey seal has undergone serious population declines due to anthropogenic exploitation throughout the last two centuries. Extensive hunting campaigns initiated in the 1800s caused functional extinction in Danish waters. In recent years, grey seals have increasingly been observed at their former haul-out sites. This has led to increased interest in the grey seal conservation status and management in Denmark, as well as interest in the effects the population increase may have on other marine mammal species in the region, and on local fisheries. The present study compares genetic diversity and structuring of the current and former grey seal population in Danish waters, providing a rare insight into their extinction and re-colonization. Genomic DNA was extracted from skin biopsies, carcasses, stool, and bone in 230 historic and contemporary grey seal samples from former and current haul-out sites in Denmark, as well as reference sites in the Baltic and the North Sea. The results support previous genetic studies that grey seals in Northern Europe are genetically divided into at least two populations: a North Sea and a Baltic Sea population. Further, our results suggest that the historic Danish grey seal population was genetically related to the current Baltic Sea population, and hence did not constitute a genetically unique Danish stock. Further, grey seals recently observed along the Danish West coast can be genetically assigned to the North Sea population, while grey seals in Kattegat and the Danish Baltic Sea appear closer related to seals from the eastern Baltic Sea. Thus, the grey seals currently re-colonizing Danish waters appear to originate from both the North Sea and the Baltic, and should consequently be managed as separate units, roughly divided by the Skagerrak.

G05

Genetic characterization of the northern bottlenose whale (*Hyperoodon ampullatus*) in the North-Atlantic

Rasmus Havmøller[1], Gísli Víkingsson[2], Tom Gilbert[3], Andrew Foote[3], Morten Tange Olsen[3], Øystein Wiig[4], Morten Allentoft[3], Conor Ryan[5], Bob Read[6], Rob Deaville[7]

(1) Centre for GeoGenetics, Natural History Museum of Denmark
(2) Marine Research Institute of Iceland
(3) Centre for GeoGenetics
(4) Natural History Museum, Norway
(5) Irsh Whale and Dolfin Group
(6) Scottish Agricultural College, Inverness
(7) Institue of Zoology, London

rasmushav@gmail.com

Belonging to the enigmatic family of beaked whales (Ziphiidae) the northern bottlenose whale (*Hyperoodon ampullatus*) has heavily hunted from the 1880's to 1920's, with some 65.000 animals caught in this period - but whaling did not cease until the 1970's. The current as well as the past population size and structure remains unknown and studies have shown that Northern bottlenose whales in Canada appears to be philopatric (Dalebout et al. 2006), and have very low genetic diversity (5 mitochondrial dloop haplotype in 184 individuals). This study includes nearly 400 samples from all of the known distribution of northern bottlenose whales from both pre, during and post whaling era and attempts to solve some of the questions for this species. Has there been an effect of whaling? Are beaked whales migratory or philopatric? Is there any population structure? This study is being conducted at the Centre for GeoGenetics, Natural History Museum of Denmark, with Prof. Tom Gilbert and Dr. Morten Tange Olsen as supervisors.

G06

How vulnerable is the Sea of Cortez fin whale population?

Vania Elizabeth Rivera León[1], Jorge Urbán Ramírez[2], Sally Mizroch[3], Christian Ramp[4], Richard Sears[5], Martine Bérube[1]

(1) Marine Evolution and Conservation, Centre for Ecological and Evolutionary Studies, University of Groningen, PO Box 11103, 9700 CC Groningen, the Netherlands
(2) Departamento de Biología Marina, Universidad Autónoma de Baja California Sur, Ap. Post. 12-B, 23081, La Paz, B.C.S., México
(3) National Marine Mammal Laboratory, Alaska Fisheries Science Center/NMFS, NOAA, 7600 Sand Point Way, Bldg. 4, Seattle, WA 98115, USA
(4) Mingan Island Cetacean Study Inc., 285 Green Street, St. Lambert, J4P 1T3, Quebec, Canada and Marine Zoologie (FB2), Universität Bremen (NW2), Postfach 330 440, 28334 Bremen, Germany
(5) Mingan Island Cetacean Study Inc., 285 Green Street, St. Lambert, J4P 1T3, Quebec, Canada

v.e.rivera.leon@student.rug.nl

Previous genetic analyses have demonstrated that the fin whales in the Sea of Cortez likely are genetically (and presumably demographically) isolated from North Pacific fin whales. Consequently the Sea of Cortez fin whale population is likely more vulnerable to anthropogenic effects and habitat changes. Here we extend previous work by genetic analyses of microsatellite and mtDNA nucleotide sequences in 375 and 24 fin whale samples from the Sea of Cortez and North Pacific, respectively. We will estimate long- and short-term effective population sizes in these two populations and compare the estimates with data from the much larger North Atlantic fin whale population(s). The objective of the analysis is to assess how vulnerable the Sea of Cortez fin whale population is to random genetic effects, such as loss of adaptive potential and inbreeding.

G07

Contribution of DNA barcoding to the study of marine mammals: species identification, monitoring biodiversity and diet analysis

Eléonore Méheust[1,2], Eric Alfonsi[1,2], Amélia Viricel[3], Willy Dabin[4], Yann Quillivic[2], Sami Hassani[2], Jean-Luc Jung[1]

(1) BioGeMME, UFR Sciences et Techniques, Université de Brest, 6 avenue le Gorgeu, 29200 Brest, France
(2) Océanopolis, Port de Plaisance du Moulin Blanc, 29200 Brest, France
(3) Littoral, Environnement et Sociétés, UMR 7266, Université de La Rochelle-CNRS, La Rochelle, France
(4) Observatoire PELAGIS, UMS 3462, CNRS-Université de La Rochelle, La Rochelle, France

eleonore.meheust@live.fr

The DNA barcoding *sensu stricto* is based on the use of a standardized DNA fragment as a tool for species identification. In the animal kingdom, the selected DNA region is a part of the mitochondrial gene encoding the subunit 1 of the cytochrome C oxydase (*Cox1*). A database, accessible at www.boldsystems.org, groups and organizes the sequences of *Cox1*. The definition of DNA barcoding *sensu lato* corresponds to identification at different taxonomic levels and can rely on different DNA fragments. We used DNA barcoding *sensu stricto* to assess and monitor the genetic biodiversity of marine mammals along French coasts (in collaboration with the French stranding network). A sequence catalogue was established and data were added to the barcode of life database (BOLD). To date, our catalogue contains 102 specimens of 18 species. The applicability of the method to the different species will be discussed. The intraspecific variability of *Cox1* was also characterized for two species, the harbour porpoise and the grey seal, and compared with polymorphisms in two other mitochondrial markers: cytochrome *b* and the D-loop. DNA barcoding was also used to determine – or confirm – the taxonomic identification of stranded animals or parts of stranded animals, when visual identification could not be performed. For instance a spectacular 10 meters-long piece of soft tissue stranded on the island of Sein was identified as *Balaenoptera physalus*. Finally, we applied the approach to the identification of soft prey remains in the stomachs of harbour porpoises and grey seals. Although degraded DNA was generally extracted from these digested tissues, we were able to identify 10 different fish species. The use of this simple DNA-based method, in addition to visual identification, increased the rate of prey identification by some 30%. Sequences obtained from these studies have been published as « BOLD » projects, available on www.boldsystems.org.

G08

Genetic sex determination of highly degraded DNA samples: methodological comparison using cetacean species

Ana Morais Pinela

Department of Animal Biology, Faculty of Biology and Biodiversity Research Institute, University of Barcelona, Barcelona, Spain

ana.pinela@gmail.com and anapinela@ub.edu

The Cetacea is a group in which sexual dimorphism is rare and sexing of the individuals in the field is extremely difficult; and even in stranding events it is dependent on the degree of decomposition of the carcass. Therefore, sex determination using genetic tools is an extended practice amongst marine mammal biologists. DNA extracted from biological material such as bones and teeth is often degraded, and thus more difficult to analyse than modern recent high quality DNA samples; and also it is noteworthy that DNA damage and degradation is often more influenced by preservation conditions than by time. A total of 90 individuals were sampled and DNA from sperm whale's, *Physeter macrocephalus*, teeth and common dolphin's, *Delphinus* spp., bone and teeth tissue was extracted and amplified using four different methodological approaches in order to genetically determine the sex of the individuals. Samples from both species originated from two locations of different latitude/longitude, each with unique atmospheric and preservation conditions. The most commonly used genetic sex determination methodologies amongst marine mammal scientists are discussed, as are the difficulties one faces when trying to apply them to highly degraded DNA samples. Success rates were compared between species and sampling sites, tissue type, genetic sex determination method and size of the DNA fragment amplified. Moreover, possible correlations between the DNA amplification success rates and other variables (latitude/longitude, size of the DNA fragment amplified) were investigated. Comparatively, all methods presented very low success rates in sexing the animals; with the CETFXY method performing relatively better than the others.

G09

Evolutionary of history of North Pacific Humpback Whales

Yvonne I. Verkuil[1], Martine Bérubé[1], R. Jorge Urbán[2], James D. Darling[3], David K. Mattila[4], Manami Yamaguchi[5], Luis A. Pastene[6], Per J. Palsbøll[1]

(1) Marine Evolution and Conservation, Centre for Ecological and Evolutionary Studies, University of Groningen, Nijenborgh 7, Groningen, the Netherlands
(2) Departamento de Biologiá Marina, Universidad Autónoma de Baja California Sur, Ap. Post 19-B, La Paz, Baja California Sur. 23081, Mexico
(3) Pacific Wildlife Foundation, Vancouver, British Columbia, V3H 1V6, Canada
(4) Hawaiian Islands Humpback Whale National Marine Sanctuary, 726 South Kihei Road, Kihei, Hawaii 96753, USA
(5) Ogasawara Marine Center, Byobudani, Chichijima, Ogasawara-mura, Tokyo 100-0021, Japan
(6) Institute of Cetacean Research, 4-5 Toyomi-cho, Chuo-ku, Tokyo, 104-0055, Japan

y.i.verkuil@rug.nl

North Pacific Humpback Whales breed on winter grounds at Hawaii, Mexico and Okinawa, and summer on feeding grounds in northern Temperate and sub-Arctic waters. Re-sighting records of photographically identified individual humpback whales suggest that breeding grounds are not isolated. Later genetic studies by Palumbi & Baker (1994) and Baker et al. (1998) inferred male-mediated gene flow between wintering breeding in Mexico and Hawaii. The result was based upon a 10-fold higher rate of gene flow estimated from bi-parentally inherited nuclear markers compared to the rate of gene flow estimated from maternally transmitted mitochondrial nucleotide sequences. In this study we re-test the notion of male-based gene flow among North Pacific winter breeding areas. We sequenced the mitochondrial control region and genotyped 6 hyper-variable microsatellite loci in 342 North Pacific Humpback whales; 109 samples from Hawaii, 77 from Alaska, 84 from Mexico and 74 from Japan. The preliminary estimates of standard population genetic divergence indices are similar to those reported by Baker et al. (1998), and analyses are on progress to determine if those are due to male-biased gene flow.

HI01

Estimated bycatch of harbour porpoise (*Phocoena phocoena*) in two coastal gillnet fisheries in Norway, 2006-2008. Mitigation and implications for conservation

Arne Bjørge, Mette Skern-Mauritzen

Institute of Marine Research, Norway

arne.bjoerge@imr.no

Based on catch and bycatch data from 2006-2008 from a monitored segment of the fleet of coastal gillnetters targeting monkfish and cod, we used general additive models (GAMs) to model bycatch rates, where number of harbour porpoises entered as the response variable, and catch by the fisheries was entered as offset. Landings statistics of target species were used to extrapolate to entire fisheries. The two best models predicted the total number of porpoise bycatch to 20,719 and 20,989 porpoises, with CVs 36.05% and 27.33%, respectively. Thus, the models predict annual total bycatches of about 6,900 porpoises in the two fisheries. The minimum fishing depths ranged from 5-200m for cod and 20-400m for monkfish nets. In cod nets porpoise bycatch rate decreased rapidly with increasing depth from 5m to 50m and then levelled off. The bycatch rate decreased linearly with increasing depth throughout the depth range for monkfish nets. According to the criteria advised by ASCOBANS (bycatches should not exceed 1.7% of the best population estimate), a population in excess of 400,000 is required to sustain an annual bycatch of 6,900 porpoises. One third of the Norwegian coast is bordering the North Sea where the abundance of porpoise is estimated at approximately 1/3 million. The abundance along the remaining Norwegian coast is not known. However, mitigation is required and our mitigation recommendations include the prohibition of large mesh nets set shallower than 50 m. For large mesh nets deeper than 50 m we recommend the use of Acoustic Deterrent Devices (ADD).

HI02

Quantification of impacts on marine mammals from the noise of offshore wind-farm installations

Carl R. Donovan[1,2], Catriona M. Harris[1], Lorenzo Milazzo[3], John Harwood[3], Nicola Quick[4], Carol Sparling[2]

(1) Centre for Research into Environmental and Ecological Modelling, The Observatory, Buchanan Gardens, University of St Andrews. St Andrews, Fife, KY169LZ, UK
(2) University of Cambridge Veterinary School, Madingley Road, Cambridge, CB3 0ES, UK
(3) SMRU Ltd, New Technology Centre, North Haugh, St Andrews, Fife, KY16 9SR, UK

carl@mcs.st-andrews.ac.uk

A framework for quantifying the impacts of SONAR on marine mammals was developed and implemented for use in a naval context. This has been modified for use in the context of off-shore wind-farm installations. The software, SAFESIMM, has been employed in EIAs for several wind-farm developments in the UK over 2012. We outline the approach, lessons learned, key sensitivities, issues and data priorities. These are informative to those seeking to quantify risk and suggest key areas for future research into the impacts of similar installations.

HI03

Are fin whales (*Balaenoptera physalus)* exposed to microplastics toxicological threat?

Maria Cristina Fossi[1], Cristina Panti[2], Daniele Coppola[1], Matteo Baini[1], Matteo Giannetti[1,2], Letizia Marsili[1], Ilaria Caliani, Roberta Minutoli[3], Giancarlo Lauriano[4], Simone Panigada[5], Jorge Urban[6], Cristiana Guerranti[1]

(1) Department of Environmental Sciences, University of Siena, Via P.A. Mattioli 4, 53100, Siena, Italy
(2) Department of Life Sciences, University of Siena, Via A. Moro 2, 53100, Siena, Italy
(3) Department of Animal Biology and Marine Ecology, University of Messina, Viale F. Stagno D'Alcontres, 31, 98166 Messina, Italy
(4) ISPRA, Via V. Brancati 48, 00144 Roma, Italy
(5) Tethys Research Institute, Viale G. B. Gadio 2, 20121 Milano, Italy
(6) Departamento de Biología Marina, Universidad Autónoma de Baja California Sur, La Paz, Mexico

Fossi@unisi.it

The emerging issue of microplastics (plastic fragments smaller than 5 mm) in marine environment is recently raising increasing attention. The impacts of microplastics on baleen whales, which potentially undergo to the ingestion of micro-litter by filtrating feeding activity, are largely unknown. Here we present the case study of the Mediterranean fin whale (*Balaenoptera physalus)*, exploring the toxicological effects of microplastics on mysticetes comparing two populations living in areas characterized by different human pressure: the Pelagos Sanctuary (Mediterranean Sea) and the Sea of Cortez (Mexico). The work is implemented through three steps: 1) collection/count of microplastics in Pelagos Sanctuary (Mediterranean Sea); 2) detection of phthalates in superficial neustonic/planktonic samples; 3) detection of phthalates and biomarkers responses (CYP1A1, CYP2B, lipid peroxidation) in skin biopsies of fin whales collected in the Pelagos Sanctuary (n=18) and Sea of Cortez (n=7). High presence of plastic particles have been detected in superficial neustonic/planktonic samples collected in the Pelagos Sanctuary areas investigated (mean value 0.62 items/m^3) with high concentration of phthalates (DEHP and MEHP), used as tracers of plastic derivates. Relevant concentrations of MEHP and higher biomarker responses (CYP1A1, CYP2B, lipid peroxidation) were detected in the skin biopsies of fin whales collected in the Mediterranean areas in comparison to the specimens of Sea of Cortez. These results suggest the use of phthalates as a tracer of microplastics assumption in fin whales and represent a warning signal on this emerging threat in baleen whales.

HI04

Humpback whale (*Megaptera novaeangliae*) entanglement evidence from the Dominican Republic

Pierre Gallego[1], Kim Beddall[1], Peter Sanchez[2]

(1) Whale Samaná, Santa Barbara de Samaná, Dominican Republic
(2) Marine Mammal Sanctuary of the Dominican Republic, Santa Barbara de Samaná, Dominican Republic

pierregallego@yahoo.com

The northern coast of the Dominican Republic is the main wintering ground for North Atlantic humpback whales. From January to April, humpback whales congregate around Silver Banks, Navidad Banks, and Samaná Bay to mate and to give birth. These three locations constitute the Marine Mammal Sanctuary of the Dominican Republic, which was created in 1996. Samaná Bay is a leading tourist destination for whale watching activities. For past 20 years, commercial whale watching vessels, in collaboration with the Center for Conservation and Eco-Development of Samaná Bay and Its Environs (CEBSE), have systematically recorded sightings and collected photographs. Data from Silver Banks was provided sporadically, with no standardized effort. Several cases of entanglement in fishing gear have been recorded from Silver Banks area, where commercial operators offer swim-with-whales activities. On two occasions, the whales were extremely emaciated and debilitated, indicating a probable prolonged entanglement. An improvised rescue attempt coordinated by local operators was successful in disentangling a whale during the 2012 season. However, the whale could not be tagged and there is no information on its fate. There are very strict regulations in place in the Samaná Bay, and the entanglement risk there appears to be minimal. There are some reports of whales cutting through artisanal breathing hoses used by divers, but with no entanglement consequences for the whales. Most entanglement events appear to occur in the waters outside the Exclusive Economic Zone (EEZ), as evidenced by reports as well as by the type of gear removed from the whales. Disentanglement efforts can be very dangerous, especially if rescuers are untrained or do not have the appropriate gear. In 2013, the International Whaling Commission will offer a workshop on large whale disentanglement in the Caribbean for all interested parties.

HI05

As main meal for sperm whales: plastic debris

Joan Giménez[1], Renaud de Stephanis[1], Eva Carpinelli[2], Carlos Gutierrez-Exposito[1], Ruth Esteban[2], Pauline Gauffier[2], Philippe Verborgh[2], Ana Cañadas[3]

(1) Department of Conservation Biology, Estación Biológica de Doñana (CSIC), 41013 Sevilla, Spain
(2) CIRCE, Conservation, Information and Research on Cetaceans, Cabeza de Manzaneda nº3 Pelayo-Algeciras, Spain
(3) Alnilam, Research and Conservation. C/Cándamo 116. 28240 Hoyo de Manzanares, Madrid, Spain

Gimenez.verdugo@gmail.com

Marine debris has been found in marine animals since the early 20th century, but little is known about the impacts of the ingestion of debris in large marine mammals. In this study we describe the first published case of mortality of a sperm whale related to the ingestion of large amounts of marine debris in the Mediterranean sea (3rd published case worldwide to our knowledge), and discuss it within the context of the spatial distribution of the species and the presence of anthropogenic activities in the area that could be the source of the plastic debris found inside the sperm whale. The spatial distribution modelled for the species in the region shows that these animals can be seen in two distinct areas: near the waters of Almería, Granada and Murcia and in waters near the strait of Gibraltar. The results shows how these animals feed in waters near an area completely flooded by the greenhouse industry, making them vulnerable to its waste products if adequate treatment of this industry's debris is not in place. Most types of these plastic materials have been found in the individual examined and cause of death was presumed to be gastric rupture following impaction with debris, which added to a previous problem of starvation. The problem of plastics debris should have a relevant section in the conservation plans of the species in the Mediterranean sea and should be a recommendation from ACCOBAMS due to these plastics' and sperm whales' high mobility.

HI06

Is the current bycatch reporting format useful for the assessment of bycatch risk?

