

23rd

Annual Conference of the European Cetacean Society

2-4 March 2009 Istanbul – TURKEY

Abstract Book



Abstracts

23rd Annual Conference of the European Cetacean Society

“Climate Change and Marine Mammals”



2-4 March 2009

Military Museum Culture Complex

Askeri Müze Kültür Sitesi

Istanbul, TURKEY

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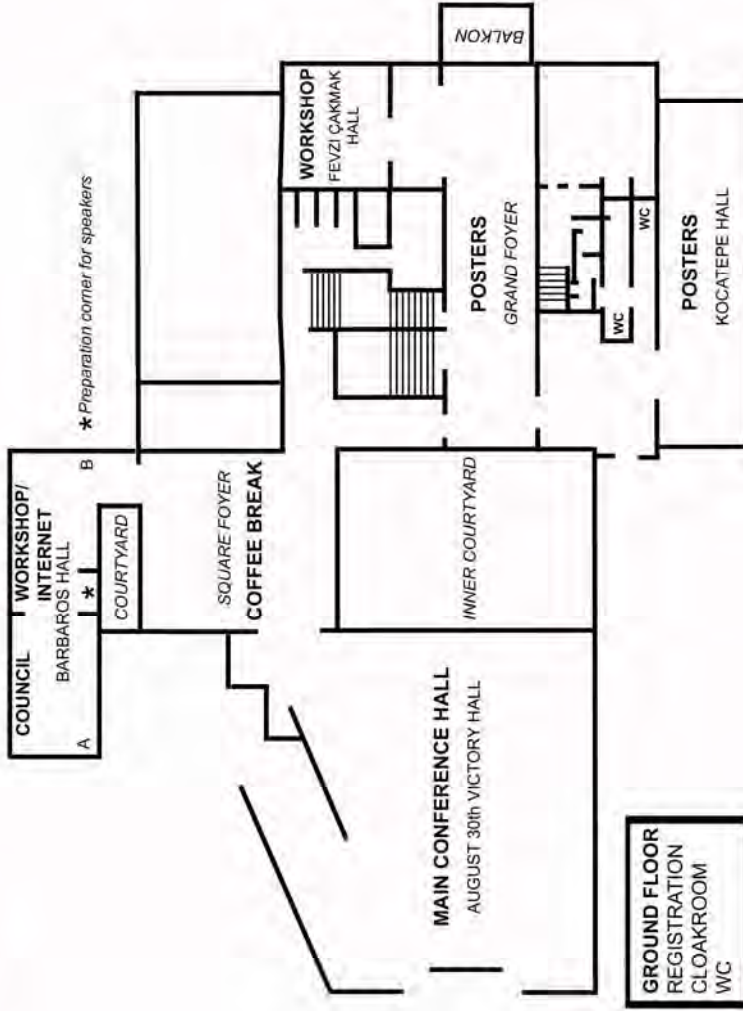
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FIRST FLOOR



23rd Annual Conference of the European Cetacean Society

Istanbul, TURKEY 2-4 March 2009

Theme: Climate Change and Marine Mammals

Hosted by Turkish Marine Research Foundation (Türk Deniz Araştırmaları Vakfı: TÜDAV)

Venue: Military Museum Culture Complex (Askeri Müze Kültür Sitesi), Harbiye, Istanbul

Conference Organizing Committee: Bayram Öztürk (Chair), Ayaka Amaha Öztürk (Secretary), Ayhan Dede, Ali Cemal Gücü, Polona Kotnjek, Roland Lick, Arda Tonay, Eda Topçu, Cecile Vincent, Bülent Topaloğlu

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Conference Program
Saturday, 28 February 2009

Workshops

Fevzi Çakmak Hall

All day Who are our seals? Moving towards a standardized population estimate approach for *Monachus monachus* (Organizers: Giulia Mo, Ali Cemal Gücü)

Barbaros A Hall

Morning Reconciling diverse perspectives for cetacean (Organizer: Alison Neilson)

Afternoon Best practices in marine mammal research (Organizers: The Science Advisory Committee of the ECS, Michel André)

Sunday, 1 March 2009

Workshops

Fevzi Çakmak Hall

All day Beaked whales and active sonar: transiting from research to mitigation (Organizers: Giuseppe Notarbartolo di Sciarra, Sarah Dolman, Natacha Aguilar Soto)

Barbaros A Hall

Morning Student workshop “Designing behavioural studies on cetaceans in the wild” (Organizers: Polona Kotnjek, Tilen Genov)

Afternoon Technological advances and related analytical methods in pinnipeds' telemetry (Organizers: Virginie Ramasco, Cecile Vincent)

15:00-18:00 Registration

18:00-21:00 Icebreaker- Square Foyer and Grand Foyer

Day 1 Monday, 2 March 2009

8:30 Registration starts

30 August Victory Hall

9:00 Opening of the 23rd Annual Conference of the European Cetacean Society "Climate Change and Marine Mammals" by Simone Panigada, Chair of the ECS

9:10 Welcome talk by Bayram Öztürk, Chair of the Organizing Committee for ECS 2009

ACOUSTICS – chaired by Paul Nachtigall & Peter Tyack

9:20 J. Gordon *et al.*: Detection and classification of beaked whales using towed hydrophones and real-time software for discrimination and localisation

9:40 M. Johnson *et al.*: Resonant air spaces and air movement in echolocating deep diving cetaceans

10:00 N. Tregenza: Static acoustic monitoring: species discrimination by an ultrasonic tone logger, the C-POD

10:20 F. Samarra *et al.*: High frequency whistles produced by killer whales (*Orcinus orca*)

10:40-11:10 Coffee break

11:10 L. Kloepper *et al.*: The effect of high frequency hearing loss on echolocation performance

11:30 Workshop reports

Invited talk

11:50 Temel Oğuz: Impacts of climate variability on the Black Sea ecosystem

12:30-14:00 Lunch break

BEHAVIOUR – chaired by Mark Johnson & Simone Panigada

14:00 A. Diederich *et al.*: Do offshore wind farms affect the behaviour pattern of harbour porpoises?

14:20 D. Herzing: Rhythmic and synchronous underwater communication signals in free-ranging Atlantic spotted dolphin and bottlenose dolphin in the Bahamas

14:40 N. Miyazaki *et al.*: Analysis of diving behaviour of sperm whales using advanced data loggers

15:00 L. Feyrer *et al.*: Between a rock and a hard place - fine scale behavioural interactions connecting predator and prey

15:20 M. Sokolovskaya *et al.*: Agonistic behaviour of Ladoga ringed seals (*Phoca hispida ladogensis* Nordquist 1899)

15:40-16:10 Coffee break

MARINE MAMMALS AND CLIMATE CHANGE – chaired by Florence Caurant & Bernd Würsig

16:10 K. Abt: Shift of harbour seal (*Phoca vitulina*) pupping phenology: a result of climate change?

16:30 A. Aubail *et al.*: Mercury and stable isotopes in teeth as tracers of a potential diet change over four decades in polar bears (*Ursus maritimus*) from Svalbard

16:50 O. Sokolova *et al.*: Examination of the level of anti-epizootic effectiveness of immune system of marine mammals as a method to estimate the influence of global changes of climate on the wild populations

17:10 Workshop reports

Grand Foyer and Kocatepe Hall

17:30-19:00 Poster session

Posters with even numbers

30 August Victory Hall

CONSERVATION/MANAGEMENT –

chaired by **Enrique Crespo & Giuseppe Notarbartolo di Sciara**

- 9:00 P. Tyack *et al.*: Beaked whales respond to navy sonar
- 9:20 N. Aguilar de Soto *et al.*: Deep divers communication. Implications for noise impacts with an example from the Mediterranean Sea
- 9:40 P. Miller *et al.*: Observations of toothed whales experimentally exposed to low (1-2 kHz) and mid-frequency (6-7 kHz) sonar signals, and in relation to a flotex naval exercise
- 10:00 A. Birkun *et al.*: Cetacean by-catches in the course of turbot and spiny dogfish fisheries in the northwestern Black Sea
- 10:20 F. Read *et al.*: Marine mammal and fisheries interactions in Galicia, north-west Spain

10:40-11:10 Coffee break

- 11:10 H. Peltier *et al.*: How strandings records can inform on cetaceans at sea: an attempt to model and validate drift and discovery rates
- 11:30 B. McConnell *et al.*: What role does telemetry have in environmental impact assessments?

Invited talk

- 11:50 Mads-Peter Heide-Jørgensen: Arctic marine mammals and climate change

12:30-14:00 Lunch break

12:30-13:45 NCP (National Contact Person) meeting - Barbaros A Hall

HABITAT– chaired by **Nobuyuki Miyazaki & Emer Rogan**

- 14:00 P. Gol'din: Harbour porpoises in the Sea of Azov: population structure, long-term dynamics and factors affecting them
- 14:20 S. Isojunno *et al.*: Porpoise habitat preferences in a strongly tidal environment: robust predictions from opportunistic data
- 14:40 M. Lammers *et al.*: Patterns of coastal use by Hawaiian spinner dolphins (*Stenella longirostris*) observed using passive acoustic monitoring
- 15:00 P. Fernandez de Larrinoa *et al.*: Satellite tracking of wild Mediterranean monk seals: a non invasive innovative tool
- 15:20 C. Vincent *et al.*: Fine scale habitat use by harbour seals, as assessed by Fastloc GPS /GSM telemetry

15:40-16:10 Coffee break

MEDICINE / DISEASE – chaired by **Ailsa Hall & Toni Raga**

- 16:10 P. Gauffier *et al.*: Estimating the consequences of a morbillivirus epizootic on long-finned pilot whales
- 16:30 T. Jauniaux *et al.*: Cytochrome p-45 1a1 expression in cetacean skin biopsies from a tropical lagoon (Mayotte, Mozambique Channel)
- 16:50 H. Frouin *et al.*: Levels and patterns of PBDEs in blood and blubber of pup harbour, grey and harp seals from the Estuary and Gulf of St. Lawrence, Canada
- 17:10 Workshop reports

Grand Foyer and Kocatepe Hall

17:30-19:00 **Poster session**

Posters with odd numbers

30 Ağustos Zafer Hall

20:00-22:00 Video night

Day 3 Wednesday, 4 March 2009

30 Ağustos Zafer Hall

DISTRIBUTION / ABUNDANCE – chaired by Alexandre Gannier & Gisli Víkingsson

- 9:00 K. Macleod *et al.*: Cetacean abundance in offshore waters of the European Atlantic
- 9:20 G. Certain *et al.*: Aerial surveys in the Caribbean and Guiana: top predator abundance, distribution and diversity in French overseas territories
- 9:40 S. Wong *et al.*: Spatio-temporal distribution of sperm whales (*Physeter macrocephalus*) in the Sargasso Sea
- 10:00 A.A. Ozturk *et al.*: Cetacean surveys in the Istanbul (Bosphorus) Strait in 2007-2008
- 10:20 A. Hall *et al.*: The adaptation and use of radio frequency identification (rfid) tags for marking harbour seals (*Phoca vitulina*)

10:40-11:10 Coffee break

NATURAL HISTORY / EVOLUTION – chaired by Peter Evans & Ursula Verfuß

- 11:10 J. Villanueva Noriega *et al.*: Understanding the evolution of the major histocompatibility complex in marine mammals
- 11:30 M. Panin *et al.*: Dual-energy x-ray absorptiometry analysis of the bone density distribution patterns in the rostrum of two families of odontocete cetaceans: a comparative study

Invited talk

- 11:50 Randy Wells: How might coastal dolphins be impacted by climate change?

12:30-14:00 Lunch break

FEEDING ECOLOGY – chaired by Graham Pierce & Vincent Ridoux

- 14:00 V. Ramasco *et al.*: Feeding behaviour and habitat use of harbour seals (*Phoca vitulina*) in the Vesterålen archipelago, Norway
- 14:20 D. Duffus *et al.*: Predator-prey dynamics of gray whales and mysids in a summer foraging site
- 14:40 R. de Stephanis *et al.*: Competition for the resources between pilot whales, bottlenose dolphins and sperm whales in the Strait of Gibraltar
- 15:00 C. Blanco *et al.*: Is the diet of western Mediterranean dolphins changing?
- 15:20 G. Vikingsson *et al.*: Recent changes in the diet of common minke whales (*Balaenoptera acutorostrata*) in Icelandic waters

15:40-16:10 Coffee break

- 16:10 E. Revelli *et al.*: First integrated study on Cuvier's beaked whale (*Ziphius cavirostris*) in the northern Ligurian Sea (Italy, Mediterranean Sea) using D-tag and photo-ID
- 16:30 G.J. Pierce *et al.*: Diet of Mediterranean monk seals (*Monachus monachus*)
- 16:50 E. Hartvig *et al.*: Do sperm whales (*Physeter macrocephalus*) use vision when foraging at depth?

17:30-19:00 Annual General Meeting / Student awards

20:00-24:00 Dinner and Dance

ABSTRACTS



TALKS

ACOUSTICS

2 March 09:20 - 09:40

DETECTION AND CLASSIFICATION OF BEAKED WHALES USING TOWED HYDROPHONES AND REAL-TIME SOFTWARE FOR DISCRIMINATION AND LOCALISATION

Gordon, J. (1), Gillespie, D. (1), Caillat, M.(1), Claridge, D.(2), Moretti, D.(3), Dalgaard Balle, J.(1), Boisseau, O.(4), Aguilar de Soto, N. (5), Viallelle, S. (6), Boyd, I. (1)

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Beaked whales remain amongst the most poorly studied mammals. Mass strandings linked to military sonar exercises have increased the need to better understand this group and to devise improved mitigation procedures. Beaked whales are extremely difficult to sight at sea, which hampers attempts to study them, and makes operational mitigation difficult. Passive acoustic monitoring could improve detection efficiency. Beaked whales are readily detected on bottom-mounted hydrophones arrays and this fits recent research on their acoustic behaviour. However, the extent to which they can be detected using near-surface towed arrays is unknown and is the focus of this work. Continuous recordings were made at a sampling rate of 192 kHz from 2 or 4 element towed hydrophone arrays during joint visual/acoustic surveys in the Bahamas, Canaries and Azores, and in conjunction with monitoring of bottom-mounted hydrophones at the AUTEK range, Bahamas, and shore based visual tracking in the Canaries and Azores. A beaked whale click detector and classifier was developed within Rainbow Click and PAMGUARD. This was run in real time and on recordings to detect beaked whale click trains. Three species of beaked whale were encountered visually and detected acoustically: *Mesoplodon densirostris*, *Ziphius cavirostris* and *Mesoplodon europaeus*. Acoustic detections correlated well with sightings and with detection on bottom-mounted hydrophones. Target motion analysis of bearings to sequences of clicks suggests a maximum detection range of approximately three kilometers

and preliminary results indicate that clicks can be identified to species. Fieldwork in the Canaries and Azores through the spring and summer of 2008 has focused on determining the effect of distance and hydrophone depth on the probability of detection. These early results suggest that passive acoustic monitoring could play an important role in improving the detection of these animals and thus facilitate population surveys, photo-id studies and, potentially, real-time detection for mitigation.

2 March 09:40 - 10:00

RESONANT AIR SPACES AND AIR MOVEMENT IN ECHOLOCATING DEEP DIVING CETACEANS

Johnson, M. (1), Madsen, P. (2), Dominguez, I. (3), Wahlberg, M. (4), Aguilar de Soto, N. (3)

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Deep diving odontocetes echolocate their prey using pneumatic sound sources. Although field data is lacking, it is presumed that the compressed air driving these sources is recycled between sets of air sacs in the nasal region. Such air spaces inevitably resonate and re-radiate sound when excited by the biosonar signal but this signal component may couple poorly into the water as it has not been described in remote sound recordings. Here we use data from DTAG acoustic recording tags attached to short-finned pilot whales, *Globicephala macrorhynchus*, to demonstrate the presence of slow-decaying click-excited resonances. Cyclical variations in the decay rate and resonance frequency of consecutive clicks, synchronized with pauses in clicking, confirm that these resonances are generated by air sacs associated with the sound production mechanism and that air-recycling is performed during the pauses. The click-to-click variation in resonance frequency provides an opportunity to measure the volume of air required to produce a click. Applying the same analysis to three other species of deep-diving echolocating cetaceans (sperm whale, Blainvilles beaked whale, and Cuvier's beaked whale, respectively, *Physeter macrocephalus*, *Mesoplodon densirostris*, and *Ziphius cavirostris*) also tagged with DTAGs, confirms the role of pauses in air-recycling in all three species, but also highlights differences in the way that the air space resonances change from click-to-click across species. Slow-decaying sound re-radiated from the air-spaces and coupling into the ears could mask detection of echoes from nearby prey. Thus, control of this source of interference may influence, along with other constraints, the way in which air is managed during echolocation and, over evolutionary time, the cranial and nasal morphology of echolocating species.

2 March 10:00 - 10:20**STATIC ACOUSTIC MONITORING: SPECIES DISCRIMINATION BY AN ULTRASONIC TONE LOGGER, THE C-POD**

Tregenza, N.

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Static acoustic monitoring of odontocetes by detection of their echo-location click trains has been used in recent years in the form of the T-POD logger and associated software. T-PODs have been shown to have a significant false negative rate for bottlenose dolphins (*Tursiops truncatus*) and very limited capacity to distinguish delphinid species or some rare non-cetacean sources of tonal ultrasound trains. A replacement digital tone train logger, the C-POD, that captures a wider range of parameters of tones in the range 20 - 160kHz, including dominant frequency, intensity, bandwidth and some envelope measures was tested by exposure to visually or contextually identified odontocetes in a variety of locations. The subsequent analysis of identified click clusters and trains to quantify differences between species, and assess the effect of marine noise on detection threshold. T-PODs were deployed alongside C-PODs in some cases. The results show very sharp discrimination of porpoises from dolphins and measurable differences between dolphin species. A striking level of diversity is seen in logged *Tursiops* click trains. C-PODs logged many *Tursiops* clicks when T-PODs failed to do so. Noise level effects were assessed by their effect on the intensity of the weakest detected cetacean clicks. This showed a distinct noise effect on detectability but also gave an indication that porpoises reduce their echo-location activity when high levels of tonal noise are present around their normal click frequency. These initial results indicate a pathway for the optimisation of acoustic species discrimination by this kind of static acoustic monitor, and for better understanding of how ambient noise affects acoustic detection processes.

2 March 10:20 - 10:40**HIGH FREQUENCY WHISTLES PRODUCED BY KILLER WHALES (ORCINUS ORCA)**

Samarra, I. P.F. (1), Miller, J.O.P. (1), Vinding, K. (2), Rasmussen, M.H. (3)

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Identifying the sound repertoire of marine mammal species is essential for vocal behaviour comparisons between species and different populations. Recording and analysis frequency bandwidth is known to affect the capabilities of accurately identifying the fundamental contours of such sounds. Killer whales are known to produce echolocation clicks, pulsed calls and whistles. Clicks extend to the ultrasonic range however reported frequencies of fundamental contours of pulsed calls and whistles are restricted to frequencies below 18 kHz. Here we present a previously unpublished sound produced by killer whales, the high frequency whistle, recorded from killer whale populations from Iceland and Norway. In addition to producing clicks, pulsed calls and lower frequency whistles as previously described for this species, these populations also produced high frequency whistles. Recording setups varied between a 4-element vertical array (sampling rate 96 kHz) and a single hydrophone (sampling rate 500 kHz) in Iceland (Vestmannaeyjar in 2008) and a 16-element towed array (sampling rate 96 kHz) and digital archival tags (D-tag, sampling rate 96 or 192 kHz) in Norway (Vestfjord in 2005-2008). Due to the high sampling rates used it was possible to investigate sounds produced in the ultrasonic range. The fundamental frequency contour of high frequency whistles recorded at both locations was most commonly above 25 kHz. Such fundamental frequencies are higher than previously reported for killer whale tonal sounds. Upsweeps, constant frequency and concave whistles were the most common whistle types found. High frequency whistles had short duration (less than 1s) and contained harmonics up to 100 kHz. As most recordings conducted in Norway were limited to sampling rates of 96 kHz it was not possible to investigate harmonic content of whistles produced by this population. Further research will be required to investigate if these whistles are related to a specific behavioural context.

2 March 11:10 - 11:30

THE EFFECT OF HIGH FREQUENCY HEARING LOSS ON ECHOLOCATION PERFORMANCE

Kloepper, L. (1), Nachtigall, P. (1), Gisiner, R. (2), Ibsen, S. (3), Breese, M. (1)

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High frequency hearing loss is documented among odontocetes, and is most likely age-related (presbycusis). Although the mechanism of such hearing loss is understood, little is known about its effect on echolocation performance. Here we show evidence of hearing loss for a false killer whale (*Pseudorca crassidens*) and report quantitative evidence of the effect on echolocation in the form of discrimination performance and outgoing signal characteristics. We replicated an

identical study conducted over 16 years ago on the same false killer whale. The whale completed a wall thickness discrimination task using a go/no go paradigm. Outgoing clicks were recorded using a Reson TC 4013 hydrophone and analyzed for signal characteristics. We recorded discrimination performance and characteristics of the outgoing echolocation clicks and compared them to values measured in the past study. By combining the results of the two experiments, we assess the impact of high frequency hearing loss on discrimination performance and outgoing signal characteristics.

2 March 11:50 - 12:30

INVITED TALK:

IMPACTS OF CLIMATE VARIABILITY ON THE BLACK SEA ECOSYSTEM

Temel Oguz

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The long-term annual mean sea surface temperature variations for the Mediterranean and Black Seas indicate different responses to climate variability up to the early 1990s but they both follow a pronounced warming trend afterwards that likely reflects the predominant signature of anthropogenic global warming instead of natural climatic variations due to the North Atlantic Oscillation. The period of warm and mild years are generally associated with relatively weak wind forcing and thus with the weaker basinwide circulation system whereas the coastal current system driven by the River Danube is more pronounced. Climatic variations do not introduce an appreciable change in the position of the anoxic interface in the presence of very strong pycnocline, but modulate considerably oxygen concentrations within the oxycline region in response to the changes in atmospheric ventilation rate. The warming phase, when prevails sufficiently long, is therefore expected to introduce a new quasi-equilibrium due to weaker biological production. The reduction in coccolithophore share in the total phytoplankton biomass from 16% during the cold phase 1985-1994 to 2.5% during the subsequent warm phase is consistent with the reduced calcification rates under the recent anthropogenic global warming due to increasing CO₂ level. Decadal fluctuations of the heterotrophic dinoflagellate *Noctulica scintillans* abundance and biomass follow consistently the climate-induced changes in sea surface and CIL temperatures; being a boreal cold-water organism, cold years favor its biomass growth whereas warm climate years support biomass increase of thermophilic combjelly *Mnemiopsis* that feeds on similar prey populations. Moreover, sprat and anchovy stocks tend to follow closely temperature variations; sprat stock is higher in cold years and vice versa for anchovy. As the ecosystem tends to recover from the adverse effects of eutrophication and *Mnemiopsis* population outbreaks, not only the anchovy egg production is expected to be higher under continuing

warming, but also their overwintering areas will be more widespread and thus they will tend to lose less fat as they do not need to follow long migration routes. Observations from 1988 to 2000 within the offshore zone of the southwestern Crimea identified new species for the Black Sea fauna and thus suggest that mediterraneanization of the Black Sea fauna is in progress. In the presence of continuing warming, it is likely to expect migration of more Mediterranean-originated species into the Black Sea although prediction of the fauna exchange between the Mediterranean and Black Sea under changing climatic conditions is not currently possible due to our limited knowledge and complexity of the processes controlling the exchange. The warming conditions are expected to promote invasion and acclimation of warm water exotic species into the Black Sea.


BEHAVIOUR

2 March 14:00 - 14:20

DO OFFSHORE WIND FARMS AFFECT THE BEHAVIOUR PATTERN OF HARBOUR PORPOISES?

Diederichs, A., Brandt, M., Grünkorn, T., Nehls, G.

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In 2005 we started a two-year project on the responses of harbour porpoises in the Danish offshore wind farms Horns Rev in the North Sea and Nysted in the Baltic Sea. Background of this study is the question, whether operating wind farms affect the distribution and behaviour of harbour porpoises. The study was conducted with acoustic dataloggers (T-PODs) recording harbour porpoise echolocation signals. During the campaign in each wind farm area ten T-PODs were deployed simultaneously. In both areas harbour porpoise presence did not differ between inside and outside the wind farm. Porpoise presence also did not seem to be influenced by distance to single turbines. However, slight differences between the two wind farm areas occurred according to the presence of animals in different distances to single turbines. The only observable effect of the turbines on harbour porpoises was on their diurnal rhythm. In 2005 a pronounced diurnal rhythm with most recordings during the night occurred at T-PODs deployed close to single turbines in both wind farms. At the same time the diurnal pattern at T-PODs deployed more than 900 m away from single turbines showed a converse pattern with a maximum of porpoise recordings during the daylight in Horns Rev. In Nysted no clear pattern between day and night could be found at T-PODs more than 700 m away from single turbines. In 2006 this diurnal pattern changed in both areas and

the differences between the distance groups was no longer very pronounced. We discuss these differences in the diurnal cycle of harbour porpoise activity with regard to differences in the fish community close to single turbines, which has been demonstrated by several other studies.

2 March 14:20 - 14:40

RHYTHMIC AND SYNCHRONOUS UNDERWATER COMMUNICATION SIGNALS IN FREE-RANGING ATLANTIC SPOTTED DOLPHIN AND BOTTLENOSE DOLPHIN IN THE BAHAMAS

Herzing, D.

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Since 1985 a resident community of Atlantic spotted dolphin (*Stenella frontalis*) and bottlenose dolphin (*Tursiops truncatus*) have been studied underwater in the Bahamas. Over 200 individuals of both species have been identified and observed over the years. Basic correlations with sound patterns and behavior such as whistles during contact/reunions, squawks during aggression, etc. have been reported. The objective of this study was to determine the degree of synchrony and rhythm contained in these dolphin communication signals. Dolphin synchronized behavior was recorded underwater using a Sony PC110 video camera with hydrophone input. Three behaviors were analyzed including 1) spotted dolphin aggressive inverted chases, 2) spotted male coalition groupings, and 3) bottlenose mother/calf scanning of the bottom. Body postures and correlated vocalizations (including interval spacing between vocalizations) were measured. Dolphins communicated using synchronized vocalizations and intervals of vocalizations (burst-pulsed vocalizations, screams) and synchronized body movements (inverted swimming, head-turning) during aggression. Mothers and calves synchronized their head rotation while scanning the bottom. Synchronized signals include not only the physical signals but also these intervals between vocalizations. These temporal aspects of the sequences of sound and postures may be important aspects of individual and group coordination for delphinids.

2 March 14:40 - 15:00

ANALYSIS OF DIVING BEHAVIOR OF SPERM WHALES USING ADVANCED DATA LOGGERS

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Bio-logging system using advanced data loggers is considered to be important tool for understanding diving behavior of aquatic animals and their environments. To know diving behavior of the sperm whales, *Physeter macrocephalus*, and their environmental conditions, we conducted research survey of seven sperm whales off Ogasawara Islands, Japan, during 2001 and 2005, using three data loggers, Mk6 model for three animals, 2000-PDT for three and 2000-W3MPD3GT for one. The suction cup tag having data logger was attached to whales by pole. Data logger released from whale was recaptured by the VHF transmitters. Tagged sperm whales spent most of their time in deep dives of > 200 m. The deepest dive recorded was 1304 m, and the longest dive duration was 49.6 min. Diel difference in diving behaviour was observed, indicating that sperm whales dived deeper and swam faster during the day than at night (daytime depth: mean 853 ± 130 (SD) m, $n = 35$; night-time depth: mean 469 ± 122 m, $n = 31$; day-time velocity: mean 2.0 ± 0.3 m s⁻¹, $n = 20$; night-time velocity: mean 1.5 ± 0.3 m s⁻¹, $n = 19$). Temperature-depth profile obtained from these data loggers indicated that obvious thermocline was formed around 400 m depth off Ogasawara Islands. Sperm whales appeared to dive to the above layer for foraging at night, while in the daytime they passed through the layer and reached to the bottom zone. Sperm whales often actively moved in the bottom phase and performed average of 1.7 bursts per deep dive. Most of burst (79%) observed in the bottom phases compared with descent (11 %) and ascent phase (10 %). Mean maximum swimming speed and duration of bursts was 3.1 ± 0.7 m s⁻¹ ($n = 68$) and 45 ± 31 s ($n = 90$), respectively.

2 March 15:00 – 15:20

BETWEEN A ROCK AND A HARD PLACE - FINE SCALE BEHAVIOURAL INTERACTIONS CONNECTING PREDATOR AND PREY

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Movement patterns of baleen whales in ocean space are largely unrestrained. Thus, an individual whale's spatial behaviour will closely reflect their response to prey quality. Large mobile predators, foraging on discrete planktonic prey, will however, immediately influence the underlying prey structure in terms of behaviour, and density. This study focuses on the fine scale foraging dive patterns of individual gray whales (*Eschrichtius robustus*) occurring during focal follow surveys

along the southwest coast of Flores Island in Clayoquot Sound, British Columbia, Canada. Gray whales exhibit distinct search and exploit dive patterns when foraging on mysid shrimp (Family Mysidae), as demonstrated in focal follow studies conducted from 2006 - 2008. We hypothesize that their response to prey quality has a distinct fine scale spatial movement pattern, which can be correlated to coincident acoustic measures of prey density and distribution. Somewhat confounding this, we also expect a behavioural response by the prey. Depending on the season and overall prey levels at the time, foraging whales tend to focus effort within a restricted area, until prey swarms reach a low threshold density, when whales will leave. However, whales sometimes subsequently return to the same area, indicating that at certain baseline prey levels, the mysid swarming behaviour may be renewing prey density over short time periods. Our analysis of spatial and behavioural patterns uses the extent of multiple foraging bouts by individual gray whales, and overlays temporally coincident, acoustic estimates of prey density for comparison. We present maps of the spatial interaction between predator and prey, illustrating prey quality requirements, approximating baseline mysid density thresholds and documenting response patterns of individual foraging gray whales. We discuss the evidence for this fine scale process, in light of total seasonal output, peaks in prey productivity, and changing ocean conditions.

2 March 15:20 – 15:40

AGONISTIC BEHAVIOUR OF LADOGA RINGED SEALS (*PHOCA HISPIDA LADOGENSIS* Nordquist 1899)

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In the summer seasons of 1998 - 2008 the study of behaviour of Ladoga ringed seal was conducted on the islands of the Valaam Archipelago. All in all 1737 hours were spent in observation. Videorecording of animals on the haul outs was also performed. A total of 2535 aggressive contacts of seals were followed from initiation to termination. The Ladoga ringed seal characteristically forms summer relaxation haul-outs. There is high competition between seals for individual territory in limited areas of haul outs and the structure of haul outs is maintained by aggressive contacts. Agonistic behaviour of the Ladoga seal was shown to comprise 15 elements of aggressive and defensive behaviour and 6 forms of contact avoidance. Aggressive behaviour is rather often observed both in hauling out seals (resident) and in intruders. The repertoire of the intruder and resident actions differs greatly in all situations. The duration of most (57 %) aggressive contacts does not exceed 3 seconds, 45% percent of aggressive interactions consist of single vocal, visual or tactile signals. The most intensive and long conflicts are observed in cases, connected with aggressive attempts of new seal to take a place

on haul-outs. The result of the encounter is also connected to a great extent with the situation. In case of interactions between neighbors there are usually no visible changes in distance and behavior of the animals. In a suppressing majority of the cases after a peaceful landing of the intruder and in case of peaceful swimming up, aggressive actions of the resident result in the intruder swimming away. Aggressive swimming up and landings of the intruder, on the contrary, often result in the resident coming down. The level of aggressive encounters on stable haul outs is low. However, it increases abruptly in case of re-formation of the haul out.

MARINE MAMMALS AND CLIMATE CHANGE

2 March 16:10 – 16:30

SHIFT OF HARBOUR SEAL (*PHOCA VITULINA*) PUPPING PHENOLOGY: A RESULT OF CLIMATE CHANGE?

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Animals may respond to climate change by shifting of their reproductive cycle. Possible changes in the breeding phenology of harbour seals (*Phoca vitulina*) in the southeastern North Sea were investigated using two kinds of data: A) serial counts of newborns from air taken in the period of 1975–2008 and B) records of pup live strandings from 1995–2007, both providing a yearly index of timing through fitting of simple Gaussian models. The indices obtained from (A) and (B) represent an estimate of the mean birth date and the seasonal peak density of newborn strandings, respectively. The latter was on average 8.5 days (± 1.5 SD) later than the former ($N = 8$), which figure may be interpreted as the mean age of pups at the time of stranding. Mean birth dates ($N = 20$) gradually shifted from 25–30 June in the 1970s to about 10 June in the 2000s. However, a quadratic regression of both indices ($N = 33$) showed that the annual change had not been constant throughout the entire period ($\chi^2: P = 0.002$). A piecewise regression model with one break point was thus applied to describe the process. From the 1970s until the estimated break point at year 2000.4 (± 1.6 SE), pupping occurred on average 0.73 days (± 0.23 SE) earlier every year. Thereafter, the time of pupping appeared to be about constant, i.e. 0.02 days (± 0.22 SE) later per year. From the literature, there is anecdotal evidence that back in the 1930s it was about as early as today, suggesting that the 1970s may have been a turning point. In that case, the shift towards earlier pupping until 2000 could be related to the recent warming phase of the 60–80-years cycle of the Atlantic Multidecadal Oscillation (AMO).

2 March 16:30 – 16:50**MERCURY AND STABLE ISOTOPES IN TEETH AS TRACERS OF A POTENTIAL DIET CHANGE OVER FOUR DECADES IN POLAR BEARS (*Ursus maritimus*) FROM SVALBARD**

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Polar bears (*Ursus maritimus*) depend on sea ice for the hunting of seals, being their main prey. Because of the earlier break-up of the Arctic sea ice, resulting from the climate warming, their access to seals is likely to be reduced during the summer season and the polar bears may be forced to fast for longer periods and search for alternative food sources. This study investigates the use of total mercury (Hg) and stable isotopes of carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) in polar bear teeth as tracers of a potential diet change over four decades. The hypothesis is that the elemental and isotopic values will reflect changes appearing from altered food sources. Mercury levels were determined in teeth (n=87) of polar bears from Svalbard (Norway) sampled between 1964 and 2003. The concentrations of Hg were low, ranging from 0.6 to 72.3 ng/g dry weight. In addition, they were found to decrease significantly over time ($P < 0.02$). Stable isotopes were also determined in the dental tissue. Stable nitrogen isotopic ratios ranged from 17.75‰ to 21.78‰ reflecting the high trophic level of this species while $\delta^{13}\text{C}$ values ranged from -17.44‰ to -14.77‰ reflecting a primary use of the marine food chain by the polar bear. Neither $\delta^{15}\text{N}$ nor $\delta^{13}\text{C}$ signatures showed significant temporal trends. Although Hg values were found to be significantly correlated to $\delta^{15}\text{N}$ values, the temporal variations in Hg concentrations could not be related to them. The decreasing time trend reported for Hg levels in the dental tissue of polar bears appears therefore to reflect a reduction in environmental mercury burden and not a diet change of this species.

2 March 16:50 – 17:10**EXAMINATION OF THE LEVEL OF ANTI-EPIZOOTIC EFFECTIVENESS OF IMMUNE SYSTEM OF MARINE MAMMALS AS A METHOD TO ESTIMATE THE INFLUENCE OF GLOBAL CHANGES OF CLIMATE ON THE WILD POPULATIONS**

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During recent decades the problem of the global warming have become very acute. The research of the influence of climatic changes on wild populations take on important significance. Marine mammals are the most endangered of the global warming, especially such species in which their vital cycle is connected with the ice surface. Except that pathogenic microflora is liven up by the high temperature of environment. At that risk of epizootic expansion into wild populations is increasing. Therefore the extraordinary actuality is taking the monitoring of the level of anti-epizootic effectiveness of immune system in individuals into wild populations. Complex of methods which is allowed to estimate the anti-epizootic effectiveness of immune system in marine mammals was developed. These complex include: immunological, microbiological, toxicological and pathologoanatomic investigations. Were studied: twenty six Steller sea lion (*Eumetopias jubatus*) pups from Medny Island and fourteen pups from Cape Kozlov (Peninsula Kamchatka) in 2004, fifty five adult Black Sea bottlenose dolphins (*Tursiops truncatus*) at various terms of adaptation from 2001 to 2004, twelve beluga whales (*Delphinapterus leucas*) in 2003, and also Ladoga ringed seal (*P. hispida ladogensis*) in 2007. The performed investigations showed a similar picture of interconnected changes of indices. In this case, there was a general trend in decrease of the immune status indices compared with a high level of the infection by pathogenic microflora in different species of marine mammals. Findings can indicate that the low level of the anti-epizootic effectiveness of immune system was detected in the investigated marine mammal species, which also explains high degree of their vulnerability during the epizootic process. In all cases visible effect of the environment on the state of health of animals was observed. Therefore these methods can be employed to estimate the influence of global climatic changes on marine mammals.