Wojciech Górski, Krzysztof Skóra, Iwona Pawliczka, Radomil Koza

Hel Marine Station

gorskipl@wp.pl

Bycatch is a vital threat to marine mammals and other protected species (birds, fishes). One significant example is the impact of gillnets on the stock of Baltic harbour porpoise (*Phocoena phocoena* L.,1758). Population of this species has been categorized by IUCN as critically endangered. To estimate the scale of fishery threat to harbour porpoise population, crucial matter is participation of this sector in delivery of fishing data. To assess the suitability of current system for the above estimates, the data from fishery reporting was carefully analyzed. The data provides the information on the date of fishing, the number and the type of the fishing gears and the sector of fishing operation. The data unfortunately doesn't contain the exact location of the fishing gear, since the fishing sector isn't concerned with accurate geographic coordinates. The current vessels monitoring system (VMS) doesn't allow to verify that problem, because it takes into account only vessels above 12m. Lack of sufficient accuracy concerning the location of the fishing areas is a true impediment in assessment of fishery pressure, especially in coastal zone, where operating fishing vessels are below 12m. The structure of daily logbook as well as instruction of filling in the logbooks were compared with the need of reporting by-catches of endangered species. The gillnet fishing effort was also analyzed for Puck Bay, which is a part of the NATURE 2000 (PLH 220032) that is dedicated to the protection of harbour porpoise among others. The data collected (in situ) concerning fishing effort was compared with information from fishing records. Obtained picture showed a major difference between the real fishing effort and location and the entries in the logbooks. The analysis show that the current fishing reports are insufficient to determine the scale of the threat and proper adjustments are necessary to be considered.

HI07

Comparison of displacement responses to construction-related increase in vessel traffic between a Mysticete, Odontocete and Phocid seal

Michael Damien Haberlin[1], Anja Brandecker[1], Mary Coleman[1], Clodagh Collins[1], Hannah Denniston[1], Mairead O'Donovan[1], Roisin Pinfield[1], Fleur Visser[2,3], Laura Walshe[1], Pia Anderwald[1]

(1) Coastal and Marine Research Centre, University College Cork, Haulbowline, Cobh, Co. Cork, Ireland
(2) Kelp Marine Research, 1624 CJ, Hoorn, the Netherlands
(3) University of Amsterdam, IBED Institute, 1098 XH, Amsterdam, the Netherlands

d.haberlin@ucc.ie

Marine construction works often lead to temporary increases in vessel traffic, which in addition to the construction itself substantially contribute to underwater ambient noise in the area of impact and increase the risk of vessel collision for marine mammals. Using a 3-year dataset of cliff-based observations, investigations were undertaken to determine whether daily sighting rates of minke whale, bottlenose dolphin and grey seal varied according to the overall number and type of vessels present during the construction of an underwater gas pipeline through a bay on the northwest coast of Ireland. Results from Generalized Additive Models and Generalized Linear Models respectively indicated that neither the overall number of vessels nor the number of particular vessel types influenced the sighting rates of minke whales or bottlenose dolphins when corrected for sighting efficiency and natural seasonal variation in occurrence. Daily sighting rates for seals (grey and harbour seals, as well as unidentified seals belonging to either species) however, decreased significantly with the number of construction vessels present. These results suggest that construction activity *per se* may have been more important in determining seal sighting rates than the associated increase in vessel traffic. Under the specific circumstances, seals were the most sensitive of the three taxa investigated, being the only group to show a decline in sighting rates in response to construction-related disturbance.

HI08

The effect of piling activities on harbour porpoises in Belgian waters: impact modeling and testing

Jan Haelters, Sébastien Legrand, Laurence Vigin, Steven Degraer

Royal Belgian Institute of Natural Sciences (RBINS), Gulledelle 100, B-1200 Brussels and 3e en 23ste Linieregimentsplein, B-8400 Ostend, Belgium

j.haelters@mumm.ac.be

Pile driving produces high levels of underwater noise: one of the major environmental concerns in offshore wind farm (OWF) construction. We assessed the impact of pile driving for the construction of the C-Power OWF (Thorntonbank, Belgian waters) on harbour porpoises during the season in which they occur in high densities in Belgian waters. We performed standardised aerial surveys covering the Belgian part of the North Sea before during and shortly after pile driving to assess changes in abundance and spatial distribution. Next to this, we collected presence and absence data through passive acoustic monitoring (PAM) inside and outside the project area. The combination and integration of both techniques proved very useful as PAM results in low spatial but high temporal resolution data, while aerial surveys have a complementary low temporal but high spatial resolution. At the end of March 2011, just before construction activities started, aerial surveys yielded an estimate of on average 2.5 harbour porpoises/km². After the start of the construction (piling) activities the average density had halved. The changes in the spatial distribution between pre-and post-piling suggested harbour porpoise disturbance. A logic impact-response model allowed quantifying the distance over which an apparent impact occurred at over 20 km, with a repopulation of part of the area observed after one day with no piling. PAM also showed a clear fine-scale match between acoustic harbour porpoise detections and piling activities. After the cessation of piling it took hours to days before new detections were made at the impact location.

HI09

SAVE from harmfull noise – real-time detection and deterrent system of harbour porpoises before pile driving

Caroline Höschle[1], Chris Pierpoint[2], Ansgar Diederichs[1], Klaus Betke[3], Rainer Matuschek[3], Wenke Karnatz[4], Signe Nielsen[4], Georg Nehls[1]

(1) BioConsult SH GmbH & Co. KG, Brinckmannstr. 31, 25183 Husum, Germany
(2) Seiche Measurements Limited, Bradworthy Industrial Estate, Langdon Road, Bradworthy, Holsworthy, Devon, EX22 7SF, UK
(3) itap GmbH, Marie-Curie-Straße 8, 26129 Oldenburg, Germany
(4) RWE Innogy GmbH; Offshore Wind Development, Überseering 34, 22297 Hamburg

c.hoeschle@bioconsult-sh.de

The noise emissions produced by pile driving during construction of offshore wind farms can physically harm harbour porpoises close to the noise source. In order to avoid potential injury to these animals German consenting authorities demand that pile driving noise must not exceed 160 dB re 1µ Pa (SEL) within 750 m of the sound source. Currently, besides the use of noise mitigation methods, acoustic deterrent devices (pinger & seal scarer) are used in advance of pile driving to ensure that all animals have left the area of harmfull noise. C-PODs are deployed in order to verify a successful deterrence. However, this information is only given when C-PODs are recovered and analysed after pile driving. Real-time monitoring would ensure that no animals are present in the vicinity just before pile driving starts. Further, the seal scarer used are not harbour porpoise-specific and may cause them to avoid a greater area then is effectively needed. We therefore initiated a project (SAVE) to develop and improve a real-time detection and species-specific deterrent system. The detection system consists of a network of buoys deployed on moorings around the pile driving location. Each buoy is equipped with a broadband hydrophone, GPS and radio telemetry; a receiving and processing station is located on a dedicated vessel. PAMGUARD is used to process the raw data and to identify clicks originated from harbour porpoises. The potential danger zone for harbour porpoises is thus continuously monitored and immediate mitigation action can be taken if necessary. The SAVE project includes a series of experiments and trials, e.g. the comparison of data with C-PODs to demonstrate the detection system works reliably. The poster will present the general approach and first results.

HI10

Interactions between bottlenose dolphins (*Tursiops truncatus*) and trawlers in the northern Adriatic sea

Polona Kotnjek, Ana Hace, Tina Centrih, Tilen Genov

Morigenos – Slovenian Marine Mammal Society, Kidricevo nabrezje 4, SI - 6330 Piran, Slovenia

polona.kotnjek@gmail.com

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. We studied interactions between common bottlenose dolphins (*Tursiops truncatus*) and different types of trawlers in Slovenian and adjacent waters, as part of a long-term study on bottlenose dolphin ecology and conservation. We carried out visual boat- and land-based surveys between 2002 and 2012. During boat suveys, we opportunistically inspected operating trawlers for dolphin presence. When encountered, with or without trawlers, dolphins were followed for a variable amount of time, and photographed for identification purposes. Out of 209 recorded sightings, 22% involved an interaction with trawlers. 52,2% of those interactions were with pelagic pair trawlers, while 47,8% were with (single) bottom trawlers. Group size during interactions ranged from 1 to 30 individuals. Calves were present in 43,5% of all interactions, but were more often present during interactions with pelagic pair trawlers. The animals followed trawlers for a variable amount of time, from 9 to 149 minutes. On some occasions, dolphins remained close to trawlers even after the retrieval of nets, followed the boats during transit, waited for trawling to resume and then continued their pursuit. Photo-identification data showed that most recorded interactions involved the same identified individuals, while such behaviour was never observed in others. No evidence of bycatch was found. Both types of trawlers appear to attract dolphins and thus alter their distribution, movements and behaviour.

HI11

Effects of maritime traffic exposure on a small resident bottlenose dolphin population: Vocal responses to vessel noise

Ana Rita Luís[1,2], Ana Rocha[1,3], Miguel Couchinho[2], Manuel Eduardo dos Santos[1,2]

(1) ISPA – Instituto Universitário; Rua Jardim do Tabaco, 34, 1149-041 Lisboa, Portugal
(2) Projecto Delfim – Centro Português de Estudo dos Mamíferos Marinhos; Rua Alto do Duque, 45, 1400-009 Lisboa, Portugal
(3) ICBAS - Instituto de Ciências Biomédicas Abel Salazar da Universidade do Porto; Rua de Jorge Viterbo Ferreira n.º 228, 4050-313 Porto, Portugal

aritaluis@sapo.pt

Maritime traffic is known to be a major contributor to the increasing levels of anthropogenic noise in the oceans. This issue is of particular concern in coastal areas, where vessel noise may be an important source of disturbance for cetaceans. In the Sado estuary (Portugal), a small resident population of common bottlenose dolphins is exposed to vessel noise on a daily basis. Core dolphins' habitat areas overlap with zones of high maritime traffic, which presents an opportunity to assess dolphin's vocal responses to specific noise sources. Field recordings of dolphin's emissions were made from April to November 2011, using a calibrated underwater sound recording system. Dolphins' behaviour patterns and group size were noted, as well as the absence or presence of different types of vessels (ferry-boats, trawlers, leisure boats and a dolphin-watching vessel) in a 500 m radius. Spectral analyses of vocalizations enabled the count and categorization of social calls. Whistles were isolated and spectral characteristics were measured. In order to assess the vocal responses to each type of vessel all results were statistically analyzed. Significant vocal responses to vessel noise were obtained. Mean overall call rates diminished greatly in the presence of operating vessels; the greatest decrease was obtained in the presence of ferry-boats (21 to 7 calls per minute). The decrease in the mean number of creaks was also significant for ferry-boats (3,5 to 1 calls per minute). Regarding the whistles, significant differences were obtained for ferry-boats: the increase of minimum and start frequency, and the decrease of amplitude. An increase of start frequency was obtained in the presence of leisure boats. Changes in vocal emissions might be related to the presence of specific boat types. Further study is needed to clarify these findings and to assess the possible biological effects of the significant changes documented.

HI12

Effect of operating wind farms on seal movements

Bernie McConnell[1], Rune Deitz[2], Jonas Teilmann[2], Mike Lonergan[1]

(1) Department of Arctic Environment, Aarhus University, P.O. 358, Frederi, DK-4000 Roskilde, Denmark
(2) Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, St Andrews, KY10 8LB, UK

bm8@st-andrews.ac.uk

Globally, the maritime generation of energy from the wind is rapidly increasing. At the same time there is both public and legislative concern about potential detrimental effects to marine. The current uncertainty in being able to predict any such effects hinders appropriate and efficient regulatory decisions. Operating wind farms may attract marine mammals through the formation of a 'reef effect'. Conversely, their operating noise may deter. To resolve this question, a study of seal movements was conducted near Nysted and Rødsand II wind farms in southern Denmark. Very high resolution track (mean 43.3 GPS locations per day) and dive behaviour data were obtained from five harbour (*Phoca vitulina*) and five grey (*Halichoerus grypus*) seals over an average duration of 160 days using SMRU GPS/GSM tags. Both species frequently transited from two haulout sites through the two nearby (<5km) wind farms. The effect of the wind farms on movements was assessed in three ways: 1. residence times within wind farm zones, 2. a comparison of path speed and tortuosity inside and outside the wind farms and 3. The proximity of individual locations to individual wind farm towers. All three analyses indicated no significant effect of the wind farms on seal behaviour. This is in accord with another local study of haulout counts that concluded that the wind farms had no long term effect on the local seal population trends. Furthermore the current harbour seal foraging areas tally with historic data collected before these wind farms were constructed. Whilst caution is urged in extrapolating these findings to all wind farms and to other seals colonies, this is the first study to demonstrate robustly that an operating wind farm has minimal impact of the movements of grey and harbour seals from a neighbouring colony.

HI13

Assessment of toxicological effects of plastic additives deriving from marine litter on Mediterranean fin whales by a gene expression approach

Cristina Panti[1,2], Letizia Marsili[1], Simone Panigada[3], Matteo Baini[1], Maria Cristina Fossi[1]

(1) Department of Environmental Sciences, University of Siena, Via P.A. Mattioli 4, 53100, Siena, Italy
(2) Department of Life Sciences, University of Siena, Via A. Moro 2, 53100, Siena, Italy
(3) Tethys Research Institute, Viale G. B. Gadio 2, 20121 Milano, Italy

panti4@unisi.it

Currently, one of the main toxicological issues, in the management and conservation of the marine environment, is the study of the impact of compounds released from marine litter, in particular plastics, such as bisphenol A (BPA) and phthalates. On this regard, the assessment of toxicological risk in marine mammals requires the development of sensitive biomarkers including those based on the use of *ex vivo* systems. BPA and phthalates are among the most distributed compounds in the world, acting as agonist or antagonist for endocrine receptors. To develop new gene expression biomarkers in cetaceans we exposed skin biopsies of fin whale (*Balaenoptera physalus*) to increasing concentration of BPA and phthalates. We selected two potential biomarker genes such as the peroxisome proliferator-activated receptors α and γ (PPAR α and γ), which belong to a superfamily of ligand-dependent nuclear receptors and regulates physiogical processes of lipids homeostasis, inflammation, adipogenesis, reproduction, etc. The mRNA levels of the two PPARs were quantified in response to the two different treatments in the slice samples. Five genes (PPARα, PPARγ, and the previously developed Estrogen Receptor α, E2F1 transcription factor and cytochrome P4501A1) are modulated by the treatments. In particular the results revealed that the BPA and phthalates treatments induce the expression of the genes PPARα and PPARγ showing a dose-response trend. Based in this results, the gene expression biomarker were also measured in 19 fin whale skin biopsies from the Pelagos Sanctuary (Ligurian and Sardinian Sea) in order to assess the potential exposure of fin whales to plastic additives. These data represent the first evidence of emerging contaminants effect on fin whale based both on an *ex vivo* experiment and in free-ranging organisms, suggesting the potential use of this diagnostic markers as early warning signal of exposure to plastic released compounds in marine wildlife monitoring.

HI14

Plastic ingestion by harbour seals (*Phoca vitulina*) in The Netherlands

Elisa L. Bravo Rebolledo, Jan Andries van Franeker, Okka E. Jansen, Sophie M.J.M. Brasseur

IMARES

e.bravootje@hotmail.com

Abundance of ingested debris by seals has been mentioned as a potential indicator of marine litter in the European Marine Strategy Framework Directive (MSFD). A sample of 107 stomachs, 100 intestines and 125 scats of harbour seals from the Netherlands was analysed for the presence of plastics. Incidence of plastic was 11% for stomachs, 1% for intestines, and 0% for scats. Younger animals, up to three years of age, were most affected. This is the first quantitative study of plastic ingestion by phocid seals. The observed level of incidence is of environmental concern, but is low in the sense of suitability of seals for MSFD monitoring purposes.

HI15

Assessing the impact of cetacean by-catch: The experience of the municipality of Almada (Portugal)

Patrícia Silva[1], Mário Estevens[1], Nuno Lopes[1], Catarina Freitas[1], Marina Sequeira[2]

(1) Departamento de Estratégia e Gestão Ambiental Sustentável da Câmara Municipal de Almada, R. Bernardo Francisco da Costa, 42. 2800-029 Almada, Portugal
(2) Instituto da Conservação da Natureza e das Florestas, Praça da República, 2900 - 587 Setúbal

pasilva@cma.m-almada.pt

Almada Municipality has a 15 km long Atlantic coastline, where fishing is a traditional activity of great socioeconomic interest, employing an important part of the population and supporting the local economy. Cetaceans occur regularly along this coast and are known to interact with fisheries, sometimes resulting in by-catch and incidental mortality of individuals, as well as damages to the fishing activity. Since 2009, the Municipality became actively involved in monitoring the strandings along its coastline, with the intent to assess the impact of interactions between fisheries and cetaceans. The municipality incorporated an internal procedure involving the various departments responsible for the different tasks (program management, on-site stranding assessment, carcass disposal) and became part of the Portuguese stranding network, working in close cooperation with the Maritime Police and the ICNF (National coordinator). Strandings are regular along this coastline, being more frequent at beaches were convergent drift currents occur. More than 50% of recent strandings correspond to carcasses in moderate to advanced state of decomposition, suggesting that the origin of the animals could be relatively distant, although some data point also to interactions with near coast fishing gears. Some occurrences show unequivocal evidence of accidental capture, but most cases remain undetermined due to poor preservation of the carcasses and/or the impossibility of conducting necropsies and tissue analysis. Future goals of the monitoring program include: (1) Establishment of partnerships for the implementation of necropsies and tissue analysis that may allow to diagnose possible causes of death; (2) Maintenance of regular observations in order to interpret annual fluctuations in strandings and accidental captures, understand patterns and identify impacts of specific events; (3) Involvement of the fishing sector in order to evaluate their impact on marine animals and, if necessary, develop solutions to decrease both the animal mortality and the damaging effects on fisheries.

MNT01

Live encounter data from self running photo cameras: the way to improve knowledge of Steller sea lion (*Eumetopias jubatus*) habitat use

Alexey Altukhov[1], Vladimir Burkanov[1,2]

(1) Pacific Institute of Geography, Kamcatka Branch, FEB RAS, 6 Partizanskaya St., Petropavlovsk-Kamchatsky, Russia, 683000
(2) National Marine Mammal Laboratory Alaska Fisheries Science Center/NOAA, 7600 Sand Point Way N.E. F/AKC3 Seattle, WA 98115-6349

aaltukhov@gmail.com

A long-term monitoring program was established for Steller sea lion populations after catastrophic declines occurred during the late XX century. The data mostly obtained at breeding seasons during summer. Visual counts of animals on rookeries and haulouts and in surrounding waters were performed daily or several times a day while observers were on site. Despite the simplicity and economic efficiency of this method observers can't stay whole years on remote area. By using self running cameras we can obtain count data also for period of observer absence. Direct use of this data may be incomparable with previous count series obtaining by different methods. To find the way to use obtained data, several counts methods was applied by the time observers present. A logistic model combined with general linear model was applied to investigatee factors affected differences between methods. The differences between visual and photo counts depend on day of year, density, and also on level of expected presence of animals on picture. All this parameters we have included in a model that predict correction coefficients for live encounter data obtained by self running cameras. This approach was tested on Kozlova Cape (KC) in 2011-2012 years. Animals appear on KC by the end of April, and approach to the maximum level by the begging of May. Animals start leave rookery in the middle of June, and by the end of August there is almost no animal present at rookery. During a winter time few animals appear on rookery several times. This is unusual pattern for reproductive rookery when females and males came together for early spring. It allow us suggest that in early spring rookery on KC used primary as haulouts by migrated animals.

MNT02

Comparison between radiocontrolled aerial technologies for cetacean studies

Mireia Bou[1], Josep M. Alonso[1], Natàlia Amigó[1], María Llarena[1], Alessio Maglio[1,2], Nicolás Puerta[1], Valeria Pugliese[1], Diego Gamo[1], Marc Salvado[1], Eduard Degollada[1]

(1) EDMAKTUB Association. C/ Manila 54, 08034, Barcelona, Spain. www.edmaktub.com
(2) Sinay Comunnity 117, Cours Caffarelli,14000 CAEN , France www.Sinay.fr

mire.bou@gmail.com

There is an increasing interest in developing non-disturbing methods for cetacean monitoring and observation in recent years. Tests for two new radio-controlled aerial technologies were performed for cetacean research, comparing an aircraft model and a multicopter. The present study was developed using First Person View radio controlled (FPV R/C) aircraft models and multicopters from a 47 ft catamaran as research platform. The tests were run during 2011/2012 Barcelona ZOO BCNCET project to survey cetaceans in the area between Barcelona and the Balearic Islands and funded also by the Fundación Biodiversidad/Ministerio de Medio Ambiente de España. Both devices are characterized for sending real-time images with flight and location data to researchers on board. They fly on electrical brushless engines powered by lithium polymer batteries. The single engine aircraft is fast and can glide for prolonged periods increasing the flight duration. The hexacopter with its six engines is very stable and can hover for prolonged periods. After several tests the differences in range, flying time and speed determined specific applications. The aircraft has a long range of more than 5 km, covering large areas in a short time and being highly useful in the search for animals. The multicopter is more suitable for behavioral studies of already sighted and nearby animals. The results of this project shows the utility of FPV R/C aircrafts and provides a step forward for optimizing resources in cetacean monitoring.

MNT03

Streamlining High-Volume Data Acquisition, Analysis and Tracking of Marine Mammals with Highly Configurable, Standards-based Software

David Steckler

Entiat River Technologies

davidsteckler@gmail.com

To meet the need for all-in-one, user-configurable, user-friendly combined survey/behavioral data collection and analysis software, the Mysticetus Observation Platform (Mysticetus) has been designed, tested and field deployed in numerous aerial, vessel and shore-based surveys for marine mammals around the world. Mysticetus provides real-time distance and bearing to a sighting by synthesizing real-time Global Positioning System (GPS) data with the declination angles (converted to distance) and times of sightings. This feature has been critical to quickly relocating sightings, particularly in higher Beaufort conditions. Relative location of the sighting to the aircraft/vessel is continuously displayed on a map on a laptop, and automatically adapts to changing distances and headings of the platform. Real-time bathymetric data are displayed, and can be used to determine numerous sea-floor characteristics in the survey area (e.g., depth, slope, aspect). Mysticetus also triangulates, in real-time, directional acoustic data received via radio from sonobuoys, allowing correlation of behavior with vocalizations, both in the field and during post-processing. Other post-survey analysis tools include automated tabular summaries of effort and sightings, Google Earth 3-D track display, distance-to-shore calculations, etc., that greatly reduce data, GIS and analysis efforts. Mysticetus is unique from other available similar software because it is easily configured by the user to select data fields/types, units, etc., and can record, summarize, analyze and plot data as indicated by the user.

Modelling

M01

Modelling interactions between fish farms and bottlenose dolphins in a Mediterranean embayment

Silvia Bonizzoni[1,2,3,4], Nathan Furey[4,5], Enrico Pirotta[3,6], Vasilis D. Valavanis[7], Bernd Würsig[4], Giovanni Bearzi[1,2,4]

(1)Dolphin Biology & Conservation, via Cupa 40, 06066 Piegaro PG, Italy
(2)OceanCare, Oberdorfstrasse 16, P.O. Box 372, CH-8820 Wädenswil, Switzerland
(3)Tethys Research Institute, Viale G.B. Gadio 2, 20121 Milan, Italy
(4)Texas A&M University at Galveston, 200 Seawolf Parkway, Galveston, TX 77553, USA
(5)Pacific Salmon Ecology and Conservation Laboratory, Centre for Applied Conservation Research, Department of Forest Sciences, University of British Columbia, 2424 Main Mall, Vancouver, BC, Canada V6T 1Z4
(6) Institute of Biological & Environmental Sciences, University of Aberdeen, Tillydrone Avenue, AB24 2TZ Aberdeen UK
(7) Marine Geographic Information Systems Lab, Hellenic Center for Marine Research, P.O. BOX 2214, 71003 Iraklion Crete, Greece

silvia.bonizzoni@gmail.com

The habitat of common bottlenose dolphins *Tursiops truncatus* overlaps with aquaculture in several coastal areas of the world. In the Mediterranean Sea, bottlenose dolphins have been often observed foraging in the proximity of fish farm cages. We investigated bottlenose dolphin interactions with fish farms in the Northern Evoikos Gulf, a semi-enclosed basin in central Greece, by incorporating multiple geographic, bathymetric, oceanographic, and anthropogenic variables. Generalized additive modelling (GAMs) and generalized estimation equations (GEEs) were used to describe dolphin presence. Boat-based surveys were conducted under favourable conditions for 2909 km. Dolphin groups were encountered on 54 occasions, and followed for 84 hours across 457 km. Dolphins were encountered mainly in the south-eastern portion of the study area. Sea surface temperature (SST) and Chlorophyll-*a* (Chl-*a*) data were obtained from remote sensing imagery, and distances to sources of anthropogenic influences including fish farms, a ferronickel plant, and a slag disposal area were calculated within a geographic information system (GIS). Dolphin occurrence was not clearly related to SST and Chl-*a*, nor to the ferronickel plant or nearby slag disposal area. Dolphin occurrence generally increased within 20 km of fish farms, with a positive farm-dolphin relationship in 4 farms, no clear relationship in 7 farms, and a negative one in 2 farms. We compared farms

based on their size, slope of the underlying bathymetry, and distance to all other facilities and to the industry. Fish farm density and slope appeared to affect dolphin distribution. Our study suggests that while uneaten food and other detritus likely attract dolphin prey, different farms can have a different appeal. The modelling of multiple variables allowed for a description of dolphin habitat use and attraction to some fish farms; more such data and analysed in similar manner would be instructive for other areas.

M02

Linking feeding behaviour and environmental variables: The distribution and habitat preferences of common minke whales (*Balaenoptera acutorostrata*) in Faxaflói Bay, Iceland

Kristina Klesse[1,4], Chiara G. Bertulli[2], Michael Schott[4], Marianne H. Rasmussen[3], Jens Krause[1,4]

(1) Humboldt University Berlin, Unter den Linden 6, 10099 Berlin, Germany
(2) Elding whale-watching, Ægisgata 7; University of Iceland, Sturlugata 7, 101 Reykjavik, Iceland
(3) Húsavík Research Centre, University of Iceland, Hafnarstétt 3, 640 Húsavík, Iceland
(4) IGB/Leibniz-Institute of Freshwater Ecology&Inland Fisheries, Müggelseedamm 310, 12587 Berlin, Germany

tininhaOz@gmail.com

Common minke whales are abundant in the inshore coastal waters of south-west Iceland, which they use as feeding areas during the summer months. The distribution and habitat preferences in terms of their feeding behaviour, however, remain poorly understood. Past studies have shown that cetaceans favour certain areas for feeding or reproduction. These preferences seem to be influenced by certain habitat conditions. Therefore, this study investigates the spatial and temporal distribution patterns of feeding behaviour of *B. acutorostrata* with respect to fixed (physiographic) and non-fixed (oceanographic) environmental variables (EV's) in Faxaflói Bay, south-west Iceland. Minke whale sightings, behavioural and effort data, GPS positions and photo-identification images were collected from whale-watching vessels between April and September during 2008-2012. A range of techniques and methods were used to determine the association between EV's (depth, slope, aspect, chlorophyll concentrations and water temperature) and observed feeding sightings, including geographical information systems (GIS), multivariate statistics and logistic regression analysis. Thirty percent of all minke whale encounters (n=2008) were defined as feeding sightings, and GIS mapping showed a densely clustered pattern in an area of approximately 70 km^2 in the south-eastern part of the bay. Furthermore, results indicated that there is a strong interaction between observed feeding sightings and fixed variables such as depth, but also with non-fixed variables such as water temperature. The outcome shows that feeding behaviour most likely occurs in areas of shallower waters and higher water temperature during the summer months. These findings may indicate an indirect linkage between feeding behaviour of minke whales and environmental conditions. This study will not only contribute to our understanding of minke whale ecology, but it may also encourage a wider use of dynamic conservation and management plans in the future.

M03

Habitat modelling using whale-watching data: a good option?

Iva Kovacic[1,2], Benjamin Torres[3], Andrea Cosentino[1,4], Nina Majnaric[1,2], Luca Tassara[1,7], Marta Acosta[1,6]

(1) MAREFA, Postboks 58, 8483 Andenes, Norway
(2) Zagreb University, Svetosimunska cesta 25, 10 000 Zagreb, Croatia
(3) Valladolid University, Paseo Belen 7, 47011 Valladolid, Spain
(4) University of Aberdeen, King's College, Aberdeen AB24 3FX, United Kingdom
(5) Universidad Rey Juan Carlos, C/Tulipan s/n, 28933 Mostoles, Madrid, Spain
(6) Tromsø University, Breivika, 9037 Tromsø, Norway

koiva@inet.hr

In many areas the only data collected on cetaceans is obtained opportunistically from whale-watching vessels. A number of whale-watching companies regularly collects effort and sighting data on observed species, with databases spanning over long time periods. However, collected data is biased due to the particular ways of finding and following cetaceans. Since the whale-watching areas are obviously cetacean hotspots, and the obtained data is often used in habitat modelling, it is of prime interest to know if the resulting models are reliable. We simulated a distribution of a whale species in a landscape: 1. as random distribution and 2. conditional on several environmental variables. We then simulated the probability of collecting the data from the two distributions incorporating three typical walewatching detection methods: visual detection at a set range, acoustical detection at a set range, and approaching a previously known sighting location. Sampling frequency is modeled as a function of distance from the departure point. We applied several different combinations to examine all the probable scenarios, with iterative samplings simulated for the dataset to correspond to 30 days with 4 trips per day. Additionally, a transect survey was simulated. We use the obtained datasets as an input for frequently used habitat modelling approaches: GAMs, GLMs, ENFA and Maxent software. We then compare the obtained model results with the initial simulation conditions and evaluate which sampling schemes could be used for obtaining reliable habitat modeling results. Finall, we apply the results to real data, a 20-year datset of sperm whale observation in Northern Norway, and compare the habitat model for the whole datataset and for the subset fulfilling the constraints found in our simulations.

M04

Preliminary study by habitat modeling of bottlenose dolphin (*Tursiops truncatus*) distribution along the east coast of Liguria (North West Mediterranean Sea)

Chiara Marini[1], Paolo Vassallo[1], Michela Bellingeri[2], Fulvio Fossa[2], Guido Gnone[2]

(1) DIPTERIS, Department for the Study of territory and its Resources, University of Genoa, Corso Europa 26, Genoa, Italy
(2) Acquario di Genova, Area Porto Antico, ponte Spinola, 16128, Genoa, Italy

chiaramarini09@gmail.com

Habitat modeling is an important tool to investigate cetacean distribution and to relate this to environmental changes. Understanding the function of habitat features in determining cetaceans distribution is a necessary step in planning management and conservation measures. The bottlenose dolphin is widely distributed in the Mediterranean Sea and it is commonly sighted along the eastern Ligurian coast, usually within the 100m isobath. This area is characterized by a strong presence of human activities; maritime traffic is intense throughout the year with marked seasonal peaks, especially with regard to pleasure boating. In the present study, an arrangement of simple statistical methods was applied to model distribution of bottlenose dolphin *Tursiops truncatus* with seven environmental variables: bathymetry, latitude, longitude, distance from coast, distance from 100 m isobath, presence of trawlers and presence of pleasure craft. The study area stretches from Capo Arenzano to Punta Bianca, along the east coast of Ligurian Sea. The database collects eight years of data and was statistically analyzed by means of MATLAB. In particular, multivariate regression and canonical correlation analyses were used to find critical habitats and core use areas. Separate predictions were provided for each dependent variable, and single best regression model was selected according to the significance of parameter estimations.

M05

Modelling the interactions between cetaceans, hake and fisheries in the Atlantic coast of the Iberian Peninsula: implications for the management of the southern hake stock

Camilo Saavedra[1], Santiago Cerviño[1], Graham J. Pierce[2], Maria Begoña Santos[1]

(1) Instituto Español de Oceanografía, Centro Oceanográfico de Vigo, PO Box 1552, 36200, Vigo Spain
(2) School of Biological Sciences (Zoology), University of Aberdeen, Tillydrone Avenue, Aberdeen, AB24 2TZ, Aberdeen, UK

milokmilo@gmail.com

In marine food webs, top predators may play an important role in controlling prey populations. In the assessment of exploited fish stocks, predation mortality is included as an unspecified proportion of natural mortality (M). Although M is often assumed to be constant, in practice it will be affected by changes in predator abundance, distribution and diet. Hake is major target species of the Spanish fleet and the southern hake stock is currently assessed using a dynamic minimum realistic model (GADGET) that can integrate trophic relationships. We aim to model the effects that predation by four of the most common species of small cetaceans can have on this stock and how hake fisheries are affected by these interactions. This work is introduced here as part of the FP7 MYFISH project (*Maximizing yield of fisheries while balancing ecosystem, economic and social concerns*), which aims to provide operational definitions of Maximum Sustainable Yield (MSY) variants which maximize measures of "yield" other than catch biomass and which account for species interactions, thus contributing to the implementation of one of the main requirements of the revised Common Fisheries Policy, to bring the fish stocks to harvest levels which can ensure MSY by 2015.

M06

Using effort, sightings, and body condition data to estimate survival and health of individual North Atlantic right whales

Robert Schick[1,2], Scott Kraus[3], Roz Rolland[3], Amy Knowlton[3], Philip Hamilton[3], Heather Pettis[3], Robert Kenney[4], James Clark[2]

(1) Centre for Research into Ecological and Environmental Modelling, University of St.Andrews, St. Andrews, Scotland, DD6 8RE
(2) Nicholas School of the Environment, Duke University,Durham, NC 27708
(3) New England Aquarium, Central Wharf, Boston, MA 02110
(4) University of Rhode Island

rss5@st-andrews.ac.uk

Natural and anthropogenic stressors are presumed to impact the health and survival of right whales, yet the effect of these stressors has proven difficult to quantify. To address this issue we built a Hierarchical Bayesian model for survival of individual right whales and fit this model to 30 years worth of sighting data. We assimilate the photographic evidence of condition for individuals as observations of true, but hidden, health. We use the model to make inference on movement, individual survival, and individual health. Estimates of individual health fluctuate across broad ranges, with a mean "healthy" score equaling 84 (on a 0 to 100 scale). In contrast, animals scored with body fat 3, have health values below 50, from which they do not recover. We are able to quantitatively link discrete health observations to underlying continuous states, though estimates are less certain for animals with sparse sighting histories. For individuals, discrete observations of poor skin and body condition in particular, appear to have a strong impact on health. At the population level, health is stable throughout much of the 1980's. Health values in the 1990's declined from a population average of 85 to a low of 72 in 1999. Population health stabilizes and increases in the 2000's, though the decade scale average (76) is lower than the 1980's. Consistent with the PCAD framework, we use these outputs to infer the differential risk associated with the major habitat zones on individual survival, however initial results suggest that coarser geographic partitioning is needed for better parameter estimation. In the future we hope to use these estimates of movement, survival and health to suggest possible management scenarios that increase survival among individuals and the population as a whole.

M07

Predicting key habitat and potential distribution of bottlenose dolphins (*Tursiops truncatus*) along the north-eastern coast of Sardinia, Italy

Katarina Slivar, Bruno Díaz López

The Bottlenose Dolphin Research Institute – BDRI – V. Diaz 4, Golfo Aranci 07020, Italy

info@thebdri.com

This study carried out along the north-eastern coast of Sardinia (Italy) presents data regarding the use of habitat models to identify core, suitable and unsuitable habitat for bottlenose dolphins in the area. Six variables which are coastal fisheries, depth, distance to a marine fin fish farm, recreational boats, trawlers and slope were comprised to this habitat models. GIS maps were produced with the Quantum Geographic Information System 1.7.4 (QGIS) and introduced to the software BioMapper. The Ecological Niche Factor Analysis (ENFA) with all six variables explained 87% and the model "without slope" 88% of the specialisation with two computed factors. A Principal Component Analysis (PCA) was calculated to confirm the ENFA's outcome. A generalised linear model (GLM), by the software R 2.13.0, with a binominal distribution and logit function was done together with the Akaike information criterion (AIC). The main purpose of the GLM was to detect variables which could be discarded. Hereby, presence and absence data was used. The model "without slope" had a better fit of the data and should be preferred. Furthermore, results have shown best outcomes for unsuitable habitat. Therefore, it can be said that the ENFA could have a severe impact on conservation management as an aid to help building up marine protected areas for cetaceans.

M08

Modelling harbour porpoise habitat preference along the Galician coast (NW Spain)

Ángela Llanova[1,2], Pablo Covelo[1], Jose Martínez-Cedeira[1], Vasilis D. Valavanis[3], José V. Vingada[4], Alfredo López[1], Graham J. Pierce[5]

(1) C.E.M.MA. Coordinadora para o Estudo dos Mamíferos Mariños. Apartado 15, 36380 Gondomar. Pontevedra, Spain
(2) Dep. Biologia & CESAM. Campus Universitário de Santiago. 3810-193 Aveiro. Portugal
(3) Marine GIS Laboratory, Institute of Marine Biological Resources, Hellenic Centre for Marine Research, Thalasocosmos 71003, Heraklion Crete, Grece
(4) CBMA / SPVS, Dep. de Biologia, University of Minho
(5) Oceanlab, University of Aberdeen, Main Street, Newburgh, Aberdeenshire, AB41 6AA, UK

allavonav@yahoo.es

The Galician harbour porpoise represents a genetically distinct sub-population and information is needed on its distribution and abundance. Since 2003 the Coordinadora para o Estudo dos Mamíferos MAriños (C.E.M.MA.) has carried out dedicated boat surveys to study the distribution of cetaceans in Galician waters. During March to October 2003-2010 a total of 111 boat surveys were carried out, corresponding to 917.04 h and 10650.22 km of effort, and 393 cetacean sightings were recorded, of which 30 were harbour porpoises. These data are used here to model porpoise habitat characteristics. Generalised additive models (GAMs) were used to relate presence of porpoises and environmental variables. Model selection involved two steps, (a) accounting for covariates (e.g. visibility) that affect observations and (b) modelling environmental effects on presence of porpoises. Due to the large number of candidate variables and the interactions between them, it was difficult to identify a single best model. Of 380 models tested, 3 were selected as the best models. Porpoise presence was more frequent over steeper seabed slopes, at medium SST values and in later months of the year. The relationship with productivity is complex: although porpoise presence was negatively correlated with chlorophyll concentration it was positively correlated with depth of the euphotic zone (Z_{eu}). There was also an effect of seabed aspect. When looking for areas of interest for the species these characteristics must be taken into account.