CONSERVATION / MANAGEMENT

3 March 09:00 - 09:20

BEAKED WHALES RESPOND TO NAVY SONAR

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Beaked whales have mass-stranded during naval exercises involving mid-frequency active (MFA) sonar, but the cause is unknown. A series of experiments were conducted recently in the Tongue of the Ocean (TOTO), Bahamas on a naval underwater range where 91 hydrophones capable of recording up to ~48 kHz enabled acoustic monitoring for beaked whales over 500 sq. miles.. Nine playback sequences (including measurements during control and exposure intervals) were conducted on four species of odontocete cetacean [Blainville's beaked whale, *Mesoplodon densirostris* (n=2); Melon-headed whale, *Peponocephala electra* (n=1); short-finned pilot whale, *Globicephala macrorhynchus* (n=4); false killer whale, *Pseudorca crassidens* (n=2)] to measure the behavioural responses of beaked whales and other odontocete cetaceans. Observations were also made of odontocete vocalizations at a coarser (group) level using the hydrophone array during playbacks and navy sonar exercises. One of the tagged Blainville's beaked whales responded to playbacks of simulated naval sonar at a received level of 136 dBrms re: 1µPa and killer whale sounds at RL = 102 dBrms by interrupting foraging dives, prematurely ceasing echolocation, and sustained avoidance of the playback area after exposure to the killer whale sounds. Acoustic monitoring of beaked whales during sonar exercises suggests sustained avoidance similar to that observed in this experiment. The other beaked whale playback evoked cessation of echolocation and foraging after exposure to a pseudo-random noise signal in the mid-frequency band at RL = 140 dBrms. The other species tested appear to be less responsive to MFA and control sounds than beaked whales, demonstrating some changes in vocal and movement behaviour but nothing like the clear avoidance responses in the beaked whales. Our results demonstrate that useful scientific information can be obtained through controlled exposure experiments on beaked whales and a range of other species without harming them.

3 March 09:20 - 09:40

DEEP DIVERS COMMUNICATION. IMPLICATIONS FOR NOISE IMPACTS WITH AN EXAMPLE FROM THE MEDITERRANEAN SEA

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Deep diving odontocetes face the challenge of communicating among individuals in a deep three-dimensional habitat. Most odontocetes studied use tonal sounds to communicate while some species produce only pulsed sounds serving several functions. Here, a multisensor, acoustic recording DTAG was used to monitor the acoustic behaviour and environment of short-finned pilot whales, Blainville's and Cuvier's beaked whales. All used echolocation to forage at depth but, in addition to echolocation signals, pilot whales produce a rich repertoire of communicative tonal and pulsed sounds. Tonal sounds change duration with depth, suggesting that pressure influences the vocal behaviour of the whales. Reunion of pilot whales returning from deep foraging dives with their group is facilitated by their active vocal behaviour and short duration of dives. In contrast, beaked whales perform coordinated long foraging dives and are mostly silent at depths of less than 200 m despite high group cohesion. Beaked whales emit bouts of high repetition FM click series, that we called "rasps", that may serve a communicative purpose while deep diving. Vessel noise may mask cetacean vocalizations even at ultrasonic frequencies where impacts have previously been considered minimal. This was exemplified by the passage of a vessel coincident with a vocal dive of a Cuvier's beaked whale in the Mediterranean Sea. In addition, noise has the potential of disrupting the behaviour of the whales even at frequencies out of the band of their vocalizations. Such findings are discussed in the light of mitigating anthropogenic noise in Marine Protected Areas such as the Pelagos Sanctuary, an area of high shipping activity in the Mediterranean Sea.

3 March 09:40 -10:00

OBSERVATIONS OF TOOTHED WHALES EXPERIMENTALLY EXPOSED TO LOW (1-2 kHz) AND MID-FREQUENCY (6-7 kHz) SONAR SIGNALS, AND IN RELATION TO A FLOTEX NAVAL EXERCISE

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Beaked whales are thought to be particularly sensitive to military sonar signals. Impacts on other species are important to study in order to test that hypothesis, but also because less dramatic effects may cumulatively yield biologically significant impacts, and may interfere with other stakeholders such as commercial tourism and the public. In a research trial conducted in Norway in November 2006, we observed the presence of killer whales in Vestfjorden during a military sonar trial (FLOTEX), and conducted two experimental exposures of sonar to killer whales

tagged with Dtags. Whale numbers declined in Eastern Vestfjorden with none seen for three days following the start of the naval exercise, which transmitted sonar signals in the 6-8 kHz frequency band. In one experiment, a tagged whale exposed 1-2 kHz sonar with a maximum received level of 154dB re 1 μ Pa continued travelling in its group which did not appear to avoid the sonar. Two whales simultaneously tagged during the second experiment, along with other whales that had been carousel-feeding together, stopped feeding and moved rapidly away during exposure to a 6-7 kHz sonar with a maximum received level of 140dB re 1 μ Pa. Some calls were recorded that appeared to match or mimic the sonar signal. These preliminary results indicated that killer whales might be more sensitive to 6-7 kHz signals than to 1-2 kHz signals, consistent with their low-frequency drop-off in hearing sensitivity. In a second trial during May-June 2008, we conducted 6 experiments (one killer whale, one sperm whale, and four pilot whales), during which both 1-2 kHz and 6-7 kHz sonar signals were transmitted in a block design. Some responses were observed, including more cases of vocal matching of the sonar. Ongoing analyses will examine the influence of sonar frequency on behavioural effects.

3 March 10:00 -10:20

CETACEAN BY-CATCHES IN THE COURSE OF TURBOT AND SPINY DOGFISH FISHERIES IN THE NORTHWESTERN BLACK SEA

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By-catches in bottom-set gillnets for turbot (*Psetta maxima maetica*) and spiny dogfish (*Squalus acanthias*) are commonly acknowledged as the major source of human-induced mortality of Black Sea harbour porpoises (*Phocoena phocoena relicta*). However, so far the magnitude of this threat to the porpoise population was not estimated and absolute numbers of the by-catches were not studied by means of onboard monitoring programmes. In 2006-2008 within the period from February to November, we recorded cetacean by-catches directly on board of conventional 22-m-long fishing vessel operated in the northwestern Black Sea off the coast of Crimea peninsula (territorial waters of Ukraine). A total of 3,604 fishing nets were examined including 1,953 nets for turbot and 1,651 nets for spiny dogfish. The nets were installed at the bottom with a depth from 30 to 90m. Each turbot net was ca 100m long, with a height of 2.6-3.0m and mesh size of 180-200mm; each dogfish net was about 50m long, with a height of 2.5-2.8m and mesh size of 100-110mm. Overall length of the examined nets came to 278km. In whole, 484 cetaceans were recorded by-caught including 480 harbour porpoises (99.2%)

and four bottlenose dolphins, *Tursiops truncatus ponticus* (0.8%; detected in turbot nets only). At the same time, total catch of target fish species (including commercially suitable specimens and discards) amounted to 4751 turbot and 1830 dogfishes in turbot and dogfish nets, respectively. All the cetaceans on record were found dead. General by-catch indices rounded to integers were evaluated as follows: 163 *P.p.relicta* and two *T.t.ponticus* per 100km of turbot nets; 195 *P.p.relicta* per 100km of dogfish nets; 67 *P.p.relicta* and one *T.t.ponticus* per 1000 turbot, and 88 *P.p.relicta* per 1000 dogfishes. Peaks of harbour porpoise by-catches occurred in June (2.70 per 1km of turbot nets) and August (7.55 per 1km of dogfish nets).

3 March 10:20 -10:40

MARINE MAMMAL AND FISHERIES INTERACTIONS IN GALICIA, NORTH-WEST SPAIN

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Galicia, north-west Spain, is one of the world's main fishing regions and fishing is an important component of the economy. Previous interview surveys with fishermen five and ten years ago highlighted a high (up to 1700 cetaceans per year) and potentially unsustainable cetacean by-catch rate. Pair trawls and gillnets reported the highest by-catch rates, with *Delphinus delphis* being the most commonly by-caught species. Since 1990, necropsies of over 1800 stranded and by-caught have been conducted, and around 1/3 of these animals were fresh enough (state 1-3) to detect indications of fisheries interactions, if present. Of these, approximately 12% were of known by-catch and a further 36% had indications of fishery interactions such as net marks and mutilations. *Tursiops truncatus* and *Phocoena phocoena* are the most commonly sighted cetaceans in Galician coastal waters although the number of strandings is much lower than for *Delphinus*. Around 1/5 of *Tursiops* and 1/3 of *Phocoena* strandings show evidence of fisheries interactions. Age, maturity and pregnancy data from stranded animals are used to construct life tables and make estimates of overall mortality and reproductive rates. Analysis of *Delphinus delphis* life-history samples shows that males were caught more frequently than females, and juvenile and sub-adult males were more frequently by-caught than older males. Results from the life table indicate that there is a 13% annual mortality in the *Delphinus delphis* population, about half of which is apparently due to fisheries interactions. This greatly exceeds the 2% by-catch limit set by ASCOBANS.

Currently, more interviews are being conducted and these results will be combined with the life-history and by-catch data to determine trends in population numbers and estimate more realistic by-catch mortality rates for both species.

3 March 11:10 -11:30

HOW STRANDINGS RECORDS CAN INFORM ON CETACEAN AT SEA: AN ATTEMPT TO MODEL AND VALIDATE DRIFT AND DISCOVERY RATES

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Stranding of marine mammals is an important source of information on cetacean populations. Nevertheless, samples of population provided by strandings result from several processes: the death of an animal, its drift, its stranding and its discovery. The aim of this study is to disentangle processes that determine drift and discovery rates in order to better identify trends in populations within stranding data series. To do this, we have determined discovery rate from data on tagged carcasses, modelled their drift by using the Météo-France model MOTHY and validated trends in stranding by comparing with trends in at-sea sightings. The discovery rate was estimated at 16.2%, showing that only a small proportion of dead animals is actually reported. A GLM analysis showed that drift ($Z=6.307$, $P=2.84 \times 10^{-10}$), season ($Z=13.935$, $P < 2 \times 10^{-16}$) and geographic area ($Z=12.308$, $P < 2 \times 10^{-16}$) had a significant positive effect on the occurrence probability of strandings. Linear regressions between strandings data and at-sea sightings from exhaustive surveys in the Bay of Biscay allowed correlation between these two variables to be tested. The correlation was strongly positive for the bottlenose dolphins, *Tursiops truncatus*, ($C=0.221$, $P=0.0002$), with a highly significant model ($r^2=0.67$) but not for the common dolphin, *Delphinus delphis*, ($C=0.001$, $P=0.923$). This could be explained by the effect of the episodes of strong winter by-catch-related mortalities only observed in the common dolphins, which blurred the stranding signal for this species. With this study, the interpretation of stranding data for monitoring marine mammal population would be improved by the newly assessed discovery rate and the understanding of environmental factors determining stranding probabilities. Finally, modelling carcass drift would allow stranding data series to be spatialized and would provide the necessary information on the geographical origin, and hence putative population, of the biological samples collected on stranded marine mammals.

3 March 11:30 -11:50**WHAT ROLE DOES TELEMETRY HAVE IN ENVIRONMENTAL IMPACT ASSESSMENTS?**

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The establishment of an underwater tidal turbine in Strangford Lough Narrows (Northern Ireland) required a risk assessment for the local harbour seal (*Phoca vitulina*) population (c. 200). 24 seals were fitted with SMRU GSM/GPS tags to track and provide a 'baseline' of their behaviour before and after turbine installation. These novel tags provided accurate and detailed track and behavioural data. The resulting 1568 seals-days of data were automatically subdivided into foraging trips, indexed with the haulout site of departure (total of 44). Results: 1). Resampling techniques revealed only weak evidence for a reduction in time near (<300m) the site (from 0.30 (sd 0.51) hours per day to 0.10 (sd 0.18)). There was no evidence that daily transit rates past the site changed. 2) There was no significant change in the haulout time budget. 3) Aerial survey and track data were combined in a GAM (~year, lat, lon, and distance to haulout) to predict spatial population usage. Before and after usage did not change significantly. The power of these telemetry data to detect population change in usage or behaviour was reduced by high inter-individual variability. Even with increased power (higher n), assigning causality to any change without reference to population trends would still be challenging. However, movement data can generate plausible (and testable) mechanisms for population changes detected by traditional surveys. We also argue that assessing the causal link from behaviour to fitness is aided if detailed individual health assessments are taken at the time of capture.

3 March 11:50 -12:30**INVITED TALK: CLIMATE CHANGE AND ARCTIC MARINE MAMMALS**

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Seven arctic marine mammals occur north of the Arctic Circle for most of the year and depend on arctic ecosystems for all aspects of their life; the narwhal, the beluga, the bowhead whale, the ringed seal, the bearded seal, the walrus, and the

polar bear. The arctic amplification of continued global warming will primarily affect these animals by the loss of sea ice as a habitat for feeding, breeding, molting, mating and as a substrate or barrier for migrations and movements. The seven arctic marine mammals will be affected differently by the loss of sea ice depending on their degree of specialized feeding habits, their dependence on sea ice for life history events and their restrictedness in distribution. None of the seven mammals are currently endangered globally but they vary widely in abundance and this will eventually also affect their population resilience to climate change. In a recent assessment of the sensitivity of arctic marine mammals the polar bear and the narwhal were identified to be highly sensitive due to their reliance on sea ice and specialized feeding (Laidre et al. 2008. *Ecol. Applications* 18: 97-125). The least sensitive species were the ringed seal and bearded seal, primarily due to large circumpolar distributions, large population sizes, and flexible habitat requirements. Recent studies of three of the arctic marine mammals may throw some light on how they will thrive with reduced sea ice. The narwhal is narrow in its habitat selection and it undertakes well defined annual migrations from coastal summering grounds usually near glaciers to specific wintering areas in heavy pack-ice. The purpose of these restricted migrations is not fully understood, but a major part of the feeding occur in winter when they make dives targeting prey at depths often exceeding 1500 m. The genetic diversity in narwhal is low and resembles the diversity found in populations that has through dramatic declines, but no such events are known from the recent history of exploitation and trends in abundance. However, narwhals very likely have limited resilience to rapid changes in North Atlantic sea ice coverage and they may have been severely affected by the sudden temperature changes that occurred towards the end of last glaciation. The bowhead whale was probably never as abundant as the narwhal but it is more plastic in movement patterns and more flexible in its habitat utilization. A recovering population of bowhead whales in West Greenland has shown an increase in abundance that exceeds what can be explained by regular population growth. More likely the whales take advantage of the receding sea ice in spring and utilize new habitats for feeding. In West Greenland they seem to operate with a dual feeding mode by feeding both on pelagic concentrations of copepods and on benthic decapods. This allows them to sustain possible mis-matches between primary and secondary production caused by changes in sea ice recession in the critical spring months. Finally the polar bear is a convincing example of how this predator relies heavily on sea ice for quick access to their preferred prey in spring when their hibernation ends.

HABITAT

3 March 14:00 - 14:20**HARBOUR PORPOISES IN THE SEA OF AZOV: POPULATION STRUCTURE, LONG-TERM DYNAMICS AND FACTORS AFFECTING THEM**

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Harbour porpoise in the Black Sea region is a separate subspecies, *Phocoena phocoena relicta* Abel, 1905. Porpoises in the Sea of Azov form a distinct population, being relatively isolated during the parturition season. Their body size is larger than in the Black Sea porpoises. Once abundant, the Azov population was harvested before 1966 and then declined in the 1980s due to anchovy stock depletion. Monitoring of strandings at the southern coast of the Azov Sea is being conducted since 1999. This monitoring site is advantageous for population studies due to environmental factors. Data on 350 specimens were analyzed. Stranding rates varied interannually (1.5 animals per km per year in average) with a tendency to slow decline. Increased or mass mortality was observed in 1999, 2002 and 2008. On the contrary, the model based on total age structure demonstrated the tendency to stability. Samples taken in the years of mass mortality also show the age structure of stable population. Birth rates varied highly interannually (maximums in 1999, 2002, 2005, 2008). Cohort analysis for animals born in 1990-2002 demonstrated fluctuations of adult animals' number with the minimums in 1995 and 1999. Adults' number falls in cohorts of animals born since 1999. So the mortality in cohorts does not correspond to the birth rates. By-catch is an important mortality factor. Average percentage of animals with the by-catch marks exceeds 20%. By-catch is non-selective for the age, sex and body size (except calves). Natural and technical catastrophes also affect the overall abundance. Thus, the Azov population is characterized by short-term periods of stable abundance, long-term tendency from stability to slow decline, and demographical fluctuations. It is vulnerable to the impact of external factors. By-catch is probably the main factor impeding population growth, while catastrophic events caused several abrupt falls of population size.

3 March 14:20 - 14:40**PORPOISE HABITAT PREFERENCES IN A STRONGLY TIDAL ENVIRONMENT: ROBUST PREDICTIONS FROM OPPORTUNISTIC DATA**

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Cetacean habitat model predictions are often highly variable and lack generality across regions. Models for harbour porpoise (*Phocoena phocoena*) rarely explain more than 50% of the variability, unless extensive prey data is available. Clearly, how cetaceans respond to their environment and how their prey is distributed is not a simple linear or additive function of the available environmental variables. We constructed more flexible models by allowing spatial and temporal environmental variables to interact in non-linear Generalized additive model (GAM) of harbour porpoise occurrence. Data were collected from a platform of opportunity in a strongly tidal and topographically complex site in Pembrokeshire Marine Special Area of Conservation (SAC), Wales. We examined a near-exhaustive set of 3003 models and used the best 30 for robust inference by model averaging. By taking model uncertainty explicitly into account, we greatly enhanced the accuracy and precision of our final predictions. This also allowed predicting outside the study area, but within the range of the environmental data. The results indicated that in the study area near Skomer Island, porpoises avoided or selected steeper slopes depending on the tidal flow conditions: when the tide started to ebb, occurrence was predicted to increase 3-fold at steeper slopes. Instead of sea state, interaction of tidal height and wind force was important, which might have better captured variability both in the observation conditions and porpoise behaviour. Of the main effects, greater depths (>40m), tidal heights (>4m) and early hours of the day (<4 hours after sun rise) significantly increased the probability of a porpoise sighting. The results show that non-linear interaction terms in a multi-model framework can improve model predictions and generate biologically meaningful hypotheses about the underlying habitat selection process.

3 March 14:40 - 15:00**PATTERNS OF COASTAL USE BY HAWAIIAN SPINNER DOLPHINS (*Stenella longirostris*) OBSERVED USING PASSIVE ACOUSTIC MONITORING**

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Spinner dolphins are the most commonly sighted cetacean in coastal Hawaiian waters and are an important higher-level trophic component of the near-shore ecosystem. Establishing their long-term patterns of occurrence is important for both their conservation and to better understand relationships between dolphins, their prey and other members of the ecosystem. Here we report on an effort to use Ecological Acoustic Recorders (EARs) to monitor the presence of spinner dolphins along the leeward coast of the island of Oahu, Hawaii. The EAR is a bottom-moored recorder with a bandwidth of 30 kHz, which allows the detection of both dolphin whistles and echolocation clicks. Eight EARs were deployed along the coast at depths ranging from 15 to 50 meters. Five units were deployed in an array, providing information about the EAR's detection range. The other three units were placed at sites along the coast commonly frequented by spinner dolphins. The results reveal distinct patterns of preference in habitat use, both for daytime resting behavior and nighttime foraging. The recordings also provide a measure of vessel traffic at locations important to spinner dolphins. Combined, these data demonstrate the value of passive acoustic methods for monitoring cetacean populations and their habitat over extended periods.

3 March 15:00 - 15:20

SATELLITE TRACKING OF WILD MEDITERRANEAN MONK SEALS: A NON INVASIVE INNOVATIVE TOOL

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The available knowledge about movements and feeding grounds of Mediterranean monk seals, one of the most endangered mammals of the world, is very scarce. The absence of telemetry studies is limiting the elaboration of conservation measures based in the knowledge of the spatial specie's ecology. The difficultness for this kind of studies is due to the scarcity of the species, its high sensitivity towards disturbances, and their use of marine caves. Here we describe the development of a new satellite tracking methodology of monk seals without the need of capturing, restraining and sedating the animals, and therefore notably minimizing the impact. Field observations allowed us to identify that at the beginning of some dives, rear flippers of the seals would surface for a very brief period of time. This fact allowed

us to design a special bracelet which houses a fast-acquisition GPS (Fastloc®), which is able to obtain locations in second's fraction, and to deploy it on the ankle of the rear flipper of an adult male while sleeping. The device was able to obtain locations in 97.78% of the days, with a mean of 6.29 and 4.62 locations per day, during two different periods of 41 and 49 days. The deployment in the bracelet of a Time Depth Recorder during the second period allowed us to evaluate the effectiveness of the gps during different diving behaviours of the animal, being effective in all of them. Field observations showed no changes in the diving or swimming behaviour of the animal with the bracelet deployed. Also, after the removal of the bracelet, no injuries were observed on the ankle of the seal. Therefore, we consider this new methodology as an effective and non invasive tool to determinate critical habitats of the species, which are essential for the design of protection measures.

3 March 15:20 - 15:40

FINE SCALE HABITAT USE BY HARBOUR SEALS, AS ASSESSED BY FASTLOC GPS /GSM TELEMETRY

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We identified harbour seals' critical habitats in two colonies in France by investigating individual strategies of habitats use in relation with local environmental conditions (tidal and daily rhythms, habitat structure). We aimed at describing individual movements, activity rhythms, haul-out and diving behavior of seals in Baie du Mont Saint-Michel and Baie des Veys. From 2006 to 2008, 20 individuals were fitted with Fastloc GPS/GSM tags developed by the Sea Mammal Research Unit. In 2006-07, on average, tags lasted 108 days and transmitted 21 GPS locations and 250 dives per day and per seal. Seals in Baie du Mont Saint-Michel barely moved outside the bay, their movements and haul-out frequency were therefore mostly governed by tide (tidal range 14 meters) and formation of low-tide channels. One seal however moved across the English Channel and travelled along the English coast, more than 400 km from the catching site. In the bay, dives were shallow and the distance between haul-out locations and foraging areas did not exceed 5 km. These results suggest that, during winter time, prey availability is sufficient within the bay for the seals. In general, harbour seals in Baie des Veys moved further away from the catching site (some over 35 km), mostly along the coastline. We observed a higher inter-individual variability in the seals' preferred foraging areas than in the other bay. Seals foraged mostly at night, close to rocky points or mussel farms along the coast, or a bit further at sea on sandy sea-bottom (and shipwrecks). Individual dives remained shallow (86% of dives not deeper than

10 meters). Critical habitats for two major seals' activities (foraging and resting) were mapped. With its high spatial and temporal resolution, Fastloc GPS/GSM telemetry seems particularly adapted for the study of this species showing short-distance movements.

MEDICINE / DISEASE

3 March 16:10 – 16:30

ESTIMATING THE CONSEQUENCES OF A MORBILLIVIRUS EPIZOOTIC ON LONG-FINNED PILOT WHALES

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Since 1996 abundance, trend, survival rate, spatial distribution, diet and conservation issues have been studied on the resident long-finned pilot whales (*Globicephala melas*) in the Strait of Gibraltar. Therefore, it was a unique situation where a population status had been known before possible variations could occur. In winter 2006-07 a Morbillivirus outbreak has been detected with an increase in stranding animals in the region with 10 stranded animals in 5 months while the average was 0.9/year in 1998-2006. Histopathological studies performed by the University of Las Palmas de Gran Canarias (Spain) confirmed the Morbillivirus presence in the stranded animals. This study investigated the consequences of the epizootic on the population of long-finned pilot whale in the Strait of Gibraltar. First, multistate robust design capture-recapture models in MARK were used to estimate the basic life parameters of the pilot whale population living in the area before the epizootic. Survival rates per age class were found to be 0.677 for calves, 0.861 for juveniles and 0.985 for adults in 1999-06 with a total abundance of 345 (95% CI: 309-445) animals in summer 2006. Secondly, robust design models in MARK estimated that the Morbillivirus epizootic induced a 21.2% reduction in the survival rate in 2006-07 and caused 51-52 additional deaths, for a total of 77-78 deaths (including natural mortality), between summer 2006 and summer 2007. This study provides the first estimation of the survival rates for calves and juveniles long-finned pilot whales. Furthermore, it assesses for the first time the consequences of a Morbillivirus epizootic on live pilot whales in their natural environment.

3 March 16:30 – 16:50**CYTOCHROME P-450 1A1 EXPRESSION IN CETACEAN SKIN BIOPSIES FROM A TROPICAL LAGOON (MAYOTTE, MOZAMBIQUE CHANNEL)**

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Cytochromes P450 are induced by exposition to various environmental contaminants such as PAHs and PCBs. Such contaminants accumulate in the marine food web and high concentrations are often detected in marine mammals tissues. Such contaminants are suspected to predispose to adverse effects on marine mammal's health, potentially impairing the immune, reproductive or nervous systems. This study describes cytochrome P-450 1A1 (CYPA1) expression on different cetacean species from the Mozambique Channel island of Mayotte. Skin biopsies have been collected from free-ranging cetaceans in the coastal waters of the island: *Megaptera novaeangliae*, n= 15; *Stenella attenuata*, n=7 and *S. longirostris*, n= 25. Biopsies were stored in ethanol, embedded in paraffin wax by routine procedures and sections of 3 µm were cut. Immunohistochemical examination was performed with a monoclonal antibody against scup cytochrome CYPA1. The sex was determined using a molecular approach consisting in the genotyping sex-specific genes (i.e., SRY and ZFX genes). CYPA1 was detected at the dermo-epiderm interface on dolphins only (1/7 *S. attenuata* and 17/25 *S. longirostris*). Dolphins that were positive at the interface were also positive in the dermis, mostly at endothelial cells. Similar observation was obtained in the dermis of one *M. novaeangliae*. Immunohistochemical slides were scored to evaluate the expression of the CYPA1 and a higher expression was observed in males. The expression of the CYPA1 is linked with the degree of contaminant exposure but is also influenced by age, sex, species, diet and health status. In the present study, expression of CYPA1 was mostly reported for one species : *S. longirostris*, suggesting a higher exposure to pollutants for this species, perhaps linked with a higher position in the marine food web. The lower expression in females is probably due to the elimination of pollutants by the milk during lactation.

3 March 16:50 – 17:10**LEVELS AND PATTERNS OF PBDEs IN BLOOD AND BLUBBER OF PUP HARBOUR, GREY AND HARP SEALS FROM THE ESTUARY AND GULF OF ST. LAWRENCE, CANADA**

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Xenobiotics have often been mentioned as a potentially important factor in the severity of epizootic episodes occurring in the last years. Since seals are at the top of the marine food web, they accumulate high levels of stable pollutants in their tissues. No studies on levels of brominated flame retardants in the tissues of eastern canadian seals during first days of life have been published. In the present study, levels of polybrominated diphenyl ethers (PBDEs) were analysed in the blubber and in the blood of twenty-four pups. Harbour (*Phoca vitulina*), grey (*Halichoerus grypus*) and harp (*Phoca groenlandica*) seals were sampled in the Estuary and the Gulf of St. Lawrence, Canada. PBDE analyses were made by gas chromatography following the international recommendation. Results indicate that harbour seals from Estuary (23.7 ± 4.7 ng/g lipid weight) were more contaminated than species from Gulf, like harbour seals (3.6 ± 0.6 ng/g l w), grey seals (3.3 ± 0.6 ng/g l w) and harp seals (0.6 ± 0.2 ng/g l w). Blubber concentrations of BDE-28, -47, -99, -100, -153 and -154 were relatively similar among the Gulf species (harbour seals from Newfoundland, harp seals and grey seals) but about 10 times higher in the harbour seals from Estuary. The patterns of PBDEs varied between species. Blood serum showed a lowest PBDE concentrations compared to blubber. The residence time of their mothers in the Estuary (proximity to sources of industrial pollution) or in the Gulf and the maternal diet are the most important factors explaining these differences.

DISTRIBUTION / ABUNDANCE

4 March 09:00 – 09:20

CETACEAN ABUNDANCE IN OFFSHORE WATERS OF THE EUROPEAN ATLANTIC

Macleod, K. (1), Burt, L. (2), Cañadas, A. (3), Rogan, E. (4), Santos, B.M. (5), Uriarte, A. (6), Van Canneyt, O. (7), Vazquez, J. A. (8), Hammond, P. (1)

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Only partial estimates of abundance exist for cetaceans in offshore waters of the European Atlantic. Up to date estimates in these waters are important to inform

assessments of favourable conservation status of several species under the Habitats Directive and to allow the impact of bycatch to be assessed. The Cetacean Offshore Distribution and Abundance in the European Atlantic project (CODA) undertook to map summer distribution, generate abundance estimates, and investigate habitat preferences of common and bottlenose dolphin, fin whale, deep diving whales and other cetaceans in offshore waters of the European Atlantic, and to develop further the management framework developed under SCANS-II to determine safe bycatch limits for small cetaceans, in particular common dolphins. The study area of 967,538 km², approximately 42-61° N, was stratified into four blocks and surveyed by five ships during July 2007. Survey methods replicated those used during the SCANS-II project. In particular, the 'trial configuration' method was used, with two teams of observers located on each survey vessel, to account for animals missed on the transect line and any responsive movement. A total of 9,494 km of transect was surveyed in four blocks. Abundance estimates obtained from the full analysis were: 118,264 (CV=0.38) common dolphins; 61,364 (CV=0.93) striped dolphins; 90,013 (0.47) long-finned pilot whales; 7,625 (0.21) fin whales; 2,424 (0.34) sperm whales. In addition, estimates uncorrected for missed animals on the transect line or responsive movement of 19,295 (0.25) bottlenose dolphins; 6,765 (0.99) minke whales and 9,771 (0.44) beaked whales were obtained. Although there are 2 years between the surveys, these estimates can be added to those for coastal shelf waters from SCANS-II in 2005 to give the most complete information on cetacean abundance available in European Atlantic waters.

4 March 09:20 – 09:40

AERIAL SURVEYS IN CARIBBEAN AND GUIANA: TOP PREDATOR ABUNDANCE, DISTRIBUTION AND DIVERSITY IN FRENCH OVERSEAS TERRITORIES

Certain, G. (1), Van Canneyt, O. (1), Dorémus, G. (1), Rinaldi, R. (2), Jérémie, S. (3), Bolaños, J. (4), Watremez, P. (5), Ridoux, V. (1)

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This study aims at identifying priority habitats to design Marine Protected Areas within pelagic waters under French jurisdiction in the western tropical Atlantic (French Caribbean: 123 000 km²; and French Guiana: 138 000 km²). Aerial transects (8400 km in the Caribbean and 7800 km in Guiana) have been conducted in February and October 2008, respectively, using a Partenavia P68C fitted with bubble windows. Two observers and a navigator constantly recorded sightings of cetaceans and seabirds following the line transect method. These surveys generated 234 cetacean and 698 seabird sightings. For Cetaceans, 70 sightings (11 species) were obtained in the Caribbean, and 164 sightings (10 species) were


obtained in Guiana. The most commonly encountered cetacean species were large whales in the Caribbean (*Megaptera novaeangliae* and *Physeter macrocephalus*) and dolphins in Guiana (*Tursiops truncatus* and *Sotalia guianensis*). For seabirds, 407 sightings (12 species) were obtained in the Caribbean, and 291 sightings (11 species) were obtained in Guiana. These surveys highlighted huge differences both in species composition and abundance amongst these two areas, with high abundance of large whales and seabirds around Caribbean islands, while small delphinids were the dominant predators off Guiana coasts. The spatial distribution of the most common cetacean species and of seabirds and cetaceans species richness was modelled with generalised additive models and environmental parameters (Bathymetry, Surface temperature, surface Chlorophyll a, wind strength and divergence, sea surface height anomaly, and associated gradients) in order to identify areas of highest abundance and diversity for conservation purpose. Minimum abundance estimates were obtained for *Tursiops truncatus* (45 960, CV= 0.24) and *Sotalia guianensis* (2 280, CV= 0.3) in Guiana waters (for which 70 and 22 sightings were obtained, respectively). These surveys constitute the first record of top predators in these areas and are therefore valuable information to document management and conservation practice.

4 March 09:40 – 10:00

SPATIO-TEMPORAL DISTRIBUTION OF SPERM WHALES (PHYSETER MACROCEPHALUS) IN THE SARGASSO SEA

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Sperm whales (*Physeter macrocephalus*) are widely distributed in all oceans, but they are clumped geographically, generally in areas associated with high primary and secondary productivity. The warm, clear waters of the Sargasso Sea are traditionally thought to be low in productivity, however recent surveys have found large numbers of sperm whales there. Little is known about the seasonal or spatial distribution of sperm whales in this area and how the Sargasso Sea can support such high numbers. We investigated the seasonal prevalence of sperm whales around Kelvin seamount in the north-west portion of the Sargasso Sea and related our findings to oceanographic conditions. An autonomous recording device was deployed over Kelvin Seamount from May 2006 to June 2007. Hourly two-minute recordings were examined for the presence of sperm whale echolocation clicks. In addition, vessel-based acoustic surveys were conducted over seven years (1993, 1995, 2000, 2004-2008) to examine the distribution and abundance of sperm whales in the Sargasso Sea. Spatial analysis with a Geographical Information Systems was used to identify “hotspots”. Sperm whales were significantly more

prevalent around Kelvin in the spring (May to June: mean = 46% of recordings contained clicks) compared to the winter (November to March: mean = 7% of recordings contained clicks). Variables that explained the seasonal prevalence of sperm whales around Kelvin Seamount included: month, distance to Gulf Stream and chlorophyll a six weeks previous. Sperm whales were more abundant in the northern part of the Sargasso Sea near the Gulf Stream and New England seamount chain. The world's oceans are dominated by areas of low productivity, and there is evidence these areas are expanding. Our research sheds insight into how such an unproductive environment can support high whale biomass and provide a broader understanding of why sperm whales are so widely distributed.

4 March 10:00 – 10:20

CETACEAN SURVEYS IN THE ISTANBUL (BOSPHORUS) STRAIT IN 2007-2008

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The Turkish Straits System, namely the Istanbul (Bosphorus) Strait, Marmara Sea, and Canakkale Strait, is known as a biological corridor between the Aegean and Black Sea for marine organisms including cetaceans. There found three cetacean species: bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*) and harbour porpoise (*Phocoena phocoena*). Due to anthropogenic stress, such as pollution, high human population, and sea traffic, there has been a great concern about these cetaceans. This study aimed to understand and monitor the seasonal and spatial distribution of three cetacean species in the Istanbul Strait. Surveys were made in March 2007-June 2008 with a 12m commuter boat and a 32m research vessel YUNUS-S, between the Black Sea exit and the Marmara Sea exit of the Strait (approximately 16.3 nautical miles in length). Thirty-seven surveys were made, totalling about 155 hours and 972 nautical miles (nmiles) of survey effort. We recorded 139 sightings (1205 individuals) and the bottlenose dolphin was the most often observed species comprising 52 %, followed by the harbour porpoise 39 % and the common dolphin 9 %. The overall encounter rate was 0.143 sightings/nmiles. When the Strait was divided into three parts: North, Middle, and South, the sightings were most frequent (53%) in North, near the Black Sea exit, where less traffic and human population create less disturbance for cetaceans. The bottlenose dolphins were dominant in North and South, while the harbour porpoises were dominant in Middle. There were regular sightings of the bottlenose dolphins at both exits of the Strait. Although the effort was not constant throughout the year, there were more sightings in spring-summer months than in

autumn-winter months, as in the previous years. Distributions of three species vary from year to year possibly due to the prey fish availability.

4 March 10:20 – 10:40

THE ADAPTATION AND USE OF RADIO FREQUENCY IDENTIFICATION (RFID) TAGS FOR MARKING HARBOUR SEALS (*Phoca vitulina*)

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The ability to recognise individually marked animals from a distance allows survival, movement and abundance estimates to be derived from mark-recapture analyses. For harbour seals a number of passive marking methods have been used, including flipper tags and natural marks but these are limited, particularly in terms of the distance to recognition. We have adapted long-range active RFID tags (IntegralRFID) for temporarily marking harbour seals. The tags transmit (303MHz) an 8 digit identification code every 5s, weigh <12g and measure 30mm in diameter. The units were waterproofed by encasing in epoxy resin which caused only a minor reduction of the signal strength. To maximize the detection range we designed and built a long range 10dBi cross-polarized Yagi antenna. The maximum directional read-range is currently 400m. Data from the receiver are streamed by cable or bluetooth to a laptop or PDA which logs tag number, signal strength and date/time. As a pilot study, in September and October 2008, 27 RFID tags were deployed on harbour seals from the East coast of Scotland (12 in the Moray Firth and 15 in the Eden Estuary) and will be shed during the moult. Weekly trips to observation points between 200 and 350m from the haulout sites were subsequently carried out. In the Moray Firth, 11 tags were detected from 5 trips. In the Eden estuary 2 tags were detected during 10 trips. This initial study suggests that RFID tags have potential application in survival studies for animals that have a restricted range. Since the tags are cheap and small seals may be readily double tagged to estimate tag loss. Having a life of ~7 years, they also have the potential for implantation, albeit with reduced range.