PPT01

The use of computerized tomography to diagnose externally non-detectable cetacean mandible fractures

Josep M. Alonso-Farré[1,6], Manuel Gonzalo-Orden[2], Daniel Barreiro[3], Andrés Barreiro[3], María Llarena-Reino[1,5], Marisa Ferreira[7], Eduard Degollada[4]

(1) Centro de Estudos do Ambiente e do Mar (CESAM), Universidade de Aveiro, Campus Universitário de Santiago. 3810-193, Aveiro, Portugal
(2) Departamento de Patología Animal, Facultad de Veterinaria, Universidad de León, Campus de Verganzana, 24071, León, Spain
(3) Servicio de Diagnóstico por Imagen, Hospital Veterinario Universitario Rof Codina, Fac. Veterinaria de Lugo, Universidade de Santiago de Compostela. Avda. Carballo Calera, 27002, Lugo, Spain
(4) Asociación EDMAKTUB www.edmktub.com
(5) Instituto de Investigaciones Marinas-CSIC. C/Eduardo Cabello 6, 36208, Vigo, Spain
(6) Coordinadora para o Estudio dos Mamíferos Mariños (CEMMA), www.cemma.org, Spain
(7) Sociedade Portuguesa de Vida Selvagem (SPVS), www.socpvs.org, Portugal
(8) Department of Biology, University of Minho, Braga, Portugal

jmalonso@iim.csic.es

Computed tomography (CT) has become a key diagnostic modality in the evaluation of head trauma in human and veterinary medicine, becoming the standard diagnostic technique to assess lesions of the maxillofacial bones. Descriptions of odontocete (toothed cetaceans) bony lesions in mandible or maxilla are uncommon and mainly related to dental anomalies or fractures. During a long-term imaging study of the cetacean cephalic region using CT and other imaging techniques, we have studied 30 cetacean heads belonging to four different species: common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*), bottlenose dolphin (*Tursiops truncatus*) and harbour porpoise (*Phocoena phocoena*). Maxillofacial bony lesions such as fracture lines (4), bony fragments (1), bony calluses (2) and skeletal deformities (1) were clearly identified in CT scans from eight individuals (27%). These lesions were all externally undetectable with two exceptions: one open fracture and the skeletal deformity. All the lesions were detected in transverse, sagittal and dorsal planes and could be clearly observed in three-dimensional (3D) reconstructions of tissues from CT datasets. In the last years, some studies have described a considerable percentage of externally undetected mandible/maxilla fractures as well as old (healed) fractures. Probably the single most important factor in missing cetacean fractures during necropsies is the lack of externally visible

displacement of involved bones. The anatomical conformation of the maxilla-mandible complex in the cetacean hearing process is especially relevant, and thus clinical or pathological evaluation of these bones becomes of great significance. Fractures, calluses and deformities are more easily identified on CT scans than through conventional radiography because of superior contrast resolution. Finally, CT datasets and 3D reconstructions considerably improve post-mortem information in several aspects and allow re-examination of the cases even many years after the necropsy.

PPT02

Herpesvirus infection associated with tubulo-interstitial nephritis in a Blainville´s beaked whale (*Mesoplodon densirostris*)

Manuel Arbelo[1], Edwige N. Bellière[2], Eva Sierra[1], Simona Sacchini[1], Fernando Esperón[2], Marisa Andrada[1], Antonio Fernández[1]

(1) Unit of Veterinary Histology and Pathology, Institute of Animal Health (IUSA), Veterinary School, University of Las Palmas de Gran Canaria. Trasmontaña s/n, Arucas 35413. Canary Islands, Spain
(2) Research Centre for Animal Health (CISA - INIA). Madrid, Spain

marbelo@dmor.ulpgc.es

The capacity of herpesvirus (HV) to cause disease in cetaceans is unclear and may show variations depending on different individual conditions and within species. Kidney pathology and intralesional virus associated infection have been rarely reported in cetaceans. Tubulo-interstitial nephritis is not an infrequent histopathological finding in cetaceans; however intralesional etiologies or pathogenic virus or bacteria has been rarely demonstrated associated with this lesion. Here we described a novel alphaherpesvirus associated with tubulo-interstitial nephritis in an adult male beaked whale (*Mesoplodon densirostris*) stranded in the Canary Islands. The animal, which showed a poor body condition, was found alive near shore on Tenerife Island, and died soon after beaching. Necropsy started 8 hours postmortem (code 1-2) and routine sampling for histological, immunohistological, electron-microscopy (EM), bacteriological and virological studies were carried out. Membranous glomerulonephritis with multifocal lymphoplasmacytic interstitial nephritis, multifocal interstitial and tubuloepithelial necrosis with presence of intranuclear inclusion bodies in tubuloepithelial cells were the main pathological findings. In the immunohistological study, HV antigen was only detected in the kidney, in which immunopositivity was clearly found in the intranuclear inclusions bodies of tubuloepithelial cells. Ultrastructurally, intranuclear inclusion bodies labeled immunohistologically, corresponded to HV particles. The HV DNA detection was conducted by a pan nested HV polymerase chain reaction (PCR). Positivity was observed in lung and kidney tissues. The same 181 bp (60 aa) sequence was obtained from the kidney and lung samples, and a 692 bp (230 aa) sequence from the kidney (GenBank accession number JN863234). With the phylogenetic analysis it was shown that the sequence obtained in this study is a novel herpesvirus.

PPT03

Prevalence of *Salmonella enterica* and *Campylobacter* spp. in wild caught and stranded neonatal and juvenile grey seals (*Halichoerus grypus*) in Scotland

Johanna Baily[1,2,4], Geoff Foster[3], Simon Moss[2], Eleanor Watson[1], Kim Willoughby[1], Ailsa Hall[2], Mark Dagleish[1]

(1) Moredun Research Institute, Edinburgh, Scotland, EH26 0PZ, UK
(2) Sea Mammal Research Unit, Gatty Marine Laboratory, University of St. Andrews, St. Andrews, Fife, KY16 8LB, UK
(3) Scotland's Rural College, Drummondhill, Inverness, Scotland, IV2 4JZ, UK

johanna.baily@moredun.ac.uk

Salmonella and *Campylobacter* spp. bacteria are zoonotic pathogens that have been isolated from marine mammals worldwide. However, their prevalence, type and significance remain poorly understood. Prevalence of these pathogens was assessed in rectal swabs from 200 (122 live and 59 dead neonatal and 19 live juvenile) grey seals from Scottish coastal waters and evaluated with regards to breeding colony substrate, spatio-temporal distribution, life stage and pathology. The prevalence of Salmonella in grey seal pups was 21.1% with *Salmonella enterica* serovar Bovismorbificans and serovar Typhimurium the only two serotypes isolated. *S.* Bovismorbificans was isolated from 18.9% of live seal pups and with a significantly ($p<0.05$) higher prevalence in live pups from sites exposed to tidal seawater compared to live pups not yet exposed to seawater (25.9% and 10.3% respectively). The prevalence of *Campylobacter* spp. was 42.2% in grey seal pups (all groups combined) with *C. jejuni* and non-hippurate hydrolysing thermophilic *Campylobacter* sp. identified. No *Salmonella* or *Campylobacter* were isolated from rectal swabs from any live juveniles. On-going work will correlate the presence of isolates with necropsy findings in dead neonates and classify these at a molecular level, examining their relationship with those found in the terrestrial ecosystem.

PPT04

Porphyrins levels in feces of free ranging fin whales living in Pelagos Sanctuary (Western Mediterranean Sea) as non-destructive biomarkers for contaminants exposure

Matteo Baini, Daniele Coppola, Matteo Giannetti, Tommaso Campani, Cristina Panti, Silvia Maltese, Silvia Casini, Letizia Marsili, Maria Cristina Fossi

Department of Environmental Sciences "G. Sarfatti" University of Siena,Via Mattiolo 4, 53100 Siena, Italy

bainimatt@gmail.com

Most xenobiotic compounds are widespread in the environment and can affect the animal health at different biological levels since they tend to be persistent in the environment and biota being therefore accumulated in the organisms. Mediterranean cetaceans accumulate very high levels of xenobiotic and moreover they are susceptible to effects of these anthropogenic contaminants. The aim of this study was to apply and validate for the first time the use of porphyrins as a non-destructive biomarker in Mediterranean fin whales (*Balaenoptera physalus*), during a sampling activities in summer 2012 in Pelagos Sanctuary Marine Protected Area (MPA). Porphyrins, intermediate metabolites of heme biosynthesis, are produced and accumulate in trace amounts in erythropoietic tissues, the liver and the kidneys and are excreted via urine or feces. Heme biosynthesis may be altered by environmental contaminants such as PCBs, dioxins and heavy metals, leading to changes in their profile due to accumulation or excretion. Porphyrins can be detected in different biological materials at low concentrations and have therefore been proposed as sensitive biomarkers of exposure to contaminants. In this study the analysis of porphyrins was carried out in feces of five free ranging fin whales. Samples were extracted and analyzed for porphyrins (copro, uro and proto porphyrins) by the fluorimetric method. In the same sample we analyzed the levels of organochlorine xenobiotics: dicholorodipenyltrichloroethane and its metabolites, polychlorinated biphenyls and hexachlorobenzene. The porphyrins profile of all samples analyzed showed a predominance of coproporphyrin with respect to protoporphyrin and uroporphyrin. It was also verified the existence of a positive statistical correlation (r=0.9) between levels of protoporphyrin and levels of hexachlorobenzene. These data represent the first evidence of contaminants effect on baleen whales based on fecal porphyrins and suggest the potential use of these biomarkers as early warning signal of exposure to contaminants in marine wildlife monitoring.

PPT05

Craniometry of bottlenose dolphins (*Tursiops truncatus*) from the Croatian Adriatic coast

Dušica Divac Brnić[1], Ana Galov[2], Tomislav Gomerčić[3], Martina Đuras[3]

(1) Pantovčak 38, 10000 Zagreb, Croatia
(2) Division of Biology, Faculty of Science, University of Zagreb, Rooseveltov trg 6, 10000 Zagreb, Croatia
(3) Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, 10000 Zagreb, Croatia

dusadivacb@gmail.com

The typical bottlenose dolphin skull is elongated antorbitally and compressed postorbitally. Many cranium bones show variation in size and shape between individuals, they are therefore used for differentiation of subspecies and populations. The aim of this study was to describe bottlenose dolphin population from Croatian part of the Adriatic Sea by craniometric data. In order to account for potential ontogenetic variation, juvenile and adult individuals were separated based on degree of fusion of maxillary and premaxillary bones. Fifty-nine cranial measurements were taken from 96 adult specimens of bottlenose dolphin collected in Croatia from October 1990 to May 2011. Measurements were conducted with 0.5 – 0.01 cm precision using a caliper. Only one morphotype was recognized; however males and females significantly differed in 19 measurements, male skulls were more robust. Comparing the Croatian results with the same cranial measures of bottlenose dolphin from other seas showed that the skulls from the eastern Mediterranean Sea (Israeli coast) and from the Black Sea were significantly smaller. The western Mediterranean data did not differ from the Croatian. On a broader scale, populations from the eastern Atlantic Ocean, the North Sea, the north-western African coast, the South African coast and the Australian coast had significantly larger skulls compared to the Adriatic bottlenose dolphins. Populations from the Chinese waters and the eastern Floridian coast had significantly smaller skulls than the Adriatic dolphins.

PPT06

Striped dolphins' (*Stenella coeruleoalba*) unusual mortality in the Adriatic Sea

Cinzia Centelleghe[1], Giovanni Di Guardo[2], Cristina E. Di Francesco[2], Silva Rubini[3], Nicola Ferri[4], Gabriella Di Francesco[4], Daria Di Sabatino[4], Sandro Mazzariol[1]

(1) Dept. of Comparative Biomedicine and Food Science, University of Padova, Padova, Italy
(2) Dept. of Comparative Biomedicine Science, University of Teramo, Teramo, Italy
(3) Instituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna, Ferrara, Italy
(4) Instituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale", Teramo, Italy

cinzia.centelleghe@gmail.com

In the Northern and Central Adriatic Sea, bottlenose dolphins (*Tursiops truncatus*) are regularly reported, both as sightings and strandings, while other odontocete species, namely Risso's (*Grampus griseus*) and striped dolphins (*Stenella coeruleoalba*) are considered occasionally present in this basin (respectively 3.7% and 9.8% of strandings). In the first 3 months of 2012, the striped dolphin strandings' trend abruptly increased to 60% (6 out of 10); two animals were found still alive and despite rehabilitation efforts they died. All the animals were in good preservation status and detailed necropsies were performed on all of them. Samples for histopathology, virology (*Morbillivirus* and *Herpesvirus*), microbiology (including *Brucella* spp.), parasitology (including *Toxoplasma gondii*) and serology were collected. Animals were generally in a poor body condition. The most relevant pathological findings were a massive ulcerative gastritis associated with *Anisakis* spp. attached to the gastric wall. Sometimes parasites obstructed the passages between gastric concamerations and, in the two live-stranded dolphins, this resulted in severe gastric impaction. Stomaches from the other animals were completely empty. Microscopic examination revealed abundant cytoplasmic pigments in pulmonary, splenic and lymphnodal macrophages, along with a severe lymphoid depletion. Pigments were positive to Danscher's staining and ESEM x-ray microanalysis confirmed the presence of inorganic mercury granules (HgSe). *Postmortem* analyses did not revealed any biological agent, although the blood serum from one dolphin carried anti-*Morbillivirus* neutralizing antibodies. Emerging cetacean pathogens, responsible for several unusual die-offs, were excluded to be the cause of the striped dolphins' mortality investigated herein. No relevant marine nor meteorological anomalies were observed in this period both in the Adriatic and in the Ionian Sea, although a significant decrease in fisheries' captures and the presence of seismic surveys running in the area should be considered as important factors

plausibly linked to the northward migration of striped dolphins.

PPT07

Supratentorial primitive neuroectodermal tumour (PNET) with features of ependymoma in a striped dolphin (*Stenella coeruleoalba*)

Mark P. Dagleish[1], Linda R. Morrison[2], I. Tony Patterson[3], Johanna L. Baily[1]

(1) Moredun Research Institute
(2) Royal (Dick) School of Veterinary Studies, University of Edinburgh
(3) Agri-Food and Biosciences Institute

mark.dagleish@moredun.ac.uk

Brain tumours in cetaceans are extremely rare with only four reported cases of intracranial tumours in the scientific literature. Monitoring and recording such cases is crucial as neoplasia may be related to viral, carcinogenic or immunosuppressive chemical exposure and can ultimately contribute to assessing the health of our oceans. A juvenile female, striped dolphin live stranded at Whitepark Bay, Co Antrim, Northern Ireland, UK and died after an unsuccessful attempt at refloatation. At necropsy, a large, soft, non-encapsulated friable mass expanded and replaced the frontal lobes, corpus callosum and caudate nucleus of the brain and extended into the lateral ventricles, displacing the thalamus caudally. Microscopical examination revealed moderately pleomorphic neoplastic cells variably arranged in dense monotonous sheets, irregular streams, true ependymal rosettes and â œependymoblastomatous rosettesâ. Liquefactive necrosis palisading glial cells, haemorrhage, and mineralisation were also frequent. Immunohistochemically, the neoplastic cells labelled positively for vimentin and showed weak, patchy labelling for S100 but were negative for GFAP, cytokeratin, NSE and synaptophysin. Based on these findings a diagnosis of supratentorial primitive neuroectodermal tumour with features of ependymoma was made.

PPT08

First case of meningitis and arthritis associated with *Brucella ceti* in a short-beaked common dolphin (*Delphinus delphis*)

Nick Davison[1,4], James Barnett[1], Lorraine Perrett[2], Claire Dawson[2], Matthew Perkins[3], Rob Deaville[3], Paul Jepson[3]

(1) Animal Health and Veterinary Laboratories Agency, Polwhele, Truro TR4 9AD, UK
(2) FAO/WHO Collaborating Centre for Reference and Research on Brucellosis & OIE Brucellosis Reference Centre, Veterinary Laboratories Agency, New Haw, Addlestone, Surrey KT15 3NB
(3) Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY, UK
(4) Present address: Scottish Marine Animal Strandings Scheme, Scottish Marine Animal Stranding Scheme SRUC Veterinary Services, Drummondhill, Inverness,Scotland IV2 4JZ, UK

nick.davison@sac.co.uk

Brucella species infection in marine mammal species has been reported to have a global distribution. In 2007 the description of *Brucella ceti* was published and formally adopted for those isolates originating from cetaceans and pathological lesions similar to those seen in terrestrial mammals infected with *Brucella spp*. have been associated with its isolation. To date, *Brucella ceti* infection specific to the central nervous system (CNS) has been described in only two species of cetacean; striped dolphins (*Stenella coeruleoalba*) in Europe and Costa Rica and an Atlantic white-sided dolphin (*Lagenorhynchus acutus*) in the UK. This poster describes the first reported case of *Brucella ceti* associated meningitis and arthritis in a third species, the short-beaked common dolphin (*Delphinus delphis*), in an animal that stranded in the UK.

PPT09

Biological features families of *Enterobacteriaceae* isolated from the different species of Marine mammals

Tatyana Denisenko[1], Olga Sokolova[2]

(1) Moscow Department of Education Palace of creativity of Children and Youth "Intellekt, K.I.Skryabin Moscow State Academy of Veterinary Medicine & Biotechnology
(2) National Hematology Research Centre (NHRC)

tedolphin@mail.ru

In marine mammals, infectious diseases are a serious problem. Often, big part of microbiota of the upper respiratory tract of marine mammals consist bacteria of families *Enterobacteriaceae*. There is reliable evidence available to testify that Enterobacteria can cause diseases or aggravate the course of infectious diseases of animals. The present study is concerned with the species composition of the microorganisms of the family *Enterobacteriaceae* in the upper respiratory tract of marine mammals. And investigation of the biological properties of causative agents and to compare the properties of our isolates to those of the strains isolated from terrestrial mammals (cattle, pigs and humans). From 1999 to 2012 our study included microbiological investigations of: Steller sea lion pups and Ladoga ringed seal, Gray whale from wild populations; capture Steller sea lion, walruses, Baltic ringed seal, Grey seal, Black sea bottlenose dolphin, Beluga whales. Materials for microbiological investigations were: smears from upper respiratory tract from Cetaceans and from an oral, nasal cavities, conjunctive, genitals, anus from Pinnipeds. Also we took water and air samples in water area. From the samples taken from all the examined animals, including capture, bacteria of the family *Enterobacteriaceae* were isolated. The isolated bacteria were identified down to the following species: *Escherichia*, *Salmonella*, *Enterobacter*, *Providencia*, *Proteus*, *Hafnia*, *Yersinia*, *Citrobacter*. In contrast to enterobacteria isolated from terrestrial mammals, isolates from Cetaceans proved to be more demanding with respect to nutritional media, and the best growth was demonstrated on blood agar and Endo with 5% defibrination of blood. The cultures of hemolytic E. coli isolated from capture Black sea bottlenose dolphin to show different pathogenic factors. This may indicate the possibility of enterobacteria be the cause of infectious diseases of cetaceans. Besides the presence of pathogenic enteric bacteria in animals and in the environment points to adverse environmental condition.

PPT10

Mixed testicular neoplasia in a short beaked common dolphin (*Delphinus delphis*)

Josue Díaz-Delgado, António Espinosa de los Monteros, Carolina Fernández-Maldonado, Manuel Arbelo, Oscar Quesada-Canales, Marisa Andrada, Enrique Rodríguez-Grau Bassas, Antonio Fernández

Institute of Animal Health. University of Las Palmas de Gran Canaria. Spain.,2 Agencia de Medio Ambiente y Agua de Andalucía. Junta de Andalucía. Spain, marbelo@dmor.ulpgc.es

josue.diaz101@estudiantes.ulpgc.es

Among the cetacean scientific literature, testicular neoplasms have been rarely described. A diagnosis of mixed testicular neoplasia in a short beaked common dolphin (*Delphinus delphis*) is present. An adult male short beaked common dolphin was found stranded on the coast of Almeria (Andalucia, Spain). At necropsy, two masses were observed in the abdominal cavity. Samples from different organs were preserved in buffered formalin (10%), embedded in paraffin, sectioned at 5 µm, and stained with hematoxylin and eosin. One of the masses was adhered to the left testicle showing poor demarcation from the adjacent testicular parenchyma, and the other, was closely related to the right testicle and consistent with a retroperitoneal lymph node. Histologically, three distinguishable neoplastic cell populations comprising a Sertoli cell tumor, an interstitial (Leydig) cell tumor and a seminoma were observed in both testicles. Lymphatic spread to examined adjacent retroperitoneal lymph node was seen for neoplastic Sertoli cells. Demonstration of clinical signs and further health implications is extremely challenging when dealing with non accessible wildlife species, such as dolphins. However, metastatic potential for these neoplastic conditions should be considered. The occurrence of this mixed pattern of testicular neoplasia has not been previously reported in wildlife pathology.