NATURAL HISTORY / EVOLUTION

4 March 11:10 - 11:30**UNDERSTANDING THE EVOLUTION OF THE MAJOR HISTOCOMPATIBILITY COMPLEX IN MARINE MAMMALS**

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Several studies suggest that evolution of the MHC of marine mammals differs from that of terrestrial mammals being the coefficient of balancing selection smaller in the former. Here, we contrast synonymous and non-synonymous substitution rates of the DQ β exon 2 and mitochondrial cytochrome b (Ctb) sequences between some marine and terrestrial mammals. Bayesian analysis of the DQ β 2 locus phylogeny revealed a number of transpecific polymorphisms in both, marine and terrestrial mammals. Cetaceans were found to have the higher non-synonymous rate at DQ β 2 and this is not associated to a higher background neutral rate as inferred from the analysis of the Ctb. The cetacean non-synonymous DQ β 2 rate appears clearly higher than the corresponding artiodactyl rate suggesting that balancing selection coefficient of the DQ β 2 is not smaller in the marine environment for this group. In the other hand, amino acid substitution rates of marine carnivores exhibited an apparent lower balancing selective pressure. We also calculated the velocity of selection (VS) based on bayesian distance differences between markers DQ β 2/Ctb for all sites and for each codon position. The VS analysis revealed that the most intense balancing selection pressure occurs at an intraspecific level. We observed differences between the expected VS occurring in the second position in marine mammals and the first position in primates, although this does not occurred for all terrestrial mammals. It is clear that the selective pressure taking place on marine mammals is equally if not stronger than in terrestrial mammals; therefore, discarding the theory of a weaker selective pressure in MHC loci. Understanding MHC selection, in different environments for different taxa, is important to assess population risks and still needs much research on the biology of immunity and disease and their relationship with the demographic and genetic population structure.

4 March 11:30 - 11:50**DUAL-ENERGY X-RAY ABSORPTIOMETRY ANALYSIS OF THE BONE DENSITY DISTRIBUTION PATTERNS IN THE ROSTRUM OF TWO FAMILIES OF ODONTOCETI CETACEANS: A COMPARATIVE STUDY**

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Toothed whales have undergone a profound rearrangement of the typical mammalian skull, due to a process called telescoping. It involves primarily an elongation of some bones of the face, with the formation of a rostrum, which is hollow and filled in vivo by the so-called mesorostral cartilage. In most species of the family Ziphiidae this cartilage becomes secondarily ossified, producing in some cases the densest bone existing in nature. Starting from this observation, we wanted to investigate the bone mineral density (BMD) distribution patterns in the rostrum of two families of odontocetes with different ecological and behavioural traits: Delphinidae and Ziphiidae. We analysed BMD by means of the dual energy X-ray absorptiometry technology, and found out two different density distribution patterns that distinctly set the two families apart. Namely, the delphinids have decreasing BMD values from the base toward the apical region of the rostrum, whereas the beaked whales show a BMD peak in the central part of it. Potential explanations of such difference are discussed in light of three main factors: muscular insertion, aggressive intra-specific interaction and diving behaviour.

4 March 11:50 - 12:30**INVITED TALK: HOW MIGHT COASTAL DOLPHINS BE IMPACTED BY CLIMATE CHANGE?**

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Much concern has been expressed regarding the effects of global warming on marine mammals in Arctic and Antarctic waters, where changes in ice coverage can dramatically and visibly change habitat availability and other features. Global

climate change is likely to impact marine mammals in many other habitats as well, due to changes in sea level, sea surface temperature, salinity, alkalinity, wave climate, weather patterns, ocean circulation, and associated factors. Effects are likely to vary by species and by habitat, and given the time scales it may be difficult to detect signals of climate change among other forcing factors within the demographics of the animals. Changes in coastal dolphin habitats in temperate waters may be more subtle than changes such as reduction in ice coverage, but hints about potential impacts from, and responses to, climate-related habitat changes are available from opportunistic observations and systematic long-term studies of species such as common bottlenose dolphins, *Tursiops truncatus*. At the extremes of the species' range, bottlenose dolphins have exhibited behavioral plasticity, through short- and long-term range shifts correlated with changes in water temperature. Range shift options may be limited for locally-resident communities located well within the species' range, where adjacent waters are already occupied by other bottlenose dolphin communities. Dolphin communities remaining in warming waters may experience changes in their prey base and increased exposure to biotoxins and environmental contaminants that may impact their survival and/or reproductive success. Findings from health assessments of bottlenose dolphins suggest that in combination, factors associated with warming waters may lead to cascading declines in individual health, but it is difficult to estimate the endpoint of such responses relative to population survival. A number of field techniques exist for coastal cetaceans for potential detection of responses to global warming. Optimal application of these approaches requires development of baselines and implementation of regular, systematic, long-term monitoring programs for species and populations selected as the most informative for potentially detecting impacts of climate change.

FEEDING ECOLOGY

4 March 14:00 - 14:20

FEEDING BEHAVIOUR AND HABITAT USE OF HARBOUR SEALS (*PHOCA VITULINA*) IN THE VESTERÅLEN ARCHIPELAGO, NORWAY

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A pilot project was carried out to study the habitat use and feeding behaviour of harbour seals (*Phoca vitulina*) in the Vesterålen archipelago in Northern Norway. By means of GPS-Phone tags created by SMRU, Scotland, the movements and diving behaviour of five juvenile harbour seals were followed for 7 months (August 2007-

March 2008). In addition, standard acoustic surveys, including trawl hauls, were performed to investigate the abundance of fish in the area. Scat sampling was used to assess the diet composition of the seal population. The dive profiles recorded from the tags were classified in the attempt to identify the dives connected with feeding behaviour and identify feeding grounds. The tagged seals foraged close to the coast and at relatively shallow depths (50% of the dives between 12-32 m) showing marked individual differences in the choice of feeding grounds. No spatial relation was found between the density of potential prey and the choice of feeding grounds. Analysis of scat sampling suggested that gadoids dominated the diet (62%) followed by herring (*Clupea harengus*) (35%). Comparison between the abundance of fish species in the study area, based on the resource surveys, and prey occurrence in the seal diet indicated that harbour seals have no preference for a particular prey species. On the other hand, within gadoids, they appeared to prefer small size classes. Therefore fish size, rather than species, could be a potential selection criterion in foraging. The local abundance of fish in the area is likely to allow harbour seals to feed on what is available close to the haul out sites. Targeting of small size classes might therefore be a consequence of habitat selection based on accessibility rather than size selection.

4 March 14:20 - 14:40

PREDATOR-PREY DYNAMICS OF GRAY WHALES AND MYSIDS IN A SUMMER FORAGING SITE

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Rarely can we simultaneously monitor baleen whales and their prey, thus the dynamic relationship between a highly influential predator and their prey population is seldom measured. We commonly believe that, although a single baleen whale takes large quantities of prey, the prey stands are so large they are resilient. Thus, food limitation and top-down drivers of local community structure are seldom hypothesized to be the dominant ecological setting. At fine spatial scales, however, we demonstrate the alternate hypothesis that gray whales regularly depress prey stocks on discrete areas and vacate those sites quickly. Further, on a coarse time scale we demonstrate the strong potential for the whales to erode prey populations to the point of local extirpation. Within each of 5 consecutive summer foraging season we present foraging whale numbers and prey quantity based on a visual census of whales and hydro-acoustic surveys of prey. The coupling between the two levels in the food chain is extremely tight with steep reduction in prey swarms followed by a complete departure by the whales. That in itself is not surprising, however, where the whales performance is analyzed over

the entire 12 year span of the whale census we see an intriguing pattern of diminishing return. In a broader context, relatively small sites like this are reasonable candidates for top down forcing creating permanent, or at least long term impairment of carrying capacity. If the same process is demonstrated with other prey types, or on larger spatial scales, perhaps our understanding of the species' ecology and population dynamics is missing important components.

4 March 14:40 - 15:00

COMPETITION FOR THE RESOURCES BETWEEN PILOT WHALES, BOTTLENOSE DOLPHINS AND SPERM WHALES IN THE STRAIT OF GIBRALTAR

de Stephanis, R. (1), García Tíscar, S. (2), Cornulier, T. (3), Verborgh, P. (1), Perez, S. (1), Esteban, R. (1), Guinet, C. (3)

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The spatial distribution of 6 species: short-beaked common dolphins (*Delphinus delphis*), striped dolphins (*Stenella coeruleoalba*), long-finned pilot whales (*Globicephala melas*), bottlenose dolphins (*Tursiops truncatus*), sperm whales (*Physeter macrocephalus*), and killer whales (*Orcinus orca*) was examined with respect to the depth and the slope in the Strait of Gibraltar between 2001 and 2004 using GAMs. These analyses indicate that these species could be ordered into three groups. A first group, with a northward tendency is composed by common and striped dolphins. This group is likely to be feeding on mesopelagic fishes or squids associated with the surface Atlantic waters. The second group, constituted of bottlenose dolphins, long-finned pilot whales and sperm whales is mainly found over the deep waters of the central part of the Strait, and would share the same habitat. The third group, formed by killer whales was associated with bluefin tuna (*Thunnus thynnus*) fisheries. Nitrogen (^{15}N) and carbon (^{13}C) stable isotopes were used, to denote the position of the species of the second group within the food web, to trace the origin of trophic resources exploited by them and then to look at possible competition for the resources. Bottlenose dolphins ($n=21$, $^{15}\text{N}=13.42$ SD=0.89, $^{13}\text{C}=-16.02$, SD=0.62) and sperm whales ($n=4$, $^{15}\text{N}=13.43$ SD=0.41, $^{13}\text{C}=-15.72$, SD=0), showed same values between them, but significantly different from the values of long-finned pilot whales ($n=54$, $^{15}\text{N}=11.27$ SD=0.38, $^{13}\text{C}=-16.35$, SD=0.40). This suggests that the two first species share the same diet, but are segregated in depth. Although they share the same spatial distribution, they have a different diet from long-finned pilot whales, which eliminates a possible spatial competition for the resources between them.

4 March 15:00 - 15:20**IS THE DIET OF WESTERN MEDITERRANEAN DOLPHINS CHANGING?**

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We analysed stomach contents of 86 striped dolphins, *Stenella coeruleoalba*, and 27 bottlenosed dolphins, *Tursiops truncatus*, stranded along the Spanish Mediterranean coast between 1990 and 2005 to investigate long-term dietary changes in both species. The results suggest that, during this period, bottlenose dolphins fed regularly upon prey from continental shelf, particularly hake, gadids and cuttlefish, without significant shifts in prey composition. In contrast, the diet of striped dolphins apparently shifted from offshore to inshore prey. Cluster analysis revealed two main prey assemblages, i.e., oceanic mesopelagic species, and bottom-dwelling species from the shelf and the upper slope. The dietary shift was particularly evident since 2000, when there was a sharp increase of merluccids, gadids and cuttlefish, with a parallel decrease of mesopelagic squid and lanternfish. As a result, there is a greater contemporary overlap between the diet of the two dolphin species. Although the above analysis was based on stranded animals, we could not find any obvious reason why sampling biases would explain the apparent dietary switch observed in striped dolphins. We therefore advance some alternative hypotheses based on ecological grounds. First, there is evidence that the bottlenosed dolphin population has decreased over the last years, and this might have allowed striped dolphins to widen their trophic niche. Second, demersal prey might have recently been consumed in greater amounts because of their higher abundance as fishery discards. Finally, the diet of striped dolphins, being rather opportunistic, might indicate fundamental changes in the structure of the trophic webs. Our study highlights the importance of long-term studies to fully understand strategies, and human impact, on the trophic ecology of cetaceans.

4 March 15:20 - 15:40**RECENT CHANGES IN THE DIET OF COMMON MINKE WHALES (*Balaenoptera acutorostrata*) IN ICELANDIC WATERS**

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During the past decade considerable environmental changes have been documented in Icelandic and adjacent waters. Sea temperatures and salinity have been well above average and changes in abundance and distribution of several fish species have been reported. Mass die-offs (mortality) and breeding failure of seabirds has been observed supposedly as a result of food shortage and possibly related to a recent recruitment failure of sandeel. At the same time results of sightings surveys and stranding records indicate a change in distribution of some cetacean species in this area. The common minke whale is the most abundant species of baleen whales in Icelandic coastal waters. It is of special interest to investigate the potential effects of the environmental changes mentioned above on the feeding ecology of this important component of the continental shelf ecosystem around Iceland. Here we present the first results from a research programme on the feeding ecology of common minke whales in Icelandic coastal waters conducted during 2003-2007 based on analysis of stomach contents from 200 minke whales. The results indicate a significant change in diet from a previous study based on material collected during 1977-1997. Overall the results show considerably higher proportions of cod, haddock and other large teleost fish species than previous study. The present study also indicated a higher incidence of sand-eel than the previous one, while krill and capelin contributed less than previously to the diet. A high degree of spatial variation was found in the diet composition and indications of changes during the sampling period (2003-2007) were detected. These results demonstrate the ability of common minke whales to utilize a wide spectrum of prey species, ranging in size from 1g to 10kgs, and to adapt to changes in prey availability.

4 March 16:10 – 16:30

FIRST INTEGRATED STUDY ON CUVIER'S BEAKED WHALE (*Ziphius cavirostris*) IN THE NORTHERN LIGURIAN SEA (ITALY, MEDITERRANEAN SEA) USING D-TAG AND PHOTO-ID

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Cuvier's beaked whales (*Ziphius cavirostris*, family Ziphiidae) are very difficult animals to study, primarily because of their cryptic behaviour. However, this species has been involved in mass strandings caused by naval mid-frequency sonar activities, and thus it is important to gain a better understanding of its biology and ecology. We studied Cuvier's beaked whales in the Ligurian Sea, using photo-identification to examine population structure, and DTAGs (Digital Acoustic Tags) to

examine diving behaviour. We were able to recognize 127 individual whales of which we identified 10 adult males, 67 undetermined adults, 47 immature and 3 calves. Out of the 127 individual whales, 34 were resighted during the 9 year study period. This high rate of resighting individual whales suggests a small population size. Eleven *Ziphius cavirostris* were tagged and 99 hours of dive data were collected. Very little is known about the feeding ecology of *Ziphius cavirostris* and the limited information available are based on stomach contents' analysis. Recently, some authors hypothesized that the Mediterranean Cuvier's beaked whale interacts directly with the sea bottom looking for its demersal prey. To better understand the feeding ecology and the relations with the sea bottom, we analysed the echoes coming from the sea bottom in DTAG data. In dives up to 2000m, we observed the whales to forage at close distances (around 10-16m) from the bottom.

4 March 16:30 – 16:50

(This talk was cancelled and replaced by F05)

STABLE ISOTOPES DIFFERENTIATE BOTTLENOSE DOLPHIN POPULATIONS OFF WEST-CENTRAL FLORIDA, USA

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A number of species of small cetaceans are common to coastal areas throughout the world; yet distinguishing among discrete populations represents a formidable task critical to the conservation of marine mammals. In this study, we evaluated the utility of stable isotopes as a potential tool for assessing population association of bottlenose dolphins (*Tursiops truncatus*) in west-central Florida. We analyzed the carbon, nitrogen, and sulfur stable isotopic composition ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$, respectively) of collagen extracted from teeth of stranded dolphins representing three potential populations. Animals of known origin and history from the Sarasota Bay (SB) estuary served as a means to ground-truth the approach, whereas animals from adjacent coastal and offshore (OFF) waters of the Gulf of Mexico (GULF) constituted the other two populations with no known history. The three populations were significantly different for each of the three isotopes. $\delta^{13}\text{C}$ values indicated that estuarine dolphins utilizing seagrass ecosystems could be differentiated from GULF and OFF populations (e.g, average of -10.6 ‰ for SB vs. -11.9 ‰ for GULF and OFF). Average $\delta^{15}\text{N}$ values of GULF (12.7 ‰) and OFF (13.2 ‰) dolphins were higher than dolphins from estuaries (12.1 ‰ for SB), consistent with differences in the trophic level of prey observed in stomach content analyses

and known prey base. The $\delta^{34}\text{S}$ values were definitive, showing clear distinctions between estuarine (7.1 ‰ for SB), GULF (11.3 ‰), and OFF (16.5 ‰) populations. We advocate a multi-isotope approach because it clearly provides much more information regarding dolphin foraging ecology, habitat affinity, and population association than any single isotope. Stable isotopes determine population assignment in bottlenose dolphins and may provide a powerful tool in ongoing conservation efforts of dolphins within the Gulf of Mexico ecosystem.

4 March 16:50 – 17:10

DO SPERM WHALES (*PHYSETER MACROCEPHALUS*) USE VISION WHEN FORAGING AT DEPTH?

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Though direct experiments to test echolocation in sperm whales (*Physeter macrocephalus*) remain impossible, the indirect evidence is overwhelming that one function of their clicks is echolocation used during foraging, as has been shown for other toothed whales. In this study we test hypotheses of Fristrup and Harbison (2002) that sperm whales might use vision while foraging at depth. The first hypothesis tested is that sperm whales should swim upside down or on their side to use downwelling sunlight to locate prey. Secondly, at night and at depths with limited light, they hypothesize that the whale may benefit by swimming upright, using the darker background of the deep sea as a contrast to spot bioluminescence in prey items. D-tag data from 26 sperm whales tagged in the Gulf of Mexico recorded the orientation and depth of the sperm whales during 134 foraging dives, of which 40 were during nighttime. In contrast to the first hypothesis, the majority of whales are swimming more upright during the day at depth where limited sunlight should be available. At night and at greater depths, the data shows that whales more often swim upside down or on their side. These analyses of the hypotheses put forward by Fristrup and Harbison do not seem to support the use of vision to detect prey during foraging at depth in the Gulf of Mexico.

POSTERS

ACOUSTICS

A01 LISTENING TO THE DEEP-OCEAN ENVIRONMENT IN A CHANGING CLIMATE

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Oceans exert a pervasive influence on the Earth's environment, most notably as a regulator of climate. Understanding the link between natural and anthropogenic processes and ocean circulation is essential for predicting the magnitude and impact of future changes in Earth's climate. Deep-sea observatories have the potential to play a key role in the assessment and monitoring of these changes. ESONET is a European Network of Excellence of deep-sea observatories that includes 55 partners belonging to 14 countries. ESONET NoE will provide data on key parameters from the subsurface down to the seafloor at representative locations and transmit them in real time to shore. The strategies of deployment, data sampling, technological development, standardisation and data management are being integrated with projects dealing with the spatial and near surface time series. LIDO (Listening to the Deep Ocean environment) is one of these projects and proposes to establish a first nucleus of a regional network of multidisciplinary seafloor observatories contributing to the coordination of high quality research in the ESONET NoE by allowing the real-time long-term monitoring of Geohazards and Marine Ambient Noise in the Mediterranean Sea and the adjacent Atlantic waters. Specific activities are addressed to a long-term monitoring of earthquakes and tsunamis and the characterisation of the ambient noise induced by marine mammals and anthropogenic noise. Here, we present the development of LIDO and its ongoing results with a special emphasis on cetacean bioacoustics and the real-time display of acoustic data and statistics.

A02 PERFORMANCE OF A CONTOUR EXTRACTION SOFTWARE FOR THE CLASSIFICATION OF FOUR MEDITERRANEAN DELPHINIDS SPECIES

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Whistles from four delphinid species commonly observed in waters of the western Mediterranean Sea (*Stenella coeruleoalba*, *Grampus griseus*, *Delphinus delphis*, *Tursiops truncatus*) were taken from GREC sound archives. FFT contours (window size 512, hanning, sampling frequency 44.1 kHz) were extracted with a custom developed Matlab software: 277 samples of striped dolphins (northwestern basin), 158 whistles of Risso's dolphin, 120 of common dolphins and 76 of bottlenose dolphins were selected. *Seafox* software extracted fifteen variables from the digitized contours, including: duration, frequency range, number of frequency extrema, beginning, ending, maximal and minimal frequencies, initial, final, maximal and minimal frequency slopes, presence of harmonics. Three of four species were significantly different (Mann-Whitney test) for average durations (respectively 0.73, 0.65 and 0.47 sec. for Sc, Gg, Dd) while the average duration of bottlenose dolphins was 0.71 sec. On the contrary, *Tursiops* whistles had a different average frequency (9.5 kHz) compared to the three other species (range 10.5-11 kHz). Frequency ranges (respectively 7.3, 6.3, 4.6 and 6.3 kHz) were significantly different for all species pairs, the bottlenose and Risso's dolphins excepted. Initial slopes were generally significant to discriminate species, but not the final slopes. From a global point of view, the bottlenose dolphin whistles were the most distinct, with 36 significant pair-wise tests out of a total of 45, followed by the common dolphin (34 significant tests out of 45); Risso's dolphin whistles were closer to other species whistles (25 significant tests) A multivariate discriminant analysis showed that three species (Dd, Sc, Tt) could be discriminated with a good confidence level (χ^2 test, $\alpha = 0.05$), only Risso's dolphin whistles being often confused, mostly with those of striped dolphins. Finally, we tested our discriminant model on a data set of southwestern basin striped dolphins, and we obtained a classification score of 68.8%.

A03 DIURNAL AND SEASONAL PRESENCE OF PORPOISES AT A NARROW STRAIT MONITORED USING A STATIONARY ACOUSTIC RECORDING DEVICE

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The presence of the finless porpoise, *Neophocaena phocaenoides*, in the Hario Strait, Japan, was monitored acoustically for one year. The Hario Strait is adjacent to Ohmura Bay, which is the habitat of the smallest population of finless porpoises in Japanese waters, consisting of approximately 300 individuals. The other sides of the strait are Sasebo Bay and the Eastern China Sea, which constitute an unconfirmed habitat of this species. Our question was whether the porpoises move through the strait or not. Porpoises frequently produce biosonar signals that allow reliable detection using passive acoustic methods. A stereo acoustic event recorder (A-tag) stored the intensity and the sound source direction of ultrasonic signals, which enabled to count the number of presented animals. From November 2007 to October 2008, 149 porpoises were detected acoustically. A clear diurnal pattern of the presence of porpoises was observed with 78 % of the finless porpoises detected at night. No porpoises were detected from 2 to 3 pm. Shipping traffic observed using the same acoustic system showed trends opposite to that of finless porpoises during the daytime. Of the 149 porpoises detected, 81 % occurred in March and April, while none were detected in July and August. For the rest of the year, only a few porpoises were detected each month. The tidal current did not affect the presence of porpoises. Local fisheries catch Japanese anchovy outside the Hario Strait from December to June. In the spring, the anchovy migrate into Ohmura Bay to reproduce. Food availability was thought to affect the presence of finless porpoises in the Hario Strait, which is a substantial corridor for marine organisms between Ohmura Bay and the Eastern China Sea. Stationary acoustics can be used to monitor other porpoises in straits such as the Bosphorus.

A04 THE USE OF A FIXED HYDROPHONE ARRAY TO RECORD AND LOCALIZE SOUNDS EMITTED BY FREE-RANGING BELUGA WHALES

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Localization of a vocalizing animal is important in many behavioral studies. The difficulty of attributing sounds to individual beluga whales inhibits our understanding of how these animals use sound in social interactions and in echolocation. We have developed and trialed a fixed array of three broad-band hydrophones to overcome this difficulty at sea. Our data were collected in July 2008 in a beluga whale reproductive gathering off Goliy Sosnovetz Island (Onega Bay, the White Sea). Hydrophones were anchored 80 m offshore small rocky island. Inter-receiver locations were obtained both with a measuring rod and with a triangulation procedure. The hydrophone array aperture was 96 m. A total of 11 hours of three-channel recordings were made. Sound recordings were carried out with a sampling frequency 48 and 192 kHz. Observers documented locations of beluga whales within the study area both by video shooting and by filling paper

forms. Two localization algorithms were used: a hyperbolic method and a Pythagorean method. Calibration trials with sound sources of a known separation distance have demonstrated appropriate accuracy in acoustical localization. We present preliminary results on localization of tonal and pulsed signals emitted by beluga whales. We have applied the system during 5 days at sea and successfully localized social and echolocation signals from beluga whales, showing the potential for this system in understanding social vocalizations and echolocation of belugas in the wild. It was found that the array provided bearing estimates (azimuth localization) to a high accuracy. However, whales could be localized (source locations) with adequate precision only within a relatively small (in comparison with area occupied by beluga whales) region right in front of the array aperture. Increasing of size of array and number of hydrophones is needed to increase the effective range of the array and reliability in the derived source location.

A05 CALIBRATING CLICK DETECTORS: A METHODOLOGY TO CALIBRATE C-PODS

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Acoustic monitoring of harbour porpoises using click detectors is a valuable method to obtain long-term data of their habitat use. A calibration of instruments used for static acoustic monitoring prior to deployment is recommended, as it ensures that the devices are working properly and that the obtained data will be comparable. Determination of the acoustic properties of the detectors can only be achieved under controlled conditions. Calibration of T-PODs (Timing-Porpoise-Detector, Chelonia Ltd., UK) has been conducted at the German Oceanographic Museum since 2002. The C-POD (Cetacean-POD) is the digital successor of the T-POD and collects a much wider range of data than the T-POD. We readjusted our calibration method to the frequency range of C-PODs to find their horizontal receiving characteristics. The frequency response was measured in a 1.0x0.7x0.7m test tank by emitting 60-150kHz pulse-series with a calibrated hydrophone in 10kHz-steps (50 pulses per frequency) at 10 Pa (140 dBre1µPa) receiving level to the C-POD, by rotating it in 22,5° steps. Pulses consisted of 15 cycles with a co-sine envelope. The recorded C-POD data were purged of echoes by using a custom-made visual basic procedure. The resulting Pp-p (relative Sound pressure level, peak-peak) values given by the C-POD were compared. The minimum receiving level was determined in 90° rotation steps using series of 100 pulses, decreasing their amplitude in 2dB steps. The 50%-threshold of all received pulses was assessed and compared. We show the results of 15 calibrated instruments and their variations. The calibration results will enable researchers to achieve comparable field data. Data gained by a

set of C-PODs can be adjusted to the minimum receiving level of the most insensitive device by filtering them with regards to the corresponding minimum Pp-p value. Correspondingly, it might also be possible to compare T- and C-POD data.

A06 PAMGUARD: SEMIAUTOMATED OPEN SOURCE SOFTWARE FOR REAL-TIME ACOUSTIC DETECTION AND LOCALISATION OF CETACEANS

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For many species, passive acoustic monitoring (PAM) has become an important field tool, with application in population surveys and mitigation monitoring as well as biological research. While there is still a role for aural monitoring, computer-based systems have distinct advantages in that they are able to detect and classify infrasonic and ultrasonic sounds outside of the human auditory range and are also able to accurately localise sounds detected on multiple hydrophones. PAMGUARD is an initiative, currently funded by the OGP E&P Sound and Marine Life project, providing a standard software to address the needs of both developers and users of PAM systems. PAMGUARD is open-source, platform-independent, and freely available. For the biologist and PAM operator, PAMGUARD provides a flexible and easy-to-use suite of programs which provide a standard interface across different platforms. It has the flexibility to allow multiple detectors to be added, removed and configured according to the species of interest and the particular hardware configuration on a project. For developers of PAM systems, an Application Programming Interface (API) has been developed which contains standard Java classes for the efficient handling of many types of data, interfaces to acquisition hardware and to databases, and a GUI framework for data display. PAMGUARD already replicates and exceeds the capabilities of earlier real-time monitoring programs such as the IFAW Logger Suite and Ishmael. Ongoing developments include improved real-time location and automated species classification.

A07 A COMPARISON OF TECHNIQUES FOR MONITORING BOTTLENOSE DOLPHINS IN A SPECIAL AREA OF CONSERVATION

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Bottlenose dolphins are on Annex II of the EU Habitats Directive and thus member states must ensure they are at a Favourable Conservation status, which requires ongoing population monitoring. The efficacy of three sampling techniques to monitor bottlenose dolphin populations was tested from July to August 2008 in the Lower River Shannon cSAC on the west coast of Ireland. Two acoustic techniques: a fixed hydrophone and self contained click detectors (T-PODs) were compared to visual surveys from a land-site. Visual observations were made during daylight hours in the same area as the acoustic devices were moored. Once dolphins were observed they were tracked using a theodolite to determine detection distances of the acoustic equipment. Visual observations were carried out on 19 days (Total of 7616 minutes). Dolphins were seen on 39 occasions, 18.3% of the observation time, with an average sighting duration of 41 ± 27 minutes. Over the visual recording period, acoustic data were recovered from three different Version 5 T-PODs. Dolphins were recorded for a total of 27 Detection Positive Minutes, which was 0.03% of the deployed time. The T-PODs failed to record dolphins on any of the 39 occasions when they were sighted within 500m of the mooring. On one occasion dolphins were detected by the T-PODs but they were not observed. The fixed hydrophone was deployed throughout the study period and was recording on all 19 days with visual observations. Results to date show that the fixed hydrophone proved to be a much better match to the visual data when compared to the results from the T-PODs.

A08 THE C-POD THE T-POD THE HYDROPHONE AND THE PORPOISE: A COMPARISON OF HARBOUR PORPOISE ECHOLLOCATION SEQUENCES SIMULTANEOUSLY RECORDED BY THREE DIFFERENT ACOUSTIC RECORDING SYSTEMS

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C-POD, a new generation of porpoise click detector, was released recently for the acoustic monitoring of odontocetes (see www.chelonia.co.uk). As in the older model (T-POD) its digital successor registers time and duration of acoustic events, but also stores additional information such as centre frequency, intensity and bandwidth of each sound. Our aim was to investigate the comparability of data obtained by these two POD models when acoustically monitoring harbour porpoises (*Phocoena phocoena*). For this purpose both POD models were calibrated to determine the minimum sound pressure level that a porpoise echolocation click needs to provide to be recorded. In August 2008, a T-POD, a C-POD and a hydrophone were moored next to each other one meter below the water surface in the Danish Baltic Sea. During a two-hour observation period, broad-band recordings were taken simultaneously to the two POD recordings while

visually observing the study area. The received data of both PODs were analyzed and compared to each other as well as to the broad-band recording analyzed in AVISOFT (Saslab). This poster shows the results of the recordings from a visually confirmed harbour porpoise encounter. The porpoise's echolocation sequences were recorded successfully on all three systems and could be assigned to each other. In the T-POD.exe software, these sequences were identified by the algorithm as high and low probability cetacean click trains as well as very doubtful trains. A comparable algorithm for C-PODs is not yet available, but the detected sequence was visually confirmed as being of porpoise origin. Parameters obtained by the different recording systems for each click such as the duration of clicks and their frequency characteristics were compared. This study shows that both POD models are valuable tools for registering harbour porpoises. Furthermore, the C-POD provides additional information to validate porpoise registrations.

A09 A SECOND GENERATION OF AN AUTONOMOUS AND PORTABLE AUDITORY SCREENING SYSTEM FOR CETACEAN CLINICAL AND RESEARCH PURPOSES

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While noise is now considered a marine hazard that can directly affect cetaceans and induce a stranding, no clinical approach has yet introduced the detection of a possible hearing loss at a stranding site as a necessary practice. Here we present the second generation of an autonomous and portable auditory screening system for cetacean clinical and research purposes. This system is composed by two independent and autonomous modules that build a more versatile, lighter and radio-magnetically isolated system. The improvement relies on the electromagnetic isolation between modules and the independency of the first one on many situations. The second module will activate only when needed for some frequencies and levels driving high voltage to the transducers thus avoiding interferences with the first module containing the low voltage amplifications system. The tool has been successfully tested for research purposes in captivity dolphins and calibrated for a stranding site diagnoses operation.

A10 HEARING SENSITIVITIES IN THE ATLANTIC BOTTLENOSE DOLPHIN USING AUDITORY EVOKED POTENTIALS

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In 1968, Norris introduced the idea that odontocetes could hear through their fat-filled lower jaws. Since then, many studies have shown that indeed the highly specialized fats found on the odontocete melon, around the meatus and on the lower jaw are involved in echolocation and sound reception. More recent studies have also shown that there might be multiple areas of high acoustic sensitivity and variations across species. However, there is no information on hearing variations across individuals of one species. In this experiment, the audiograms of five Atlantic bottlenose dolphins (*Tursiops truncatus*) were obtained using the auditory evoked potential technique. In addition, hearing sensitivity of over 15 points on the head and inside the mouth of three animals was measured using a piezo-electric ceramic embedded in a suction cup. The preliminary audiograms show variations in range of best sensitivity and evidence of high frequency hearing loss for at least two individuals (with a 50kHz high frequency cut-off). In addition, the hearing sensitivity results show that - with simulated echolocation clicks - the panbone region was indeed the most sensitive area (up to 30dB relative SPL). Inside the mouth, the lower jaw was found to be equally sensitive indicating that hearing is very directional in this species. This experiment supports the shaded receiver hypothesis and contributes to a better understanding of how odontocete morphology channels sound to the middle ear. In addition, this project represents baseline information that can be used to compare to other odontocetes species.

A11 DEVELOPMENT A NEW ACOUSTICS DETERRENT DEVICES FOR BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*) FOR MARINE FISH FARM

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Interactions between bottlenose dolphins (*Tursiops truncatus*) and marine fish farms appear to be occurring with increasing frequency. Bottlenose dolphin attacks on farmed fish (bass and corb) could represent a problem faced by the industry in terms of financial loss through: 1) Damage to floating cage's nets in the form of holes in the nets as the bottlenose dolphins attempt to remove fish; 2) Reduction in the amount or value of the farmed fishes as the dolphins mutilate; and 3) Indirect damages caused by induced stress (reduction in the size or quality of the farmed fish as the frequent bottlenose dolphins' presence). We present the new acoustic

deterrent device for marine fish far and the results of field experiments for testing the efficiency of the device.

A12 SYSTEM ARCHITECTURE FOR REAL-TIME MONITORING OF NOISE POLLUTION

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The monitoring of noise pollution in the oceans has become an important topic. Increasingly, governments require monitoring during sea construction projects or operations. For example, it is important to monitor the noise produced during construction of a wind mill park, as well as the noise it produces during operation. Noise monitoring has also become one of the objectives of the European Seafloor Observation Network (ESONET), to investigate the level of noise produced around European coastlines and its impact on the environment and cetaceans especially. It is expected that all platforms under the ESONET will be equipped with a hydrophone array to allow monitoring of the environment. Presented is the architecture for noise monitoring as it is currently implemented in ESONET through the LIDO (Listening to the Deep Ocean Environment) project. The aims of the project are to detect in real-time changes in the background noise levels (natural, biological and anthropogenic), and then to identify and track the sources. As the system will be implemented in varying environments it is important to use a modular design that can be adapted easily, based on local requirements. While the system will most often run from a shore station, provisions have to be made to allow a more limited version that can run autonomously with minimal power requirements. Analysis results are streamed in real-time to a FLASH based client that allows anyone interested to monitor an area. Additionally, any data that could be of interest for research is stored in high quality and made available for download to registered users. Finally, storage of all analysis results in a database will give insight into the relation between human and cetacean activities, as well as direct comparison between the different locations that are being monitored.

A13 REAL TIME DETECTION AND CLASSIFICATION OF NATURAL BIOLOGICAL AND ANTHROPOGENIC SOUNDS FROM UNDERWATER ANTENNAS

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Passive acoustic monitoring (PAM) is a powerful tool for the study of marine mammals and anthropogenic sounds in the marine environment. However PAM campaigns result in huge quantities of data. In this context it is desirable to reduce the data volume in order to alleviate the burden put on data transmission, storage and analysis. To address this problem we developed a set of algorithms that work in real time and in a fully automated mode. The algorithms perform two tasks: (1) They detect acoustic events (e.g. cetacean calls, ship noise, explosions), thus making possible the automated discarding of data segments that contain only sea noise. (2) They tag the remaining data into broad groups (e.g. impulsive sounds, constant tonals, frequency modulated tonals). This allows to pass only specific subsets of the data to more sophisticated and time consuming analyses. The performance of our algorithms was assessed on datasets from several deep sea platforms. These datasets encompass all the diversity of sounds that must be expected in long term PAM campaigns (e.g. they also contain data segments with low SNR or with the simultaneous presence of different kind of sounds). The achieved performance indicates that the algorithms are very reliable and hence can be used as a data processing step in deep sea PAM campaigns. During the presentation a RT detection and classification of recorded data will be performed and displayed.