PPT11

Phylogenetic analysis of Herpesvirus in cetaceans stranded at the Portuguese coast line

Carolina Bento[1], Ana Duarte[1], Marisa Ferreira[2], José Vingada[2,3] , Luis Tavares[1]

(1) CIISA, Faculdade de Medicina Veterinária, Universidade Técnica de Lisboa, Av da Universidade Técnica, 1300-477 Lisboa, Portugal
(2) Dep. Biologia e Sociedade Portuguesa de Vida Selvagem. Universidade do Minho. Campus de Gualtar, 4710-057 Braga, Portugal
(3) Centro de Estudos sobre Ambiente e Mar. Universidade de Aveiro. Campus Universitário de Santiago. 3810-193 Aveiro, Portugal

anaduarte@fmv.utl.pt

Since 1988 herpes virus infections have been identified in cetaceans (porpoises, dolphins, and whales) associated both with local and systemic infections. Until now Alphaherpesviruses and Gammaherpesviruses have been reported worldwide from cetaceans' species. Due to the important marine mammal stranding rate of Northern Portugal, we have recently conducted a molecular survey for detection of herpesvirus DNA in biological materials from stranded cetaceans available through the National Marine Mammal Stranding Network and through the CRAM-Q - Quiaios Marine Animal Rehabilitation Centre, Portugal. HV positive organs were identified in common dolphins (8/90) and Harbour porpoises (3/18), from tissue samples collected during 2011 and including common dolphin (*Delphinus delphis*) (n=90); striped dolphin (*Stenella coeruleoalba*) (n=5); bottlenose dolphin (*Tursiops truncatus*) (n=1); harbour porpoise (*Phocoena phocoena*) (n=18); pilot whale (*Globicephala melas*) (n=1) and True's beaked whale (*Mesoplodon mirus*) (n=1). After amplicon sequencing blast analysis (http://blast.ncbi.nlm.nih.gov/Blast.cgi) confirmed its specificity and identified close nucleotide sequence proximity with Alphaherpesvirinae and Gammaherpesvirinae in Common dolphins, but also of Alphaherpesvirinae, genus Varicella in Harbour porpoise samples. In order to clarify the phylogeny of these newly recognized sequences a phylogenetic analysis was conducted. The full characterization of Herpesvirus sequences will certainly contribute to the understanding of the evolution pattern of these viruses.

PPT12

First mercury report of an unusual case of stranded striped dolphins in the Italian northern Adriatic coast

Costanza Formigaro[1], Annalisa Zaccaroni[1], Sandro Mazzariol[2]

(1) Large Pelagic Vertebrate Research Group, Department Veterinary Medical Sciences, University of Bologna, Cesenatico (FC), Italy
(2) Department of Public Health, Comparative Pathology, and Veterinary Hygiene, University of Padua, Italy

cost2408@hotmail.it

Striped dolphins are world-wide distributed pelagic small cetaceans. In the Mediterranean Sea, *Stenella coeruleoalba* is the most abundant cetacean but no estimation exists for the eastern Mediterranean Sea. Mercury levels were evaluated in four specimens' organs and tissues of the dozen striped dolphins stranded along the Italian northern coast of the Adriatic Sea between January - March 2012, an event certainly rare because both geographically speaking and for the abundance. Hg levels (176,64 ± 70,18 µg/g w.w. in liver) were comparable to others works done on stranded *S. coeruloalba* in Adriatic coasts (Croatian and southern Italian coasts, with 182 ± 91.6 and 156.2 – 216.7 µg/g w.w. in liver respectively), higher than Corsican sea (115 µg/g w.w.), and lower than French (668.4 µg/g w.w.) and Spanish (260.8 µg/g w.w.) Mediterranean coasts. Concentrations decrease in the following order along organs and tissues: Liver > Melon > Lung > Kidney > Muscle > Heart > Skin, with mean concentrations in the liver being 7-36 times higher than in the other tissues. On the contrary of what Literature reports, high values were found in melon (8.36 - 41.78 ppm *vs* 1.3 – 4.1 ppm). For one specimen also blubber, brain, bone marrow and lymphnodes were analyzed, showing anyway lower levels than the other organs and tissues collected. The main way of contamination seems to be the food through trophic chain, explaining higher levels in metabolizing organs, but skin and lung are also known to play a role in metals absorption. In this case reported, mercury doesn't seem to be the main cause of death for these four dolphins but it may have contributed in their health decline, leading them to strand along unusual coast for *Stenella coeruloalba.* Further analysis will be conducted for better understanding this phenomena.

PPT13

Perfluorinated alkylated contaminant profiles of three marine mammal species from the North Sea: a comparative study

Anders Galatius[1], Rossana Bossi[2], Christian Sonne[1], Frank Farsø Rigét[1], Carl Christian Kinze[3], Christina Lockyer[4], Jonas Teilmann[1], Rune Dietz[1]

(1) Department of Bioscience, Aarhus University, Frederiksborgvej 399, DK-4000 Roskilde, Denmark
(2) Department of Environmental Science, Aarhus University, Frederiksborgvej 399, DK-4000 Roskilde, Denmark
(3) Rosenørns Allé 55 2. tv., DK-1970 Frederiksberg C, Denmark
(4) Age Dynamics, Huldbergs Allé 42, DK-2800 Kongens Lyngby, Denmark

agj@dmu.dk

Perfluorinated alkylated substances (PFASs) are synthetic compounds with several applications, e.g., fire-fighting foams, cleaners, lubricants and various coatings. Among the reported effects of PFASs are reproductive toxicity, neurotoxicity, hepatotoxicity, immunotoxicity and effects on the metabolism. Profiles of seven compounds of perfluoro-alkyl substances (PFASs) were compared among three species of top predators from the Danish North Sea; the white-beaked dolphin (*Lagenorhynchus albirostris*), the harbour porpoise (Phocoena phocoena) and the harbour seal (*Phoca vitulina*). The seals had higher total burdens (757.8 ng g-1ww) than the dolphins (439.9 ng g-1ww) and the porpoises (355.8 ng g-1ww), probably a reflection of feeding closer to the shore and thus contamination sources. The most striking difference among the species was the relative contribution of PFOSA to the profiles; the seals (0.1%) had much lower levels than porpoises (8.3%) and dolphins (26.0%). In combination with values obtained from the literature, this result indicates that Carnivora species have a much higher capacity for transformation of PFOSA to PFOS than cetacean species. Another notable difference among the species was that the two smaller species (seals and porpoises) with supposedly higher metabolic rates had lower concentrations of the perfluorinated carboxylic acids (PFCAs), which are generally more easily excreted than perfluorinated sulfonamides (PFSAs). Species-specific characteristics should be recognized when PFAS contamination in marine mammals is investigated, for example, several previous studies of PFASs in cetaceans have not quantified PFOSA.

PPT14

Persistent Organic Pollutants (POPs) in the blubber and liver of 27 Bottlenose Dolphins (*Tursiops truncatus*) stranded along the coasts of Canary Islands from 1997 to 2011

Natalia García Álvarez[1], Octavio Peréz Luzardo[2], Antonio Fernández[1], Vidal Martín[3], Manuel Arbelo[1], Aina Xuriach[1], Maria Reyes Suárez Hanna[2], Marisa Tejedor[3], Manuel Zumbado[2], Luis Domínguez Boada[2]

(1) Unit Histology and Pathology, Institute of Animal Health, Veterinary School, University of Las Palmas, 35413 Arucas, Las Palmas de Gran Canaria, Spain
(2) Toxicology Unit, Department of Clinical Sciences, University of Las Palmas de Gran Canaria, P.O. Box 550, 35080 Las Palmas de Gran Canaria, Spain
(3) SECAC. Sociedad para el Estudio de los Cetáceos en el Archipiélago Canario, Spain

natalia.garcia117@alu.ulpgc.es

The persistent organic pollutants (POPs) accumulate in lipid-rich tissue and build up along trophic levels, therefore affecting populations of marine mammals all over the world; in spite of this fact, little information is available on cetaceans from the Canary Islands. Organochlorine compounds (OCs), especially polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs), and polycyclic aromatic hydrocarbons (PAHs) were measured in the blubber and liver of 27 bottlenose dolphins (*Tursiops truncatus*) stranded along the Canary Islands coasts from 1997 to 2011. The preliminary results show that among the 41 OCs studied, dichlorodiphenyltrichloroethanes (DDTs) and PCBs levels were predominant in the two tissues but presented higher concentrations in the blubber (median of 23155 and 27592 ng/g lipid basis respectively) than in the liver samples (median of 288 and 430 ng/g lipid basis respectively). Among the 18 PCBs analyzed, the highly chlorinated PCB180, 153 and 138 were the prominent congeners. We found a ppDDE/tDDTs rate of 0.86 in blubber and 0.88 in liver, which is indicative of DDT ageing. All the samples showed detectable values of some of the 16 PAH studied. Phenanthrene was the most frequently detected and at the highest levels as it was indicated in a previous research of contaminants in sea turtles of the Canary Islands. The present study represents relevant information of contamination in stranded *T. truncatus* from the Canary Islands which increases the data already reported from the studied area. The pollutants found were at toxicologically significant levels in many animals. Further studies are needed to investigate potential associations between contaminants and health status.

PPT15

Prevalence of a particularly severe skin condition among common bottlenose dolphins from the Amvrakikos Gulf, western Greece

Ioannis Giovos, Joan Gonzalvo

Tethys Research Institute. Viale G.B. Gadio, 2. 20121 Milan, Italy

ioannis.giovos@gmail.com

Since 2001, we have been carrying out a long-term study on a highly resident population of common bottlenose dolphins (*Tursiops truncatus*) in the eutrophic waters of the Amvrakikos Gulf, western Greece. Based on photo-Id data collected between April-September 2011 (comprising a selection of 1,429 photos out of a total of 2,867), a particularly severe and relatively easy to detect skin condition, tentatively named as white-dotted (WD), was examined. Out of 121 identified individuals, 39 showed some kind of skin condition; 21 (54%) of those presented WD with different levels of intensity. The majority of these, 17 dolphins, manifested a mild condition; however, for the remaining 4 it appeared to be particularly severe. By taking advantage of our long-term photo-Id effort we managed to evaluate the evolution of 3 of these 4 animals from 2006 (on previous years photo-Id effort was not comparable). We determined that 2 of them suffered a significant degradation from mild to moderate and to the currently severe skin condition over a 6-year period. This suggests that all the dolphins currently showing mild WD symptoms might eventually reach a severe condition. Several reports connect water pollution to skin lesions in cetaceans and remarkably in bottlenose, a species more likely to be affected given its mainly coastal distribution. This population in particular lives in a virtually closed ecosystem; whether the prevalence of this skin condition among local dolphins is due to habitat degradation resulting from rapidly growing eutrophication and pollution in recent years, and its significance in terms of population health cannot be established at this time unless a diagnostic study is performed.

PPT16

Stress protein inclusions in livers of stranded cetaceans, morphological study

Ana Godinho[1], Paul Jepson[2], Manolo Arbelo[3], António Espinosa de los Monteros[3], Marisa Andrada[3], Antonio Fernández[3]

(1) Centro de Investigação em Ciências Veterinárias (CICV), Faculdade de Medicina Veterinária, Universidade Lusófona de Humanidades e Tecnologias, Campo Grande, 376, 1749 - 024 Lisboa, Portugal
(2) Marine Mammal Stranding Research, Zoological Society of London, Regent's Park London NW1 4RY, UK
(3) División de Histología y Patología Veterinaria. Instituto Universitario de Sanidad Animal. Universidad de Las Palmas de Gran Canaria. Transmontaña s/n, Arucas, Las Palmas de G. C. España

ana_godinho@yahoo.com

The aim of this article was to study the presence, the morphology and the nature of intracytoplasmic eosinophilic globules in hepatocytes of cetaceans stranded in the Canary Islands. Materials and Methods: Liver samples from 115 cetaceans of 17 different species were formalin fixed and paraffin embedded. In samples which presented globules, histochemistry and immunohistochemistry techniques were carried out to detect glycoproteins with Periodic acid-Schiff with diastase treatment (PASd), and specific acute phase proteins: alpha-1-antitrypsine (A1AT) and fibrinogen (FB). An ultrastructural study of the globules was also performed. Results: In 95 out of 115 (82,6%) livers we observed the presence of intracytoplasmic hyaline eosinophilic globules in hepatocytes, with different results to PASd, A1AT and FB, and also different ultrastructural morphology. Conclusion: We concluded that intracytoplasmic protein inclusions (hyaline globules) are present under different inflammatory and cardiovascular circumstances in stranded cetaceans and these formations are depending of same animal characteristics like the age and body condition.

PPT17

A possible function for delayed rostral fusion in porpoises (Phocoenidae)

Pavel Gol'din

Department of Zoology, Taurida National University, 4 Vernadsky Avenue, Simferopol, Crimea, 95007, Ukraine

pavelgoldin412@gmail.com

Phocoenids are considered to be suction feeders, like many odontocetes and some mysticetes. Short rostrum, unusually shaped or reduced teeth, blunt mandibles, early fused hyoid bones and, possibly, fused cervical vertebrae are among their skeletal adaptations associated with suction feeding. Also porpoises are known for their paedomorphsis particularly expressed in delayed suture fusion in skeletal elements; however, the elements functionally important for feeding (e.g., hyoid) attain skeletal maturity well before than in some 'peramorphic' delphinids. Maxilla-premaxilla sutures especially retard in fusion; in *Phocoena phocoena*, they usually do not fuse for the lifetime. In this trait, phocoenids differ from many delphinids, in which rostral fusion progresses quickly and often completes before attaining sexual maturity. Delayed fusion is partly explained by the prolonged growth of rostrum in width in phocoenids, the process facilitating suction feeding. Another explanation is cranial kinesis (functional movements) of rostral elements during the feeding act, a phenomenon known for many filter feeders (e.g., baleen whales). Loose fusion of rostral elements with each other and with frontal bones, especially in early life, enables cranial kinesis and allows encircling the gape needed for suction. So cranial kinesis itself is a result of paedomorphic development, and it functionally compensates narrowness of rostrum during its growth.

PPT18

Ductus arteriosus and foramen ovale in the bottlenose dolphin (*Tursiops truncatus*)

Sanja Horvat, Martina Sakač, Mirta Seletković, Korina Šlogar, Tomislav Gomerčić, Martina Đuras

Faculty of Veterinary Medicine, University of Zagreb Heinzelova 55, Zagreb, Croatia

sanja.horvat2008@gmail.com

Ductus arteriosus and foramen ovale are anatomical structures present in the fetal heart which close after birth to ensure the proper function of the cardiovascular system. The aim of our study was to define the time of closure of these fetal structures in bottlenose dolphins (*Tursiops truncatus*). For this purpose we dissected 49 hearts which originated from bottlenose dolphins found dead from October 1990 till April 2011 in the Croatian part of the Adriatic Sea. Right atrium and aorta were opened with the help of anatomical tweezers and scalpel and were inspected macroscopically. Status of ductus arteriosus and foramen ovale was noted. A female of 220 cm body length and estimated age between 4 and 5 years was the largest bottlenose dolphin with an open ductus arteriosus. The oldest dolphin with an open foramen ovale was a male, 3 years old, and with a body length of 210 cm. Our study showed that both structures are open in bottlenose dolphins at time of birth, stay open for months in yearlings, and close during the first years of life. In humans, these structures close during first months of life and cause serious circulatory disorders if present later. We presume that evolutionary pressure concerning open fetal structures is lower in marine versus land mammals.

PPT19

Blubber Cortisol Concentrations in a Baleen Whale and a Phocid Seal

Joanna Kershaw[1], Christian Ramp[2], Simon Moss[1], Ailsa Hall[1]

(1) Sea Mammal Research Unit, Scottish Oceans Institute, University of St. Andrews, St. Andrews, Fife, United Kingdom
(2) Mingan Island Cetacean Study, 378 Bord de la Mer, Longue-Pointe-de-Mingan, Quebec, Canada

joannakershaw@hotmail.com

Because of the potentially harmful effects of chronic stress on various aspects of animal physiology including immune function and reproduction, there is an increasing interest in measuring stress in free-ranging marine mammals, particularly cetaceans. To date, levels of steroid stress hormones, or their metabolites in the blubber have not been published, and as such, nothing is known about how they may be stored or mobilised, and at what rates. However, reproductive steroid hormones are present in the blubber of marine mammals, and the same extraction method developed by Kellar *et al.* (2006)* was used here to determine cortisol levels in blubber biopsy samples taken from humpback whales *(Megaptera novaeangliae*) in the Gulf of St Lawrence, Canada, and harbour seals *(Phoca vitulina)* in Scotland. Hormone concentrations were then quantified using an established ELISA method. The preliminary results from this study suggest that high levels of cortisol can be found in the blubber of humpback whales. In order to investigate the relationship between blubber and plasma cortisol, the harbour seal was used as a model species. Blubber and plasma samples were collected simultaneously from the same individuals. Using generalised additive models, the plasma and blubber cortisol concentrations were shown to be influenced by the total capture time, although the relationship was different. Significant seasonal and sex differences in both plasma and blubber cortisol were also seen, and blubber cortisol was influenced by body condition showing strong individual variation. Finally, there was a significant positive correlation between plasma and blubber cortisol levels during the August moult ($p=0.028$), but not during the other seasons sampled. Thus, blubber cortisol levels can be measured, and could be a useful stress response marker for large cetaceans in conjunction with other stress measures.

PPT20

Unknown nodular ulcerative skin disease in a Delphinus sp. in New Zealand waters

Anna Maria Meissner, Karen A. Stockin

Coastal-Marine Research Group, Massey University

anna.meissner@gmail.com

We report on a case of unidentified nodular ulcerative skin disease affecting a free-swimming common dolphin (*Delphinus* sp.) in New Zealand waters. The dolphin was observed on March 4th 2012 among a group of 10 adult and juveniles in the Tauranga harbour (37°40'00"S, 176°10'50"E), Bay of Plenty, on the East Coast of the North Island in New Zealand. The dolphin, of unknown gender, presented multiple skin lesions with a nodular aspect, characterized by white, gray and pink verrucuous congregating lesions and in pronounced relief, some of which were ulcerating. The lesions extended on both sides from the eye to the caudal area and from the dorsal to the ventral side. However, the lesions did not appear symmetrically distributed and the dorsal fin was not affected. Unfortunately, no tissue sample could be obtained for diagnosis and furthermore, no other individual in the pod seemed to be affected by the same type of lesion. While morphologically consistent with *Lobomycosis*, a mycotic disease caused by *Lacazia lobois*, it seems unlikely given no cetacean species has previously been reported with this disease within South Pacific waters. However, this observation does lend support to rigorous confirmation of lesion type and prevalence during necropsies of fresh beach cast carcasses, where possible. Furthermore, biopsy of affected free-ranging animals, such as the individual detailed herein, is recommended.

PPT21

Assessment of the toxicological status of small cetacean species from the North West Iberian Peninsula

Paula Méndez-Fernandez[1,2,3], Lynda Webster[4], Tiphaine Chouvelon[1], Paco Bustamante[1], Marisa Ferreira[3], Ángel F. González[5], Alfredo López[2], Colin F. Moffat[4], Graham J. Pierce[6], Fiona Read[5], Marie Russell[4], Maria B. Santos[7], Jérôme Spitz[1], José V. Vingada[3,8], Florence Caurant[1]

(1) Littoral environment et Sociétes (LIENSs), UMR 7266 CNRS-ULR, 2 Rue Olympe de Gouges, 17042 La Rochelle Cedex 01, France
(2) Coordinadora para o Estudo dos Mamiferos Mariños (CEMMA), Apdo. 15, Pontevedra, 36380, Spain
(3) Centro de Biologia Molecular e Ambiental (CBMA)/Sociedade Portuguesa de Vida Selvagem (SPVS). Dep. de Biologia, Universidade do Minho, Campus de Gualtar, Braga, 4710-057, Portugal
(4) Marine Scotland, Marine Laboratory, Victoria Road, Aberdeen AB11 9DB, UK
(5) Instituto de Investigaciones Marinas (C.S.I.C), Eduardo Cabello 6, 36208, Vigo, Spain
(6) Oceanlab, University of Aberdeen Main Street, Newburgh, Aberdeenshire, AB41 6AA, UK
(7) Instituto Español de Oceanografía, Centro Oceanográfico de Vigo, P.O. Box 1552, Vigo, 36200, Spain
(8) Centre for Environmental and Marine Studies (CESAM), Universidade de Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal

paula.mendez_fernandez@univ-lr.fr

In order to determine the contamination status and vulnerability of five of the most frequent small cetaceans from the NW Iberian Peninsula (NWIP) (common dolphin *Delphinus delphis*, harbour porpoise *Phocoena phocoena*, bottlenose dolphin *Tursiops truncatus*, striped dolphin *Stenella coeruleoalba* and long-finned pilot whale *Globicephala melas*), 32 congeners of polychlorinated biphenyls (PCBs) were analysed in their blubber and 14 trace elements (Ag, As, Cd, Co, Cu, Cr, Fe, Hg, Mn, Ni, Pb, Se, V, Zn) in liver and kidney. Samples were obtained from stranded or by-caught animals between 2004 and 2008. The study confirmed that contaminant concentrations are highly dependent on two biological factors (age and sex) but also on ecological factors i.e. trophic level, prey preferences and the habitat used. Among the five species, bottlenose dolphin and harbour porpoise showed the greatest total PCB levels (56.4 ± 35.2 and 20.5 ± 20.4 mg/kg lipid, respectively) exceeding the PCB toxic thresholds (determined in the literature for marine mammals) of 17 mg/kg lipid. Pilot whale and bottlenose dolphin exhibited the highest Cd and Hg concentrations, with 30.0 ± 26.9 and 5.7 ± 13.8 µg/g wet weight of Cd in kidneys, respectively, and 31.0 ± 59.5 and 19.1 ± 22.4 µg/g wet weight of Hg in liver, respectively. Moreover, arsenic (As) was only detected in the latter two species. Bottlenose dolphin was the most contaminated species, which can be related to its mainly coastal habitat in the area. However, a geographic comparison over Northeast Atlantic waters

showed that Iberian bottlenose dolphins are slightly less contaminated. With regard to future research priorities in the NWIP, a continuous monitoring program of contaminants in cetaceans might provide regular baseline data to improve assessment of temporal trends and potential effects at population level.

PPT22

Necropsy of dead Steller sea lions (*Eumetopias jubatus*, SSL) pups on Tuleny Island in 2011-2012

Maria Ososkova[1], Svetlana Artemyeva[2], Nikolay Simbirtcev[1], Vladimir Burkanov[3,4]

(1) Moscow State Academy of Veterinary Medicine and Biotechnology named after K.I.Skryabin, Moscow, Russia
(2) Moscow State University, Moscow, Russia
(3) Kamchatka Branch of the Pacific Geographical Institute, FEB RAS, Petropavlovsk-Kamchatsky, Russia
(4) National Marine Mammal Laboratory, AFSC, NMFS, NOAA, USA

burkanovy_kov@mail.ru

SSL currently in endangered species. One of the possible reason of the population decline are diseases. However, this factor is very poorly studied. Our researches were conducted on Tuleny Island (Russia) during summers 2011,2012. Totally, we randomly necropsied 8 dead pups: 6 in 2011 and 2 in 2012 . Five of 6 pups in 2011 were branded 7 to 45 days before death. Necropsy of 4 dead pups was similar to salmonellosis, 3 pups to viral enteritis, 1 pup to sepsis, 2 pups to distemper. Necropsy of one dead pup was probably similar to the action of 2 or more infectious agents. However, we haven't performed specific research methods. Death of branded pups were not associated with the burn brand. We didn't report complications in the healing of skin burns and didn't observe burn disease or traumatic shock from the hot branding. Death of 3 pups derived from gastroenteritis, hepatitis, nephritis, complicated proteinosis infarction and pneumonia with pulmonary edema. Death of 2 pups derived from gastroenteritis and pneumonia. Death of 1 pup was pulmonary edema with gastroenteritis, steatosis, nephrosis and suppurative arthritis. Death of another 1 pup was sudden from pneumonia and pulmonary edema against airway obstruction milk. Mortality of branding pups in 2011 on Tuleny Isl. was 7.1% and 5.6% in 2012. In 2011 the SSL mortality was normal for this species, but a bit higher than average SSL pups mortality rate in the Far East of Russia. Probably, stress of the hot branding could revitalize the infectious agents (viruses or bacteria) which in a healthy body are inactive. Future researches are plan to be conducted on Tuleny Islands to a examine the possible infectious agents of SSL pup.

PPT23

Neuropathological investigations on cetaceans stranded along the Ligurian Sea coast of Italy (2007-2012)

Alessandra Pautasso[1], Maria Domenica Pintore[1], Cristiana Tittarelli[1], Maria Goria[1], Laura Serracca[1], Carla Grattarola[1], Alessandro Dondo[1], Giovanni Di Guardo[2]; Walter Mignone[1], Cristina Casalone[1], Barbara Lulini[1]

(1) Istituto Zooprofilattico del Piemonte Liguria e Valle d'Aosta
(2) Università degli Studi di Teramo-Facoltà Medicina Vaterinaria

alessandra.pautasso@izsto.it

Aquatic mammals could act as reservoirs for potentially zoonotic and emerging infectious pathogens, which may trigger at their turn epidemics of lethal disease in cetacean populations, or represent a threat to human health. From 1990 to 1992 and from 2006 to 2008, two mass die-offs of striped dolphins (*Stenella coeruleoalba*) occurred in the Mediterranean Sea and were caused by two closely related Dolphin Morbillivirus (DMV) strains. Moreover, cysts and zoites of *Toxoplasma gondii,* commonly believed to be an opportunistic pathogen for aquatic mammals, were detected in the brain of striped dolphins stranded in 2007 during the second DMV epidemic. This protozoan agent likely played a primary etiologic role in the development of a lethal meningoencephalitis. Finally, a prion disease case was recently described in a free-ranging bottlenose dolphin (*Tursiops truncatus*) found stranded on the Atlantic USA coast. This report summarizes the neuropathological findings detected in cetaceans stranded along the Ligurian Sea coast. From 2007 up to date, *post mortem* examinations were performed on 47 cetaceans. Histological, immunohistochemical, biomolecular and microbiological investigations were conducted on the central nervous system (CNS) sampled from 32 well preserved carcasses. An in-depth search for the presence of pathological prion protein (PrPSc) was carried out in all cases. Neuropathological analysis showed inflammatory lesions in 16 cases; 1 sample was unsuitable for analysis due to autolysis and no histological lesions were found in the remaining cetaceans. Investigations for PrPSc detection are still underway. In conclusion, brain lesions were frequently observed in the animals included in this study; therefore CNS sampling during necropsy should be performed routinely since it can provide relevant scientific informations on cetacean health and conservation status.

PPT24

Contaminants Monitoring Programme in Stranded Marine Mammals in the Region of Murcia (Southeast Iberian Peninsula)

Jose Peñalver[1,2], Ana Cristina Miñano[1], María Dolores Marín[1], Antonio Alcaraz[1], Emilio María-Dolores[1], Emma Martínez-López[2], Antonio Juan Garcia[2]

(1) Autonomus Community of Murcia Region, Plaza Juan XXIII, Murcia, Spain
(2) Área of toxicology, Faculty of Veterinary, University of Murcia, Spain

josepenalver@um.es

The Region of Murcia, through the Fisheries and Aquaculture Service in 2009 initiated a program of health monitoring of marine life (mammals, turtles and sharks) stranded on the coast of Murcia. The controls include virology, bacteriology, parasitology and toxicology. In this final section tested tissue levels of heavy metals, organochlorine pesticides and polychlorinated biphenyls (PCB's). The Region of Murcia has 180 km of Mediterranean coastline, there are stable populations of *Tursiop truncatus*, *Stenella coeruleoalba* and *Delphinus delphis*, *Globicephala melas* and *Grampus griseus* and, being a transit of *Balaenoptera physalus* and *Physeter macrocephalus*. The stranding network in the Region of Murcia is the responsibility of DG Environment, who, through the Recovery Center Wildlife El Valle involved in stranding in collaboration with the Fisheries and Aquaculture Service. A veterinary team, after the measurement of morphometric parameters standardized, formal autopsy performed and proceeds to the taking of samples. For toxicological analysis will take the following tissues: subcutaneous fat, liver, kidney, brain, muscle, and where appropriate, lung and bone. Heavy metals (Hg, Cd, Pb and As) are quantified in liver, kidney, brain, muscle and lung in the Agri-Food and Health Laboratory, organochlorines (group hexachlorocyclohexane, cyclodiene derivatives and group DDT) are quantified in fat in Toxicology Service, Faculty of Veterinary Medicine, Murcia and PCB's (10 coplanar congeners and 7 non-coplanar) are studied in fat in the Public Health Laboratory.In the first three years (2009-2011) have been studied 29 specimens of *Stenella coeruleoalba*, three specimens of *Globicephala melas* and one specimen of *Tursiop truncatus, Delphinus delphi , Grampus griseus* and *Balaenoptera physalus*. We describe the results: high concentrations the Hg in metals, the ΣDDT in pesticides, the non-coplanar congeners PCBs were commonly detected at high levels but we have found only the coplanar congeners PCBs (PCBs like dioxins) 118 and 167.

PPT25

Bone anomalies in cetacean' skeletons preserved in two Italian museums

Michele Povinelli[1], Emanuele Zanetti[1], Giuseppe Palmisano[1], Maristella Giurisato[1], Alessandro Zotti[2], Michela Podestà[3], Bruno Cozzi[1], Sandro Mazzariol[1]

(1) Dept. of Comparative Biomedicine and Food Science, University of Padova, Padova, Italy
(2) Dept. of Animal Medicine, Production and Health, University of Padova, Padova, Italy
(3) Museum of Natural History of Milan, Milan, Italy

michele.povinelli@hotmail.it

Pathological changes in cetaceans bones and joints have been reported in several species. In particular, degenerative and inflammatory lesions are grossly evident both in museums collections and during necropsies. In this study we investigated anomalies of 55 cetaceans skeletons preserved in two Italian collections, the University of Padova Museum (19) and the Museum of Natural History of Milan (36) belonging to 5 odontoecetes species (*Tursiops truncatus, Stenella coeruleoalba, Delphinus delphins, Grampus griseus, Globicephala melas*). Gross examination was compared with x-ray analysis and microscopic findings (only for Padova Museum specimens). Data were compared with gender, age class and species in order to understand any difference related to physiological condition. Pathological changes were observed in 74.5% of examined skeleton: anomalies related to remodelling of bones under continuous mechanical stress (i.e.: neurospinal deviations and indented scapulae) were the most represented anomalies (49% of the examined specimens). Articular degenerative findings and fractures are also well represented (respectively 43,6 and 23,6 %), particularly in males. Pathological findings are generally concentrated in skulls, forelimbs and cervical vertebrae. No other correlation with gender, age or species was confirmed. High incidence of bone anomalies in cetaceans reported in this investigation confirms that a systemic study of bone pathology, may yield deeper insights into health status of cetacean and Museum specimen or bad preserved stranded animals could be useful in this issue. Whether animals suffering from bone pathology are more likely to end up in a Museum because of their relative fragility is a question still unsolved.

PPT26

The *locus coeruleus* of toothed whales: a microscopical description of the brain largest catecholaminergic nucleus

Simona Sacchini[1], Cristiano Bombardi[2], Manolo Arbelo[1], Antonio Fernández[1], Eva Sierra[1], Miguel Rivero[1], Pedro Herráez[1]

(1) Institute of Animal Health, University of Las Palmas de Gran Canaria, Trasmontaña s/n, Arucas, Las Palmas, 35413, Spain
(2) Department of Veterinary Medical Science, University of Bologna, 40064 Ozzano dell'Emilia, Bologna, Italy

ssacchini@becarios.ulpgc.es

The brain is still an undiscovered world; we are just starting to grasp the mysteries of neuroscience. Moreover, there is a great lack of information concerning neuroanatomy of Cetaceans. One of the main difficulties is to obtain fresh brain samples of such unique animals with so big brains. *Locus coeruleus* (LC) is a densely packed cluster of norepinephrine producer neurons, located in the upper part of the rostral rhombencephalon, near the floor of the fourth ventricle. It´s the largest catecholaminergic nucleus of the brain ad it supplies norepinephrine to the entire central nervous system. LC is involved in attention, behavioural activation and arousal and it is of great interest nowadays for its involvement and neuronal loss in Alzheimer's and Parkinson's diseases. Until today the only examined cetacean species for this nucleus was a *Tursiops truncatus* (Manger et al., 2003). Seven animals of six different species of the suborder Odontoceti (*Mesoplodon densirostris*, *Globicephala macrorhynchus*, *Grampus griseus*, *Stenella coeruleoalba (n=2)*, *Stenella frontalis* and *Delphinus delphis*) were used for this study. Serial, rostro-caudal, 50 µm-thick coronal sections of the rostral rhombencephalon (from the most caudal level of the caudal colliculus to the rostral myelencephalon) were made using a sliding freezing microtome. Serial sections were later stained for Nissl substance with thionin. Immunoperoxidase staining was carried out on free-floating sections that were immunocytochemically stained for Tyrosine Hydroxylase (TH) and Corticotropin Releasing Factor. LC extended from the caudal level of the motor nucleus of the trochlear nerve to the rostral level of the motor nucleus on the trigeminal nerve. TH-immunopositive neurons were mainly three to four sided large polygons with three to four primary dendrites. This is the first description of LC in these species and we are interested in a future study of its involvement in acute stress response in live stranded Cetaceans.

PPT27

Ossification of flipper bones in bottlenose dolphins (*Tursiops truncatus*)

Martina Sakač, Sanja Horvat, Mirta Seletković, Korina Šlogar Tomislav Gomerčić, Martina Đuras

Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, Zagreb, Croatia

msakac@vef.hr

Despite intensive research on bottlenose dolphins the ossification of its flipper bones remained unstudied. In order to study the ossification pattern of the bottlenose dolphin flipper, we examined 232 radiographs of the left and right flipper originating from 60 male and 57 female bottlenose dolphins with body lengths from 99 to 322 cm and age from 0 to 28 years. The radiographs originated from bottlenose dolphins found dead from October 1990 to January 2010 in the Croatian part of the Adriatic Sea. Ossification centers of flipper bones were identified and their fusion was evaluated. Our study showed that ossification of the flipper progresses from proximal towards distal bones. We designed equations and graphs based on stages of ossification for estimating important biological characteristics such as body length, body mass and age of the bottlenose dolphin. These equations can be used to estimate important biological data in cases where only bone remains of bottlenose dolphins are found.

PPT28

Herpesvirus associated to genital lesions in a stranded striped dolphin (Stenella coeruleoalba) in Canary Islands

Eva Sierra, Manuel Arbelo, Marisa Andrada, Daniele Zucca, Simona Sacchini, Josué Díaz Delgado, Antonio Fernández

Veterinary Histology and Pathology, Department of Morphology, Institute of Animal Health, Veterinary School, University of Las Palmas de Gran Canaria (ULPGC). Trasmontaña s/n. 35416, Arucas. Las Palmas. Spain

esierra@becarios.ulpgc.es

An adult male striped dolphin (*Stenella coeruleoalba*) stranded alive at Arico, Tenerife, Canary Islands, Spain, on 16 May 2011. The animal died shortly after stranding and a complete necropsy examination was performed. Both 10% neutral buffered formalin-fixed and fresh unfixed samples, for histopathological and microbiological studies, respectively, were taken from selected tissues. Tissue sections for microscopic studies were stained routinely with hematoxylin and eosin. The most remarkable gross finding was the presence of two fleshy masses of approximately1 cm in diameter, raised, both tan and pigmented, respectively, near the tip of the penis. Histologically, these masses were composed of hyperplastic epithelial cells with pigmentary incontinence. Ballooning degeneration and margination of chromatin were observed within superficial stratus of the epidermis. Lymphocytes and plasma cells were present at the epidermal-dermal junction in the affected regions. Based on the association of herpesviruses with skin lesions in other marine mammal species, a universal nested PCR that amplifies a conserved region within the polymerase gene of the Herpesviridae family was applied. The product of the PCR was electrophoresed in 2% agarose gel. An amplicon of about 215 and 315 bp was obtained (expected size) and sequenced.

PPT29

The interdisciplinary approach at the development of the lifetime methods of the health assessment of the free swimming live large whales

Olga Sokolova[1,2], Tatiana Denisenko[3], Vladimir Vertyankin[4]

(1) National Hematology Research Centre (NHRC), Moscow, Russia
(2) Ya.R. Kovalenko All-Russian Institute of the experimental veterinaria, Moscow, Russia
(3) K. I. Skryabin Moscow State Academy of Veterinary Medicine and Biotechnology, Moscow, Russia
(4) Kronozkiy State Natural Preserve, Kamchatka, Elizovo, Russia

ovsokolova@mail.ru

In the last decades the great attention is given to development of a complex of methods allowing during lifetime to estimate a state of health of wild populations in order opportunely to define any dangerous influence on population and in due time to take measures for its protection and recovery. Special difficulties arise in attempts to estimate the status of health of population of free swimming live large whales as there is not possibility to conduct the standard list of tests which apply to investigation of the health status of populations of terrestrial mammals, birds, pinnipedia and also small cetacean. The available complex of methods and tests which were already applied to definition of the health status of populations of large whales include: collecting of the morphometry data (size of a body), biological characteristics (age, fatness, sex, photoidentification), endocrine characteristics (hormones levels), toxicological characteristics (contents of toxins in hypodermic fat), genetic characteristics (results of a biopsy of a skin), isolation of pathogens in exhaled air (blow) of with slime (viruses, bacteria, microscopical mushrooms et cetera), observing of the clinical symptoms of diseases. In the present work the new method which allows to estimate indirectly a status of immune system of large cetacean is offered. This method is based on correlations between quality (species composition, properties of the isolated microorganisms) and quantitative indices of microflora of the upper respiratory ways and also immunological characteristics of an individuals. This method was developed on small cetacean - the Black Sea bottle-nosed dolphin (*Tursiops truncatus*). Also this method was used by gray whale (*Eschrichtius robustus*). The received results allow to propose this method for a complex assessment of the health status of the free swimming live populations of large cetaceans.

PPT30

Parasite related findings in Dutch stranded harbour porpoises

Marielle ten Doeschate[1], Els de Jong[1], Sjoukje Hiemstra[2], Lineke Begeman[2], Arjen Strijkstra[1], Angelique Kuiper[1], Andrea Gröne[2]

(1) Van Hall Larenstein, Agora 1, 8934 CJ, Leeuwarden, the Netherlands
(2) Utrecht University, Department of Pathobiology, Faculty of Veterinary Medicine, Yalelaan 1, 3584 CL Utrecht

marieltdoeschate@gmail.com

From December 2008 until October 2011, 346 harbour porpoises stranded dead along the Dutch coastline were examined at Utrecht University, of which 141 individuals were suitable and used in this study. While the primary goal of the necropsy was to examine the cause of death, information on the presence and severity of parasite infestations in the lungs and the auditory system was collected. Statistical analysis was undertaken to identify possible associations with biological parameters (age, gender, and body condition), seasonal influence, and mortality factors. Results indicated pulmonary parasites are a common finding, and no significant differences were detected in presence and severity of parasites between bycaught and nonbycaught individuals. Taken that bycaught individuals represent a random selection of the healthy population, this indicates that parasites do not highly contribute to mortality. Other results showed parasite load is probably age related, and highly supports that transmission of parasites occurs through an intermediate host. A seasonal variance was identified for parasites in the lungs and parasites in the auditory system, with a more severe parasite infestation in summer and autumn. Assuming parasites are indeed transmitted through intermediate hosts, this suggests that parasite load is very likely related to the occurrence and dynamics of prey species that serve as host population to pulmonary parasites. When analyzing only juveniles, individuals with a lower body condition score showed a more severe parasite infestation of the auditory system than individuals with better body condition. Additionally, the severity of the parasite infestation in the ears was higher in bycaught animals. This is a notable result as animals from this category were shown to have a better body condition, while previous analysis showed a negative correlation with body condition. This interesting finding needs further investigation, and could possibly contribute to the understanding of why animals are being bycaught.