A14 INDIVIDUAL DISCRIMINATION IN SPERM WHALE CODAS

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Long term social aggregations of animals may lead to the development of behavioural strategies that are based on individualized relationships within groups, potentially leading to the development of mechanisms that allow recognition of individuals. Female and immature sperm whales live in long term stable social units in tropical and temperate waters. Some authors have suggested that within these units menopausal females might have a special role assisting kin, caring for calves and acting as repositories of information that enhances group fitness. Also within social units individuals have preferred associations and avoidances. Differential interaction among unit members allows for an individual discrimination system. Sperm whales rely on the emission of stereotyped series of clicks termed codas for communication. studies have demonstrated the sharing and production at similar

rates of different coda types between individuals which not support the idea of individual distinction by differences in coda repertoire. However, variations within coda type could potentially carry information on animals identity allowing both group and individual level information to be transmitted. This hypothesis was tested using a dataset of codas assigned to individual whales by their inter-pulse intervals from a social unit off Dominica. From the initial 315 codas having between 3 and 10 clicks, classified into 15 types using k-means clustering, only those in three types had enough clicks to be used in the analysis. Using discriminant analysis it was possible to discriminate between individual whales with lower error rates than the ones obtained from a randomly assigning identities to codas. The discrimination performance was not the same for all coda types suggesting differential functionality between coda types. These findings agree with the prediction that preferred associations among sperm whale unit members, which would require the ability to discriminate among individuals, can be transmitted by codas.

A15 KILLER WHALE HUNTING BEHAVIOR AND ACOUSTICS IN THE STRAIT OF GIBRALTAR

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Two groups of killer whales successively visit the Strait of Gibraltar, associated with the reproductive migration of bluefin tuna. The second group, composed of 3 subgroups, has developed a hunting strategy based on taking away tuna being caught by fishermen and being hauled up into the vessels. Interactions between killer whales and fishermen have been described in several parts of the world. Furthermore, the killer whales of the Strait of Gibraltar are regularly seen being chased by pods of resident long-finned pilot whales, sometimes up to 4 times in a day. This study aims at describing these killer whales' hunting technique interacting with the fishermen, as well as at acoustically identifying this group. Research was carried out mainly from platforms of opportunity, but also from some dedicated surveys, during the months of July and August 2004 through 2008. Acoustic recordings were carried out and data was collected on individual identity, group structure, distribution and hunting technique. 47 clear hunting events were recorded. In most cases the killer whales were patrolling around the Moroccan fishing vessels staying between them and the Moroccan coast. Attack would mostly be initiated once the fishermen throw a buoy into the water to mark the position of the tuna, this action seemingly acting as a cue. Once the tuna stolen, the whole

group moves westwards or southwards to share the food. Acoustic activity has been very scarce during all our recording attempts, and solely consisted of echolocation clicks; no whistles were recorded so far. Our interpretation is that these killer whales remain relatively silent to avoid attracting the pilot whales' attention, using only echolocation for hunting/swimming. Their patrolling south of the fishing vessels is probably a measure of protection, in order to have the vessels between them and potential pilot whales swimming in the area.

A16 THE DEPENDENCE OF THE RATE OF BIPHONIC DISCRETE CALLS IN KILLER WHALES (*ORCINUS ORCA*) VOCALIZATIONS ON THE PRESENCE OF MIXED OR NON-MIXED GROUPS

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Killer whales live in stable social pods of closely related animals, but often form mixed groupings of non-related animals when two or more pods travel together. In this study we estimated the rate of biphonic discrete calls in killer whale vocalizations depending on presence of mixed or non-mixed groups, which was established according to photo ID. Research was conducted in Avacha gulf of Pacific ocean off Kamchatka coast where the structure of resident killer whale pods was studied for 8 years of photoID and acoustic research. To compare the rate of biphonic discrete calls we discerned three types of groupings: first type (1) non-mixed groupings (consisting of whales from one pod) while no other pods were present in the area; second type (2) non-mixed groupings (consisting of whales from one pod) while other pods were present in the area; third type (3) mixed groupings consisting of whales from different pods. Mann-Whitney U-test was used to compare the rate of biphonic discrete calls between different types of groupings. We didn't find a significant difference in biphonic discrete calls usage between types of groupings (1) and (2) ($p > 0.05$, Mann-Whitney U-test). Significant differences were found between types (3) and (1), and types (3) and (2) ($p < 0.05$, Mann-Whitney U-test). The percent of biphonic discrete calls was significantly higher in aggregations of type (3) than in type (1) or (2). This result suggests that the biphonic discrete calls are used for inter-pod communication or, alternatively, to maintain intra-pod contact when pod members are spread and mixed with other pods.

A17 CHANGE ACOUSTIC SIGNALING OF BELUGA WHALES (*DELPHINAPTERUS LEUCAS*) DURING ANTHROPOGENOUS INFLUENCE

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Recently, anthropogenous influence on beluga whales increases. We observed of beluga whales, which form summer reproductive congestions at Cape Buluzhy of the Solovetsky Island in the White Sea, Russia. This congestion consists of females with pups, it is extremely vulnerable, therefore with increase anthropogenous influence, this problem has become particularly important. Of special interest is the investigation of the acoustic responses in belugas. The acoustic channel is the main for beluga whale's communication and orientation. The purpose of researches was to reveal change acoustic signaling of belugas during anthropogenous influence. The greatest harassment of belugas is caused by passages of motor boats near or at the place of congestion, therefore these situations were analyzed. The material was collected in August, 2007. From 36 situations of anthropogenous influence, 10 were acoustic analyzed. At the analysis of acoustic data identified proportion of different signal categories: communicative true-tonal signals (high-frequency whistles and whistles) and communicative pulse signals (pulse tones, series of communicative pulses, mechanical and identified not origin signals). Also the common frequency of occurrence of the signal and the frequency of occurrence of all the above signal categories. It was found that during anthropogenous influence the beluga acoustic activity decline, at the same time the frequency of occurrence of communicative true-tonal signals increases, but the frequency of occurrence communicative pulse signals declines. Proportion high-frequency whistles considerably increases: before influence 4.4%, during influence 30.3%, after 2.0%. Though certain type of signal, which function would be the notification about danger, is not found out, we revealed general trend to changes in the acoustic signaling of beluga whales during anthropogenous influence: in the decline of acoustic activity and proportion of high- frequency whistles increased.

A18 PREY CAPTURE BY HARBOR PORPOISES

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The harbor porpoise (*Phocoena phocoena*) is a small toothed whale living mostly in coastal waters. There are large, but unknown, numbers in the inner Danish waters. Four are in captivity at Fjord & Bælt, Kerteminde, Denmark, one of which was born here in 2007. Harbor porpoises use their ultrasonic clicks as biosonar for orientation and detection of prey (mostly smaller pelagic and bottom dwelling fish), and for communication. For studying wild animals, hydrophone arrays

[Villadsgaard et al. J.Exp.Biol. 210 (2007)] and acoustic (time/depth) tags [Akamatsu et al. Deep Sea Research II 54 (2007)] have been used. For studying captive animals, arrays and video techniques [Verfuß et al. J.Exp.Biol. 208 (2005)] as well as miniature acoustic-behavioral tags [Deruiter et al. JASA 123 (2008)] have been used. While searching for prey, harbor porpoises use clicks at long intervals (>50 ms) that progressively decrease when closing on a landmark. The source levels of captive animals reduce by about half for each halving of the distance to the target. After detecting the prey, the click interval first stabilizes at about 50 ms and then becomes progressively shorter while approaching the prey. The sequence ends in a terminal, high repetition rate buzz (>600 clicks/s) just before capturing the prey (a video will be shown). The temporal sequence resembles that of beaked whales and bats [Verfuß et al. submitted].

A19 THE TYPE OF LOW FREQUENCY SIGNALS OF BELUGA WHALES (*DELPHINAPTERUS LEUCAS*) AS SIGNALS WITH INDIVIDUAL RECOGNITION FUNCTION

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The search of signals with individual recognition function is a new and actual objective for investigators of cetaceans. This type of signals can help to understand features of vocal learning of marine mammals and can help in solving the problem of individual recognition in herds of the free-ranging cetaceans. Signature whistles were found and described for bottlenose dolphins (*Tursiops truncatus*) both in captivity and in the wild (Cook et al., 2004, Janik et al., 2006). In 2006 were published preliminary evidence for signature vocalizations among free-ranging narwhals (*Monodon monoceros*) (Shapiro, 2006). However individual recognition signals for beluga whales (*Delphinapterus leucas*), which in the same familia as narwhals, have not been described before. As it was done for narwhals we sorted out low frequency signals (0.5 – 3 kHz) of beluga whales as possible signature vocalization. This choice based on some theoretical conclusions: this type of signals was emitting by separated in water area animals (adults and calves), and there were no group interactions between them. In our investigation we used records of vocalization of free-ranging beluga whales in the Myagostrov region, (Onega Bay), Russia. Based on frequency-duration characteristics cluster analysis were conducted. As the result all signals were divided into significant different 3 clusters. The first cluster is the smallest and signals from that group are found during only first 9 minutes of analyzed record. Last 2 clusters contain 2 types of signals which are found in all time of record in high repetition rate. According to data of videotape with synchronized underwater acoustic animal activity, during recording session in a water area there were stable 3-5 animals in some hundreds meters

away from each other. Under the received data we can interpret described type of low-frequency signals as individual recognitions. But to confirm this assertion we need further investigations.

A20 THE WHISTLE REPERTOIRE OF BELUGA WHALES OF MYAGOSTROV LOCAL STOCK (ONEGA BAY THE WHITE SEA)

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Beluga whales (*Delphinapterus leucas*) produce whistles, narrowband tonal calls, which are generally thought to have a communicative function. This study describes the whistles repertoire of beluga whales belonged to the myagostrov local stock. The data were collected during June-July of 2008 in a sparse reproductive gathering of belugas off Goliy Sosnovetz Island (64°24' N, 35°49' E). Sound recordings were made using the hydrophones anchored 80-100 m offshore. A total of 48 h of records was obtained. Spectrographic analysis was carried out by the Adobe Audition. Beluga sounds were divided into two main physical categories: tonal signals (whistles) and pulsed sounds. Whistles were classified into 24 types. A total of 544 whistles with high signal-to-noise ratio were sampled for acoustic analysis (by Syrinx 2.1). The following parameters were measured: signal duration; the beginning, ending, minimal, and maximal fundamental frequencies; the dominant frequency; the total number of harmonics; the number of the dominant harmonic; and the number of inflection points in the frequency contour. For multicomponent whistles, the number of elements was counted. For combined whistles (i.e. for stable combinations of two signals), interval between the signals was measured. The average whistle duration varies from 0.08 to 1.79 s for different types. The average value of the maximum fundamental frequency varies from 1.5 to 13.1 kHz, the average value of peak frequency is from 0.8 to 11.7 kHz, and the average number of inflection points is from 0 to 18 per signal. The system of whistles is highly graded. However on this background, a number of stereotypic, distinctive whistle types are well distinguished. The main whistle types of myagostrovskiy belugas are shared with well-studied solovetskiy belugas, but some types are unique.

A21 THE VOCAL REPERTOIRE OF COMMON DOLPHINS (*DELPHINUS SP.*) IN THE HAURAKI GULF NEW ZEALAND

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Quantifying the vocal repertoire of a species is critical for subsequent analysis of signal functionality, geographical variation and social relevance. While vocal repertoires have been documented for several fauna, detailed descriptions for some cetaceans remain lacking. For the first time, we present the vocalisations of free-ranging common dolphins (genus *Delphinus*) recorded in New Zealand waters. Data presented here represent preliminary results of a doctorate study examining the vocal repertoire of common dolphins in the Hauraki Gulf, Auckland. Common dolphins in this region occur year-round and are subject to high levels of vessel traffic. Vocalisations of focal dolphin groups were made between February and August 2008 using a hydrophone PZ-1A and Sony minidisk. A total of 70 minutes of recordings were collected involving more than 200 whistles. Vocalisations were then analysed using Raven Pro 3.0 and compared with published data available for common dolphins examined in UK waters. Seven contours previously reported for UK common dolphins were identified in the New Zealand data set. Additional contours apparently specific to New Zealand *Delphinus* were also identified. Our initial findings offer valuable insight into both the whistle characteristics and vocal repertoire of the Hauraki Gulf common dolphin population.

A22 GEOGRAPHIC VARIATION OF WHISTLES CHARACTERISTICS OF STRIPED DOLPHIN (*STENELLA COERULEOALBA*) BETWEEN DIFFERENT AREAS OF THE MEDITERRANEAN SEA

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
The striped dolphin is a cosmopolitan species distributed world-wide, it is generally abundant, but some populations face significant challenges, as in the Mediterranean Sea. Mediterranean population is considered a distinct conservation unit by IUCN experts. Morphological and genetic studies strongly suggest that the Mediterranean and Eastern North Atlantic populations are isolated from each other, with little or no gene flow across the Straits of Gibraltar. Characteristic of vocal behaviour have been often used to distinguish populations of many cetacean species. This work describes the geographic variability of striped dolphin “whistles” vocalisation in the Mediterranean Sea, that allows to identify distinct conservation units inside the basin. Acoustic data were collected from 1994 to 2004 in different areas of the Mediterranean Sea, using multiple platforms. Thirty independent sightings were made, approximately 19 hours of recordings

were inspected and 1190 whistles were extracted and analysed. The results of this project show that the whistles emitted by the animals living in distinct locations are different. DFA analysis allows correctly classifying the animals of the Eastern and Western part of the basin in the 70% of the case. More, some characteristics of the whistles show a geographical gradual gradient. Different causal explanations of geographic variation will be discussed: ecologic, genetic, social and historical factors.

A23 QUANTITATIVE ANALYSIS OF KILLER WHALE CALLS: COMPARISON OF DIFFERENT METHODS

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A widespread problem in the study of animal vocal repertoires is the classification of their sounds into discrete categories. Two basic approaches are known in the sound classification: qualitative, or perceptual, and quantitative analysis, which includes comparison either of discrete acoustic parameters of sounds or their frequency contours. The last method is traditional for the classification of whistles, found in many dolphin species. Unlike most of them, the majority of sounds produced by killer whales are pulsed sounds, which are much more complex signals than whistles. Nevertheless, a number of researches use the technique of contour comparison for the classification of killer whale stereotyped sounds (calls). The aim of our research is to compare the results of killer whale calls classification obtained by using the above mentioned quantitative methods. Total 809 calls recorded from killer whales in Kamchatka, Commander and Kuril Islands were chosen for the analysis. According to the perceptual classification, these calls belong to 8 discrete types which are common to whales from these regions. For each call 12 discrete acoustic parameters were measured and 20 points of its frequency contour were extracted. We performed discriminant and cluster analyses to see if similar calls are classified in the same type or aggregated in one cluster. When classifying calls by discrete acoustic parameters we have come to a perfect agreement with the preliminary perceptual classification. In case of frequency contours such agreement is observed only in those types of calls, which are characterized by a relatively simple structure, while classification of complex calls containing several components failed to agree with the perceptual analysis. These results show that classification of pulsed sounds presents a much more difficult problem than that of whistles and certain care should be taken when using frequency contours for the comparison of killer whale calls.

A24 WHISTLES ANALYSIS AND COMPARISON OF TWO DELPHINIDAE SYMPATRIC SPECIES (*DELPHINUS DELPHIS* AND *STENELLA COERULEOALBA*) IN THE AREA OF CUMA CANYON (ISLAND OF ISCHIA ITALY)

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Sympatric occurrence of two related species is expected to lead to diverging or converging shifts in signal characteristics of one or both species. This study investigated acoustic similarities and variations between common (*Delphinus delphis*) and striped (*Stenella coeruleoalba*) dolphin around Ischia Island, a key feeding and breeding site for other cetacean species too, including *Grampus griseus*, *Physeter macrocephalus* and *Balaenoptera physalus*. We compared the species' whistle repertoires collected between 2004 and 2006: a) characterising the vocal parameters of frequency within a selected range (3-22000 Hz), b) measuring whistles' duration and c) examining the aforementioned acoustic parameters within two behavioural states (mating and feeding). A total number of 1369 minutes (471 min. in presence of common dolphins and 898 of striped dolphins), collected actively in 217 surveys using deployed hydrophones, was analysed by the means of Whistle Detector software. The investigation on over 27.000 whistles within the same frequency range revealed significant variations between the two species, with a strong behavioural relationship. The divergent pattern between sympatric populations would be expected to significantly reduce heterospecific mating in sympatry as well as optimize communication during feeding activities. Moreover, the analysis performed on whistles' duration showed the presence of highly stable values in each species, underlying major differences among common and striped dolphin. We speculated that this last finding could be valuably used for the acoustic discrimination and identification of the two species. Further studies appear to be necessary on other Mediterranean groups to support the congruence and significance of this hypothesis.

A25 LOW-FREQUENCY SOUNDS OF BELUGAS (*DELPHINAPTERUS LEUCAS*): THE CLASSIFICATION AND POSSIBLE FUNCTIONAL SIGNIFICANCE

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In 2008, the complex ethologic-acoustic research of belugas continued with local herd throughout the region of Roganka - Myagostrov Islands in the Onezhsky Gulf (White Sea). The important part of the investigation was the registration of the underwater acoustic activity of the animals. The fundamental method of collecting data was video recording. The Panasonic NV-GS400 digital camera documented the behavior of the belugas with a synchronic record of their underwater sounds (at a frequency range up to 24 kHz). In addition, parallel sound recording linked to the computer, provides valuable corresponding data in a broadened range up to 48 kHz. With the analysis of collected data, it is possible as before, to divide the sounds of belugas into three principal categories: series of pulses, tonal signals such as whistles and squeaks, and pulse tones. The latter category is the most frequent, representing up to 60% of the whole repertoire. The structure of these sounds is also the most complicated. Low-frequency sounds recorded in the range to 2,5 - 3 kHz are of special interest. These sounds appear to be the most suitable for understanding the relationship between the behavior and underwater acoustic activity of belugas. They can easily be formalized for further analysis. Some of them are low-frequency components of complicated wide-range sounds, which can be interpreted as analogs of tonal sounds. Besides that, this diapason is full of independent sounds. These are divided into "standard" sounds that contain a very simple, or rhythmical form of contour, and "variable" sounds, which have a contour of change within wide limits. The "standard" sounds are universal and non-specific. They are recorded during many different behavioral situations. The functional significance of sounds may include: 1) a specific "strict command" for some of group actions, 2) "test - signals," and 3) identification sounds.

A26 MID-ATLANTIC SURVEYS FOR BEAKED WHALES: THE POTENTIAL FOR ACOUSTIC PREDICTION OF CRITICAL HABITATS

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The beaked whales are one of the least known families of cetaceans and yet there is compelling evidence they are vulnerable to intense anthropogenic sounds. Mitigation of the impacts of these sounds is possible by altering the nature or location of potentially harmful activities by, 1) active monitoring and response to positive detections and/or, 2) predicting important habitats and prohibiting harmful activity in these areas by, for example, the designation of Marine Protected Areas. Predicting important habitats is difficult as information on beaked whale distribution is sparse. Higher densities have been reported in continental

slope waters and around offshore volcanic islands and many recent strandings have been in areas with abrupt bathymetry. A better understanding of the preferred habitats will support measures to protect them. In 2008, acoustic/visual surveys for beaked whales were conducted in the North Atlantic from RV Song of the Whale using a towed hydrophone array and visual observers. Investigations were carried out in locations where beaked whales have been regularly sighted around the Azores, Madeira and Canary Islands. In addition, surveys were conducted over Northeast Atlantic seamounts. Approximately 25,000 km of survey effort were completed between May and November 2008 of which 455 hours (12,000 km) were offshore. Although no beaked whales were seen offshore, four species were encountered in coastal areas. However, beaked whales were detected acoustically using a click classifier in both coastal and offshore regions; analysis of acoustic encounter rates are presented and compared with other areas. Offshore detections of beaked whale are unusual and of intrinsic interest. Shallow seamounts are strong candidates as potential beaked whale habitats as they may concentrate prey and can be within the diving capabilities of foraging whales. These surveys also demonstrate that due to their inconspicuousness, acoustic detection may become an important tool for locating beaked whales.

A27 HISTOLOGY OF THE DOLPHIN COCHLEAR NUCLEUS

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Despite the outstanding auditory capabilities of dolphins, only a few papers concerning the cytological architecture of the medullary auditory nuclei in these animals have been published so far. A comprehensive characterization of the various neuron populations along the auditory pathway including their homologization with corresponding neuron populations in other orders of mammals is still lacking. To resolve this lack of information we investigated the cochlear nuclei (CN) of five brains of common (*Delphinus delphis*) and La Plata (*Pontoporia blainvillei*) dolphins using routine microslide series. In general, the CN in dolphins comprises the same set of subnuclei as in other mammals. However, the volume ratio of the dorsal cochlear nucleus (DCN) in comparison to the ventral cochlear nucleus (VCN) of dolphins represents a minimum among mammals. Since in cats the DCN is necessary for reflexive orientation of the head towards a sound source, the massive restrictions in head moveability in dolphins and the absence of their outer ears may be correlated with the reduction of the DCN. The same set of main neuron types were found in the dolphin CN as in other mammals, including octopus and multipolar cells. Since the latter neuron populations are thought to be involved in the recognition of complex sounds, including speech, we speculate that,

in dolphins, they may be involved in the processing of their communication signals. Comparison of our two delphinid species revealed that large spherical cells (LSC) are present in *Pontoporia* but absent in *Delphinus*. These neurons are known to be engaged in the processing of low-frequency sounds in terrestrial mammals. Accordingly, in *Delphinus*, the lack of LSC seems to be correlated with a shift of its audiogram to the high-frequency range. However, the existence of LSC in the VCN of *Pontoporia* suggests that this species uses lower frequencies.

BEHAVIOUR

B01 SEA BIRD ASSOCIATED FORAGING IN RORQUALS: DOES ENVIRONMENT DICTATE DIVERSITY?

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Many studies have investigated the associations between seabirds and rorqual whales. However, in comparison to cetaceans, seabird diversity can vary significantly across marine habitats. The aim of the investigation presented was to determine if different species groups of birds, observed during rorqual whale encounters, varied in composition across the environment of the study area. Data regarding seabird species diversity, coordinates and environmental parameters associated with rorqual (minke *Balaenoptera acutorostrata*, humpback *Megaptera novaeangliae*, and fin whale *Balaenoptera physalus*) occurrence were collected from an opportunistic platform during the summer period (July- August) of 2007-2008, Atlantic Coast, Nova Scotia. Results of analysis between environmental parameters (depth, slope, sea surface temperature SST and chlorophyll-a concentration) and seabird species (auks, Larus gulls, shearwaters, gannets, cormorants and no birds) observed in association with rorquals encountered showed significant differences for all parameters (Kruskal-Wallis Test: depth: $H=35.17$ $p < 0.001$; slope: $H=32.97$ $p < 0.001$; SST: $H=39.49$ $p < 0.001$; chlorophyll-a: $H=29.04$ $p < 0.001$). The results indicate major differences may occur between habitat preferences of seabird functional groups at depth, with cormorants and gannets occurring in shallowest waters, auks in medium depth waters, gulls and shearwaters in deepest waters. Apart from depth, different functional groups occur in habitats with very similar features: shallow slopes, low SST and high chlorophyll-a concentrations (features associated with high productivity). Rorquals seen with no birds association occurred in deepest areas with steepest slopes, highest SST and low chlorophyll-a concentrations. It is

interpreted from the study that the species and functional diversity of birds encountered with rorqual whales was highly influenced by co-occurring environmental parameters. These could be used in turn to provide suitable indicators of prey species diversity, or processes leading to optimal aggregations of prey, for foraging bird and rorqual species.

B02 SURFACE FEEDING STRATEGIES OF BRYDE'S WHALES DURING MULTI-SPECIES AGGREGATIONS IN THE HAURAKI GULF, NEW ZEALAND

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Surface feeding strategies of Bryde's whales (*Balaenoptera brydei*) in the Hauraki Gulf were studied between March 2003 and February 2006. Whales were observed surface feeding on 128 of the 333 encounters, primarily during commercial whale-watch trips aboard a 20 meter diesel powered catamaran. Whales were assumed to be surface feeding on krill during two of these encounters and presumably on schooling fish during 126 encounters when surface feeding was observed in association with common dolphins (*Delphinus* sp.) and various diving sea bird species (e.g., *Morus serrator*). Photographs of dorsal fins taken for individual identification enabled surface feeding behaviours of individuals to be recognised (n = 32). The surface lunging strategies were identified for only six of these whales; three individuals used only lateral lunges, one individual used only vertical lunges and two individuals used both lateral and vertical lunges. The five whales observed using lateral lunges exhibited lateralised behaviour; there was a right-side down preference in 84 % of the lateral lunges (21 of 25 lunges). Whales were observed surface feeding year-round throughout the Hauraki Gulf but feeding seemed to peak during autumn when feeding was observed during 46 % of encounters. Aggregation sizes of whales were significantly larger during feeding compared to non-feeding encounters. The Hauraki Gulf appears to be an important feeding area for Bryde's whales. Differences in prey selection of Bryde's whales are reported between the Hauraki Gulf and other research in the South Pacific. However, preliminary analyses of DNA from faeces suggest that these differences are due in part to a bias towards sighting and approaching whales involved in surface feeding.

B03 *This poster was cancelled*

B04 IMPACT OF BOAT TRAFFIC ON BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) IN GALICIA

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Of 20 cetacean species recorded in Galicia (NW Spain), both harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*) are on Annex II of the EU Habitats Directive. Galicia has a large number of ports, reflecting the high socioeconomic importance of fisheries, and there is a growing number of recreational vessels. To evaluate the possible impact of the boat traffic on Galician cetaceans, a study was carried out in two ports, Sanxenxo and Portonovo. These ports are characterized by a high intensity of boat traffic and the regular presence of dolphins, especially bottlenose dolphins, throughout the year. During 4 weeks in 2007 (periods of low, medium and high tourist activity) between 2 and 4 observers recorded data on environmental conditions, boats, cetacean presence, and interactions between cetaceans and boats. Observations totalled 168 hours. An average of 165.2 boats per day was recorded. There were 22 sightings of bottlenose dolphins, which lasted in total for around 14 hours (8.3% of the observation period). On 35% of occasions when boats were seen to pass close to dolphins, a reaction was seen. The proportion of times that a reaction occurred was highest for commercial passenger vessels (66.6%), followed by recreational vessels (51%), inflatable boats (40%). Lower reaction rates were seen for windsurfers and sailing boats (33.3%) and fishing vessels (5%). Bottlenose dolphins travelled through the study area without interactions with boats during 64% of the sightings. Reactions were seen during 36% of sightings and negative reactions were seen during 25% of sightings. Thus the majority of reactions to boats by bottlenose dolphins were negative. These involved changes in group behaviour, changes in direction of travel or aggressive reactions. The results of this study will contribute to the scientific background necessary for a management plan for conservation of the species in Galicia.

B05 SOME OBSERVATIONS OF MINKE WHALE (*BALENOPTERA ACUTOROSTRATA*) AND WHITE-BEAKED DOLPHIN (*LAGENORHYNCHUS ALBIROSTRIS*) ASSOCIATION WITH SEABIRDS IN FAXAFLÓI BAY, ICELAND

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Over the past two years Minke whales (MW) and white-beaked dolphins (WBDs) occurring along the coast of Faxaflói Bay (Iceland) during summer months have been recorded behaving in the presence of seabirds during daily whale-watching tours. The presence (number, species) of any birds in the vicinity (≤ 100 m) of the whales was noted, dividing up birds into auks (razorbills, guillemots, puffins), gulls (kittiwakes, Laurus species), fulmars, gannet, arctic terns and skua species. Data collection has also involved recording sightings, water temperature and fish presence (Furuno). Bird data were analysed to determine which bird species associate with different cetaceans (MW,WBD) and a non-parametric test (χ^2) was used to assess differences in bird distribution in relation to presence of cetaceans (MW or WBD). Birds were present in the vicinity of the whale/dolphin during 62 tours, 134 sightings (\bar{x} , duration: May=3hr, June=2.80 hr, July=2.80 hr and August=2,70 hr). The number of birds per whale/dolphin sighting by month shows that sightings during July and August have the highest percentage of birds (May=361 birds/4sighting (3 tours); June=87 birds/10sighting (6 tours); July=538 birds/78sighting (35 tours); August=436 birds/42sighting (18 tours)). The relative proportion of each bird species by month shows that WBDs associate mainly with Larus gulls (36%, $\chi^2=0.051$, $p>0.05$), kittiwakes (34%, $\chi^2=2.442$, $p>0.05$) and gannets (14%, $\chi^2=0.097$, $p>0.05$); MWs instead with Larus gulls (33% $\chi^2=0.051$, $p>0.05$), kittiwakes (40%, $\chi^2=2.442$, $p>0.05$) and puffins (15%, $\chi^2=6.129$, $p<0.05$). The χ^2 test demonstrates only a significant difference in bird distribution in relation to presence of cetaceans between MWs and puffins. In conclusion, the distribution of MWs and WBDs along the Southwestern coast of Iceland associates with many different bird species. More dedicated studies of association between cetaceans and birds, in relation to fish abundance and distribution, should be conducted in future to provide valuable insights into this local ecosystem.

B06 DOES EXIST THE “OPERATIONAL INTERACTION” BETWEEN PONTOPORIA BLAINVILLEI AND SOTALIA GUIANENSIS WITH THE ARTISANAL FISHERIES IN THE BABITONGA BAY?

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Babitonga Bay is located in the northern coast of Santa Catarina, Brazil, and represents an important haunt for sympatric populations of *Sotalia guianensis* and *Pontoporia blainvillei*. Preceding studies showed a by-catch of these dolphins in the area. The incidental capture in fishing nets is considered a threat for *S. guianensis* populations and for *P. blainvillei*, that is the most commonly caught cetacean in Brazilian coastal gillnet fisheries. The main objective of this study is analysing the phenomenon of the “operational interaction” between artisanal fisheries and *Pontoporia* and *Sotalia* species in the Babitonga Bay. The experiment was conducted using a drifting surfacing net (length 112 m., size 10). For each haul, data concerning the catch (abundance of fish, fished species) and net damages were collected. Moreover, the number of dolphins and behavioral categories of groups - which were observed at different distances from the net (500, 200, 100 meters) using a Scan Sampling Method at 3 minutes intervals - were collected. 44 hauls were made and the data analysis shows that there is no variation of the catch in function of the distance of dolphins species from the net (U-test Mann-Whitney $p > 0,05$). No by-catch event nor damages were recorded in the net. The *Pontoporia* species was observed (in to the 200 m area) in the 14% of hauls (mean of 7.13 ± 1.2 animals) and the *Sotalia* species in the 54% (mean of 6 ± 1.8 animals). Any feeding strategy can be related to fishing operations: in fact, the dolphins did not approach the net during its shoot/hoist aboard. We conclude that the phenomenon observed is not related to "competitive" events but it is the result of the “Habitat Use” as well as the different feeding strategies done by dolphins in order to captures fishes in the Bay.

B07 INTERSPECIES INTERACTION BETWEEN LONG-FINNED PILOT WHALES AND KILLER WHALES IN THE STRAIT OF GIBRALTAR

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Long finned pilot whales and killer whales are present almost during the summer in the waters of the Strait of Gibraltar, and are often seen interacting together in the Strait, the Pilot whales chasing the killer whales from their feeding grounds (Blue fin tuna). A total of 4926 kilometres of effort were made. During this transects 332 and 54 groups of pilot whales and killer whales were made respectively. The strength of the spatial relationships between pairs of species was represented using 2 indices of the frequency of co-occurrence. To illustrate the association patterns of the species, average-linkage cluster analyses were constructed, showing that the two species only are present in 23% of the same area. Skin

samples of the two species were collected using a crossbow in the same month (July) to avoid skin turnovers. Isotopic relationship of Carbon and Nitrogen were then analysed, giving levels of $\delta^{15}\text{N}$: 11.29 ± 0.40 and $\delta^{13}\text{C}$: -16.37 ± 0.49 for pilot whales and $\delta^{15}\text{N}$: 12.48 ± 0.21 and $\delta^{13}\text{C}$: -16.78 ± 0.43 for killer whales. The levels were significantly different between them (Test U-Mann-Whitney for C and N respectively $p=0.00006$ and $p=0.0281$). These results show that those two species are present together in the Strait of Gibraltar, but avoid themselves, and no explanation could be given using the diet. One of the possible reasons could be that the pilot whales could be very territorial, and that two species with the same type of social structure could represent a conflict from a territorial point of view. While the true nature of the interaction is difficult to interpret, this suggests that long-finned pilot whales can show aggression towards, or at least threaten, killer whale. Pilot whales have also been observed chasing common and striped dolphins in the Strait, however so far no physical interactions have been

B08 WHAT DRIVES FORAGING STRATEGIES IN NEW ZEALAND COMMON DOLPHINS (*DELPHINUS* SP.)?

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Few studies have examined the foraging ecology of free-ranging delphinids. Recent research examining the behaviour of New Zealand common dolphins (*Delphinus* sp.) identified the use of both individual and cooperative foraging strategies. Herein, we compare the foraging behaviour of common dolphins from the Hauraki Gulf and the Bay of Plenty, two adjacent regions on the east coast of North Island New Zealand. High-speed pursuit and carouselling were the most predominant individual and cooperative strategies, respectively. Kerplunking, considered as a cooperative strategy in the Bay of Plenty was observed extensively more in the Hauraki Gulf, where in contrast it was performed by individuals only. In the Hauraki Gulf, common dolphins spent almost double the amount of time feeding than in the Bay of Plenty. At both sites, Bryde's whales (*Balaenoptera brydei*) and Australasian gannets (*Morus serrator*) were observed to feed in association with common dolphins. However, considerably more associated feeding was observed in Hauraki Gulf waters. Observed differences in foraging strategies likely reflect the shallow coastal versus open oceanic waters of the Hauraki Gulf and Bay of Plenty regions, respectively. The elevated use of cooperative feeding strategies recorded in the Bay of Plenty may explain the larger group sizes observed in this region compared with the Hauraki Gulf.

B09 KILLER WHALE PREDATION ON NORTHERN FUR SEALS NEAR MEDNIY I., COMMANDER ISLANDS

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In recent years, mammal-eating killer whales have attracted a particular interest. It is supposed that killer whales, as an apex predator of the marine trophic pyramid, may significantly influence the numbers of marine mammals. Observations on mammal-eating killer whales were held on the southern end of Medniy Island, Commander I. during the summer periods of 2000-2007 where are located the northern fur seals and Steller sea lions rookery. For the years 2000 and 2003-2006, first encounters took place from June 14 until July 12. In 2007 the first encounters took place May 30 and second time was encountered from July 15 until August 7. Killer whales were observed hunting on northern fur seals 1 day in 2000, 1 day in 2003, 3 days in 2004, 9 days in 2005, and 10 days in 2006. In 2007 we were observed 4 hunting days, but all summer was stormy and foggy with poor observed conditions. Only one attack of killer whales on fur seals was recorded in 2000, but in 2006, 16 attacks were observed. 8 predation cases were observed in 2007. The number of attacks varied by day and on average 2.0 attacks on adults and subadults males fur seals were observed per day. The majority of the attacks on fur seals were observed near Yuzhny Cape on the border of the kelp. In 2000, two adult males killer whales were observed hunting and between 4-7 individuals in 2003-07. In 2003-2007 was registered one group which includes same individuals. The number of attacks near the southern end of Medniy Island has noticeably increased over the last 6 years. Before 2000 no observed attacks killer whales on fur seals throughout all historical period of observations on Medniy I.

B10 SEASONAL OCCURRENCE AND POTENTIAL MOVEMENT OF FEEDING AREA OF BLUE WHALES AROUND ICELAND – PRELIMINARY STUDIES

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Blue Whales (*Balaenoptera musculus*) are presumably feeding around Iceland in the months June, July and August. The blue whales were regularly observed from whale watching vessels starting from Ólafsvík (64°52'60"N, 23°43'0"W) on the Snæfellsness Peninsula in West Iceland until 2004. They appeared in Skjálfandi Bay in the northeastern part of Iceland in the summer 2004 sighted from the whale watching boats starting from Húsavík (65°57'18"N, 017°25'31"W). Blue whales have been observed in this bay every year since except 2005. This study aims to figure out why the animals moved north. The temperature has increased 0.5°C in the west of Iceland from 2000 - 2004 and the temperature difference between west and north of Iceland is 2-3°C. In Skjálfandi Bay there have been 76 observations of blue whales in past 5 years. Of these observations we have been able to use 18 sightings for analyses. Sightings of solitary whales were most common (77.7 %), however, a few couples (16.6 %) were seen and the largest groups of blue whales were 3 individuals together (5.5 %) even though the highest number of whales in the area was 8 blue whales at one time. This corresponds very well with previous blue whale observations. The mean dive time in the area was 3 min. 47 Sec. (n=61) with a dive interval of 3.3 (n=51) suggesting shallow feeding. The water depth is up to 200 m where the blue whales have been sighted in Skjálfandi Bay. Plankton samples were taken when possible as well as pictures of the fish finder on board the boat. The fish finder often showed plenty of animals in 20-30 meters depth where the blue whales were observed. Preliminary results of the plankton analyses (n=7) showed some Euphausiacea, however, the main contents were various copepod species and invertebrate larvae.