PPT31

A potential genetic basis for a heart disease in pygmy sperm whales (*Kogia breviceps*)

Amélia Viricel[1,2], Patricia E. Rosel[2]

(1) University of Louisiana at Lafayette, Department of Biology, LA, USA
(2) National Marine Fisheries Service, Southeast Fisheries Science Center, Lafayette, LA, USA

amelia.viricel@gmail.com

The pygmy sperm whale (*Kogia breviceps*) is one of two cetacean species known to display a heart disease, cardiomyopathy (CM). This disease is prevalent in *K. breviceps* individuals stranding along the southeastern coast of the U.S.A. Distinct forms of CM have been described in humans and other mammalian species. The pathology observed in *K. breviceps* is a mixed-form and has been described as a chronic, progressive disease found predominantly in adults. In humans, mutations in genes coding for sarcomeric proteins have been identified as a leading cause for CM. We investigated a potential genetic basis for the pathology seen in *K. breviceps* by screening portions of two of these candidates genes (*MYH7* and *MYBPC3*) in a panel of affected and unaffected individuals. Mutation screening revealed 11 nonsynonymous substitutions (*MYH7*: 1, *MYBPC3*: 10) that were predicted to have a detrimental effect on protein function. Although these mutations were not restricted to the affected group, the proportion of *K. breviceps* individuals carrying these mutations was almost twice as high in the affected group (38%) as in the control group (20%). Moreover, the mutation identified in *MYH7* causes CM in humans. For *MYBPC3*, although the 10 detrimental substitutions identified in *K. breviceps* have not been reported previously, they were located in protein domains where mutations at other sites have been associated with the disease in humans. The fact that some *K. breviceps* individuals from the unaffected group harbored detrimental mutations could be partly age-related and could also be due to the influence of environmental factors on the development of CM, as seen in humans. It is concluded that genetic factors are likely to play a role in CM observed in *K. breviceps*. However, the etiology of this disease is likely complex and probably multi-factorial.

PPT32

Is there a connection between pollution, mass-strandings and pilot whales from Australia?

Liesbeth Weijs[1,2], Detlef Tibax[1,2], Anthony C. Roach[3], Therese M. Manning[3], John C. Chapman[3], Katelyn Edge[3], Ronny Blust[1], David Pemberton[4], Adrian Covaci[2]

(1) Department of Biology, University of Antwerp, Groenenborgerlaan 171, 2020 Antwerp, Belgium
(2) Toxicological Centre, University of Antwerp, Universiteitsplein 1, 2610 Wilrijk, Belgium
(3) Office of Environment & Heritage, PO Box 29, Lidcombe, NSW, Australia
(4) Wildlife Management Branch, Department of Primary Industries, Parks, Water and Environment, GPO Box 44, Hobart 7001 Tasmania, Australia

liesbeth.weijs@ua.ac.be

Previous studies have suggested that pollution can lead to impaired immune systems in marine mammals, thereby leading to illnesses. However, little information is available regarding the levels of various pollutant classes in any tissue of Australian pilot whales or the impact of these levels on the incidence of mass strandings. To investigate this, blubber samples from 55 long-finned pilot whales involved in the Sandy Cape (Tasmania, Australia) mass-stranding in 2008 and from 60 long-finned pilot whales involved in the Stanley (Tasmania, Australia) mass stranding in 2008 were collected. In all samples, 37 PCBs, 6 PBDEs, 6 DDXs, HCB, chlordanes and 5 MeO-PBDEs were analysed using GC-MS. Animals were divided into groups according to their age (assessed through their body size) and gender. In all groups, DDXs were prevalent, followed by PCBs and MeO-PBDEs. PCB 153 was the most dominant congener among all PCBs in most groups, PBDE 47 and 6-MeO-PBDE 47 were predominant among all PBDEs and MeO-PBDEs respectively and *p,p'*-DDE was the most persistent among the DDXs. In terms of bioaccumulation, concentrations of PCBs, PBDEs, MeO-PBDEs, CHLs, DDXs and HCB decreased with age. Although the toxicological understanding of dose-response is limited in marine mammals and average concentrations of chemicals in the present study seem lower than concentrations reported worldwide, it is of concern that the highest levels of POPs were mostly found in the youngest animals. Within the limits of the present study, it is unknown whether these levels are toxic for this particular group or whether these levels induce changes that are compromising the well-being of pilot whales on the longer term.

PPT33

Diagnosis of morbillivirus in stranded dolphins from the Apulian Ionian and southern Adriatic coasts of Italy during the first Mediterranean epizootic

Daniele Zucca[1], Eva Sierra[1], Simona Sacchini[1], Marisa Andrada[1], Antonio Fernández[1], Nicola Zizzo[2]

(1) Institute for Animal Health
(2) Department Veterinary Medicine

danielzucca@tiscali.it

Genus Morbillivirus (family Paramyxoviridae) is known to be highly pathogenic in cetaceans, being responsible for several episodes of mass mortality worldwide over the last 20 years. In the summer of 1990, an epizootic infection caused by Cetacean Morbillivirus, strain dolphin morbillivirus (DMV), killed several thousand striped dolphins (*Stenella coeruleoalba*) in the Mediterranean Sea. In 1991 and 1992, the epizootic reached the Italian and Greek waters. The infection by DMV, in the acute period of the epizootic, caused encephalitis, pneumonia and depletion of lymph nodes. The main lesion observed in the CNS was non suppurative encephalitis. This work focuses on the Italian cases occurred between April and December 1991, along the Apulian Ionian and southern Adriatic coasts. Necropsy was done on 53 stranded cetaceans, 48 striped dolphins and 4 bottlenose dolphins (*Tursiops truncatus*). Samples obtained during necropsy procedure were fixed in formalin, routinely processed and stained with hematoxylin and eosin for histopathological studies. Histopathology revealed the presence of non suppurative meningoencephalitis, mainly characterized by the presence of one to three layers of mononuclear perivascular cuffing in 10 out of 48 (20.83%) striped dolphins, one of the bottlenose dolphins studied showed Morbillivirus related lesions. Sections from paraffin-embedded CNS tissues were examined immunohistochemically for the evaluation of morbillivirus antigen presence, using the avidin-biotin-peroxidase method. Preliminary results revealed that 23 out of 48 (47.9%) striped dolphins showed immunopositivity for Morbillivirus, a data extremely high compared to results found in previous similar studies. None of the bottlenose dolphins examined were positive. Despite the elevated rate of infection observed in our study, only 4 out of 23 immunopositive animals (17.4%) showed inflammatory associated lesions in the nervous system.

Strandings

S01

27 years of cetacean necropsies in southwest England – a summary of pathology found

James Barnett[1], Michael Cranwell[2], Nicholas Davison[1], Robert Deaville[3], Jan Loveridge[4], Robert Monies[1], Susan Quinney[1], Vic Simpson[5], Stella Turk[6], Paul Jepson[3]

(1) Animal Health and Veterinary Laboratories Agency, Polwhele, Truro, Cornwall TR4 9AD, UK
(2) Animal Health and Veterinary Laboratories Agency, Staplake Mount, Starcross, Exeter, Devon EX6 8PE, UK
(3) Institute of Zoology, Regents Park, London NW1 4RY, UK
(4) Cornwall Wildlife Trust Marine Strandings Network, Five Acres, Allet, Truro, Cornwall TR4 9DJ, UK
(5) Wildlife Veterinary Investigation Centre, Jollys Bottom Farm, Station Road, Chacewater, Truro, Cornwall TR4 8PB, UK
(6) Shangri-La, Reskadinnick, Camborne, Cornwall TR14 0BH, UK

James.Barnett@ahvla.gsi.gov.uk

Between October 1985 and December 2011, 701 cetaceans were necropsied in southwest England. Cetaceans stranding in Cornwall were necropsied at the Animal Health and Veterinary Laboratories Agency (AVHLA) Truro, informally between 1985 and 1990 and on a systematic basis thereafter. The majority of cetaceans stranding in Devon were necropsied at the Institute of Zoology, London and a smaller number at AHVLA Starcross. Occasionally, cetaceans have been necropsied in situ on the coast, particularly of larger species. Common dolphins (*Delphinus delphis*, n=406) and harbour porpoises (*Phocoena phocoena*, n=230) constituted over 90% of animals examined. Other species necropsied included striped dolphins (*Stenella coeruleoalba*, n=32), bottlenose dolphins (*Tursiops truncatus*, n=10), pilot whales (*Globicephala melas*, n=6), Risso's dolphins (*Grampeus griseus*, n=4), Atlantic white-sided dolphins (*Lagenorhynchus acutus*, n=4), white-beaked dolphins (*Lagenorhynchus albirostris*, n=2), Sowerby's beaked whale (*Mesoplodon bidens*, n=1), Cuvier's beaked whale (*Ziphius cavirostris*, n=1), pygmy sperm whale (*Kogia breviceps* , n=1), fin whale (*Balaenoptera physalus*, n=1), sei whale (*Balaenoptera borealis*, n=1) and one indeterminate species dolphin (species obscured by marked decomposition). Bycatch was by far the most common cause of death, accounting for 60% of the common dolphins and nearly 40% of the harbour porpoises examined. In 1992 pathologists examining cetaceans stranded in southwest England provided the first comprehensive review of lesions consistent with bycatch. Other notable findings over

the last 27 years include the diagnosis of *Brucella ceti* associated meningoencephalitis in both striped and common dolphins, detection of chronic gas bubble lesions in common dolphins, investigation of the largest mass stranding of common dolphins in the United Kingdom on record and identification of pathological lesions consistent with bottlenose dolphin interaction with small cetaceans, not only harbour porpoises but also four dolphin species.

S02

Protocol for the rescue, rehabilitation and recovery of Marcos, an striped dolphin (*Stenella coeruleoalba*) from the South coast of Spain

Eva María Morón[1], Emilio Guil[1], Ana María García-Cegarra[2], Anca Corcodel[1], Francisco Toledano[1]

(1) Stranding Network Almería PROMAR/Ecologistas en Acción Almería, Spain
(2) Genetics Laboratory, University of Cádiz, Spain

ana.g.cegarra@gmail.com, *promarsosfaunamarina@nodo50.org*

Historically, the prognosis for rehabilitating stranded cetaceans has been poor. Recent advances in husbandry and medicine have improved an animal's prospects for survival after release, but the rehabilitation process is longer, more labour-intensive, and costlier than for other marine mammals. On August 21th, 2012, the Emergency Service 112 reported a dolphin off the coast of Roquetas de Mar, Almería, Spain. The Association PROMAR reported that the dolphin was a calf male striped dolphin (*Stenella coeruleoalba*), called Marcos. Marcos was initially negatively buoyant, weak, unable to swim and showed external parasites (*Xenobalanus globicipitis*) attached to the dorsal and caudal fin. The rescue team took a blood and tissue samples, which were immediately sent for analysis to a lab specializing in veterinary work. The results allowed rescuers to determine the degree of dehydration and the presence of infections. Rescuers immediately administered the appropriate antibiotics and treated the nutrition, hydration and muscle atrophy problems. Marcos remains in the sea, in a net pool manufactured by PROMAR, which is the best place for his rehabilitation. Blood sampling is performed on a regular basis throughout the rehabilitation process, in order to monitor how well the animal is responding to treatment. The next step is his release to the wild, however criteria for his release include good health and nutritional status, normal behaviour, and normal blood profiles. The risk of introduce disease is a concern in light of a recent morbillivirus epizootic in striped dolphins in the Mediterranean sea. Marcos should be released within their home range and it is known the presence of striped dolphin families off the Almería coast. This is the first case of dolphin release of its kind in Spain and we do not know about a similar case of a dolphin of this young age which was successful.

S03

A unique prolonged mass stranding of harbour porpoises (*Phocoena phocoena*) along the Dutch coast from July to October 2011

Sjoukje Hiemstra[1], Mardik. F. Leopold[2], Guido O. Keijl[3], Lineke Begeman[1], Andrea Gröne[1]

(1) Utrecht University, Faculty of Veterinary Medicine, Department of Pathobiology
(2) Wageningen UR IMARES, Texel
(3) Naturalis Biodiversity Centre, Leiden

shiemstra25@gmail.com

From July to October 2011, strandings of harbour porpoises (n=559) along the Dutch coast line increased significantly compared to the typical average for this period (five year average =153). In July 2011, 114 harbour porpoise strandings where reported and, in August 2011, 208 strandings where reported, which are fourfold increases compared to the average number of strandings in these months between 2005 and 2010 ($\bar{n}$=55). This fourfold increase continued in the next two months of this year (September n=130, previous $\bar{n}$=32; October n=107, previous $\bar{n}$=29). 234 (41%) of these stranded harbour porpoises were collected and stored frozen for pathological examination. Necropsies were performed by a specialized team of veterinarian pathologists and biologists from different European institutes. At necropsy, the state of autolysis from these harbour porpoises was determined to be advanced to very advanced (n=202, 86%), which made it difficult to assess the cause of death in many cases. In this poster, the biometric data, stomach contents, and pathological findings from the 2011 strandings will be compared with data collected from 2009 and 2010 of stranded harbour porpoises within the same period. Stomach contents were analysed and were not different from the contents evaluated from the previous years in these months. A striking feature in many 2011 cases was extensive dark red pooling of blood in the sub cutis, that was initially interpreted as post mortem artefact, however ante mortem haemorrhage cannot be excluded at this time. These findings point toward events that occurred at multiple times in multiple places rather than a single localised cause. Further research has been initiated to examine the possibilities of emaciation, blunt trauma or acute (algal) intoxication as the cause for this mass mortality.

S04

Postmortem findings in stranded whales in Italy (2006-2012)

Sandro Mazzariol[1], Cinzia Centelleghe[1], Cristina Casalone[2], Walter Mignone[2], Pier Luigi Acutis[2], Fabio di Nocera[3], Antonio Pintore[4], Giovanni Di Guardo[5]

(*1) Dept. of Comparative Biomedicine and Food Science, University of Padova, Padova, Italy*
(2) Istituto Zooprofilattico Sperimentale del Piemonte, della Liguria e della Val d'Aosta, Turin, Italy
(3) Istituto Zooprofilattico Sperimentale del Mezzogiorno, Salerno, Italy
(4) Istituto Zooprofilattico Sperimentale della Sardegna, Sassari, Italy
(5) Dept. of Comparative Biomedicine Science, University of Teramo, Teramo, Italy

sandro.mazzariol@unipd.it

One of the major threats for Mediterranean mysticetes' population is represented by vessel collisions. Although external examinations could provide significant findings confirming these events, a detailed necropsy should be carried out to exclude any other cause of death, even if field examinations are usually difficult due to logistic conditions. A specific and equipped task force funded by the Italian Ministry for the Environment and collaborating with the Ministry of Health sistematically performs complete *postmortem* analyses; in this study, we summarize the main findings in whales stranded along the Italian coastline. Fifteen carcasses of fin whales (*Balaenoptera physalus*) and one common minke whale (*Balaenoptera acutorostrata*) were reported between 2006 and 2012. Only 6 males (37.5%) were submitted to complete necropsy, due to bad preservation of the carcasses, or logistic problems (carcasses floating in high waters). All the examined fin whales showed parasitic lesions limited to the cardio-vascular system, such as granulomatous mural myocarditis, granulomatous endoarteritis and renal vascular thrombosis; only in three individuals these were recognized as the likely cause of death, while in the other two whales a deadly *Dolphin Morbillivirus* (DMV) infection was revealed by biomolecular and morphopathological analyses. In the latter two animals opportunistic infections were also detected, namely by *Toxoplasma gondii* and *Klebsiella pneumoniae*. The latter was also deemed to be the cause of a deadly pulmonary infection in a newborn common minke whale. No signs of ship strikes were detected on the examined whales. As previously reported, *Crassicauda* spp. nematodes, found in all the fin whales and causing premature mortality in young whales, should be considered as a major threat for whales' conservation also in the Mediterranean Sea. Such parasitic condition, along with ship strikes and marine pollution, is highlighted during emergencies, such as the DMV epidemic occurred throughout 2006-2011 in the Mediterranean Sea.

S06

Can stomach analysis help understand where harbour porpoises (*Phocoena phocoena*) involved in mass strandings came from?

Lara Mielke[1], Eileen Heße[1], Guido Keijl[2], Mardik Leopold[1]

(1) Institute for Marine Resources & Ecosystem Studies (IMARES), P.O. Box 167, NL-1790 AD Den Burg, the Netherlands, e-mail: mardik.leopold@wur.nl
(2) Nederlands Centrum voor Biodiversiteit Naturalis, PO Box 9517, 2300 RA Leiden, the Netherlands

lara.mielke@wur.nl

Along the Dutch shores hundreds of harbour porpoises strand each year. The stomach contents of about 100 animals per year are studied to get to know their diet. Porpoises are generalists, feeding on >20 different fish species, but concentrating on only a few staple foods. Exactly which prey are staple foods, likely depends on local availabilities of various prey. Even within a geographical region, a particular batch of stranded porpoises might thus have particular diet characteristics. This can help to pinpoint the location of die-offs, and help to understand under which circumstances these took place. A recurrent phenomenon in the Netherlands are spring-strandings of heavily mutilated porpoises, now suspected to be victims of grey seal predation. Most corpses are fresh and strandings cluster in two separate regions. This would suggest that the corpses are “produced” locally. We substantiated this hypothesis by stomach contents analysis. Mutilated had their stomachs full of gobies, more so than comparable non-mutilated animals. Moreover, relatively many gobies were probably common gobies (*Pomatoschistus microps*), known to occur closely inshore. Non-mutilated porpoises had a more varied diet, with a.o. more whiting, sandeels and clupeids. Our findings provide further evidence that porpoises feeding closely inshore on an abundant population of gobies, run a risk of becoming prey themselves, if they come close to major seal haul out sites.

S07

Investigations of UK stranded beaked whales (1990-2011)

Matthew Perkins[1], Rob Deaville[1], Andrew Brownlow[2], Rod Penrose[3], Brian Smith[4], Paul Jepson[1]

(1) Institute of Zoology, Zoological Society of London, Regents Park, London, NW1 4RY, UK
(2) SRUC Veterinary Services, Drummondhill, Inverness, IV2 4JZ, UK
(3) Marine Environmental Monitoring, Penwalk, Llechryd, Cardigan, Ceredigion, SA43 2PS, UK
(4) The Natural History Museum, Cromwell Road, London, SW1 5BD, UK

matthew.perkins@ioz.ac.uk

Between 1990 and 2011, 10507 stranded cetaceans were reported to the UK Cetacean Strandings Investigation Programme. Of these, 127 were members of the *Ziphiidae* family (beaked whales), comprising Sowerby's beaked whale (*Mesoplodon bidens*, n=49), northern bottlenose whale (*Hyperoodon ampullatus*, n=38), Cuvier's beaked whale (*Ziphius cavirostris*, n=37), Blainville's beaked whale (*Mesoplodon densirostris*, n=1) and beaked whales of indeterminate identity (n=2). Strandings occurred around the UK coast, with largest numbers found around north-west Scotland. Beaked whale strandings increased from a mean of 3.1/year between 1990 and 1999 to 8.8/year between 2000 and 2009. This increase was in part driven by an atypical stranding event that occurred during 2008 where a number of deep diving species, including 27 beaked whales were found stranded in the UK. Forty three beaked whales were necropsied during this period, comprising Sowerby's beaked whale (n=18), northern bottlenose whale (n=15), Cuvier's beaked whale (n=3) and Blainville's beaked whale (n=1). Causes of death included live stranding (n=28), starvation (n=3), gas embolism (n=2), meningoencephalitis (n=2), physical trauma resulting from boat strike (n=2) and physical trauma of unknown origin (n=1). A cause of death could not be established in five beaked whales. Ingestion of plastic appeared to be a relatively more common finding within the *Ziphiidae*, compared to cetaceans from other taxonomic groups examined in the UK. This perhaps reflects the increased risk of marine litter ingestion as a result of specific feeding strategies in beaked whales, although numbers were low and no significant pathological impact was observed in any individual.