B11 THE EFFECT OF PILE DRIVING ACTIVITIES ON THE DISTRIBUTION PATTERNS OF HARBOUR PORPOISES IN THE NORTH SEA

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A lot of European countries promote the extension of renewable energies in order to protect the atmosphere from harmful emissions. To reach this aim the installation of offshore wind farms is supposed to play a major role. Meanwhile several projects in North Sea waters have already been realised. While on the one hand this is a welcome effort to reduce the effects of climate change, the installation of offshore wind farms at a large scale has raised concerns about possible impacts on the marine environment. Construction of offshore wind farms goes along with considerable noise emissions during pile driving, which might negatively affect marine mammals. Until today little is known about the extent of these effects. We investigated the influences of pile driving on the distribution pattern of harbour porpoises, the most common cetacean species in the North Sea, with the use of aerial surveys in combination with stationary passive acoustic monitoring devices (PODs). With more than 7 ind/km² highest known densities of

harbour porpoises were observed by aerial surveys in a 1200 km² wide study area west of Sylt. The same method revealed that during pile driving porpoise density declined by about 75 % in the study area covering a distance of up to 20 km from the noise source. By using PODs, a higher temporal resolution could be achieved and times of pile driving activities were connected with presence or absence of porpoises in different distances to the noise source. Thereby we attempt to identify the approximate impact zone and time period over which this negative effect is apparent.

B12 DIFFERENCE IN ECHOLOCATION USE BY TRANSIENT AND RESIDENT KILLER WHALES

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It is known that resident and transient killer whales have difference in sonar use, transients often use single impulses and also their echolocation trains are irregular. But it is nothing known about dominant frequency of their impulses and about other parameters of their echolocation trains. We think that this information is important to understand their strategy of the sonar use. The purpose of our work was to understand how transient and resident killer whales use echolocation during feeding activity. Our data was collected in summer 2006-2008 in Kamchatka Peninsula. Underwater sound recording was conducted using a Sony TCD-D100 DAT and Zoom H4 Handy Recorder with a mono-hydrophones (Offshore Acoustics, frequency range 10 Hz-40 kHz and frequency range 0.006 to 203 kHz). Recordings were made with a sampling frequency 48 and 96 kHz. Spectrographic analysis was carried out by Cool Edit Pro 1.2 and Avisoft SASlab Pro. We measured: number of clicks in trains, repetition rate, length of the train, interclick intervals and the dominant frequency of clicks (DF). These parameters of transients echolocation shows how they mask themselves. When they detect their prey they use mean DF of 27 kHz and 33% of clicks are over 30 kHz, their trains are very short (mean 1,8 s). When transients eat their prey they produce long trains (mean 8 s) with mean DF of 14,5 kHz. When residents feed on salmon they use mean DF of 17 kHz, but when they feed on atka mackerel the mean DF is 21 kHz. These meanings of DF can be related with the size of the prey, but in the case of transients the audiogram of the prey can be the reason of such high frequencies during detecting activity.

B13 COMMUNICATIVE MECHANISMS FOR MAINTENANCE OF THE COASTAL COLONIES STRUCTURE OF EARLESS SEALS (PHOCIDAE)

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During the hauling out period, true seals retain high sociality. In limited haulout area, there is high competition between seals for individual territory. The structure of shore haulouts of seals is maintained by optic, olfactory, and acoustic communicative signals. Approaching the coast, the seals strive to detect the haulout signals – characteristic outlines of the shore, sounds, odors, the image of bedding-out conspecifics. The primary stimulus for entry onto land is imprinted image of the relief of shores. The olfactory signals are of substantial importance in orientation on the substrate surface, and also in direct and indirect communication. Dominant stimulus in the identification of the haulout area is the substrate odor. As it gets to the shore the animal first sniffs the ground. The first contact with the hauling out conspecific is olfactory in addition to visual. In conflict situations inside the haulout site competition include stereotypic visual displays prior to or excluding a scuffle. Audio signals of true seals have of leading role to play in competitive relations on coastal haulouts. In combination with visual displays, they accompany all intra-group interaction. Consider the sounds of *Pusa caspica*. An approach of an intruder causes a threatening response by the nearest resident. It assumes a threatening posture and utters a threat trill – a harmonic signal with a fundamental frequency of 500 Hz. Its duration is 0.6-3.9 seconds, the frequency of amplitude modulation being 40-70 Hz. A more intensive – strained signal is uttered with an open mouth, a more quiet one, with a closed mouth. When resident has a low rank in the hierarchy, its response contains threat in combination with defensive behavior (frustration). The residents utter a low harsh call fear and threatening. Its fundamental frequency is 100-200 Hz. The frequency of amplitude modulation is 70 Hz. The duration is 0.5-1 seconds.

B14 SOME CHANGES IN SPATIAL STRUCTURE OF A ROOKERY OF STELLER SEA LION (*EUMETOPIAS JUBATUS*) ON TULENY ISLAND, 2006-2007

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Breeding rookery of steller sea lion (*Eumetopias jubatus*, Schreber, 1776) on Tuleny island is a young, increasing and slightly vulnerable community. It was formed in 1970-80s on the harem rookery of northern fur seals (*Callorhinus ursinus*). The population of northern fur seals increases in number now. It's out of the question, that annual harvest of northern fur seals on Tuleny island affects steller sea lions. In the current work we studied the influence of humans and northern fur seals upon spatial structure of the haulout steller sea lion. Our investigations have showed that human activity gives rise to short-term changes in spatial structure. Number of steller sea lions on the rookery rapidly restores after cessation of influence. Intriguingly, the anxiety caused by invading of northern fur seal, can lead to deep changes in spatial structure of the rookery and shift of harems from traditional rookeries. It's possible for steller sea lions not to return to the breeding rookeries or reduce time of staying on natal rookery. So northern fur seals presence and disposition on the seaboard may be crucial for steller sea lions breeding rookeries disposition.

B15 DIVING BEHAVIOUR OF HARBOUR SEAL (*PHOCA VITULINA*) IN KATTEGAT, DENMARK

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The aims of the study were to describe diving behaviour and locate potential feeding areas of harbour seals in Kattegat. We hypothesised that harbour seals are individual feeders with separate feeding areas. The study was conducted in April-May 2007 on Anholt where four harbour seals (three males, one female) were equipped with TDRs and satellite transmitters. The TDRs recorded dive data for 10h, 14, 20 and 21 days respectively. The average dive depth differed between individuals from 8.9 to 19.2 m with a maximum dive depth of 60 m. There were no trends for any individual in changes of dive parameters (number, depth and duration) and haul-out time through the study period. A diurnal dive pattern was found for all dive parameters for each individual with low number but long and deep dives during midday and more but shallower dives during the night, probably due to vertical movement of the prey. The haul-out time and duration was strongly influenced by human disturbance at the haul-out site where almost all daily disturbances caused the seals to flee into the water and not returning to land until the evening. Harbour seals from Anholt feed within the whole Kattegat but have individually preferred feeding areas. All individuals showed high site fidelity, coming back to Anholt after each feeding trip. There were large individual differences between the four seals in duration and depth of feeding trips and in dive parameters and profiles which could result from diet preferences, sex differences, physical parameters of Kattegat or/and subdivision of feeding areas

between individuals. This study gives the first insights into the feeding behaviour and important feeding places for harbour seals in the Kattegat. The information will be valuable during planning of the worlds largest offshore wind farm in Kattegat.

B16 ASSESSING ASSOCIATION PATTERN COULD COMPLETE PERSONALITY SURVEYS ON BOTTLENOSE DOLPHINS *TURSIOPS TRUNCATUS* AND HELP IN MAINTAINING GOOD WELFARE AND WELLBEING IN A GROUP

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Bottlenose dolphins (*Tursiops truncatus* Montagu) are social animals which live in a fission fusion system, characterized by more or less frequent changes in group membership. To assess association patterns between seven individuals of a captive group of Park Asterix (France), we investigated the general behaviour of each dolphin and then compared the average and the total duration of each association dyad. Furthermore, we calculated the Half Weight Index to highlight preferred associations. Dolphins' behaviours were recorded through an underwater viewing window according to ad libitum sampling protocol (Altmann, 1974) and analyzed independently by two raters. The sociograms obtained showed three main associations depending on the type of behaviour. The frequency of associations (via the Half Weight Index) showed that dolphins don't associate randomly and provided the same results : the preferred associations are a mother and calf's dyad, a dyad involving two old males and a dyad of two juvenile females. This study completes the personalities found by Talotta *et al.* (submitted) for each dolphin and showed that the two members of the same preferred pair association had the same personality. Finally, our study provides an efficient tool to assess dolphin's behavioural and association patterns in captive groups. Despite captivity, each individual expresses its' own behaviour and has a specific rank in the social network, which is an indicator of the wellbeing of the group. Inversely, this study has several applications in the management of captive dolphins: the standardisation of the preferred associations and behavioural patterns is useful to maintain this stability and to detect any changes which can be an indicator or source of sickness.

B17 COMPARATIVE APPROACH AND ANALYSIS OF SHIFTS IN BEHAVIOUR PATTERNS IN BOTTLENOSE DOLPHIN *TURSIOPS TRUNCATUS* FROM THE ALBORAN AND ADRIATIC SEAS

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In this study we aim at comparing some shifts in the behavioural budget of two populations of bottlenose dolphin *Tursiops truncatus* in the Alboran Sea and the Adriatic Sea. Both populations share the common “challenge” to overcome the impact of humane activities over their habitats which have increased, to a great extent, over the past years. The main threats common for the whole Mediterranean basin are chemical contamination of the water, reduction in prey availability, accidental bycatch in fishing gear and acoustic pollution. Recent studies have shown that bottlenose dolphins from the Adriatic Sea have a strong impact by the presence of boats and the noise caused by them. However, this does not seem to affect in the same magnitude the Alboran Sea bottlenose dolphin population despite the high levels of maritime traffic. Therefore, we are investigating if there have occurred significant shifts in the behavioural budget which can be due to these human impacts and if there is some “general rule” followed by the two populations. For comparisons between the two populations, we use four main behavioural states: feeding, travelling, socializing and milling; two periods of time: years 1994-1996 and 2004-2007; and two levels: inter- and intra- population. The results show that there are prominent shifts in the activities of the Alboran population, which can be attributed to more flexibility and greater adaptability through redistribution of the energetic costs due to the occurred changes in the habitat. On the other hand, the Adriatic population shows changes in the travelling rate, but to lesser extent. This may be related to the increasing rate of seasonal and diurnal displacement demonstrated in other studies which are assumed as a possible effect of the intensive boat traffic.

B18 THE NURSING OF THE INFANTS OF THE WHITE SEA BELUGA (*DELPHINAPTERUS LEUCAS*) IN THE NATURE

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Studies of the cetacean behaviour during the lactation period had been conducted mainly on the captivity. We managed to follow the process of the nursing of the infant white whales using underwater videocamera. The researches were conducted at the belugas reproductive gathering off the Cape Beluzhy, Solovetsky Island, White Sea, in the July 1997, 2000-2002, 2006. We had constructed and successfully applied a remote-controlled videocamera. It was installed at the

bottom at the depth of 4 meters at the place of the constant conglomeration of the belugas, and allowed to watch after the animals without disturbing them and by any means affecting their behaviour. Altogether there were analyzed 31 videocassettes, each of them 60 minutes long. Close contact of the newborn rostrum with the mother nipples we regarded as its nutrition; there were 50 cases registered. During the nutrition the mother turns on her side slightly, the infant is perpendicular or at the angle of 45° to its belly. Only in 4 cases the mother had a position with its belly up, and the infant had its nutrition in the position above its mother with a slight bend. Duration of one nursing is 8.4 seconds, and between 3 and 24 seconds, practically the same as the duration of the nursing of the bottlenose dolphins (Cockroft, Ross, 1990; Mann, Smuts, 1999). The duration of the nutrition of the infants in the first 2 months of their life does not depend on their age ($P > 0.01$). We could not define the frequency of the nutrition of the one-year old infants because of the unappropriated conditions for such observations.

B19 FOLLOW UP OF A SOLITARY DOLPHIN IN THREE EUROPEAN COUNTRIES: THE CASE OF JEAN FLOC'H/GASPAR

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Bottlenose dolphin coastal communities in the European coast are usually the source of some individuals that, for some reason, are solitary and/or live near humans. Since the 70's, there have been several records of solitary dolphins in Galicia, along with travelling dolphins. In particular, the case of JeanFloc'h/Gaspar deserves special attention. In December 2007, a solitary dolphin (named Gaspar in Galicia) was repeatedly detected in southern Galicia harbours (NW Spain), where it dangerously approached boats and boat engines. CEMMA researchers immediately started a follow up on this animal while trying to obtain data from other European research teams on solitary dolphins displaying similar flipper and beak wounds. These distinctive features had never been detected in any dolphin in Galicia during the last 15 years. The dolphin was finally identified by Réseau-Cétacés (France) as "Jean Floc'h", an adult bottlenose dolphin who roamed the coast of Brittany (Finistère/Morbihan, France) from September 2002 until August 2007, sometimes in company of other solitary dolphin (Donny/Randy). Within the first 5 months of 2008, Jean Floc'h/Gaspar moved among several Galician harbours. However, on the 11th of June 2008, this animal was detected in Figueira da Foz (Central Portugal). During 43 days it travelled up north moving between several Portuguese harbours, as recorded by SPVS researchers. Finally, this bottlenose dolphin moved back to Galicia, remaining in Ria de Vigo for 2 months. It was estimated that this animal travelled 3000-4000km. "Jean Floc'h/Gaspar" behaviour was studied regarding its

relation towards resident dolphins and humans. This work presents detailed information on long distance movements, movement speed, health status, behaviour towards boats, contact with divers and sailors in harbours.

B20 SOCIAL ECOLOGY OF COMMON BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*) IN THE ISRAELI COASTAL MEDITERRANEAN SEA

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The study aimed to fill a knowledge void in coastal habitat use of cetaceans in the easternmost Mediterranean. Between 1998 and 2007 a total of 232 half-day dedicated surveys were performed, covering over 3000 km, in a 65 km long by 11 km wide strip along the central Israeli coastline. Common bottlenose dolphin *Tursiops truncatus* (CBD) was the only species sighted. The overall encounter rate increased significantly when searching around bottom trawlers (1.91 and 5.65 groups/100 km effort, respectively). Sighting frequency was independent on season, suggesting a year-round stability of population size in the study area. The population prefers depths >40m and gives birth during the warm months. Mean group size was 5.7 ± 6.9 , significantly larger in spring (7.5) than in summer (3.4) and significantly smaller when foraging (4) than when traveling, resting or socializing (8). On 100 sightings, 154 individuals were photo identified, most seen once or twice. The cumulative discovery curve is still steadily increasing, suggesting an "open" population, possibly with a small resident nucleus but with mostly transient animals. Dolphins are mainly observed performing long dives, either while following bottom trawlers or without much horizontal movement. Of 23 dolphins sighted four times or more, all were observed at least once foraging behind a bottom trawler, suggesting that engagement in this activity, a major cause of death for the local population, is of force rather than by choice.

B21 PRELIMINARY DESCRIPTION OF ADOPTION BEHAVIOUR DETECTED IN THE MEDITERRANEAN MONK SEAL (*MONACHUS MONACHUS*) AT THE COLONY OF THE CABO BLANCO PENINSULA (MAURITANIA-MOROCCO)

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Mediterranean monk seals are in critical danger of extinction. The largest aggregation known that still keeps a colonial structure is located at the Cabo Blanco

peninsula (Mauritania-Morocco). Colony uses two principal caves to haul-out and breed. Thanks to the female skin scars and pup characteristic ventral patch, every year an intensive surveillance is being done, with a video-surveillance camera system, of each mother-pup couple until the pup molts at the age of two months, disappears or dies. From this surveillance, the Ad Libitum data of adoption behaviors is obtained. Even though some previous studies described these types of behaviors in a general way, here are described and defined in a more detailed way. From 2000 to 2007, 253 pups were followed and 69 Ad Libitum were taken. Of them, a 39% described pup stealing, staged by adoptive females that had lost their pups and interacted aggressively with other females to take away theirs; in a 13%, pup interchanges were described between two mother-pup couples; and in a 35%, adoptions by wet nurse were described. The survival of these adopted pups oscillated between 100% and 80% depending of the behavior. The other 13% of data belonged to abandoned pups. No abandoned pup survived. A more detailed study of the adoption behavior of this species is necessary to get a better understanding of its breeding biology for the forthcoming management, handle and protection of their populations.

B22 BEHAVIOUR OF FREE-RANGING COMMON DOLPHINS (*DELPHINUS SP.*) IN THE HAURAKI GULF, NEW ZEALAND

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Very few studies have examined the behaviour of free-ranging common dolphins (*Delphinus* spp.). Here we present the first data describing the behaviour of common dolphins in the Hauraki Gulf, New Zealand. Activity budgets were used to assess the effects of diel, season, depth, sea surface temperature, group size and composition on dolphin behaviour. Additionally, the presence/absence of Bryde's whale (*Balaenoptera brydei*) and Australasian gannet (*Morus serrator*) was examined in relation to dolphin behaviour. Data were collected from 686 independent dolphin groups during boat-based surveys conducted between February 2002 and January 2005. Foraging (46.7%) and social (7.2%) were the most and least frequently observed behaviours, respectively. Travel (28.9%), mill (9.5%) and rest (7.7%) accounted for the remainder of the activity budget. Behaviour varied seasonally, with the highest proportion of foraging and resting groups observed during the spring and autumn, respectively. Behaviour also varied with water depth, with foraging animals observed in the deepest and resting groups recorded in the shallowest regions of the Hauraki Gulf. A correlation between

group size and behaviour was evident, although behaviour did not vary with the composition of dolphin groups. Resting, milling and socialising animals were more frequently observed in smaller group sizes. Foraging behaviour was prevalent in both small and large groups, suggesting foraging plasticity exists within this population. Behaviour differed between single- and multi-species groups, with foraging more frequent in multi-species groups. Resting, milling or socialising was rarely observed in the presence of any associated species, indicating the primary mechanism for association is likely prey-related. Data suggest the Hauraki Gulf is an important feeding area for New Zealand common dolphins.

B23 *This poster was cancelled*

B24 ONTOGENY OF REST BEHAVIOUR IN BOTTLENOSE DOLPHIN CALVES DURING THE FIRST YEAR OF LIFE

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Tursiops truncatus newborns immediately after the birth place themselves alongside the mother in echelon position, in order to receive protection and, dragged in the mother wave, save and recover energies. However, bottlenose dolphin are well known to perform another reposing behaviour defined as “rest at surface” and characterized by a motionless staying on water surface keeping the blowhole exposed in air. The aim of this study was to monitor the ontogeny of this behaviour in *Tursiops truncatus* during the first year of life. Subjects were four calves (two males and two females) born in different periods (1995, 1997, 2003 and 2007) at the Rimini Delfinario (Italy). Behavioural data were systematically collected during the first 52 weeks after their birth in a total of 1160 sessions lasting 30 minutes each (total 580 hour). Observer (Noldus) was applied to assess the frequency and duration of rest. While the females revealed the ability to perform the rest at surface at an age of two weeks, the studied males seemed less precocious and did it only from the second month. However, a progressive increase of rest frequencies through the year characterized all the calves. In particular, if during the first six months of life they were used to rest from zero to 5 times per hour, in the second semester they showed quite doubled values. Moreover, while the total rest durations overlapped frequency trends, the rest bout length was relatively constant during the year generally ranging between 10 and 30 seconds. Again, the results pointed out some social features of rest, revealing the newborns never stopping at surface alone in the first month. In summary, bottlenose dolphin infants appeared to find resting difficult at first, but the development of physical competence gradually enabled them to recover energies even with this strategy.

B25 THE ASSOCIATION PATTERNS BETWEEN KILLER WHALE (*ORCINUS ORCA*) OFFSPRING AND THEIR MOTHERS DURING THE FIRST YEARS OF LIFE

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Fish-eating (resident) killer whales form stable matrilineal groups and spend whole their life in close proximity to their mothers. Previously it was mentioned that associations between females and their offspring depend on the stage of the offspring (e.g. sex and maturity). This study looked at the frequencies of the presence of killer whale offspring in the neighbourhood to their mothers during the first years of offspring's life (from the birth till the age of six). The data was collected during summer seasons 2005-2007 in Avacha Gulf (Kamchatka, Russia, Northwest Pacific). All offspring (n=37) were divided into three categories depending on their age stage during the particular season: newborns (n=10), calves (n=34) and juveniles (n=23). Offspring which were encountered more than four times during a season were used in the analysis. We noted the neighbour of the offspring on the photo taken during the work with group of killer whales (observation period). Three categories of possible neighbourhoods were used: mother, other killer whale or absence of a neighbour. We calculated the frequency of neighbourhood with the mother for each offspring during each field season. The significant differences were found between offspring categories in the frequencies of their appearance in the neighbourhood with their mothers ($p < 0,001$, Kruskal-Wallis test). Newborns were found in the neighbourhood with their mothers in 75% out of 147 observations, calves – in 55% out of 533 observations and juveniles – in 27% out of 347 observations. In spite of that killer whale offspring always stay close to their mothers, the association patterns between females and their offspring change significantly during the first years of the offspring's life.

B26 BOAT EFFECTS ON THE BEHAVIOUR OF INDO-PACIFIC HUMPBACK (*SOUSA CHINENSIS*) AND IRRAWADDY (*ORCAELLA BREVIROSTRIS*) DOLPHINS IN COWIE BAY, SABAH

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Different types of boats give different impacts on the behaviour of Indo-Pacific Humpback (*Sousa chinensis*) and Irrawaddy (*Orcaella brevirostris*) dolphins in Cowie Bay, Sabah. The study was conducted during Spring and Neap tides from April to September 2008. The objective of the study was to determine the effects of fish trawler, speed boat, tug boat and passenger boat on the behaviour of the two species. The behaviour of dolphins described as, negative, positive, neutral and undetermined behaviours. Direct or indirect, long and short term impacts were observed during data, long and short impacts were observed during data collection period. Results showed that trawler boat gave biggest effects on both species on their feeding behaviour. When trawlers were present, the two dolphins chased and fed behind them. Previous studies described negative effects of this activity on animal's normal behaviour. Limiting the number of boats could be effective in minimizing the short term impacts on the dolphins. Finer scale behavioural observations, such as dive behaviour analysis, could prove to be vital for understanding the potential long term implications of dolphin-boat interactions. The enforcement of laws and regulations are difficult to be compromised between community needs and vulnerable dolphins' population.

B27 LET'S TAKE A BREATH TOGETHER

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Several cetacean species swim or surface in synchrony, as a defensive technique or to demonstrate social bonds. We studied what could influence this behaviour in the Long Finned Pilot Whales (*Globicephala melas*). We analyzed pairs of individuals who breathe at the same time and whether this might be influenced by different variables. We analysed the difference in synchronicity in relation to sea temperature, type of behaviour, group size, type of animal (adult or calf), the presence of boats and the time of day. We videoed the animals from a whale watching vessel and recorded the whales' breathing time. We used GLM to analyze the data and Akaike's weight to best understand the model chosen by GLM. We discovered a correlation between group size and the whales' synchronization. We also found a second order correlation between synchronization and the behavioural context. No correlation was found between the type of animals within the pair (calf, adult or adult, adult) as was expected according to present literature. We explained our results by linking synchronicity with both social relationship and defensive technique. Pilot Whales are known to create subgroups, which may remain the same for days, months, or even years, and synchronicity may be a reflex of their unity. However, as a smaller group is more vulnerable, we cannot exclude defence as an explanation of the observed behaviour, despite finding no correlation with boat presence or other possible stress factors.

B28 WHEN THE BELL RINGS!

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Parc Asterix trainers taught their dolphins to individually respond to an acoustic signal. Each arbitrary sound corresponds to one particular dolphin and is variably used during training, veterinary sessions or other occasions when needed. We were interested in analyzing how the dolphins reacted when their acoustic signal was emitted. An experiment was performed from September 28th, 2006 to October 9th, 2006. We analyzed the sound produced and the behaviour displayed by the individual dolphins following the emission of each acoustic signal. The results showed that all dolphins quickly learned to answer to their own personal signal: 8 out of 11 dolphins responded more than 50% of the time. The acoustic analysis showed a variety of sounds were produced by the animals when getting close to the provenience of sound. When making sure that all dolphins positively react to the sounds, we suggest that this set-up could be used as a reinforcement or be part of an enrichment program.

**B29 STEREOTYPED CALL TYPES IN SHORT-FINNED PILOT WHALES
(*GLOBICEPHALA MACRORHYNCHUS*)**

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Four short-finned pilot whales, *Globicephala macrorhynchus*, were tagged with Digital Acoustic Tags (DTAGs) for a total of 30 hours in the Bahamas during 2007. We examined these data for stereotyped call types. All sounds with a high enough signal to noise ratio to resolve the contour were digitized ($n = 3,202$). A subset of spectrograms was visually sorted, and 514 calls were placed into 60 stereotyped call types, i.e., call types that occurred at least twice. The mean number of occurrences of each call type was 8.6 (maximum = 69). Although the majority of stereotyped call types were recorded on only one tag (52/60, 87%), 7 call types were recorded on two tags, and one call type on three tags, suggesting that at least some may be shared among whales. However, we cannot rule out the possibility that calls of specific individuals may have been picked up on multiple tags. Stereotyped calls were highly likely to occur in sequences; of the 514 calls currently classified, 381 (74.1%) occurred within 30 seconds of another call of the same type.

Several call types occurred in dense (but non-overlapping) sequences; for example, 36 repetitions of the same call type occurred within a 95 second period. A long-finned pilot whale (*G. melas*) tagged in the Alboran Sea (not included in this data set) produced similar sequences, in one case producing 178 repetitions of the same call type in a 10 min period. This pattern is very similar to sequences of bottlenose dolphin signature whistles. However, pilot whale social structure resembles that of killer whales, and the possible existence of shared stereotyped calls would indicate similarities in their acoustic behaviour as well. Further studies will investigate the behavioural context of these sequences and the degree of individual distinctiveness of stereotyped calls.

B30 AFFILIATIVE AND AGGRESSIVE BEHAVIOUR IN TWO ORINOCO RIVER DOLPHINS IN A CONTROLLED ENVIRONMENT

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Social behaviour is generally considered like a group of complex activities, regulated by the selective advantage of group life. Dolphins are animals particularly social that live together performing a variety of cooperative and agonistic interactions. An opportunity to research social behaviour in Orinoco river dolphins (*Inia geoffrensis humboldtiana*) was provided by observation of two adult males (approx. 35 and 55 years old) hosted at Duisburg Zoo, Germany, since 1975. The aims of the study were to determine the daily share of solitary vs. group time and the characteristics of affiliative and aggressive displays. Data were collected in May 2006 in a total of 120 observation sessions, lasting one hour each (60 hours/subject), and analysed by means of Observer (Noldus) software. The results indicated that the animals slightly preferred to spend time together (52%). However, this tendency was more accentuated in the early morning (62,9%) than in the evening (39,8%). Affiliative behaviours were expressed by the Inias in a very great number reaching frequencies of 92,9 active acts per hour in the elder and 80,8 in the young. Principally focused on the first part of the day, the acts mainly consisted in punctual contacts mostly performed through pectoral fins and directed to the flank of the conspecifics. On the other hand, aggressive behaviours were absolutely more unusual than affiliative ones (5,4 active acts/h the elder and 7,2 the young). Moreover, in an interesting and socially useful way, aggressiveness was mainly performed through threatening displays such as direct open mouth, showed about 3-4 times per hour, rather than via physical injuries (e.g. biting, the most frequent, reached at least 1,2 events/h). In summary, the studied dyad revealed to

have contrived proper social dynamics and balance, that allowed them to live successfully together for more than thirty years.

CONSERVATION / MANAGEMENT

C01 RESEARCH ON CETACEAN POPULATIONS AND DETECTION OF SPECIAL AREAS FOR CONSERVATION OF BOTTLENOSE DOLPHIN IN THE COAST OF GIPUZKOA, SOUTHEASTERN BAY OF BISCAY

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Since 2003, cetacean populations have been continuously studied in adjacent Gipuzkoan waters, Bay of Biscay, following the Spanish Cetacean Society methodological protocols of shipboard visual surveys. The scientific field survey results confirm the importance of the area for bottlenose dolphin (*Tursiops truncatus*) showing a density of one sighting per 83 miles sailed. For other cetacean species, the densities were; common dolphin (*Delphinus delphis*) each 80 miles, long-finned pilot whale (*Globicephala melas*) each 127 miles, striped dolphin (*Stenella coeruleoalba*) each 157 miles and Cuvier's beaked whale (*Ziphius cavirostris*) each 415 miles sailed. The human activity in the area was simultaneously studied to detect possible threats for cetaceans (acoustic, traffic, fisheries, surface pollution and trash). From the results obtained, the area has proved to be a notable zone for several cetacean species, particularly bottlenose dolphin, present all year round in the whole area and other bird, shark and turtle endangered species. As a consequence, a specific work line has been developed in order to detect areas of special interest for bottlenose dolphins, based on spatial and temporal distribution and population density, group size and abundance of the species. A proposal to define a Special Area for Conservation (SAC) has been developed, based on cataloguing and identifying the distribution and density of cetacean and bird protected species present in the area. The current legislation was revised and the application of protocols in the area was evaluated. Relationships between working groups in the area and governmental administration have been initiated in order to manage the Proposal. Areas of special interest for bottlenose dolphins have been delimited and a proposal to take control of human activities in the area was defined, while detecting the deficiencies and needs as to create an appropriate frame to proceed with the creation of a Marine Protected Area

C02 HARBOUR PORPOISE SURVEYS TO SUPPORT THE DESIGNATION OF SPECIAL AREAS OF CONSERVATION IN IRELAND

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During 2008, eight coastal sites around the entire Irish coast were surveyed to determine the density of harbour porpoises in order to identify potential sites for designation as Special Areas of Conservation (SAC). These sites ranged from 104 to 547 km². Surveys were carried out between July and September with six survey days at five sites and three survey days at three sites. During 37 days at sea, 475 track-lines totaling 20,662km of effort were surveyed in sea-state ≤2 using distance sampling. From the total of 332 sightings, 618 individual porpoises were observed. Overall densities ranged from 2.03 to 0.53 porpoise per km²; mean group size ranged from 1.19 to 2.67 animals. The proportion of young was typically 6-8% but 14 and 18% were recorded at two sites. Abundance estimates ranged from 87 to 402 porpoises depending on the density estimate and area of the site. At three sites passive acoustic monitoring was carried out using T-PODs. Mean Detection Positive Minutes per hour (DPM) ranged from 0.8 to 11.8. Acoustic detections were consistent with density estimates with sites in the Irish Sea recording the highest densities and DPM. Results from a similar survey in the Blasket Islands cSAC in 2007 were used as a reference which led to four sites being recommended as potential SACs. The data were also used to recommend monitoring protocols which should meet the requirements of the EU Habitats Directive.

C03 SHOULD BEAKED WHALES BE PROTECTED OR "DATA DEFICIENT"? A POPULATION APPROACH TO THEIR CONSERVATION STATUS

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Beaked whales are deep diving species subject to a range of human impacts. The little scientific data available suggest that local populations might be small and genetically isolated, affecting their capability to recover if depleted. However, the lack of knowledge on basic population parameters of beaked whales makes it difficult to assess their conservation status and they are classified as data-deficient in conservation law. El Hierro (western Canary Islands) holds rare year-round coastal populations of Blainville's and Cuvier's beaked whales (*M. densirostris* and

Z. cavirostris), offering an ideal research area to gather data on these elusive beaked whale species that usually inhabit deep areas far from the coast. This has allowed constructing a valuable photo-ID catalogue from 2003 to 2008 on these species. This paper applies standard mark-recapture techniques to the photo-ID data, presenting the first abundance estimation for any population of beaked whales in European waters. Best abundance estimate of the sum of the populations of *M. densirostris* and *Z. cavirostris* is below 150 individuals and a preliminary analysis of the photoID data suggest large calving intervals. Results are discussed in the light of their implications for the vulnerability of the species. An example is the mass mortality of 14 beaked whales recorded in Fuerteventura and Lanzarote (eastern Canary Islands) in 2002 in coincidence with naval exercises. Such a mortality would be estimated to take some 10% of the joint population of Cuvier's and Blainville's beaked whales inhabiting El Hierro. The combination of small populations with high territorial fidelity and an elevated sensitivity to acoustic disturbance makes beaked whales vulnerable to human impacts. Results from Canary Islands and other seemingly small local populations, such as Hawaii, Bahamas and Liguria, should be applied to base the consideration of the status of beaked whales as vulnerable in conservation law.

C04 WHAT IS THE CONSERVATION STATUS OF LONG-FINNED PILOT WHALES IN THE STRAIT OF GIBRALTAR?

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Long-finned pilot whales are classified as "data deficient" in the Mediterranean Sea by the IUCN. This study used population viability analysis of pilot whales in the Strait of Gibraltar to assess their conservation status. Photo-identification techniques allowed estimating the basic life parameters of the population. Survival rates were found to be 0.677 for calves, 0.861 for juveniles and 0.985 for adults in 1999-06 with a total abundance of 345 animals in 2006. The inter-calving interval was found to be 4.5 years (range 2-7). These life history parameters were first used to assess the viability of the pilot whale population before the Morbillivirus event over 100 years using PVA models. The population was estimated to persist over 100 years with a 100% probability. Secondly, 2006-07 Morbillivirus epizootic was estimated to induce a 21.2% reduction in the survival rate. Finally, a second PVA was realized to assess a potential change in the population extinction probability after the epizootic event. Simulating catastrophe events every 16 years and a 21.2% survival reduction, a decreasing trend was observed over 100 years (43% reduction of population size) but the extinction probability only rose to 0.1%.

Therefore, the pilot whale population of the Strait of Gibraltar was believed to persist over 100 years even with chronic Morbillivirus events. This study assessed for the first time the viability of the population in the Strait of Gibraltar over 100 years before and after the epizootic. In the latter cases the population should be classed as “vulnerable” according to the criteria A3 as more than 30% decrease is expected over 100 years due to a “pathogen” which is the Morbillivirus.

C05 CETACEAN INTERACTION WITH FISHERIES IN THE STRAIT OF GIBRALTAR

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Seven different species of cetaceans coexist in the Strait of Gibraltar. Because of its high productivity and rich ecosystem, large selective and non-selective fishing fleets as well as numerous sports-fishing vessels operate in the area. High bycatch levels are known from the past, with estimated 3000 bottlenose dolphins (*Tursiops truncatus*) and 4000 short-beaked common dolphins (*Delphinus delphis*) being captured every year in the Mediterranean sea. Incidental captures worldwide have increased by nearly 130% in the 21st century. This study aims at determining which lesions observed on cetaceans from the Strait of Gibraltar can be attributed to interactions with fisheries, and with which degree of certainty. This study was carried out from opportunistic platforms of whale-watching departing from Tarifa, Spain, during the months of April to October, from 2003 to 2008. Data was collected from observations, photographs and necropsies. Lesions ranged from cuts, tears, propeller marks, amputations, as well as ulcerations from entangled fishing gear, and were categorized according to the probability of interaction with fishing gears as: possible/probable/certain. Most of the lesions appear to be linked to the activity of sports-fishing vessels operating in the research area, which are known to target cetaceans because of the belief that schools of tuna and other large fish species swim beneath them. This represents a clear breach of the Spanish Royal Decree 1727/2007, which establishes clear protection measures for cetacean species. The illegal use of driftnets also represents a clear cause for cetacean injuries and fatalities. We conclude that many lesions observed on cetaceans from the Strait of Gibraltar can still be attributed with a relatively high level of certainty to interactions with fisheries. Existing legislation should be enforced and applied in order to reduce the impact on these cetacean populations and ensure their conservation.

C06 MONK SEALS IN MADEIRA: THEIR INTERACTION WITH FISHERIES

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Historically (1419) seals were abundant on Madeira - the main island of Madeira archipelago; five centuries later, in 1988, the population was estimated at only 6-8 individuals and was restricted to the Desertas Islands, having disappeared from Madeira. Interaction between seals and fisherman was the main reason for the seals' decline. Seals were killed accidentally by nets and illegal explosives, and intentionally by fishermen who considered the species as a pest. The first legal step to protect the species was taken in 1986 when a law was passed to protect marine mammals in Madeira waters, and in 1990 the last habitat of the monk seal was protected by creating the Nature Reserve of the Desertas Islands. At the same time the Parque Natural da Madeira Service (PNMS) began a program to protect the species. As a result in 1997 seals began to re-colonize Madeira Island where interaction between fishermen and the seals is inevitable. Reported interactions show that conflict between fishermen and seals is likely. However since this perception is based only on the reports of some fishermen who were mainly looking for financial compensation, the SPNM decided to implement a survey of the fishermen, looking for a more realistic approach to the seal/fishermen interactions in Madeira. This is the basic step to implement measures in order to minimize eventual conflicts.

C07 OUT MUSSELED? – IMPACTS OF AQUACULTURE FACILITIES ON AN UNSTUDIED POPULATION OF BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) IN THE MARLBOROUGH SOUNDS, NEW ZEALAND

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The Marlborough Sounds, New Zealand is home to intensive green-lipped mussel (*Perna canaliculus*) aquaculture. Bottlenose dolphins (*Tursiops truncatus*) also occur in these waters, although no study to date has investigated this population or any potential impacts associated with this industry. Boat-based surveys, photo-identification and focal group follows were used to assess spatial distribution, abundance, home range, and behaviour patterns of bottlenose dolphins between

2003 and 2005. Group size ranged from 3–172 photo-identified individuals and was positively influenced by the presence of calves. Activity budgets revealed bottlenose dolphins spent the majority of their time travelling (48%) and socialising (23%), irrespective of mussel farm activity. However, feeding, milling and resting states increased with the presence of mussel farms, while travelling and socialising decreased. Sightings occurred throughout all austral seasons, suggesting that bottlenose dolphins utilise this region year-round. Photo-identification revealed regular movements between Queen Charlotte Sound, Pelorus Sound, Admiralty Bay and Current Basin throughout all seasons. Bottlenose dolphins were found to be semi-resident with 211 (C.I. = 195-232) individuals utilising the Sounds year-round. Additional dolphins were found to migrate in and out of the area on an annual basis. Our data suggest the Marlborough Sounds form an important part of the home range for at least a portion of this data deficient population. Activity budgets for bottlenose dolphins within and outside of mussel farms indicate minimal impact from this industry. However, elevated nutrient levels associated with aquaculture facilities may still have consequential effects on prey availability. Future dietary studies will be used to provide further insight into this hypothesis.

C08 THE COST OF CHANGING GEARS: LARGE WHALE ENTANGLEMENTS IN NEWFOUNDLAND AND LABRADOR (CANADA), 1979-2007

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During summer months, many large whales forage along the coast of Newfoundland and Labrador (Atlantic Canada), when commercial fishing effort in these waters reaches its peak. Consequently, entanglements of whales, particularly humpback whales (*Megaptera novaeangliae*), in fishing gears (frequently resulting in mortality) have been recorded regularly for the past three decades, currently by the Whale Release and Strandings Program. Following widespread fisheries closures in 1992-1993 caused by drastic reductions in abundance of groundfish stocks (particularly Atlantic cod, *Gadus morhua*), Newfoundland and Labrador's fishing industry has been forced to diversify leading to increased exploitation of non-traditional species. Currently, the most important fishery in terms of landed value targets snow crab (*Chionocetes opilio*) using crabpots. This has caused a shift from the traditional small-boat coastal fishery towards larger vessels fishing in deeper offshore waters. These changes have affected entanglement risks to large whales. Reported nearshore whale entanglement rates have declined since the shift away from traditional fishing methods. However, this has been accompanied by an increase in reported

entanglements offshore, particularly in ropes attached to crabpots. Between 1979-1992 (prior to the moratoria), hardly any whale entanglements were reported in offshore waters, but this has risen to 27% between 1993-2008. Similarly, only 1.4% of whale entanglements between 1979-1992 involved crabpots, but between 1993-2008, 15.5% of entanglements involved this gear type. Changes in fisheries have resulted in fewer reported whale entanglements overall but have created logistical difficulties for the Whale Release and Strandings Program in responding to offshore entanglements. Because of distances involved and risk of spoilage of catch, fishers often release entangled whales with fishing gear still attached. Offshore entanglement rates, and consequent injury and mortality rates, among whales in Newfoundland and Labrador waters are poorly understood but may be considerable.

C09 INTERACTION BETWEEN TRAWLERS AND CETACEANS IN IZMIR BAY: PRELIMINARY FINDINGS

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This study was carried out to assess the interactions between cetaceans and trawlers in legal trawling ground of the outer part of Izmir Bay, Aegean Sea between 23 November 2007 and 14 April 2008. The main site selection criterion for the study area was the utilization of Foça Harbour as the largest base for the trawlers ($n=17$) in Turkish Aegean. During study period, the researchers conducted on board observations arbitrarily in 30 fishing days to observe the cetaceans and their interactions with fishing vessels. The data collected were mainly categorized on meteorology, fishing vessel and its operational characteristics, and cetaceans. For the cetaceans; species and sightings, time of the day and depth were the data collected. Then, the sightings were categorised on the basis of distance between sighting point and the vessel. Four categories were defined as follows: Sighting within 50 m from the vessel, sightings between 50-100m, between 100-300 m and sightings >300 m. Then the interaction between the vessel and the observed animal were further classified by considering vessel's state of operation, animals behaviour and duration of observation. The interactions data were calculated as percentage frequencies. During study period, two species, *Tursiops truncatus* ($n=95$) and *Delphinus delphis* ($n=1$) were observed. The observation frequency of *T.truncatus* per fishing day, which was the only cetacean species observed in interactions with the trawl fishery, was 3.2. While there was no cetacean by-catch neither recorded by the researchers nor reported by any trawl captains from the Izmir Bay, 3 times damage to nets were recorded. The most of the interactions per

day were recorded at 54 % over the areas with depths between 50 and 100 m. Though interactions were observed during study period, no direct negative affect was recorded. However, indirect affects like on total catch should further be studied.

C10 ECOTOXICOLOGICAL STUDY OF FIN WHALE (*BALAENOPTERA PHYSALUS*) POPULATIONS IN THE PELAGOS SANCTUARY (MEDITERRANEAN SEA) AND IN THE GULF OF CALIFORNIA (MEXICO)

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In the last 20 years there has been growing concern about the potential threats to Mediterranean cetaceans caused by persistent organic pollutants such as organochlorine compounds (OCs) and polybrominated diphenyl ethers (PBDEs). Cetaceans of the Gulf of California (Mexico) are known to be less exposed to anthropogenic pressure but the presence and effects of contaminants in this area have seldom been investigated. The main objective of this project was to develop/apply a suite of sensitive non-lethal diagnostic biomarkers to skin biopsies of fin whales to evaluate the toxicological status of this mysticete in the Pelagos Sanctuary (Ligurian-Corsican, north Tyrrhenian-Seas) and in the Gulf of California (Sea of Cortez). We propose to develop a “multi-trial-biomarker-tool” applied to biopsies, combining molecular biomarkers (western blot of CYP1A1, CYP2B, HSP) and gene expression (RT-PCR) with analysis of OCs, PAHs and PBDEs. In the first phase of the project we explored the level and effects of OCs, PBDEs and PAHs in skin biopsies of fin whales of the two populations. In the second *in-vitro* phase, we applied this multidisciplinary approach to whale biopsy slices treated with mixtures of OCs, PBDEs and PAHs in order to explore the toxicological effects of contaminants. Differences in organochlorine levels (ng/g d.w.) and biomarker responses were detected between the two populations, with higher levels of PCBs in the Mediterranean fin whales (\bar{x} =5075.9) in comparison with the Cortez specimens (\bar{x} =915.8). High induction of CYP2B in Mexican whales (\bar{x} =73.26 relative-pmol) can be related to the presence in the blubber of OC insecticides such as DDTs (\bar{x} =2241.1) and its metabolite pp’DDE (\bar{x} =1860.3). Future development of this methodology could provide a statistical “expert system” for more complete information about “toxicological-stress-syndrome” in cetaceans, providing a predictive model for hazards in susceptible areas (Sea of Cortez) targeted by increasing tourism.

C11 45 YEARS OF DEVELOPMENT OF THE MARINE FOSSIL FUEL INDUSTRY IN BRITISH WATERS AND ITS IMPLICATIONS FOR MARINE MAMMALS: PROGRESS?

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The UK Government has been issuing licences to search for oil and gas in UK waters since 1964. The environmental effects associated with exploration activity, construction, production and transport of equipment, materials and products, and their combined impacts, are many, including contribution to climate change. Early activities tended to be far offshore and 'out of sight and out of mind'. Then, from the 12th and 14th licensing rounds, in the early 1980s, oil and gas exploration moved into inshore known sensitive areas, such as Cardigan Bay in Wales, and along the Dorset coast. Here we relate the initiation and history of the interactions between a consortium of marine focused non-governmental bodies and the relevant governmental regulators (Joint Links Oil and Gas Environmental Consortium' (JLOGEC)). Successes included the implementation of a series of Strategic Environmental Assessments from the mid 1990s and that, since 1999, nearly all developments have required the production of a project Environmental Impact Assessment before the final exploration or production licence is granted. However, more recently, it has become apparent that many EIAs are generally of poor quality, little baseline research has been conducted and there are flaws in the protective regimes developed, including potentially the development of fossil fuel extraction activities in core habitat for cetaceans. Such areas include EU designated Special Areas of Conservation, despite a requirement to demonstrate scientific certainty of lack of impacts, that can not be achieved. In addition, the newly formed Department of Energy and Climate Change sits outside the proposed UK and Scottish Marine Bill processes, further adding to our concerns for future decisions surrounding offshore developments and potential impacts on marine mammals. We discuss how this has come to pass and its implications for marine nature conservation.

C12 DEVELOPMENT AND APPLICATION OF NOISE EXPOSURE CRITERIA FOR GRAY WHALE MONITORING OFF SAKHALIN ISLAND, RUSSIA

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We present a set of noise exposure criteria developed for applied to the monitoring of feeding western gray whales (WGW), a population listed by IUCN as critically endangered. Development of these criteria was carried out in 2005-2008 as part of scientific panels, specifically the Western Gray Whale Advisory Panel and its predecessors, convened by IUCN in partnership with the Sakhalin Energy Investment Company to reduce the risks to WGW of the Sakhalin II oil project. Our goal was to derive recommended noise exposure criteria using the best scientific information currently available, and to construct them in practical form so they could be applied in real time to mitigate potential impacts on WGW. Our criteria recommended for construction period 2005 were based primarily on the behavioral evidence for disturbance of 50% of animals at 120 dB_{RMS} noise level (Malme *et al.*, 1984). These criteria were designed to lead to diagnostic halt of construction activity if levels of continuous or transient noise exceed: 130 dB_{RMS} for two consecutive half-hour periods, or 140 dB_{RMS} for five-3 minute intervals within 1 hour. For large- scale construction period 2006 we recommended exposure criteria based on dose approach to account for noise levels as well as time of noise exposure. We again endeavored to use the best available scientific information, including a precautionary 5 dB level\time exchange rate and monitor of daily dose. For an upcoming seismic survey in the area we also attempted to develop dose exposure criteria, but due to the lack of some key pieces of data we recommended using widely known limitation 163 dB_{RMS} and 180 dB_{RMS} to prevent behavioral disturbance and hearing injury, respectively. We will present results of real time acoustic measurements in WGW feeding area during 2005-2006 constructions, and these results demonstrate the rationality and practicality of our efforts.

C13 MASS MORTALITY OF HARBOUR PORPOISES IN THE SEA OF AZOV IN 2008

(This poster was cancelled)

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Data on mortality of harbour porpoises were obtained during monitoring of strandings at the Crimean coast of the Sea of Azov (35 km strip between Bogatube and Fonar' capes) and an expedition to the Temryuk Gulf coast. Remarkably high mortality was observed during the 2008 field season: 60 carcasses were found between April 27 and November 3, which is the second result for 10 years of monitoring (cf. 39 carcasses in 2006, 25 in 2007), 47 of them during the summer. 16 carcasses were found at the 16 km strip at the Temryuk coast on August 4. Age structure of strandings corresponded to a normal population structure: 17% of calves and neonates in Crimea and 25% in Temryuk; 20% of animals aged 7 years and more in Crimea; ratio of animals aged 1 and 0 years was 0.7 in Crimea and 0.75

in Temryuk. By-catch marks were found in 20% of carcasses in Crimea (21.3% in summer strandings); also, 40% were strongly decomposed, so no by-catch marks could be distinguished. This rate does not differ significantly from mean annual rates. Thus, the mortality rise was not caused by alterations in by-catch rates. In Temryuk, 37.5% of animals had by-catch marks; this is the evidence of higher by-catch rates in Russian waters than in Ukrainian. Pathological findings were rare and can be regarded as incidental. Thus, stranding rate for harbour porpoises at the monitoring site was 1.7 specimens per km per year. Unlike previous mass mortality event in 2002, there was no distinguished peak of strandings (the strandings were regularly distributed during the summer), and by-catch rate was twice higher than in 2002. However, the cause of the mortality rise remained unclear like in 2002.

C14 WHALE-WATCHING OPERATOR DATA FORMS: A TOOL FOR CETACEAN STUDIES AND MANAGEMENT?

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In the last two decades the whale-watching activity has grown rapidly, representing an important tourism industry in many parts of the world. In the past, the Azores has been known from the whaling activity targeting sperm whales. Whale-watching in this region is a recent activity, started only in 1993 and has grown rapidly in a decade becoming an important tourist attraction with a significant economically role. Vessels of opportunity can be used for surveying cetaceans, indicating a cost-effective method of collecting and monitoring data to estimate relative abundance and habitat preferences. The increase of the whale-watching boats in the Azores has enabled the possibility to collect more data on cetaceans. From 2000 to 2006, data from several cetacean species observations was recorded regularly in sighting forms by the whale-watching operators in the archipelago of the Azores, especially during the summer months. A total of 7243 cetacean encounters were recorded, corresponding to 19 identified species and other taxa. The sperm whale, common dolphin, bottlenose dolphin and Risso's dolphin were the most sighted species. Baleen whales were more frequent during spring time, while for the other species the sightings were, generally, more numerous during the summer months. GIS tool applied for cetacean distribution showed that most of the sightings were recorded in the south of Pico. Associations of different cetacean species were observed by various types of encounter. The most sighted behaviours in most species were travelling, approach and feeding. For several months it was possible to observe calves of different species. Frequently more than one whale-watching boat was present at the same time and most boats stayed within the legal minimum distance. Relevant data can be collected by these whale-watching data forms with

advantages for scientific investigation and the improvement of whale-watching activities.

C15 AN ALTERNATIVE PHOTO-IDENTIFICATION TECHNIQUE FOR THE MEDITERRANEAN MONK SEALS IN THE NORTHEASTERN MEDITERRANEAN

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The Mediterranean monk seal (*Monachus monachus*, Hermann 1779) has been listed as one of the most endangered mammals in the world. Due to its rarity, vulnerability and critical status, use of photo-identification is one of the widely used approaches to obtain essential data on these animals such as their population structure, migration behavior and critical habitats. In this study, 3D model construction from photographs was tested as an alternative photo-identification method for the monk seals since it does not only enable researchers to identify individuals but also allow them to compare the same individuals in time and different individuals to each other without handling them. This technique is based on matching the points on a set of photographs of the same object taken from different angles. 3D model construction process was performed by using the photogrammetry software Photomodeler Ver.3.1a. In order to obtain suitable photographs for the software, some of the caves that are suitable for seal use were equipped with Vigil P-Box infrared monitors that may detect a seal up to 18 meter distance with a passive infrared motion detector and sense heat-in-motion with its conical beam. Besides, to choose sufficient and appropriate reference points that precisely describe the shape of the monk seal, the object having true proportions of a monk seal was used to estimate the minimum number of reference points. According to 3D model results, at least 4 cameras should be placed horizontally in a way to capture lateral, anterior and posterior aspects of the animal and at least 100 reference points should be defined. Additionally, using wider angle lens and infrared film as well as improving the light source may enhance the quality of photographs and so may improve the method.

C16 OCCURRENCE AND PHOTO-IDENTIFICATION OF COASTAL BOTTLENOSE DOLPHINS OFF SESIMBRA (PORTUGAL)

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Bottlenose dolphins (*Tursiops truncatus*) off the Portuguese mainland coast have been recorded since the nineteenth century and in 1863 a resident population was discovered in the Sado estuary. Since the 1980's this population has been a subject for a long term study, but occurrence of coastal populations has not been addressed. During 2007 and 2008, 63 boat based surveys were conducted in the coastal waters off Sesimbra, Peniche and Nazaré (west central Portugal) and resulted in a total of 45 sightings of cetaceans. From those, 20% of the sightings were bottlenose dolphins, only observed off Sesimbra in groups ranging from 1 to 100 individuals. These groups were sighted mainly at bathymetries below the 30 meters and at sea surface temperatures between 16°C and 21°C. In 2008, we started a photo-identification program to try to understand their presence and possible migrations near to shore as well as to match these coastal individuals with the nearby resident bottlenose dolphins of the Sado estuary. We analysed a total of 182 photographs, 45 photographs were used for photo-identification and 24 different dorsal fin profiles were indentified corresponding to distinct individuals. Considering the group size from one sighting (between 50 and 100 individuals), bottlenose dolphins observed were not the group of the resident population (presently comprising about 26 individuals). Also, there was no match between coastal and resident bottlenose dolphins. More information needs to be gathered in the years to come because resident bottlenose dolphins have been sighted in the adjacent waters of the estuary and their interactions, even briefly, with coastal populations is a possibility. Analysis of habitat use and social interactions of resident and coastal bottlenose dolphins is extremely important for the management of the endangered population and protection of both populations.

C17 THE OCCURRENCE, DISTRIBUTION AND PHOTO IDENTIFICATION OF RISSO'S DOLPHINS AROUND THE ISLE OF MAN

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Risso's dolphins (*Grampus griseus*) are one of the least studied cetaceans in European waters, particularly in northern regions, due to their typically offshore nature. The presence of Risso's dolphins in the Irish Sea, a relatively enclosed and accessible environment, provides a valuable opportunity to increase our understanding of this species. Since 2006, the Manx Whale and Dolphin Watch (MWDW), based on the Isle of Man, in the centre of the Irish Sea, has been collecting Risso's dolphin sightings data via a public website. Since 2007, MWDW has also been carrying out photo identification of Risso's dolphins from boat based surveys. Opportunistic sightings (n=244) have shown a peak sighting frequency between March and July, but with sightings throughout the year. Their distribution is predominantly on the east coast with a southwards shift in sightings during the season, spring sightings having higher average latitude than summer sightings.

Photo identification has facilitated the creation of a catalogue of Risso's dolphins in Manx waters. To date, this numbers 21 'Well marked' individuals, 6 'Left' and 8 'Right' individuals (animals which can only be identified from images of the left/right side of the fin). Although the discovery curve indicates that new animals are still to be identified, there have been 4 individuals re-sighted between years, suggesting a degree of site fidelity. It is hoped, through collaboration with research groups throughout the Irish Sea and beyond, that photo identification will be used to gain more specific information about Risso's dolphin life history traits. The inshore nature and high frequency of sightings make Manx waters a unique location for studying Risso's dolphins. The central position of the island and accessibility to this consistent group of animals means the Isle of Man should have a key role in the future management of Risso's dolphins in the Irish Sea.

C18 INDIVIDUAL IDENTIFICATION OF THE MONK SEAL COLONY MEMBERS AT CABO BLANCO PENINSULA (MAURITANIA-MOROCCO)

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Mediterranean monk seals are in critical danger of extinction. The largest aggregation known for this species that stills keeps a colonial structure is located at the Cabo Blanco peninsula (Mauritania/Morocco). Until May 1997, this population was estimated in 317 individuals between juveniles, subadults and adults. A mass mortality reduced drastically its population to 109 animals as estimated in 1998. Since 2000, an intensive effort of identification of the adult and subadult fraction of the population is being performed with photoidentification and with video-surveillance cameras installed in the entrance of the two principal caves that the colony use to haul-out and breed. Adult males are black with a ventral patch exclusive for each individual. Females and subadults of both sexes have a grayish fur with dorsal scars that allows individualizing them. Juveniles are excluded of identification due to the difficulty of their recognition because of the lack of natural marks on their fur. Between 2003 and 2007, 4 photoidentification sessions have been performed and 18.158 pictures of adult females and subadults of both sexes were obtained. Between 2000 and 2007, 2.349 series of recordings of adult males in caves were obtained with the video-surveillance cameras. With this information, an identification catalogue has been elaborated containing a minimum number of 140 animals individually identified, of which 64 are males, 59 are females and 17 are of indeterminate sex. Reproduction of 53 of the identified females has been observed. Even though the catalogue does not represent a population estimate but a minimum number of individuals, and does not include the juvenile fraction

that was also estimated in 1998, we can state that in the last 10 years period the population has suffered a progressive recovery.

C19 35 YEARS OF STRANDING RECORDS IN FRANCE REVEAL TRENDS IN MARINE MAMMAL POPULATIONS

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The national french stranding network (RNE) was set up in 1971 and its efficiency increased during 10 years. Today, a long-term time series document marine mammal's stranding along the french coast over more than 35 years (14 367 strandings). Our study aims at investigating whether the temporal patterns of cetacean and seal strandings on the French coasts have changed during this time period. First, Generalised Additive Models were used to model the large-scale temporal trends existing for each species. In a second step, we focused on the evolution of the species composition of the community of stranded individuals, to relate it to potential shift in the species composition of the marine mammal community at sea. Our analyses revealed significant increasing trend for small marine mammals (common dolphins, bottlenose dolphins, striped dolphins, harbour porpoise, grey seals and common seals). Among them, two species (harbour porpoises and common seals) shows a very marked increase after 1995. By contrast, most deep diver species (pilot whales, beaked whales, risso's dolphins, sperm whales) shows no increase in stranding abundance, with the exception of fin and minke whales whose stranding frequency has significantly increased. An important change in the species composition of stranded individuals has been identified in 1998 related to the increase in harbour porpoise strandings. Most of the temporal trends revealed in the strandings data of the RNE can be related to biological changes observed in real populations: routine monitoring of the French colony of common seals revealed a dramatic increase since 1997, and the SCANS 2 survey revealed that harbour porpoise populations recently shifted its spatial distribution in Europe, moving toward south and possibly invading the English Channel and the Bay of Biscay. These example shows that strandings data can reflect real biological and ecological change in at-sea populations.

C20 OCCURRENCE OF CETACEANS OFF PORTUGAL MAINLAND: HISTORICAL AND WHALING RESEARCH BETWEEN 1921 AND 1978

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Historical oral sources indicate that whales, dolphins and particularly common dolphins, were captured in large numbers off Portugal mainland during late 19th and 20th centuries. Considering this information, we conducted an historical research to understand the past occurrence of cetaceans off Portugal mainland and obtained cetaceans' capture records for three distinct decades. Whaling data obtained from the secretariat of the International Whaling Commission was compared to Portuguese statistical books and a whaling data sheet was produced. We found 1313 occurrences of great whales (including several baleen whales and two species of odontocetes, sperm whales and orcas) in whaling captures off Setúbal and Sesimbra, for two separate periods: 1925-1927 and 1944-1951. From these, fin whales were the most common whales (80%), followed by sperm whales (20%); the other species were only caught sporadically. This land-based industrial whaling activity occurred continuously and, in both situations, ceased due to the reduced number of available whales. Unpublished information and grey literature for the 1970's was also included, when referring to the capture of cetaceans and, between 1976 to 1978, a total of 45 cetaceans were counted in several fish markets along the Portuguese shore. Most captures were small delphinids (87% common dolphins), even though four baleen whales were registered. These captures were part of local non industrial fisheries and were not the main target, rather opportunistic catches or even by-catches of other fisheries. Globally, and regarding all historical evidences, it seems to be a tendency for captures to happen in the central west coast (which includes the region off Sesimbra), where probably a greater diversity of cetaceans' species and abundance of individuals do occur. Another region to consider in future studies is in the north, the village of Póvoa de Varzim, where significant high numbers of common dolphins were captured.

C21 LIVE CAPTURES OF *TURSIOPS TRUNCATUS* – CAN THEY BE JUSTIFIED BY DOLPHIN ASSISTED THERAPY?

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In 2006 and 2007, with the permission of Turkey's Ministry of Agriculture and Rural Affairs, 23 bottlenose dolphins (*Tursiops truncatus*) were captured alive from the "vulnerable" Mediterranean population, in spite of the lack of sound scientific research needed to prove that captures would not be detrimental to the

population(s) targeted. In 2008, 12 bottlenose dolphins captured in a Japanese “drive hunt” were exported to Turkey, again without proof of a non-detriment finding having been made or information about the impact on the conservation of the population targeted. All these dolphins and at least a dozen others imported by Turkey from Black Sea states have been used for shows, swim- with and Dolphin Assisted Therapy (DAT) programmes. There are currently at least nine facilities in Turkey holding captive *Tursiops truncatus*, eight of them offering DAT either within their facilities or guidance to centers in Kaş, Kemer and Antalya. Scientific examination of the studies published by DAT practitioners conclude that DAT has not been demonstrated to have any long-term beneficial impact on those who have attended a DAT programme. Concerns about the captures in Turkish waters and their impact on the conservation of the populations targeted have been raised by the Bern Convention and ACCOBAMS, which passed a resolution on the issue at its last Meeting of Parties. As the IUCN’s Cetacean Specialist Group notes, live captures are equivalent to killing as the individuals removed or killed during capture operations are no longer available to help maintain their populations. Recent studies have also revealed the importance of individuals in the social network and community structure of bottlenose dolphins, which would be effected by the removal of individuals in live capture operations. Legislative change to regulate trade and the keeping of cetaceans in captivity in Turkey could address some of these problems.

C22 SUMMER HAUL OUTS OF LADOGA RINGED SEALS (*PHOCA HISPIDA LADOGENSIS* NORDQUIST 1899)

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Phoca hispida ladogensis is an endemic subspecies which only inhabits Lake Ladoga. Ladoga ringed seal numbers are now at the lowest level ever recorded. This subspecies requires immediate attention and protection. The study of the Ladoga ringed seal haul outs was conducted during the summer seasons of the years 2001 – 2008. For these years number of haul outs on islands near to coast of Ladoga has catastrophically decreased. This tendency is connected with sharp increase of unorganized tourism and fishery in these areas. Mass haul-outs are concentrated in the Valaam Island in the center of the Ladoga Lake. In majority of cases on haul outs only adult animals are observed (males noticeably prevail – more 70% of hauling out animals), cubs are registered seldom. The maximum numbers of hauling-out seals on the islands of the Valaam Archipelago were registered at the end of May - June, reaching in some years 600-750 individuals, corresponding to approx. 15-20% of the total population size. The probability of seals haul outs forming in July and August significantly varied from year to year.

The presence of seals in this area in July and August can be closely associated with an abundance of fish (Cisco) and the level of human impact. The number of the seals on the haul out places is changing constantly. The main causes of the small comings down are conflicts between seals, birds passing by, sudden wave splash, and so on. The causes of mass comings down are mostly (more than in 70% of cases) anthropogenic. Anthropogenic factors not only leads to the great decrease of the number of hauling out seals, but also seriously influence the level of animals' wariness and aggressiveness. Valaam Islands should be strictly protected during the open water period from mid May to the end of September.

C23 A REASON TO SUPPORT WHALE CONSERVATION – A TOURISM IMPACT CASE STUDY FROM THE DOMINICAN REPUBLIC

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In 2007, 206 tourists in the Dominican Republic were surveyed to determine whether the stance of a country in support of whale conservation, or in support of whaling, would affect their decision as to whether to visit that country on holiday. The majority (77.1%; n=205) stated that if a Caribbean country supported the hunting or capture of whales or dolphins they would be less likely to visit it on holiday (more likely: 2.9%; no opinion 20.0%). Moreover, a larger majority (81.1%) stated that if a country has a strong commitment to whale and dolphin conservation they would be more likely to visit this country on vacation (less likely: 4.9%; no opinion: 14.1%). At the time of this study the Dominican Republic was not a member of the International Whaling Commission (the international competent authority for whale management) but government officials were debating membership and their policy with respect to cetacean utilization in this highly polarized treaty organization. The current study suggests that a highly visible national policy towards cetacean conservation, and against the capture of cetaceans, would be beneficial in terms of attracting tourists, whereas a visible pro-whaling policy might repel them.

C24 IS FLIPPER FLIPPED OUT? AND WHY DO WE CARE?

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The management of marine mammals traditionally focuses on lethal takes, such as in bycatch, vessel collisions and strandings. However, we are beginning to realise

that non-lethal impacts of human disturbance can also have serious conservation implications, indicating that mortality counts only reveal a fraction of the picture. Possibly the most important of non-lethal (at least, not immediately lethal) impacts arises from the prolonged or repeated activation of the stress response. The physiological stress response is a life-saving combination of systems and events that essentially maximises the ability of an animal to kill or avoid being killed. However, "chronic stress" is linked to numerous conditions in humans, including coronary disease, immune suppression, anxiety and depression, cognitive and learning difficulties, and infertility. How does this relate to marine mammals and their conservation? Growing human activity in the marine environment is increasing the frequency with which human disturbance triggers stress responses in cetaceans and other marine mammals and thus also the likelihood of inducing chronic stress. As noise travels further in water than air, marine mammals, like other marine fauna, will be acoustically exposed to human activity at much greater distances than terrestrial animals and may thus be particularly sensitive to chronic stress. Coastal species will be especially vulnerable due to the concentration of human activity in these areas. The possibility that endangered marine mammals might express the various conditions linked with chronic stress in humans has troubling implications for conservation efforts (especially MPAs), demands management attention, and may explain, at least in part, why some species have not recovered after protective measures have been put into place.

C25 INTERACTION BETWEEN BOTTLENOSE DOLPHINS AND FISHING AT LAMPEDUSA ISLAND

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With the conclusion of the LIFE project NAT/IT/000163 "Del.ta" is finished the dolphin-fishery interaction study conducted in the archipelago of Pelagie islands. The local fishery fleets consists in 46 bottom trawls, 18 long lines, 14 gill nets, 4 surrounding nets, 9 pots and more than 45 hand lines. The interaction of dolphin (*Tursiops truncatus*) with fishing activities was monitored by researcher directly boarded on fishing boats. In the study period 40 surveys on bottom trawls, 90 surveys on gill nets and 13 surveys on surrounding nets have been carried out. In case of dolphins sightings, the observers collected data on number of animal and behaviour in order to describe interaction among dolphins and fishery gear. The landed fishes were also weighted and checked for damage at the end of any fishing trip. All the fishing tools were monitored through interview on a sample of 47 fishermen. This study highlights the existence of what was called "operational competitive interaction" between bottlenose dolphins and fishermen. Statistical

analysis show a significant reduction of fishing catch for *Mullus surmuletus* in case of dolphins presence only on gill nets. The economical impact on this gear is about the 15% the total revenue.

DISTRIBUTION / ABUNDANCE

D01 A REVIEW OF THE DISTRIBUTION OF HARBOUR PORPOISES (*PHOCOENA PHOCOENA*) ON SEA OF AZOV DURING PERIOD 2005-2008

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Information about modern distribution of the dolphins in the Sea of Azov is poor. During investigation period, distributional data were collected from the coast and R/V DENEK. Summer survey showed two animals crowds on the Sea of Azov. It was situated close western and eastern coasts of the sea. The relief of the sea bottom has bank vault on this place. Here we observed foraging behaviour of the dolphins. On ice-free winter time harbour porpoises in Don River was observed. Spring discovery of the adult female in Taganrog Bay (fishnet caching) also important.

D02 OCCURRENCE OF HARBOUR PORPOISES IN THE BLACK SEA: DATA OF SOVIET SURVEYS IN 1970S – 1980S

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In 1976-86, under the control of Marine Mammal Lab, AzCherNIRO Odessa Branch, headed by the author, aerial survey of Black Sea cetaceans was conducted. The survey was conducted by strip transect method. Data from 41 flight maps and vessel surveys were generalized (Distribution maps were compiled). In 1981, parallel aerial/vessel survey was conducted in the eastern Black Sea (together with Tim Smith). The number of porpoises detected in vessel surveys was much larger than in aerial ones. Thus, the porpoises' percentage among Black Sea cetaceans has to be much higher than it was suggested before. The idea of exclusive inshore occurrence of harbour porpoises was rejected. Being able to forage on pelagic fishes, they were regularly observed in offshore Black Sea waters, including deep

areas. Thus, the distribution maps for the Black Sea harbour porpoise published in Red Data Books and other documents should be corrected. At least during the warm season, harbour porpoises form relatively stable aggregations (stocks, populations): Crimea-Caucasus, south-eastern, north-western and south-eastern. Their locations coincide with the distribution patterns of the important prey object, anchovy (Crimea-Caucasus, Caucasus-Anatolia and Western Black Sea stocks). Only porpoises from the Crimea-Caucasus stock take feeding migrations to the Sea of Azov and back, so only they can be called "azovka". For the other Black Sea porpoises the Russian names "svinka", "chushka" or "pykhtun" are more appropriate. It is necessary to combine efforts of all Black Sea nations for organization of observations on cetacean distribution both in inshore and offshore waters, in warm and cold seasons. Future aerial surveys should be conducted with the use of not only line transect, but also strip transect method. It would allow to obtain the data comparable with past surveys and to discover changes in distribution and abundance of harbour porpoises.

D03 ROUGH-TOOTHED DOLPHIN (*STENO BREDANENSIS*, G. CUVIER IN LESSON, 1828) IN ISRAELI MEDITERRANEAN: 1993-2008

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Rough-toothed dolphin (*Steno bredanensis*) is considered an occasional visitor to the Mediterranean. To our knowledge, apart from a single skull in the British Museum collected near Haifa in 1949, records from the Levantine basin were unknown until recently. Prior to IMMRAC's involvement, there were no skulls of this species in the Tel-Aviv University Zoology museum, ever since they started their collection in the early nineteen fifties. Between 1993 and 2008, IMMRAC's team attended to nine stranded rough-toothed dolphins out of 230 cetacean strandings along the Mediterranean coast of Israel, the first one in March of 1997. The stranding sites spanned the entire coastal length, from the Gaza strip in the South to Shavey-Ziyon, near the Lebanese boarder, in the north. All strandings occurred between February and May, suggesting a seasonal presence. All but one were young calves (body length range 145-191 cm). In addition, one unusual sighting of two live pods, each containing about 40 individuals of all age groups was made on March of 2005, one inside and one outside the breakwater of Haifa Port. The sojourn inside the port lasted from early morning to late afternoon, with the dolphins in tight formation feeding on mullet (*Mugil* sp.) which abounded in the port on that day. Seven animals were photo IDed and cataloged. This apparent regional clustering may represent Lessepsian migration, a point to be resolved

through genetic analysis. Taken together with other recent sightings and acoustic detections from the region and from the Mediterranean at large, the species' residence status may need revision.

D04 SPATIAL AND TEMPORAL DISTRIBUTION PATTERNS OF *DELPHINUS DELPHIS* AND *STENELLA FRONTALIS* IN SÃO MIGUEL ISLAND, AZORES

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In the southern coast of São Miguel Island, Azores, common dolphins (*Delphinus delphis*) are sighted all year round, whereas Atlantic spotted dolphins (*Stenella frontalis*), are seasonal, sighted most often between May and November. Opportunistic data based on sightings of whale watching companies were collected from April 2006 to November 2008. Statistical and GIS analyses were performed in order to clarify the distribution patterns of these species in the period when they are both present. Results give no evidence of the competition suggested in previous studies: the perceived abundance of *D. delphis* does decrease in July, when numbers of *S. frontalis* are growing, but both species reach peak densities simultaneously in September. The hypothesis that the common dolphins move offshore in the beginning of summer, as documented in other areas, is investigated. The behavioural interactions between *Delphinus* and *Stenella* are described. The advantages and inconveniences of opportunistic data for future studies of this issue are discussed.

D05 *This poster was cancelled*

D06 EXCEPTIONAL INSHORE PRESENCE OF FIN WHALE OVER THE NORTHERN IONIAN CONTINENTAL PLATFORM

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During summer 2008 dedicated vessel based survey were carried out in Northern Ionian waters, in an area of about 3.500 square km, in order to investigate the cetacean presence and distribution. During sighting the photo-identification technique was adopted and information about position, behaviour, group size and interaction with boats were also collected. A total of about 1.000 nautical miles were navigated in search for cetaceans. For about three weeks, between the 5th and 21st of August, fin whale presence was exceptionally recorded in a small area of nearly 30 square km, Southern of Antipaxos and Northern of Lefkada. A total of 4 sightings with one or two individuals at once were registered. Presence of the species in the area was already known but, differing from previous study, 2008 sightings were located in shallower waters, ranging from 180m to 300m of depth. The observed depth resulted similar to the one of sightings recorded over the continental platform around Lampedusa island, considered as a fin whale feeding winter ground, but it is very different from the ones of the Ligurian sea and previous sightings of the same area, which report the species in deeper waters. The shift in distribution could be due to a change in presence of the prey or to seasonal change in SST of the area.

D07 COAST TO COAST: FIRST EVIDENCE FOR TRANSLOCATIONAL MOVEMENTS BY SCOTTISH BOTTLENOSE DOLPHINS

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There has been much debate in recent years whether or not individual bottlenose dolphins from apparently isolated or discrete coastal communities interchange with one another or not, but in UK waters the literature very much suggests the latter. However, in a recent effort to exchange photo-identification data between organisations working with the species in Scottish coastal waters, the very first evidence for movement of animals between the inner Hebrides of the west coast and the Moray Firth in northeast Scotland has been established. The confirmation of matches between the two geographically-separate communities was made from 7 adults with distinctive dorsal edge marks recorded in the southern outer Moray Firth by the CRRU research team on 4 occasions in July 2001. These individuals were positively matched by AULFS with subsequent sightings by HWDT in 2002, 2004 and 2005 around the islands of Mull and Skye, some 400+ kilometres away. These findings are believed to be highly significant to our current understanding of individual and genetic mixing between adjacent studied bottlenose communities,

but also to wider-scale population structure and dynamics and perhaps even overall distribution in western European waters.