S08

Interpreting cetacean mortality rates using strandings data

Graham J. Pierce[1], Jennifer A. Learmonth[1], Sinead Murphy[2], Fiona L. Read[1], Maria Begoña Santos[3], Andrew Brownlow[4]

(1) Oceanlab, University of Aberdeen Main Street, Newburgh, Aberdeenshire, AB41 6AA, UK
(2) Institute of Zoology, Regents Park, London NW1 4RY, UK
(3) Instituto Español de Oceanografía, Centro Oceanográfico de Vigo, P.O. Box 1552, Vigo, 36200, Spain
(4) SAC Wildlife Unit, Inverness, IV2 4JZ, UK

g.j.pierce@abdn.ac.uk

Life history (e.g. age, maturity, pregnancy) data from strandings are essential to interpret information on cause of death, health status, prevalence of infectious diseases, contaminant burdens and diet. They can also be used to reconstruct population age structure using life tables, thus providing estimates of mortality rate, survivorship and life expectancy. However, the accuracy of such estimates depends on a stable age structure. Given the likelihood of a? variable mortality rate, what are the implications for estimation of mortality rates from strandings? Firstly, we used age data from porpoises stranded in Scotland 1992-2005 to construct a life table and estimate annual mortality rate from the whole data set and various subsets (e.g. comparing west and east coasts; comparing three time periods) to determine spatial and temporal patterns and trends. Results indicate a higher mortality rate on the east coast, associated with a high prevalence of dolphin kills, and an increased mortality rate in the latter part of the study period. Secondly, we used a simple simulation model with either a fixed mortality rate across all age classes or three different mortality components ("juvenile", "senescent" and "constant", after Siler) to investigate how changes in the true mortality rate would affect the number of strandings recorded and the apparent mortality rate calculated from the age structure of strandings. We show that the mortality rate from strandings is rather insensitive to changes in true overall mortality rate but that the observed change in mortality rate from strandings is consistent with an increase in juvenile mortality.

S09

Cetacean stranding records on the Turkish Western Black Sea coast during September 2010-September 2012

Arda M. Tonay[1,2], Ayhan Dede[1,2], Ayaka A. Öztürk[1,2]

(1) Faculty of Fisheries, Istanbul University, Ordu Cad. No:200 Laleli, Istanbul, Turkey
(2) Turkish Marine Research Foundation (TUDAV) P.O. Box:10 Beykoz, Istanbul, Turkey

atonay@istanbul.edu.tr

Between 1 September 2010 and 31 September 2012, stranding surveys (seasonal for the first 8 months and monthly for the rest) covering a total of 46 km seashore on the western Black Sea coast of Turkey were conducted. Stranded cetaceans were recorded, photographed and measured. Besides, all information collected by İÜ-TUDAV Cetacean Stranding Network and media were also taken in to consideration on the 600km coast line from the Bulgarian border up to Sinop in the middle of the Turkish Black Sea. In total, 211 stranded cetaceans were found, which included 155 harbour porpoises (74%), 32 bottlenose dolphins (15%), 14 common dolphins (7%), seven unidentified and three delphinid individuals. Most strandings were observed in June (38%), followed by May (22%) and April (15%). Most of the carcasses were at an advanced stage of decomposition (Stage 4 and 5, 77%). The fin and tail flukes of 28 individuals were partly missing, which may have been removed during fishing operations due to bycatch. These carcases were found especially in spring and early summer which was the turbot fishing season and also in autumn when other types of fishing were common. Live strandings of two bottlenose dolphins and eight harbour porpoises were recorded. A high neonate mortality rate (50 individuals) was observed in June and July. This may be related with indirect effects of turbot fishery which accidentally catch calving mothers.

S10

Multi-year dynamics and seasonality of cetacean strandings in the southern Sea of Azov

Karina Vishnyakova[1,2], Pavel Gol'din[1]

(1) Department of Zoology, Taurida National University, 4 Vernadsky Avenue, Simferopol, Crimea, 95007 Ukraine
(2) Southern Scientific Research Institute of Marine Fisheries and Oceanography (YugNIRO), 2 Sverdlov str., Kerch, Crimea, 98300 Ukraine

karinavishnyakova@gmail.com

Monitoring of cetacean strandings has been conducted at the 35 km of the Crimean coast of the Sea of Azov since 1999. Age and sex categories, reproductive status, by-catch marks and pathological findings were recorded. For 14 years of monitoring efforts, 531 strandings were recorded, of which 524 were *Phocoena phocoena* (HP) and 7 were *Tursiops truncatus* (BD). 4 from 7 BD were recorded in October. HP strandings were recorded from March to December, the maximum rates were observed in July (46%) and August (20%). The peaks of HP strandings were in 2002, 2008 and 2011–2012. The maximum number was in 2002 (67 cases). Mass mortality events were recorded in 2002 and 2012: they were tentatively associated with epizooties. After the 2002 event, decline in stranding rate was observed during 2003–2007 (16 cases in 2003 and 2005): the HP population in the Sea of Azov hypothetically reached its modern historical minimum after 1966. The life table indicates a negative trend in birth rate in 1999–2001; since 2002, an overall positive trend in birth rate is observed. In 2008–2011, positive birth rate trend is accompanied with sufficient rise in occurrence at sea and in stranding rate, suggesting the population growth. The growth is possibly caused with increasing stock of anchovy, an important prey species for HP. By-catch is considered to be the primary mortality factor. Estimated annual by-catch rate varied within 25-60% of stranded animals. By-catch affects age aspects of mortality and the seasonality of strandings. The most vulnerable groups are 1-year-old animals and lactating females with neonates: by-catch rate reaches the maximum in July, after the peak of calving season in late June.

Whale-watching

WW01

Whalesafari Andenes: Case study on the synergy between whale watching and cetacean research

Marta Acosta Plata[1,2,3], Andrea Cosentino[1,4], Iva Kovacic[1,5]

(1) Marine research and Education Fund of Andenes (MAREFA), Hamnegata 1-C, 8480 Andenes, Norway
(2) Whalesafari Andenes, Postboks 58, 8483 Andenes, Norway
(3) Universidad Rey Juan Carlos, c/Tulipán s/n, 28933 Móstoles. Madrid, Spain
(4) Institute of Biological and Environmental Sciences, University of Aberdeen, School of Biological Sciences, Tillydrone Avenue, Aberdeen, AB24 2TZ, UK
(5) University of Zagreb, University of Zagreb, Rooseveltov trg 6,10000, Zagreb, Croatia

macostaplata@gmail.com

Whale watching operations are commonly used as opportunistic platforms for cetacean research. Some advantages of the use of these platforms include: (1) the possibility to collect extensive data, (2) access to remote populations, (3) reduced research cost and (4) economic support. Despite the collaboration between both activities is extended worldwide, few case studies have been analyzed in order to assess the synergy between them from the industryâ ™s economic point of view and the environmental sustainability of the activity. Here we present the case study of Whalesafari Andenes (Norway) and the establishment of a cetacean survey land-based station for research purposes in 2011, which allows detecting and locating cetaceans before the whale watching trips start. The first paramount outcome of this innovation has been the discovery of a new area of sperm whale distribution (Andfjord), the main target of the whale watching industry in the area, which was mainly encountered in the Bleik Canyon during the last 20 years. Variables such as: number of cancelled trips, trip duration, distance covered, trip success, time of detection of the first whale, time to the first sighting, and the number of shared sightings with other vessels will be analyzed. These variables for 2012 will be compared with data available from previous years and within the two current whale watching areas (Andfjord and Bleik Canyon) in order to develop an economical and environmental assessment of the benefits of the implementation of this new research technique. The results of this study will be presented at the conference.

WW02

Tourism diving/swimming impact on a non-reproductive rockery of Southern sea lions

Mariano Coscarella[1,2], Silvana Dans[1,2], Enrique Crespo[1,2]

(1) Universidad Nacional de la Patagonia San Juan Bosco, Blvd. Brown 3150, 9120 Puerto Madryn, Argentina
(2) Laboratorio de Mamíferos Marinos, Centro Nacional Patagónico, CONICET, Blvd. Brown 2915, 9120 Puerto Madryn, Argentina

coscarella@cenpat.edu.ar

This work evaluates the influence of tourism boats and divers on the dynamic of a non reproductive rockery of *Otaria flavescens*. Data were gathered at Punta Loma, Chubut (42 °48' S, 64 °53' O) between June 2011 and February 2012. Fixed time censuses were carried out once a week at least three times a day, and additional censuses were carried out when a boat with divers was spotted near the rookery. Number of sea lions classified by age category, number of boats, number of divers and swimmers and distance from the rockery to the boat were gathered. The effects of these variables on the number of sea lions were assessed adjusting GAMMs, modeling variance heterogeneity and autocorrelations, using as response variables the total number of sea lions on the rockery and the number of adult males. Models were selected using AICc. Total number of individuals was affected mainly by the time of the day and date of census, varying daily and seasonally; increasing from February to September. The only two other variables influencing the number of sea lions were the number of swimmers (snorkeling) near the rockery and the number of boats, although these were weakly correlated. Adult males behave very different, and also the time of the day and date were the major factor influencing it's dynamic. The other variables are not detected as influential, with the exception of the number of females in the rockery. The tourism related variables present a minimal influence on the rockery dynamic when compared with natural (ie: seasonal and daily) fluctuations.

WW03

Dolphin-watching in Península Valdés Argentina: multiway approach for its management

Silvana Dans[1,2], Mariana Degrati[1,2], Enrique Crespo[1,2]

(1) Centro Nacional Patagónico CONICET, Blvd Brown 2915, Puerto Madryn,Chubut, Argentina
(2) Facultad de Ciencias Naturales, Universidad Nacional de la PatagoniaSan Juan Bosco, Blvd. Brown3100, Puerto Madryn, Chubut, Argentina

dans@cenpat.edu.ar

Whale-watching in Península Valdés, Argentina, was exponentially growing, showing an annual rate of 14%. This expansion also has lead to the diversification of services. Dolphin-watching emerged as an alternative target in 1997. The activity is still underdeveloped and is based on dusky dolphin groups, during summer, mainly because navigation is forbidden outside this season due to the presence of right whales. The effects of boats on dusky dolphins were already evaluated and several changes in behavior and activity budgets were detected. In this work, several approaches were integrated in order to produce management recommendations: a) the feasibility of rethink the marine protected area based on habitat use pattern, b) the establishment of carrying capacity in terms of energetic costs that the interaction represents for animals, and c) the elaboration of a code of conduct based on ways to minimize behavioral changes. Data were obtained from boat-based surveys and groups followed from 2001 to 2007. Distribution of dusky dolphin groups was analyzed by means GIS tools, in order to test for habitat preferences and temporal variation. Behavioral sequences were modeled by Markov chains and behavioral budget estimated by eigen-analysis as well as its seasonal variation. Eigenvector sensitivity analysis was used for predicting which behavioral changes would produce most significant changes. Dusky dolphins showed preference for some depth and distance to shore categories, however dolphins´ locations changed through years. This result precludes the utilization of a restricted area as a management tool. Feeding activity budget was one of the most affected by boats presence, decreasing from 22 to 15%, Feeding time budget was 11% during winter months when an alternative feeding strategy was observed involving longer-lasting dives. Feeding time budget was more sensitive to the probability of dolphins changing from traveling to feeding, and more less from maintaining a feeding bout.

WW04

Using multiple data sources and methodologies to improve understanding of interactions between cetaceans and whale-watching activities in Madeira

Luis Freitas[1,2], Filipe Alves[1,2], Ana Dinis[1,2], Cátia Nicolau[1], Cláudia Ribeiro[1,2], Adalberto Carvalho[1], Ana Cañadas[3], Philip Hammond[4]

(1) Madeira Whale Museum, 9200-031 Caniçal, Madeira, Portugal
(2) CIMAR/CIIMAR – Centre of Interdisciplinary Marine and Environmental Research, University of Porto, Rua dos Bragas 289, 4050-123 Porto, Portugal
(3) Alnilam Research and Conservation,Cándamo 116, 28240 Hoyo de Manzananres, Madrid. Spain
(4) Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, Fife KY16 8LB, Scotland, UK

luisfreitas@museudabaleia.org

Whale-watching (WW) started in Madeira in the end of the 1990s and has been growing since then. It has been self-regulated during the last 7 years with most operators following a voluntary code of conduct devised by the Madeira Whale Museum (MWM). However, there are no limitations or regulatory measures in place to control the growth of the industry. Studies carried out by the MWM in recent years have shown short-term impacts on cetacean groups targeted by WW boats. These issues combined raise questions about the medium-to-long term impacts on the cetacean populations targeted by the industry and, more specifically, on the animals using Madeira waters. Recently, the Madeira Regional Parliament approved legislation to regulate the observation of marine vertebrates in the archipelago. The legislation defines the need to reconcile development of these activities with the conservation of these species and animal welfare. It also establishes management and control mechanisms for WW activity to be implemented if needed, based on scientific advice. In the last 12 years the MWM has conducted several studies in Madeira coastal waters with the aim of improving understanding of different aspects of cetacean populations using the area. Systematic visual line transect surveys, genetic studies, photo-identification of some species and specific work targeting the interactions between WW boats and cetaceans have been carried out. Here we compare and integrate data from different sources and results from different analytical methodologies to improve understanding of the dynamics and population context of the cetaceans using Madeira waters and their interactions with WW activity. This information will be used to assess the need for specific management measures towards the WW industry in order to contribute to ensure favourable conservation status of the targeted species.

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DICTIONARY

Conference center	Fórum Municipal Luisa Todi

Fundamentals / Básicos

ENGLISH	PORTUGUÊS
Yes	Sim
No	Não
All right	Tudo bem
I'm sorry /Excuse me	Peço desculpa / Com licença
Good morning	Bom dia
Good afternoon	Boa tarde
Good night	Boa noite
Goodbye	Adeus
What is your name?	Como te chamas?
My name is ...	Eu chamo-me ...
Where is ...? / I am looking for ...	Onde é … ? / Estou à procura de …
How far is it …?	A que distância fica …?
… by bus	… por autocarro
… by foot	… a pé
… by bicycle	… por bicicleta
Which direction should I take?	Que direcção devo tomar?
… to the left	… para a esquerda
… to the right	… para a direita
… straight ahead	… sempre em frente
… back there	… lá atrás
Could you please show me on the map …	Poderia indicar-me no mapa, por favor?
Could you please help me?	Poderia ajudar-me, por favor?
Welcome	Bem-vindo
Hello	Olá
How are you?	Como estás?
Very well, thank you	Muito bem, obrigado.
Where are you from?	De onde és?
I am from …	Eu sou de …
Nice to meet you	Prazer em conhecer-te
Good luck	Boa sorte
Have a nice day	Tem um bom dia
I don't understand you	Não te compreendo
Please	Por favor
How much is it?	Quanto custa?
Excuse me?	Desculpe?
Could you please write it down for me?	Poderia escrever-me, por favor?
Thank you/ Thank you very much	Obrigado / Muito obrigado
My address is …	A minha morada é …
My phone number is …	O meu número de telefone é ...

SIGNS / SINAIS

Entrance	Entrada
Exit	Saída
Pull	Puxar
Push	Empurrar
No smoking	Proibido fumar
No admission	Proibida a entrada
Emergency exit	Saída de emergência
Elevator	Elevador
Up	Subir
Down	Descer
Stairs	Escadas

Numbers / Números

NUMBERS / NÚMEROS		CARDINAL NUMBERS / NÚMEROS CARDINAIS
0	Zero	
1	Um	1. Primeiro
2	Dois	2. Segundo
3	Três	3. Terceiro
4	Quatro	4. Quarto
5	Cinco	5. Quinto
6	Seis	6. Sexto
7	Sete	7. Sétimo
8	Oito	8. Oitavo
9	Nove	9. Nono
10	Dez	10. Décimo
11	Onze	
12	Doze	
13	Treze	
14	Quatorze	
15	Quinze	
16	Dezaseis	
17	Dezasete	
18	Dezoito	
19	Dezanove	
20	Vinte	
30	Trinta	
40	Quarenta	
50	Cinquenta	
60	Sessenta	
70	Setenta	
80	Oitenta	
90	Noventa	
100	Cem	
200	Duzentos	
300	Trezentos	
400	Quatrocentos	

500	Quinhentos
600	Seiscentos
700	Setecentos
800	Oitocentos
900	Novecentos
1000	Mil
2000	Dois mil
5000	Cinco mil
10000	Dez mil
100000	Cem mil
1000000	Um milhão

Transportation / Transporte

TRAIN / COMBOIO

Station	Estação
Central station	Estação central
Tourist information	Informações turísticas
Ticket office	Bilheteira
Ticket	Bilhete
Reduced ticket	Meio-bilhete
Platform / track	Plataforma / linha
Timetable	Horário
Departure	Partida
Arrival	Chegada
Waiting room	Sala de espera
Delay	Atraso
Direct train	Comboio directo
Express train	Alfa-pendular
Slow train	Inter-cidades
First / second class	Conforto / Turística
Reserved seat	Lugar reservado
Luggage rack	Compartimento de bagagem
Restroom	Casa-de-banho
Where is the railway station?	Onde é a estação de comboios?
A single ticket to … please.	Um bilhete único para ... por favor.
A return ticket to … please.	Um bilhete de regresso para … por favor.
How much is a single ticket to …?	Quanto custa um bilhete único para …?
At which track does the train to … leave?	Em que linha parte o comboio para …?
Excuse me, is this seat occupied?	Desculpe, este lugar está ocupado?

COACH / AUTOCARRO

Where is the bus station?	Onde é a estação de autocarros?
How can I get there?	Como consigo chegar aqui?
Is there a bus to the …	Há um autocarro para …?
At which time does the bus to … leave?	A que horas o autocarro para … parte?
At which time will we arrive at …?	A que horas iremos chegar a …?

Accommodation / Alojamento

Hotel	Hotel
Guest house	Pensão
Youth hostel	Pousada da juventude
Reception desk	Balcão de recepção
Bathroom	Casa-de-banho
Showers	Chuveiros
I have booked a room on the name …	Eu reservei um quarto no nome de ...
I would like a room	Eu gostaria de ter um quarto
a single room	um quarto simples
a double room	um quarto duplo
a three-bed room	um quarto com três camas
Could I have a room with a bathroom?	Poderia ter um quarto com casa-de-banho?
Ash-tray	Cinzeiro
Coat rack	Roupeiro

Meal / Alimentação

Bottle	Garrafa
Cup	Caneca
Fork	Garfo
Knife	Faca
Spoon	Colher
Teaspoon	Colher de chá
Glass	Copo
Breakfast	Pequeno-almoço
Lunch	Almoço
Dinner / supper	Jantar
Menu	Ementa
Table	Mesa
Napkin	Guardanapo
Plate	Prato
Matches	Fósforos
Toothpick	Palito
Tip	Gorgeta
Self service	Serviço-próprio
Tea	Chá
Beer	Cerveja
Wine (red, white, rosé)	Vinho (tinto, branco, rosé)
Ice cream	Gelado
Pepper	Pimenta
Salt	Sal
Bread	Pão
Butter	Manteiga
Yogurt	Iogurte
Cheese	Queijo

Appetizer	Entrada
Meat	Carne
Fish	Peixe
Salad	Salada
Vegetable	Vegetal
Vegetarian	Vegetariano
Sandwich	Sanduiche

TIME / TEMPO

Hour	Hora
Minute	Minuto
Second	Segundo
What time is it?	Que horas são?
It is … o'clock?	São … horas.
At what time?	A que horas?
How long will it take?	Quanto tempo irá durar?
In the morning	Pela manhã
At noon	Ao meio-dia
In the afternoon	Pela tarde
Evening	Noite
At night	De noite
At day	De dia
Week	Semana
This week	Esta semana
Today	Hoje
Tomorrow	Amanhã
Monday	Segunda-feira
Tuesday	Terça-feira
Wednesday	Quarta-feira
Thursday	Quinta-feira
Friday	Sexta-feira
Saturday	Sábado
Sunday	Domingo

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