D08 MARINE MAMMALS IN THE COASTAL WATERS NORTH-EASTERN PART OF THE SAKHALIN ISLAND

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The marine mammals observation conducted during the summer–autumn periods of 2004-2007 on the north-east part of Sakhalin island, as a part of the “Gray Whales Observation” project. During 2004-2007 all observations has been done in a Pul’tunskiy region (total: 540 hours). The observations conducted every 1-3 hours during the day’s light time. In 2004 larga seal was registered almost every day and daily in 2005-2007. The animals number (2006) on the common haulout increased at the end of June (30-50 animals) to the begging of September (200-250). In 2004 was one meshed juvenile animal, which traveled in a south direction (probably on Tuleniy Island). Harbor porpoise were observed in 2004 during whole field season (33 animals), in 2005 were observed only in August and in September (9 animals). There were 17 minke whales traveled mostly northward alone in a 1-2,5 km offshore during research years. We did not observe adult beluga whales in the region, but the 1 month calf has been found in a Pil’tunsky Gulf in a low tide. The remains of adult beluga whale has been found in the same place next year (2006). Also the remains of the adult beluga whale male founded in 2004 on the Piltunskaya Spit. 26 of July 2005 in south of Sakhalin in region peninsula Kril’on Baird’s beaked whale were found. Also, another Baird’s beaked whale’s remains were spotted on the Astokhskey Spit. The Killer whales observed during whole field seasons, except 2006 (total: 34). We did not observe the killer whales predation on the gray whales. There are many marine mammals species inhabit the region. Most probably, the nearshore water enriches by the organic and non-oranic materials from the Pil’tunsky Gulf and it increases the phyto- and zooplankton productivity in the coastal water north-eastern part of Sakhalin.

D09 MARINE MAMMALS IN THE COASTAL WATERS OF NORTHERN PART OF ANADYR GULF (BERING SEA) IN SUMMER, 2007

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Stationary surveys of marine mammals were conducted under the monitoring of the shore haulouts of the Pacific walrus in the summer-autumn period 2007 on the western extremity of the Meeskyn Spit Island (MSI) and the Retkyn Spit (RS) in Rudder Bay (total: length walking routes 750 km and vessel - 311 km). Visibilities were counted twice a day. On MSI, the larga was sighted throughout the entire observation period (max=11). In the RS regions, the larga occurred much less frequently (max=4). Six seals were sighted near of Enmelen River. On MSI 2 ringed seals were sighted. Two sightings bearded seal: off MSI and in the region of Cape Bering (CB). Steller sea lion was sighted twice: near shore of the MSI and in the region of Uel'kal'. On CB there were no more than 10-15 individuals. The hunters of Uel'kal' took a female northern fur seal at the entrance of Kresta Bay. Off MSI, gray whales were sighted almost daily (max=28). Near CB were sighted regularly. Minke whales were sighted at the entrance to Kresta Bay (max=5), and the other observations apply to MSI. Killer whale was sighted regularly off MSI and Uel'kal' during the entire observation period (max=15) and on those days killer whales showed high hunting activity attacking walruses. In the CB region and Rudder Bay were sighted twice. A young polar bear for 2 days stayed at the western edge of the MSI. Our observation in the northern Anadyr Gulf in 2007 revealed that the specie composition of marine mammals in the summer-fall season there was diversified, and the baseline species are the Pacific walrus, spotted seal, gray whale, killer whale and Minke whale, and for many of them (polar bear, Steller sea lion, northern fur sea), Anadyr Gulf is the edge of the range.

D10 STATUS, POPULATION TREND AND POPULATION STRUCTURE OF SOUTH AMERICAN FUR SEALS *ARCTOCEPHALUS AUSTRALIS* IN SOUTHWESTERN ATLANTIC WATERS

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The South American fur seals were severely depleted during the XVIII century. The objective of this work was updating information on distribution, abundance, population trend, population genetic structure and potential migratory paths along the Southwestern Atlantic. Distribution in Argentina includes: Mar del Plata (Buenos Aires), Isla Escondida, Isla Arce, Isla Rasa and Cabo dos Bahías (Chubut), Cabo Blanco and Islote del Cabo (Santa Cruz), seven rookeries in Staten Island and islets of the Beagle Channel (Tierra del Fuego). Censuses were carried out in rookeries from Isla Escondida to Staten Island from 1996 to 2007. The largest concentration is found in Chubut where numbers range from 4500 to 15500

depending on the season of the year. On Staten Island 4500 seals are found. Pups were recorded at Isla Escondida (200-300), Isla Rasa (30) and 5 rookeries at Staten Island (around 1000). Skin samples (n=65) were taken from Southern Brazil (=Uruguay) (n=27), Mar del Plata (n=9), Puerto Madryn (n=5), Chubut Islands (n=24) and Tierra del Fuego (n=1) in order to evaluate population structure and expansion through mtDNA analysis. While in Uruguay the rate of increase is around 10% annually since the cease of exploitation in 1991, in northern Patagonia is close to 8%. From year to year an increasing number of fur seals are recorded in northern Patagonia, indicating seasonal migrations north–south. mtDNA analysis indicated no population subdivisions (Φ_{st} : -0.0292, F_{st} : -0.00716) along the Southwestern Atlantic and also detected a rapid population expansion from a small effective size in the fur seals from Uruguay (Fu's F_s : -10.85149, $P < 0.0001$) and Chubut Islands' (Fu's F_s : -6.58459, $P < 0.001$). These results support the hypothesis that migration among breeding colonies sustains an ancient gene flow that results in a single Atlantic population for the species.

D11 SEALS ON THE GALICIAN COAST: FROM SPORADIC TO REGULAR RECORDS

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Since 1991, the NGO CEMMA has been attending strandings and surveying marine mammal populations along the Galician coast. Although there is no historical evidence of seal colonies in the northern Iberian Peninsula, the presence of these animals is reflected in natural history literature from the XVII century. Nowadays, the sporadic references to seals have become usual year by year. In spite of this, no seal species have been included in the Galician or Spanish lists of fauna and flora. From 1991 to 1999, there were 35 sightings and strandings of pinniped species on the Galician coast. Between 2000 and 2008, a clear increase in the frequency of records has been seen in this area, with 51 seals recorded. The most common species recorded was the grey seal (*Halychoerus grypus*) (71%), followed by the hooded seal (*Cystophora cristata*) (9%), common seal (*Phoca vitulina*) (1%), ringed seal (*Phoca hispida*) (1%), harp seal (*Phoca groenlandica*) (1%), with the remaining 16% being non-identified seals. Considering records of all species together, 75% were found stranded and 25% were observed alive and healthy in the sea. The major causes of stranding were starvation, extreme weakness, hypothermia (grey seals) and hyperthermia (hooded seals), all of them frequently associated with respiratory and digestive problems. Approximately 78% of rescue and rehabilitation attempts have been successful. Since 1996, when the strandings network might be considered fully established, an average of 4.7 grey seals per

year has been registered. This fact demonstrates the regular presence of seals in Galicia, making us consider that the grey seal has to be included officially in the Galician and Spanish lists of fauna and flora.

D12 ABUNDANCE OF STRIPED DOLPHINS IN THE PELAGOS SANCTUARY: INSIGHTS THROUGH LINE TRANSECT SURVEYS

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To assess cetacean densities in the Pelagos Sanctuary area and generate baseline data to provide insight on possible trends, a survey was carried out in the western Ligurian and Corsican Seas in August 2008, thus supporting cetacean conservation and management activities in the Sanctuary. An area of 58,000 km² was surveyed in eight days with equally spaced zigzag transects, covering 1,255 km in favorable conditions. Tracklines were designed using Distance 5.0 to allow for homogeneous coverage probability over the selected area. Fifty three sightings of four cetacean species were made: striped dolphins (n=37), fin whales (12), sperm whales (3) and Cuvier's beaked whales (1). The best model and detection function, selected with the lowest Akaike's Information Criteria (AIC) values, had a half normal function with cosine adjustments. Unlike in previous surveys, due to the small number of sightings the only cetaceans for which an absolute abundance estimate was possible were striped dolphins; the dearth of fin whale sightings made analyses impossible for this species. Striped dolphin populations size resulted to be 13,232 (%CV=35.55; 95% C.I.=6,640.0-26,368), with a density of 0.23 individuals km⁻¹ (%CV=35.55; 95% C.I.=0.11-0.45). The central value of the 2008 estimate was almost half of that of a survey conducted in 1992 in the same area with comparable effort and platform (N=25,614; %CV=25.3; 95% C.I.=15,377-42,658). These results raise the concern that cetacean abundance in the Sanctuary - a Specially Protected Areas of Mediterranean Importance (SPAMI) specifically designated to protect cetaceans - over the past 16 years may be declining and urge for further systematic monitoring. Considering that recent Red List assessments for Mediterranean striped dolphins and fin whales are Vulnerable and Data Deficient, respectively, we stress the need for urgent conservation measures in the high seas throughout the Basin.

D13 HOW MANY ARE THERE? ESTIMATES OF PILOT WHALES (*GLOBICEPHALA* SPP.) ABUNDANCE IN OFFSHORE WATERS OF THE NE ATLANTIC

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During July 2007 a coordinated international survey took place in offshore Atlantic European waters, with the aim of obtaining estimates of abundance for the main cetacean species present in the area, as part of the Cetacean Offshore Distribution and Abundance in the European Atlantic (CODA) project. CODA followed the methodology applied in SCANS (Hammond *et al.*, 2005) and SCAN-II (SCANS-II, 2008) in shelf waters in 1994 and 2005 respectively. Five vessels surveyed an area of 967,538 km². We used mark-recapture line-transect methods to obtain estimates of abundance of individuals and groups of long-finned pilot whales (and all pilot whales since a few sightings were also made of short-finned pilot whales). Estimates of abundance were calculated for the whole study area and each of the 4 blocks into which it was divided. Global estimates were: 25,101 (CV=0.33; 95% CI 13,251 – 47,550) for long finned pilot whales and 26,778 (CV=0.34; 95% CI 13,835 – 51,831) for all pilot whales. Density of long finned pilot whales throughout the study area was also predicted using density surface modelling methods and a suite of environmental variables (e.g. depth, sea surface temperature, sea surface height anomaly, chlorophyll a, slope, depth range, etc.). Modelling results suggest that long finned pilot whales tend to be found in deeper waters, in areas of seabed slope with a southeast orientation and at warmer temperatures. We discuss the estimates obtained and the potential influence of the environmental variables on the estimates and their biological significance.

D14 HIGH PERCENTAGE OF BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*) GROUP WITH NEW-BORN AND CALF DURING THE EARLY SUMMER 2008 IN SOUTHERN CORSICA AND NORTHERN SARDINIA

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During summers 2007 and 2008 vessel based surveys were carried out in coastal waters between Southern Corse and Northern Sardinia, in order to assess the presence and distribution of bottlenose dolphin (*Tursiops truncatus*), by employing the photo identification techniques and the collection of geographical parameters. This is a difficult area to survey due to frequent negative weather conditions and to massive presence of pleasure boats. Nevertheless it resulted very interesting for bottlenose dolphins, showing, in 2008, a high percentage of groups with calves, about 71% of the total. Newborns were observed in July 2008 and calves in August of the same year. Group dimensions of adults with calves were bigger in relation to the ones without. For the Mediterranean sea summer is the reported period of bottlenose dolphin birth. A shift of few weeks, towards the late spring or the early summer could be related to climate change, since highest water temperatures may represent a physiological advantage to the newly-born young and reduce the energy demand on the pregnant female. An analysis of pattern of SST in the area, before the summer and in relation with sighting would be discussed.

D15 APPROACHING THE SIZE OF A SPERM WHALE (*PHYSETER MACROCEPHALUS*) OPEN POPULATION IN MALANGSDJUPET AREA, OFF NORWAY

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Sperm whale males are known to remain segregated from the female groups. These groups are stable and stay all year round in low latitude areas, males abandon the group when reaching sexual maturity heading for higher latitudes. Young males often establish bachelor groups, but older individuals remain alone. These long distance movements are related to feeding, as some areas like the Malangsdjupet, in Norway, are very productive. It's uncertain if these individuals return to lower latitudes to mate in the winter time, and the frequency of the migrations. The aim of this study is to make an approach to the population size, for such an open population using mark-recapture techniques. During the summer of 2008, 45 trips were conducted in a whale watching vessel and pictures of sperm whale flukes collected. Pictures were catalogued and matched by eye, finding at least 65 different individuals. The 25% of the pictures were not suitable for the analysis, as the individuals were poorly marked. Data was analyzed using the

Chapman-modified Petersen estimator to minimize the small sample size bias. To deal with the open population trend, the summer period was divided in 32 surveys, where geographical closure can be assumed. Discovery curves showed a linear trend, suggesting there are still more individuals to encounter. Plotting discovery curves by classes, we observed that groups of young males seem to arrive periodically, but still, the old males are more abundant. Only 12 individuals were re-sighted, and while some individuals were seen in periods up to 21 days, others remain for one day, so the area may be just one step in a migration route as no short-term fidelity has been demonstrated. According to the analysis the population oscillated between 3 and 29 individuals during all the season.

D16 DRAMATIC DECREASE OF SHORT-BEAKED COMMON DOLPHIN (*DELPHINUS DELPHIS*) SIGHTINGS IN THE STRAIT OF GIBRALTAR

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The short-beaked common dolphin is one of the four resident dolphin species of the Strait of Gibraltar. It is listed by the IUCN as critically endangered. The Strait of Gibraltar and the adjacent Alboran Sea are thought to contain the last large populations of this species in the whole Mediterranean Sea. Our research took place in the Strait of Gibraltar and the Bay of Algeciras from April to October 2003 through 2007. Data was collected from platforms of opportunity and included: sighting frequency, group size, behaviour as well as reactions to the vessels. During the study period, the number of observations of common dolphins declined by 55%, and group size by 68%. These decreases are much more significant in the Strait of Gibraltar than in the Bay of Algeciras. The main causes for these decreases are probably (in order of significance): bycatch, habitat loss and prey depletion. Bycatch still takes a significant toll on this species as long driftnets are still being used in these waters, despite their being banned in all Mediterranean waters. Increasing human activities (increased numbers of fast ferries and intensification of their transit, development of mega-harbours in the area) probably play an important role in the displacement of this species. Whale watching seems to be of little impact as this species is not the main targeted cetacean species in the Strait. On the other hand, this species is the main targeted one in the Bay by four companies based in Gibraltar, which do not comply with whale-watching best practice. From our observations we can conclude that common dolphins are

disappearing from the Strait of Gibraltar at a fast pace, due to either displacement or removal. It appears that the present measures of conservation for this species in the discussed area are inadequate or insufficient or both.

D17 COASTAL OBSERVATIONS OF CETACEANS IN THE SOUTH-EASTERN CRIMEA

(This poster was cancelled)

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Waters of the Karadag Natural Reserve were proved to be an important area for cetacean conservation. In May-October, 2008, coastal observations were conducted in the Karadag area and the coast of the Feodosiya Gulf. Visual observations were conducted during the daytime with the use of optics. 29 field expeditions were performed. 118-125 cetacean sightings were recorded, among them 112-118 for bottlenose dolphins (*Tursiops truncatus*) and 6-7 for harbour porpoises (*Phocoena phocoena*). Common dolphins (*Delphinus delphis*) were not recorded from the coast-based observation points. Animals were usually seen at the distance of 400-70 m from the coastline. While hunting, bottlenose dolphins approached to 2 m from the coastline (among them, a calf). The average group sizes were 2.6 bottlenose dolphins and 3 harbour porpoises. The maximum group size was 9 individuals for the bottlenose dolphins, and 5 individuals for the harbour porpoises. One calf was twice observed in the group of bottlenose dolphins. Most often cetaceans were registered in the morning (hunting behaviour), but in general were observed during all daylight hours with low storm activity. Carcasses of two common dolphins were found in May on the Koktebel beach and at the Chameleon cape with no by-catch marks; the cause of death was not determined. Two strandings of bottlenose dolphins were recorded in May, in Beregovoe and Prymorsky. In June, 4 carcasses were found at the Karadag coast: 2 bottlenose dolphins and 2 harbour porpoises. Helminth invasion was found in the harbour porpoise male; it was likely to be a cause of death. On August 6, a stranding of a bottlenose dolphin calf was reported from the Lisy bay.

D18 CETACEAN SIGHTINGS IN THE EASTERN MEDITERRANEAN SEA DURING THE CRUISE MADE IN SUMMER 2008

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The Eastern Mediterranean Sea is one of the least studied areas for cetaceans in the Mediterranean Sea. Lack of basic knowledge such as species composition and habitats makes it impossible to develop effective conservation measures. Therefore, in order to determine the species composition, size and distribution of cetacean population, cetacean sighting data were collected during a research cruise carried out in summer (11-24 July) 2008 in the international water of the Eastern Mediterranean Sea, as well as the Turkish, Lebanese and Syrian territorial waters, to determine the species composition, size and distribution of cetacean population. This research cruise was conducted with a 32-m research vessel YUNUS-S and followed standard line transect sampling procedures. Totally 860 nautical miles (nm) of survey effort was made and average speed of the vessel was 8 nm/h. During the study, five *Physeter macrocephalus* in one sighting, 53 *Stenella coeruleoalba* in five sightings, two *Grampus griseus* in one sighting (associated with *S. coeruleoalba* individuals), two *Delphinus delphis* in one sighting and 24 *Tursiops truncatus* in nine sightings were recorded. The overall encounter rate was 0.18 sightings/10 nm while 0.12 for Turkish, 0.54 for Lebanese and 0.11 for Syrian territorials. Two large and three young individuals of *P. macrocephalus* were observed in the international water between Fethiye and Rhodes while presumably foraging in deep waters near Rhodes Trench. In addition, *S. coeruleoalba* and *D. delphis* were also observed in the area with the depth of 1000-2000m. These cetacean species are under the protection by national and international laws (eg. Barcelona and Bern Conventions). This is the preliminary study for understanding cetacean population in the Eastern Mediterranean Sea, but the results of this study will provide basic information for developing conservation plans in the area.

D19 OCCURRENCE OF CETACEANS OFF MAINLAND PORTUGAL: BOAT-BASED SURVEYS DURING 2007 AND 2008

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Portugal mainland has a coastline of about 832 km with several important topographic features and a cetacean biodiversity which has never been a continuous and long term study object. Along the years some researchers have dedicated their efforts to the study of cetaceans' occurrence, but a constant scientific methodology is still missing. A total of 63 boat-based visual surveys with an effort of 8226 minutes at sea, were conducted during 2007 and 2008 from three different geographic locations, Nazaré, Peniche and Sesimbra (west central Portugal), which were considered regarding important bathymetric characteristics. In Nazaré there is a submarine valley which is the largest canyon in Europe and one of the largest in the world, and more to the south, there are two other submarine canyons, Lisboa and Setúbal, and two major estuaries, Tejo and Sado estuary. Our

surveys resulted in a total of 45 sightings of cetacean: 71 % common dolphins (*Delphinus delphis*), 20% bottlenose dolphins (*Tursiops truncatus*), 7% striped dolphins (*Stenella coeruleoalba*) and 2% minke whale (*Balaenoptera acutorostrata*). Sesimbra is the geographical area with a greater diversity of cetaceans, considering the presence of the four referred species, but only shows a percentage of sightings per unit of effort (number of sightings/number of surveys x 100) of 60%. On the other hand, Nazaré has a SPUE of 84,61% but only common dolphins were sighted. On both situations cetaceans seems to occur mainly between the 100 and 200 meters bathymetric lines which corresponds to the referred ocean topographic features very near to shore. Generically, the small delphinid community along the central coast of Portugal is similar to what can be found, for instance, in the Bay of Biscay (Spain) where areas of primary interest for dolphins were also identified as the shelf break, canyon areas, and river plumes.

D20 NETWORKING CETACEAN MONITORING, USING PASSENGER FERRIES AS A PLATFORM OF OPPORTUNITY, IN ITALY

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Monitoring cetacean presence, relative abundance, distribution and migration timing is an effective indicator to detect environmental changes and habitat degradation and can provide information to improve conservation and adaptive management of marine ecosystems. In particular large-scale monitoring programs are needed to better understand relationship between cetacean and oceanographic parameters. Types of observation platforms and cost of research have been the main problems on the development of monitoring programs capable to survey cetacean population over time. Given low cost, standard route, speed and height of the observer, ferries are an efficient and cost-effective platform of opportunity for long-term monitoring programmes of cetaceans. In 2008 a network of research bodies joint together to monitor cetacean presence along the Central Tyrrhenian and the Ligurian Sea. In this conference paper we present the results of weekly observations undertaken during summer 2008 along three ferry's route. Each transect was considered as an independent statistical unit. We primarily analysed presence, relative abundance (measured as number of sightings per hour spent in observation), mean group size and distribution. Observations were undertaken in fine weather condition and sightings were also associated to environmental parameters and nautical traffic. Moreover, possible episodes of "ferry-whale" collisions were recorded. Along the three routes, in 80 runs, in a total

of 301 hours of survey effort were recorded 166 sightings of six cetacean species totalling approximately 759 individuals; mean encounter rate was 0,51 sightings/hour. Main sighted species were *Stenella coeruleoalba*, *Balaenoptera* spp. and *Tursiops truncatus*. Results, however, showed differences in presence and relative abundance of animals amongst the three routes. No Ferry-whale collisions were recorded in a total of 8335 NM. Final aim of the Network is to validate and standardise this large-scale monitoring programme and assess the efficacy in term of early sign of negative effect of environment changes on cetacean populations.

D21 CETACEAN SIGHTINGS IN THE AEGEAN SEA IN SUMMER 2007 AND 2008

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Since Turkey has a long coastline of 8353km along the Black Sea, Marmara, Aegean and Mediterranean Sea, it is difficult to cover all its coasts for understanding cetacean distribution. It is important, therefore, to take every opportunity to collect information on cetaceans. Research cruises were made along the Aegean coast of Turkey in summer 2007 and 2008 on a 32-m research vessel YUNUS-S. The survey effort was 639 nautical miles (nm) in 2007 and 653 nm in 2008 between Gokova Bay and Gokceada in the northern Aegean Sea. The average speed of the vessel was 8 nm/h. During two cruises, totally 26 sightings were recorded, which belong to three species; *Delphinus delphis* (6), *Tursiops truncatus* (15) and *Stenella coeruleoalba* (5). The encounter rate was 0.0062 sightings/nm for 2007 and 0.034 sightings/nm for 2008, the overall rate 0.020 sightings/nm. Most of the sightings were recorded in Saros Bay and near Canakkale Strait in the northern Aegean Sea, where pelagic migratory fish were abundant due to its location at the entrance of the Turkish Straits System. All *S. coeruleoalba* groups were observed in high sea, while *T. tursiops* were observed close to the coastline. As for *D.delphis*, which is listed as Endangered in IUCN Red List, we still had several sightings along the Turkish coast both in 2007 and 2008. This is the preliminary study for understanding cetacean distribution in the Aegean Sea, but the results of this study will provide basic information for developing conservation plans for the cetaceans in the area.

D22 AN INTERANNUAL COMPARISON OF SEASONAL STELLER SEA LION (*EUMETOPIAS JUBATUS*) DYNAMICS ON REPRODUCTIVE ROOKERIES IN THE KURIL ISLANDS

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In view of changing environmental conditions, whether due to climate change or direct anthropogenic impacts, it is important to monitor behavioral responses of animals on an interannual scale and across its range. Such monitoring is particularly important for endangered or threatened species. We compared seasonal dynamics, pupping rates and reproductive success between the four rookeries in the Kuril Islands (Antsiferov Island, Dolgaya Rocks, Raykoke and Brat Chirpoev islands) and over a five year observation period (2003-2007). A logistic growth equation was used to model both pup counts and total numbers of animals until saturation of a rookery. The estimated parameters suggest that the total population of the SSL's is stable, varying within the estimated error. On one island in the central Kurils, there is a distinct increase in adult counts. Nor has the number of pups born annually hasn't changed significantly since 2003, though there is a consistent upward tendency. The temporal window of the reproductive period depends on latitude of the rookery: The saturation and peak pupping dates of more northern rookeries occur sooner than on southern rookeries. The central islands (Dolgaya and Raykoke) display the steepest maximum pupping rate. However, all of these parameters remain stable on any given rookery between years. Similarly, the reproductive contribution of females has also remained constant over many years of observation. The main factors that regulate pinniped populations are environmental: weather, predation, disease, prey supply, etc. Were any of these factors to be having a significant impact on the population, this would have been reflected in the parameters we explored. Over the past seven years of observation, none of these parameters have displayed any changes or tendencies. We conclude that negative effects of environmental factors on SSL populations in the Kuril Islands are either absent or negligible.

D23 MONICET - THE WHALE-WATCHING COMPANIES AND THE PUBLIC IN AZORES ISLANDS AT THE SERVICE OF CETACEAN KNOWLEDGE AND CONSERVATION

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The importance of cetaceans as key elements of the ocean environment, and as indicators of ecosystem health, is increasingly accepted. A strong whale-watching industry has developed in the Azores in the last decade, and with it concerns about the sustainability of the activity. For theoretical and pragmatic reasons, therefore, the need for long term monitoring of the distribution and abundance of cetacean populations in the Azores is obvious. In this context, the leading Azorean whale-watching companies have decided to join hands to develop protocols for data collection which will provide the necessary data while remaining consistent with the constraints and requirements of the commercial activities. The collected information will be stored in custom-built databases, designed to be easy to manage but powerful enough to hold the long term data series needed. Three different kinds of information will be stored: on-board data (records of what the boats are seeing in each trip, an opportunistic but strong effort), land-based data (records of the sightings of different lookouts placed along the coast, covering a large area and having a systematic effort) and photographs made by elements of the companies and by interested clients. The protocols used for data collection, treatment and storage will be based on the best practices of the field, and subject to peer validation. The MONICET project intends to create a Long Term Database based on the touristic activity, creating a link between tourism and conservation, and opening new research opportunities.

D24 CONSIDERATIONS WITH THE USE OF DATA FROM AUTOMATIC IDENTIFICATION SYSTEMS (AIS) TO ESTIMATE PATTERNS OF SHIPPING DENSITY

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The introduction of Automatic Identification Systems (AIS) for large commercial vessels has provided the opportunity to gather data on shipping movements around the world including vessel location, type and velocity. Understanding distribution patterns of shipping in relation to whales is important for modelling collision risk and potential exposure to underwater noise or disturbance. AIS data can be received from either fixed shore based receivers or vessels at sea. The relationship between range from the receiver and detection probability can vary greatly between areas and over time. AIS data collected from the IFAW research vessel *Song of the Whale* are used to illustrate alternative methods for analysis depending on receiver coverage and reception conditions. Absolute estimates of

shipping density were made for the Eastern Mediterranean basin. Along the major shipping route from the Sicilian Channel to Suez Canal the estimated shipping density was 280 km travelled per km² per year.

D25 IMPROVING THE CONSERVATION OF HARBOUR PORPOISES BY REFINING THE INTERPRETATION OF SIGHTINGS RECORDS AND ACOUSTIC DATA

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Conserving the harbour porpoise is a priority, yet designating SACs is challenging. The systematic offshore surveys of cetaceans yield low-resolution data over a large scale, but virtually no fine-scale information from inshore areas exploited extensively by porpoises. In assessing the importance of inshore areas as potential conservation sites and to monitor any changes occurring within them, a cost-effective approach is required. Observations recorded by the public are potentially a major resource but are under-used because of uncertainty about data interpretation. This study determines the potential for volunteer watch data and static acoustic monitoring technology (T-POD) to provide robust indices of porpoise activity within a site. The ability of these methods to detect trends in harbour porpoise occurrence is assessed in relation to temporal factors, alongside the relevance of these methods to obtain base-line data. By analysing data from Seaquest Southwest volunteers at Capstone Point, North Devon and by deploying T-PODs at 16 locations in this area, we have shown that tidal and diel patterns are strongly linked with the probability of porpoises being sighted or detected by acoustic monitors. T-POD porpoise detections were significantly higher during the ebb and low tide (Wald's $\chi^2_{3,1189} = 71.96$; $p < 0.001$), displayed a significant peak at dusk (Wald's $\chi^2_{3,1189} = 128.09$; $p < 0.001$), remaining elevated throughout the night. Visual effort data concurred an increased presence of harbour porpoise during the ebb tide ($F_{3,138} = 5.60$; $p = 0.001$). This study emphasises that when a site is monitored, the likelihood of detecting porpoises varies with, tidal state and time of day. It may still be possible to detect underlying time-trends despite this 'noise', but certainty about the size of the trend will be reduced. Adjustment therefore needs to be made for these factors before undertaking between-site comparisons.

D26 THE JOINT CETACEAN PROTOCOL: SETTING STANDARDS FOR THE INTEGRATION AND UTILISATION OF EUROPEAN CETACEAN ABUNDANCE AND DISTRIBUTION DATA

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In 2006, a working group was established to update the *Atlas of cetacean distribution in north-west European waters* (Reid *et al.* 2003). One of the main drivers for this work is the EC Habitats and Species Directive (HSD; EEC 1992), which places an obligation on European Union member states to accord cetaceans strict protection and carries with it the requirement to report on their conservation status every six years. The group aims to achieve this through establishment of a Joint Cetacean Protocol (JCP) rather than a static database. The JCP will comprise standards for the integration of cetacean abundance and distribution data collected from European waters using a variety of methods. Data will be shared under a common agreement, ideally through a web-based portal demanding little maintenance, which would, if necessary, restrict access to data not in the public domain. As part of the initial phase of the project, exploratory analyses were commissioned on a subset of data from the southern Irish Sea, which was considered representative of the eventual JCP data resource. The aim of this pilot study was to determine how disparate data types might be integrated and what power the final data resource may have to detect trends in range and abundance. This project has received support from ASCOBANS and a growing number of European governmental and non-governmental organizations.

D27 PHOTO ID AS A TOOL FOR STUDYING A LOCAL STOCK OF BELUGAS (*DELPHINAPTERUS LEUCAS*) IN THE WHITE SEA

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The studies were conducted in the White Sea (Solovetsky Island, Beluzhy Cape) in June – August, 2007. The objective of the study was obtaining information on individual marks on the belugas' bodies. Data were compared to the visual marks recorded during the particular observation season and also with data of 1996-2007


years. The study performed revealed the seasonal and inter-seasonal dynamics of the visitation by belugas of the water area off Beluzhy Cape and provided a new insight in the composition and structure of the Solovetsky beluga reproductive gathering. As of study 131 sides were determined, among which 47 right and 58 left sides were identified. In 12 we failed to identify whether it was the right or the left side. In 7 individuals both right and left sides were identified. 112 out of 131 identified sides fell into two groups in relation to the time of visiting the area under the study. The first group (35 sides) was belugas that were photographed in late June to the first ten days of July. The second group (77 sides) comprised belugas, which appeared after July 10 to remain there until the end of July and the early August. Only 19 were registered throughout the entire observation season. Hence:

1. Belugas' visits to Cape Beluzhy is regular rather than accidental. It confirms our hypothesis of stable "family" groups.
2. In the middle of July the gathering composition change.
3. The abundance of the Solovetsky local herd is more than we presumed basing on the visual observations and outnumbers 200 animals. The herd partly preserves its constancy from year to year.
4. The herd partly preserves its constancy from year to year. The data of 2008 are processed, and confirmed our conclusions. The research was supported and funded by the IFAW.

D28 MOVEMENTS OF GREY SEALS (*HALICHOERUS GRYPUS*) IN SOUTH WEST ENGLAND USING PHOTO-IDENTIFICATION

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Long term photo-identification is being used to learn about complex grey seal movements around South West England (Cornwall, Devon and Isles of Scilly). A database of left/right seal profiles has been collected since 2000 from Godrevy, Cornwall. These were visually compared to images from other sites and matched with 5 marker patterns to ensure a positive identification, through a non-invasive capture-mark-recapture methodology. 28 different seals from Godrevy were identified at a second location. 6 seals (3 male, 3 female) were seen at St Ives/Carracks, which is 6-11km west by shortest sea distance route (SDR) with the average number of days between sightings at the two different sites (AS) being 126 days. 1 seal (male) was seen at Portreath, 8km east by SDR with an AS of 3 days. 12 seals (8 male, 4 female) were seen at Porth Joke/Newquay 26-31km east by SDR with an AS of 123 days. 1 seal (male) was seen at Nanjizel, 43km west by SDR and was recaptured at Godrevy 13 days later. 7 seals (4 male, 3 female) were seen at the Isles of Scilly, 71km west by SDR with an AS of 222 days. 1 seal (female) was seen at Morte Point, Devon, 89km east by SDR and was recaptured at Godrevy 12 days later. Several notable movements were recorded, including DP41 Seahorse

(male) at Godrevy on 01/09/03, Porth Joke 09/09/03 and Godrevy 13/09/03; DP143 3 Pearls (male) at Godrevy on 15/03/08, Scillies 25/03/08 and Godrevy 27/03/08 and S262 Ghost 2 at Morte Point on 08/09/08, Godrevy 20/09/08 - pupping on 23/09/08. As research continues and expands to other sites, a much greater understanding of individual seal (and age/gender group) seasonal movement patterns can be learned, to better inform conservation efforts of the species.

D29 FIRST PHOTO-IDENTIFICATION CATALOGUE OF SHORT-BEAKED COMMON DOLPHINS (*DELPHINUS DELPHIS*) OF THE STRAIT OF GIBRALTAR AND GULF OF CADIZ

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Although short-beaked common dolphins (*Delphinus delphis*) are widely distributed in tropical to cool temperate waters of the Atlantic and the Pacific oceans, the subpopulation of the Mediterranean Sea has suffered an important decline in the past decades. Several recommendations to use photo-identification have been made due to its inclusion as an endangered subpopulation by the IUCN. Here we present the first catalogue of photo-identified individuals of short-beaked common dolphins inhabiting the Strait of Gibraltar and the Gulf of Cadiz (South Spain), using nicks, notches and the variable size and shape of the white patch in their dorsal fins. The study was made using more than 1000 fin images taken by the CIRCÉ crew from 2004 to 2008 during the summer period (May to September). Data was analysed to investigate: a) abundance b) site fidelity and movements between different areas; and to allow future studies of home range, life history, social structure and to quantify the real decline of this subpopulation. A total of 245 individuals were identified in the Strait of Gibraltar and 109 individuals in the Gulf of Cadiz. The catalogues of common dolphins found in the Gulf of Cadiz and the Strait of Gibraltar were compared but no matches could be found. This suggests that little interchange occurs between the two areas. Also recaptures of common dolphins found in the Bay of Algeciras and the Strait of Gibraltar show that when conservation plans will be done for that specie it should not be restricted solely to the Bay but should be extended to the entire area of the Strait of Gibraltar.

D30 EVIDENCE OF LONG-DISTANCE MOVEMENTS OF BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) AROUND THE IRISH COAST USING PHOTO-IDENTIFICATION

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Under the EU Habitats Directive member states are required to designate SACs for bottlenose dolphins. In order to identify potential SACs, images of bottlenose dolphins from around the Irish coast were obtained from a number of sources. A total of four catalogues were examined for matches, including Galway Bay, Clew Bay, Donegal Bay, and images submitted to the Irish Whale and Dolphin Group (IWDG) from around the entire Irish coast. A total of 114 individual dolphins were identified from the four catalogues, of which 16 were subsequently re-sighted (14% re-sighting rate). The distance between re-sightings ranged between 130 and 700km, and the duration between re-sightings varied over 26-760 days. The largest distance between re-sightings was c700km (between Dublin Bay and Galway Bay). The longest time period between re-sightings was of an individual with a condition described as scoliosis when first recorded in Galway Bay in June 2005 and was re-sighted in Clew Bay in July 2007, 760 days later. The Shannon Dolphin and Wildlife Foundation (SDWF) manage a catalogue of resident bottlenose dolphins from the Shannon estuary comprising of c200 individuals. No matches were found between the resident dolphins and the 114 dolphins identified as part of the present study. This short study provides evidence that these dolphins are undertaking vast movements around the Irish coast, for which there is no previous data, and has broad implications for the conservation and management of this species.

D31 HETEROGENEITY FROM NATURAL MARKS IN BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*)

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Monitoring trends of animal population is known as an essential part of conservation issues. Although individuals of many cetacean species have distinctive natural variation in appearance which allows identification of individuals through field photography of free-ranging individuals, the use of mark-recapture methods involves several assumptions. The most important assumption is that every animal should have equal probability of being captured within any sampling occasion. In photo-id studies of bottlenose dolphins (*Tursiops truncatus*) photographs of dorsal fin have been used for matching. Marks on animal were not equally distributed in the population, due to the fact that some individuals are unmarked or with not so visible mark, while others have very large marks that make them easily recognized. The goal of this study was to identify potential heterogeneity in capture probabilities between females and the rest of population. 6550 photographs were

taken over four year sampling in both Ligurian and Northern Tyrrhenian Sea. Only high quality pictures were selected from the catalog and used for examination. We analyzed 492 photographs (247 left sides, 245 right sides) making a distinction between adults female, identified as the individuals seen in strong association with a calf, and the other components of the population. We identified different type of natural marks: notch, scar, protruding piece, scrape, back indentation, hole, deformation, white coloured area. Finally the prevalence, abundance and intensity of each mark types have been assessed in order to underline heterogeneity between the two groups analysed.

D32 THE ONLINE ITALIAN STRANDING DATABASE

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A national stranding database has been created by CIBRA (University of Pavia) and the Museum of Natural History of Milan with a grant from the Italian Ministry of the Environment, within the frame of the ACCOBAMS protocol to monitor cetacean populations. Stranding data published yearly between 1986-2005 by Centro Studi Cetacei have been geo-referenced and transferred to a relational database. In recent years new agencies started the record of stranding information and consequently data for the database is now collected from different networks operating in the field. Each record in the database provides information about the date of the event, its location, data of the specimen such as species, sex, length, etc. The records also hold information about toxicological and parasitological investigations, description of samples collected and the institute where the samples are stored. The database is online at <http://mammiferimarini.unipv.it>. Two types of access are allowed: public access to view generic data such as date, species, geographical location on google map and bibliographic reference if available; controlled access for registered users that can access all recorded information such as causes of stranding, conditions of stranded animals, catalog of biological material sampled from animals, results of necroscopy, and photographic documents. The database is linked to the Cetacean Tissue Bank (<http://www.mammiferimarini.sperivet.unipd.it>) of the University of Padova, where samples collected from the stranded specimens are stored since 2005. At present the database contains 3566 records concerning 3660 stranded specimens, belonging to 14 species. Summary and statistics of the data are presented and discussed.

D33 CETACEAN STRANDINGS IN THE TURKISH STRAITS SYSTEM (TSS) AND THE NORTHERN AEGEAN SEA COAST OF TURKEY DURING 1999-2008

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The Turkish Straits System (TSS), namely the Istanbul Strait (Bosphorus), the Marmara Sea and the Canakkale Strait (Dardanelles), constitute a biological corridor for dolphins as well as for pelagic fish between the Black Sea and Mediterranean Sea. In the TSS, three cetacean species; *Tursiops truncatus*, *Delphinus delphis* and *Phocoena phocoena*, are known to occur. In the Aegean Sea, nine cetacean species are known to occur; these are, *D. delphis*, *T. truncatus*, *Stenella coeruleoalba*, *Globicephala melas*, *Grampus griseus*, *Pseudorca crassidens*, *Ziphius cavirostris*, *Physeter macrocephalus* and *Balaenoptera physalus*. The occurrence of the harbour porpoise has been little studied in the Marmara and Aegean Sea. A total of 56 stranded cetaceans (27 individuals from the Marmara Sea, 22 from the Istanbul Strait, 1 from the Çanakkale Strait, 6 from the Aegean Sea) were reported during 1999-2008. Among them, there were 18 *P. phocoena*, 17 *D. delphis*, 15 *T. truncatus*, one *G. griseus*, one *S. coeruleoalba*, 2 dephinids, and 2 unidentified individuals. Four of them were live stranded and rescued, 13 were bycaught (7 *P. phocoena*, 6 *D. delphis*). *G. griseus* in Edremit Bay and *P. phocoena* in Saroz Bay were the first stranded records for these species in the Turkish Northern Aegean Sea coast. *P. phocoena* found in the Canakkale Strait was also the first record for the area. The result of this study contributes to the basic information of cetacean species known to occur in the area.

D34 FIRST RECAPTURES OF FIN WHALES (*BALAENOPTERA PHYSALUS*) MIGRATING THROUGH THE STRAIT OF GIBRALTAR

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Fin whales are one of the migratory species of the Strait of Gibraltar, swimming eastwards from the Atlantic Ocean into the Mediterranean Sea in autumn-winter, and westwards during spring-summer. The Ligurian-Corsican-Provençal Basin in the Mediterranean Sea is a well-known feeding ground for this species, where most of

the sightings occur in August. On the other hand, fin whale populations in the North Atlantic Ocean have been described as being genetically isolated from other populations. The aim of this study was to estimate the amount of whales passing through the Strait, to see if there are cross-matchings with other adjacent areas, as well as to assess whether individuals returned after leaving the Mediterranean Sea or even passed several times through the Strait. This study was carried out from opportunistic platforms of whale watching departing from Tarifa, Spain, from April through October in the period 2003-2008. It is based on mark/recapture of dorsal fins. An average of 17 whales are sighted every year. Two individuals were photographed independently for the first time during their westerly migration in July 2005, and were recaptured in the same area in the summer of 2008, both swimming westerly. In addition, one of the recaptured whales was traveling in a group on each occasion, but both groups were composed of different individuals. The second one was seen with another individual the first time, but alone in 2008. To our knowledge, this represents the first recaptures of fin whales migrating through the Strait of Gibraltar. Therefore we conclude that at least some Mediterranean fin whales migrating through the Strait of Gibraltar to the Atlantic Ocean may do so more than once in their lifetime, possibly on a periodical pattern, possibly every 3 years. These fin whales probably associate randomly during their migrations through the Strait of Gibraltar.

D35 FIRST ANALYSIS OF LONG TERM ASSOCIATION OF RISSO'S DOLPHIN (*GRAMPUS GRISEUS*) POPULATION IN THE LIGURO – PROVENÇAL BASIN AND GULF OF LION

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Risso's dolphin (*Grampus griseus*) is a medium size odontocete distributed in the deep pelagic waters, especially on continental slope. The presence of Risso's dolphin in the Liguro-Provençal Basin and Gulf of Lion is known from daily survey and the stranded specimens. They are mostly seen where waters is 500 – 800 meters deep and no often near the shore. This study presents preliminary result on association pattern among population of the north western Mediterranean Sea. This work was performed on data present in two different databases from two different institutions, that work in two different areas. The data were collected when the sea state was 3 or less on the Beaufort scale. Photo identification technique was used to capture specimens. Natural marking present on the dorsal fin and surrounding flank was analysed to identify individuals. The data from first database was collected in the Ligurian and Tyrrhenian Sea by the Department of

Biology of University of Genoa and CIMA Research Foundation of Savona from the 2004 to 2008 during 34 sightings; the second one was contained data from the Ecoocéan Institute in Montpellier collected from 1991 to 2007 during 27 sightings in the north western Mediterranean Sea. Two databases were joined to a new one in order to homogenize data like photographic quality assessing and then all the records were compared on the right and left side. 276 animals were identified on the right side and 297 animals were identified on the left side. 153 individuals were identified in the both side. 63 and 72 specimens were recaptured on the right and left side respectively at least two times. A long-term association analysis was performed. Result showed that the population of the study area was separated into 8 groups formed by individual in preferred association: 5 small and 3 main groups.

D36 NEW DATA ON CETACEANS IN KARKINIT GULF OF THE BLACK SEA

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Karkinit Gulf in the north-western Black Sea is one of the northernmost edges of distribution ranges of the Black Sea cetaceans: harbour porpoises, bottlenose and common dolphins. The most complete data on the population structure and social ecology of bottlenose dolphins in this region were obtained in 1970s, while the present data are sparse. The data were obtained from authors' studies at the coast of Tarkhankut peninsula in 2005-07 and polling of university students and local residents of the coastal regions in 2002-08. Total occurrence of cetaceans remained relatively stable from year to year with some fluctuations. Both in field observations and questionnaires, bottlenose dolphins dominated in sightings, while harbour porpoises dominated in strandings. Bottlenose dolphins and harbour porpoises were recorded in all parts of the Karkinit Gulf all year round, although almost all observations fall to summer. Common dolphins were reported rarely; however, sightings and strandings were recorded in various sites. Bottlenose dolphins are constantly present in the south-western part of the gulf during summer. The number of the herd is at least 40 animals. This estimate is consistent with earlier data which is an evidence of stability of the stock. Bottlenose dolphins usually approached the coastline in the mornings (6–11 a.m.) and evenings (6–8 p.m.), demonstrating roaming and feeding behaviour. Respondents reported constant summer presence of bottlenose dolphins in the eastern and northern parts of the gulf. Mean group size reported by respondents was 4.4 dolphins, resulting in the corrected estimate of 2.9 animals, which agrees with the authors' observations. By-catch was reported by local residents as an important mortality

factor (which probably primarily concerns harbour porpoise). Several cases of food consumption of carcasses by coastal residents and tourists were reported.

D37 THUNNUS SURVEY: CETACEANS OF THE ALBACORE TUNA FISHERY ALONG THE BAY OF BISCAY AND GRAND SOLE

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Special Through a new collaboration between the NGO CEMMA and the Galician Government's Fishery Service, in summer 2007 and 2008 a cetacean observer was placed onboard the ships of the Galician Coastguard Service that accompany and support the albacore tuna (*Thunnus alalunga*) fleet in the Bay of Biscay and Grand Sole (Celtic Sea) fishery areas, to study the cetacean community associated with this tuna fishery. During 5 trips, with a total duration of 82 days, observations were made along 159 tracks totalling 4525 km and 324 hours observation time. In total, there were 300 sightings of cetaceans belonging to 13 species. On average a sighting was recorded for every 1.1 hours of observation and 15 km sampled. Photos and video recordings of most of the sightings were made. The most frequently sighted species was fin whale *Balaenoptera physalus* (68% of sightings) – which, like albacore tuna, feeds mainly on krill. The other species observed were: striped dolphin *Stenella coeruleoalba* (10.3%), common dolphin *Delphinus delphis* (7.3%), sperm whale *Physeter macrocephalus* (3.4%), sei whale *Balaenoptera borealis* (2.0%), long-finned pilot whale *Globicephala melas* (1.7%), bottlenose dolphin *Tursiops truncatus* (1.3%), Cuvier's beaked whale *Ziphius cavirostris* (1.0%), minke whale *Balaenoptera acutorostrata* (0.7%), Sowerby's beaked whale *Mesoplodon bidens* (0.7%), Risso's dolphin *Grampus griseus* (0.7%), killer whale *Orcinus orca* (0.3%), harbour porpoise *Phocoena phocoena* (0.3%) and non-identified cetaceans (2.3%). The arrangement with the Coastguard Service is working well and these data will be analysed to provide information on distribution, relative abundance and interactions with the tuna fishery.

FEEDING ECOLOGY

F01 DIET OF THE BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*) IN THE CENTRAL CANTABRIAN SEA

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The stomach contents of nine bottlenose dolphins *Tursiops truncatus* (Montagu, 1821) stranded on the Asturian coast (Northern Spain) were studied. One stomach was empty due to obstruction by plastics and fishing net debris. All the specimens examined were male. A total of 496 prey remains belonging to 13 species were found. Nine species of fish from six different families and five species of squid from four families were identified. The total mass of examined food was 34,000 g, which represented an average stomach content of 4,250 g. In terms of prevalence, fish were the most important prey consumed (96.6%), whereas cephalopods represented the other 3.4%. Diet is based mainly on two fish species: blue whiting *Micromesistius poutassou* and hake *Merluccius merluccius*, both of great commercial importance in Asturian waters. Blue whiting was the most common prey, representing 84.9% by number and 50% by mass of the fresh fraction. Hake constituted 9% by number and 39.3% by mass of the fresh fraction. On the other hand, the oceanic cephalopod *Todarodes sagittatus* is the most important cephalopod prey (4.8% by mass of the fresh fraction). Our results indicate that bottlenose dolphin is an ichthyophagous species because fish seem to constitute the bulk of its diet. As most of the fish preys were demersal species inhabiting the area between the outer continental shelf and the continental slope, this suggests that this area is the most frequently used by this species.

F02 CEPHALOPOD PREY OF CUVIER'S BEAKED WHALE *ZIPHIUS CAVIROSTRIS* FROM THE ADRIATIC SEA

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Sightings of beaked whales in the Adriatic Sea have been reported from its southern part, which is between 200 and 1000 meters deep. Information on diet composition of deep-diving whales is scarce and not available for the Adriatic Sea.

Between 1990 and 2007 three specimens of *Ziphius cavirostris* were found dead, stranded along the Eastern Adriatic coast. We examined the specimens stomachs in order to determine the diet and compare it to the data from the Mediterranean Sea. Secondly, examining the diet could suggest the length of stay in the Adriatic Sea as the species are not considered resident in the area, and stomach contents include food remains of several feedings. Food remains were found in only one animal and consisted solely of cephalopod beaks. The total number of cephalopods found was 94, and they were ascribed to 7 mesopelagic and bathypelagic species of the order Teuthida, with estimated biomass of 11 kg. *Octopoteuthis sicula* and *Chiroteuthis veranyi* dominated both in terms of number (68.5%) and weight (64.5%), and the prey size implies the foraging depth was between 400 and 1000 meters. Two of the prey species have not been listed in the Adriatic cephalopod fauna, but as are widely distributed in the Mediterranean Sea. We suggest that the whale was recently feeding in the Mediterranean Sea, but was also foraging in the Adriatic Sea as the dominant prey species are the most abundant deep-sea Teuthida in the Adriatic Sea.

F03 PREFERABLE DIET OF HARBOUR PORPOISES (*PHOCOENA PHOCOENA RELICTA*) IN THE NORTHERN AND WESTERN BLACK SEA

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According to the published data, a total of 19 fish species were confirmed to be prey items for the Black Sea harbour porpoise (*Phocoena phocoena relictata*) but only few of them can pretend at present to the role of its basic diet. Stomach contents of 112 porpoise carcasses, collected stranded and by-caught in the northern and western Black Sea, have been studied through the instrumentality of a reference collection of Black Sea fish otoliths and bones. Food remains represented by fish residues were found in 97 porpoises. Three fish species turned out the most common prey, including the Mediterranean/Black Sea sprat (*Sprattus sprattus phalericus*, 61.9% of "fish-positive" samples), Black Sea whiting (*Merlangius merlangus euxinus*, 54.6%) and Black Sea anchovy (*Engraulis encrasicolus ponticus*, 29.9%). Sometimes these favourites were detected three together (8.2%) but more often they were found in pairs: sprat and whiting (32.0%), sprat and anchovy (15.5%), whiting and anchovy (14.4%). Sprat and whiting residues occurred in the stomach contents during all seasons year-round. Less frequent findings were represented by the Far-east mullet (*Liza haematocheila* = *Mugil so-iuy*, 5.2%) intentionally introduced into the Black Sea in 1970s-1980s, gobies (*Gobiidae gen. sp.*, 4.1%), Black Sea shad (*Alosa kessleri pontica*, 1.0%) and pickarel (*Spicara flexuosa*, 1.0%). In nine cases from eleven, when these rare prey items were recorded, they collocated with 1-3 species of the dominating prey. Above results

differ in essence from those presented by previous authors. For instance, not only newly acclimatized Far-east mullet but also indigenous sprat were never described in the stomach of Black Sea harbour porpoises before our study started in 1989. The discrepancy between recent and former data on the diet of *P.p.relicta* may be caused, in particular, by pronounced alterations of the Black Sea ecosystem during last five decades, since early 1960s.

F04 CEPHALOPODS FROM THE STOMACHS OF CUVIER'S BEAKED WHALE (*ZIPHIUS CAVIROSTRIS*) IN THE CENTRAL CANTABRIAN SEA

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Data from stomach contents of three females of Cuvier's beaked whale, *Ziphius cavirostris* Cuvier, 1823 stranded on the Asturian coast (Northern Spain), were presented. In all specimens, the first stomach compartment was almost full of plastic bags. Even so, a total of 2184 beaks of 17 species of cephalopods belonging to 12 families were identified. Both muscular and ammoniacal cephalopod species have been found, but the latter were more frequently represented. Moreover, 1 otolith of blue whiting, *Micromesistius poutassou* and remains of the shrimp *Pasiphaea sivado* were also found. The pelagic deep-water squid *Histioteuthis reversa* was the most common prey (33.5% by number and 5% by mass of the fresh fraction). *Gonatus steenstrupi* was the second most common prey (16% by number and 11% by mass of the fresh fraction) and the third most common prey was *Todarodes sagittatus* (13% by number and 71% by mass of the fresh fraction). The importance of *T. sagittatus* by mass of the fresh fraction seems to be due to the size of the specimens consumed (average size: 460 mm mantle length). The rest of cephalopod prey appeared in very low percentages (<2%). The range of prey size was 23.5-651.7 mm estimated mantle length (average=210 mm). Results from this study suggest that *Z. cavirostris* in the Cantabrian Sea is a teuthophagous species that fed on both oceanic and mid-water cephalopods, mainly on ommastrephids, histioteutids and gonatids. The bathymetric distribution of these cephalopods seems to indicate that this cetacean species feeds on the continental slope.

F05 DIET OF MEDITERRANEAN MONK SEALS (*MONACHUS MONACHUS*)

(Moved to Talk Session Day 3 16:30 – 16:50)

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The Mediterranean monk seal is a critically endangered species which faces a range of threats including fishery interactions. The diet of this species was investigated as part the project "Monk Seal and Fisheries: Mitigating the conflict in the Greek Seas", supported by the LIFE-programme of the European Commission. Stomach contents were obtained from 27 carcasses collected between 1990 and 2008 from different areas of Greece. Seals of both sexes and a range of ages were analysed. A total of 483 prey items from 75 prey species were identified, with approximately 13% of prey being unidentified. We found 266 cephalopod items (55%), 205 fish (42%), 8 non-cephalopod molluscs (2%) and 2 crustaceans. Faecal samples were also collected but contained no identifiable prey remains. Although monk seals feed on a wide range of prey, octopus - especially *Octopus vulgaris* (43% of prey by number) but also *Eledone cirrhosa* (14%) - are the most numerous prey and probably form the largest part of prey biomass. Fish of the families Sparidae (15%) and to a lesser extent Congridae (3%) and Atherinidae (3%) were also frequent. Most prey species recorded are of commercial importance in fisheries. Exploratory multivariate analysis (redundancy analysis, RDA), suggested seasonal and interannual variation in diet, although statistical significance was marginal (perhaps due to small sample size). No trends in diet related to sex and age class were identified. A reference collection of potential fish prey of monk seals was assembled. Specimens were measured and weighed, the otoliths and jaw bones (dentaries, premaxillae) extracted and measured to derive regression relationships between hard part size and fish size which will be used to estimate the size and weight of the prey. The predominance of commercial fish species confirms the high probability of interactions between monk seals and commercial fishing activities.

F06 ECOLOGY OF SPERM WHALE IN A NORTH ATLANTIC FEEDING GROUND OFF NORWAY

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Canyons are known to be high productive areas and therefore favorable feeding grounds for sperm whales. The aim of this study is to create a photo-id catalogue

for Malangsdjupet area (off Norway) and to observe how individuals sperm whales are geographically distributed. This study was carried out in the southern canyon area of Malangsdjupet (geographic range: 69°43'-69°50'N; 16°18'-16°36'E), from June till the end of August 2008. Sperm whale presence has been monitored onboard *M/S Cetacea*, the whale-watching vessel of *Arctic Sea Cruises*. According to the weather conditions, one or two hours were spent in the canyon area per day. Photo-id protocol was carried out taking pictures of all encountered individuals (flukes, flanks and heads) in order to construct the photo-id catalogue. Pictures collected in 2008 were then compared to photos available taken in 2007. Geographic positions and behavior of individuals has been registered in order to study the distribution of the species. In 2008, 45 surveys have been conducted spending about 100 hours in the study area recording 136 sightings, confirming that the area is a hotspot. 38 % of individuals were seen in waters shallower than 1000m and depth distribution does not seem to depend on day-light hours. Photo-id catalogue contains 123 pictures, 35 from 2007 and 88 from 2008. Results indicate that 20 sperm whales were re-sighted in the study area, 15 animals within year 2008 and 5 within year 2007. Two individuals were sighted in both 2007 and 2008. Our results demonstrate site fidelity over years and that no individuals have been re-sighted for a period longer than 20 days confirming previous studies about the absence of short-term site fidelity.

F07 PRELIMINARY RESULTS ON FATTY ACID COMPOSITION IN FOUR ODONTOCETE SPECIES IN THE NORTH WESTERN MEDITERRANEAN SEA

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Accurate information on the foraging ecology of predators is essential to the understanding of marine ecosystems. Fatty acids (FA) represent a large group of molecules that comprise the majority of lipids found in all organisms. FA signatures from cetacean blubber have been used qualitatively to infer trophic levels and spatial and temporal differences in diets both within and among species. In this preliminary study, it was investigated the FA profile of blubber samples from 4 cetacean specie found in the Ligurian Sea (from 2006 to 2008), *Grampus griseus* (n=4), *Stenella coeruleoalba* (n=12), *Tursiops truncatus* (n=18), *Ziphius cavirostris* (n=4). Blubber samples were compared in order to identify intra- and/or inter-specific differences in FA profile. Intra-specific ANOVA pointed out differences in FA composition among specimens belonging to both bottlenose dolphin and striped dolphin specie. There were not differences among specimens belonging to the other two species analysed. These results confirmed evidences obtained from previous stomach contents studies, on mediterranean specimens. The first component analysis (PCA) found some similarity in FA composition among striped

dolphin, bottlenose dolphin and Risso's dolphin. On the other hand Cuvier's beaked whale FA composition was significantly different from the other three species analysed.

F08 A "SWITCHING" PREDATOR IN A CHANGING OCEAN: IS PREDATOR-PREY CYCLING IN THE EASTERN GREY WHALE SUSTAINABLE?

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It is well known that some Eastern grey whales do not complete the northward migration, summering instead in the Pacific Northwest. This "Southern Feeding Aggregation" is estimated to number about 250 animals, and is distributed between northern California and southeast Alaska, the so-called "tertiary" feeding area. These animals are known to feed primarily on mysid shrimp in the shallow coastal zone. In the Cape Caution, British Columbia, area, mysids are often, though not exclusively, associated with kelp beds, and form extensive, dense swarms. We have conducted grey whale surveys in the area annually since 1994. Our data show a cyclic abundance of grey whales, with a period of approximately eight years. The most recent cycle peaked at nearly 100 whales in 2004, followed by a crash the following year that bottomed out in 2007 to only five animals. Sighting effort remained constant throughout the period. The proximal explanation lies in the abundance of mysids: in the years immediately following the crash, mysids remained scarce in the study area. By 2007, recovery had begun, and in 2008 mysids appeared to have returned to levels similar to those observed in 1999-2000. The whales, too, returned: more than 25 whales were sighted in 2008, with many animals resident in the area all summer. We believe that the cycling is evidence of a classic predator-prey system, which includes a 'switching predator' - in this case, a highly mobile predator able to switch to other locations. As is the case with all such cycling predator-prey systems, however, the concern is that the abundance in low years must remain above some threshold for recovery to take place. The changing condition of the North Pacific may lead to grey whales locally overexploiting their patchily-distributed prey stocks to the point where they may be unable to recover.

F09 FIRST PREDATORY ACTIVITY OBSERVATIONS OF BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) ON COMMON OCTOPUS (*OCTOPUS VULGARIS*) AROUND THE LAMPEDUSA ISLAND (ARC.PELAGIE).

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Lampedusa Marine Mammals Workshop is a project that studies the behaviour, the distribution and the dynamics population of some cetacean around the waters of Lampedusa island in the last three years. During the survey have been recorded important observations on the bottlenose dolphins (*Tursiops truncatus*) predatory activity on common octopus (*Octopus vulgaris*). The observations and the harvest of the relative simultaneous images of the predatory activity had allowed to hypothesize the strategy with which the prey comes captured and subsequently senseless before being swallowed up by the bottlenose dolphins. This behaviour has been observed more times in the same area. By the photo-identification technique is possible to understand that this predatory method is made by the same adult individual. By the years, in these waters are been conducted studies of interaction among *Tursiops truncatus* and fishing activity. In the past, predatory behaviour of this species has not been studied in normal conditions. Therefore, the moment which the bottlenose dolphin prey in solitary way *Octopus vulgaris*, in the area was recorded the presence of some fishing boats in trawl fishing activity. This activity occupied others bottlenose dolphins, them preyed in trawl sack proximity and subsequently on the fishery discard thrown in the sea. Studies have shown that fishery discard produced by the trawl fishing can be at the base of an increase of the secondary production and the *Octopus vulgaris* is among the scavenger species. It is possible that the bottlenose dolphin observed from us more and more times, had developed a different strategy of hunting in comparison at other individuals of the same species in the area.

F10 MEASUREMENT OF FEEDING BEHAVIOR OF DIVING ANIMALS USING AN ACCELEROMETER

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Diving animals have to forage under strict physiological constraint, and they are supposed to increase their diving and foraging efficiency. While diving physiology has been extensively studied how their diving capacity are enhanced, much effort has not been paid in foraging behavior study. Although several techniques for measuring the feeding events have been developed, it is still difficult to understand complexity of their foraging behavior unless information both on feeding rates and effort of foraging were not given simultaneously. We tested a new method to

measure feeding events and strokes (i.e. effort) simultaneously using a miniaturized accelerometer. Here we report the results of some experiments on captive marine mammals.

F11 DEPREDATION OF SPERMWHALES (*PHYSETER MACROCEPHALUS*) ON BOTTOM-SET LONGLINES FOR TOOTHFISH (*DISSOSTICHUS ELEGINOIDES*) ON THE HIGH SEAS OF THE SOUTHWEST ATLANTIC

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Spermwhale (*Physeter macrocephalus*) depredation on toothfish hooked on bottom-set longlines can cause considerable economic loss for Spanish fishing vessels operating in Southwest Atlantic waters. The aim of the present study was to determine which factors influence depredation rates (frequency and the N° of fish removed) including visual presence/absence of spermwhales, fishing effort, soak time, different areas of operation and environmental variables such as SST, water depth, sea state, cloud cover and moon phase. We further wanted to test the efficiency of the so-called “umbrella system” as a measure to reduce depredation on catches by comparing the CPUE for different designs of this system. Data were collected during 297 hauls on a commercial longliner between November 2007 and April 2008 in international waters of the SW Atlantic. During our study sperm whales were sighted close to the longliner during 32% of hauls, usually solitary although groups of up to 5 animals were seen. Depredation occurred during 8% of hauls, always during gear retrieval. Sperm whales were seen during 71% of depredation events. Both occurrence of depredation and number of fish damaged were found to be positively related to the presence of sperm whales and negatively related to sea state. Catch consumed ranged between 0.76% and 6.67% per haul (average = 3.03%). We concluded that sperm whales seem to be particularly attracted to longlines, where large, easily accessible fish are provided. The occurrence of depredation and % of total catch damaged were low during our study. The lower depredation rate in calm seas may be because longlines are usually retrieved much faster than in rough seas, thus giving the whales less time to take the hooked fish.

F12 DOLPHINS-ARTISANAL FISHERY INTERACTION IN ITALIAN MARITIME DISTRICTS: INSIGHT THROUGH INTERVIEWS

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Despite the widespread occurrence of the dolphin's impact on small-scale fishing activities along Italian coasts, to date, his evaluation in Italy is scarce. In order to infer dolphin depredation on the artisanal fisheries, an interview survey was done along Italian coast. Fishermen were asked to recall on their activity in the previous year. Questions were related to: fishing gears, sightings of the interacting fauna [(Dolphins -*Tursiops truncatus*, *Stenella coeruleoalba*, *Delphinus delphis*), tuna-like fishes, marine turtles, *Mola mola*, and sharks] and depredation damages caused to the fish catches and to the fishing gears. The analyses were conducted on a representative sample (11.09%) of the Italian fleet. Static nets such as gill and trammel nets resulted the most common used gears (80.6% of the cases), followed by the bottom long line (21.4 %) and by the encircling gillnet (10.1 %). Correspondence Analysis was used to investigate the relations among damaged gears, their targets and the interacting fauna. The analysis showed an interaction between Dolphins and gill and trammel nets (94% of the total inertia, represented by the β_{Ri} , is explained by CA). The extent of depredation amongst regions was analysed with a logistic model. Four coastal regions, appear to have a greater

interaction compared to the Italian average; fishing gear damage is 2,8 times (β_{Ri}) more in Sardinia (SE=0.14; p-value <1%), 2,49 (SE=0,12; p-value <1%) in Campania, 1.95 (SE=0,08; p-value <1% in Apulia and 1.92 (SE=0,19; p-value <1%) in Friuli.

Dolphins ($\beta_D=1.08$; SE=0,03; p-value <1%) are responsible of fishing gear damages. In the mentioned regions the frequencies of the fishing gear and fish damaged are respectively 75.8 and 100 % in Sardinia, 83,1 and 93 in Campania, 87.5 and 90.3 in Apulia and 91,6 and 92,6 in Friuli. The information inferred, underline the necessity of further studies in those regions.

F13 MARINE MAMMALS STATUS IN THE BARENTS SEA IN MODERN STAGE AS ELEMENT ITS ECOSYSTEM AND CLIMATIC CHANGES

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To the last time considered that about 24 marine mammals species regularly occur in the Barents Sea, comprising 7 species of pinnipeds, 12 of large cetaceans, and 5 of small cetaceans species. The most met frequently of marine mammals species are harp seal (*Phoca groenlandica*), white-beaked dolphin (*Lagenorhynchus*

albirostris), walrus (*Odobenus rosmarus*), and minke whale (*Balaenoptera acotostrata*). Some of marine mammals species observe in the Barents Sea area all year around and some of them can occur in certain time their life or time of year. In carrying out of annual Russian-Norwegian ecosystem surveys in the Barents Sea (August-September) during the last three years were discovered some evident changes in distribution, numbers and marine mammals staying in the Barents Sea area among animals who traditionally registered here (area expansion, numbers, and time duration staying increasing). Also observed here were some marine mammal species which were not discovered earlier. This fact is closely associated with considerable the Barents Sea water warming which was registered in the last years. This circumstance it is necessary to take into account in rational management by fisheries, including development and improvement ecosystem models, as it is known that marine mammals are top predators and they are significant of the Barents Sea ecosystem component, where they have annual food consumption in assume of marine fisheries organisms (prey) in several times more than total catch by commercial marine fisheries. For example, minke whales and harp seals consume 1.8 million and 3.5 million tones of prey per year, respectively, where prevail crustaceans, capelin, herring, polar cod, and gadoid fish, dependent on area and time of year. Functional relationship between marine mammals and their prey seem closely related to fluctuations in the marine ecosystems.

HABITAT

H01 CONTEMPORARY PROBLEMS OF ECOLOGY OF THE MARINE MAMMALS OF THE ARCTIC

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The marine mammals play the important part in the ecosystem. In connection with sharp getting warmer in the Arctic the reproductive strategy of Pinnipeds (*Cystophora cristata*, *Phoca vitulina*, *Pagophilus groenlandicus*, *Odobenus rosmarus*) became not adequate. The changes of ice conditions in 2007 evoked a noticeable decrease of the walrus number in the Chukchi Sea (10 - 20 %), decrease of the harp seals breeding in the White Sea (25 - 30 %). In present the influence of sharp climatic changes on the whales are less noticeable. However a tendency to decrease (3.5 %) a number of the Solovetsky local herd of beluga (*Delphinapterus leucas*) in the White Sea was revealed. This tendency was recorded from 2002. The causes of beluga number decrease are the climatic changes and

increase of anthropogenic influence. There is a necessary to take urgent measures for protection of beluga's reproductive areas - critical places for this species habituation. In present we estimate the current noticeable manifestations, which are accompanied by a raw of changes that are small and not visible now, but may be accumulated in future and lead to essential deviation of the hole ecosystem (biodiversity, bioproduction, "red flows", hydrophysis, impact etc). In course of the Arctic getting warmer and increase of the anthropogenic influence (shipping, fishing, oil-gaz extraction etc.) it is possible to suppose the following reactions of ecosystem: 1- the adaptation of the reproductive strategy of the pagohyle pinnipeds for the new conditions (use the edge of ice and the seashore for reproduction and shedding of hair); 2 - the change in distribution and number of the resident species; 3 - increase of number of immigrant species. The only mean to foresee the consequences of these changes for the marine mammals is the organization of monitoring.

H02 EFFECTS OF UNDERWATER EXPLOSIONS ON PRESENCE AND HABITAT USE OF HARBOUR PORPOISES IN THE GERMAN BALTIC SEA

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With the end World War II the Allies agreed to dispose the remaining ammunition. Especially sea mines and chemical weapons were dumped into the Baltic and North Sea. One of these sites is in the German Baltic Sea in the Kiel Bight, where at least 70 sea mines and warheads were discovered recently in water depth up to 20m. In 2006 the "explosive ordnance disposal service" of Schleswig-Holstein began removing this ammunition by blowing it. The Kiel Bight is a key habitat for harbour porpoises (*Phocoena phocoena*). Thus the shock waves and sound emissions of the explosions pose an additional threat to this already highly endangered species in the Baltic. NGOs raised concern about this potential negative impact on harbour porpoises and their highly sensitive hearing. Therefore, the removal of the ammunition was paused for one year to determine how frequently harbour porpoises use the area and to find and test possible alternatives to blowing as well as mitigation measures. Static acoustic monitoring devices (T-Pods) were deployed at two positions close to the dumping site and two reference positions from June 2007 onward. A five year T-POD monitoring had previously been performed at the reference stations. In April and June 2008 a new mitigation method was tested by blowing small charges using bubble curtains. During these tests, deterrent devices were used and the area was also surveyed for harbour porpoises by visual observers. Data will be presented on the general presence of harbour porpoises in

the area and seasonal variation in their habitat use comparing the dumping sites to the reference sites. The preliminary analysis indicates that harbour porpoises use this area continuously if undisturbed, but avoided the dumping site in a wide perimeter for an extended period of time after the detonations of the test charges.

H03 ASSOCIATION PATTERNS AND HABITAT USE OF A BOTTLENOSE DOLPHIN POPULATION IN THE EASTERN LIGURIAN SEA.

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Bottlenose dolphins have a fission-fusion society with associations between individuals that in several cases may be stable in time and space. The aim of the study is to investigate the social habit of this species in the Eastern Ligurian Sea, analysing the association patterns between individuals. Data were collected between 2001 and 2008 and photoidentification mark-recapture technique was applied to study the population structure. 170 individuals were included in the photographic catalogue, but only animals with at least 5 recaptures were considered for a total of 35. The association rate between individuals was measured with the half weight (HWI) and simple ratio (SR) indexes. To determine whether the patterns of associations between individuals were significantly different from random, the association matrix was permuted (20.000 permutations). A 4 animals group, Alfa, showed high values for both indexes for each individual (HWI>0,8; SR>0,7) and can be considered a stable group sighted from 2001 to 2007. Another 15 animals group, Beta, showed high values for both indexes (HWI>0,5; SR>0,4) and a strong association for a shorter period of time between 2006 and 2007. The Minimum Convex Polygon analysis was applied to visualize the home range of every animal of each group. Furthermore, a comparison with the CE.TU.S. photographic catalogue was performed to investigate possible movements between East Liguria and North Tuscany. No matching was founded and a sharing area for Alfa and Beta was highlighted. These results propose Alfa as a group usually frequenting our area and mixing with others within narrow periods of time, maybe as response of reproductive demand. As well as contributing to our understandings about the factors influencing distribution patterns and sociality of the bottlenose dolphin in the Ligurian waters, the present findings may contribute to define management standards.

H04 ANALYSIS USING GIS OF HOME RANGE, HABITAT USE AND RELATIONSHIPS WITH FISHERIES BY BOTTLENOSE DOLPHINS IN PORT D'ANDRATX.

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The GIS programs are a powerful tool for the study of life history of marine mammals. Combined with the new generation of GPS navigators they multiply the capacity of data field acquiring and its posterior analysis. With this new methodology we have collected and analyzed the data of 128 standardized surveys in a zone of 1.250 Km² in Port d'Andratx, SouthWest of Majorca Island, Western Mediterranean. Home range for 158 individually identifiable bottlenose dolphins was calculated using Kernel Home Range method. Data for these individuals were collected a five year (2004-2008). We have transformed the 3.900 sampling nautical miles into 86.602 "control points". Each "control point" has associated the following variables: year, month, day, hour, position, sea state, cloud cover, boat speed, boat course, boats presence, fishing gear presence, sighting number, number of individuals, number of calves, swimming speed, feeding form, socializing y/n, resting y/n, non-classified activity y/n and identified animals presence. We have divided the zone of study in squares of 2x2 Km. Each square has two associate variables: depth and slope. So each "control point", by his position, incorporated these two variables. Finally, we have calculated the perpendicular distance from the coast of each "control point". With this great information volume we have analyzed the dolphin's behaviour and its relationships with the human activities. They are observed differences between the population sizes in summer/winter. Furthermore exists a seasonal pattern summer/winter linked to the coast distance. In addition the analysis of individuals association and temporal presence/absence indicates the existence of two groups: resident and transients. And only the resident interacts with the bottom gill and bottom trammel nets. A more exhaustive analysis will allow to extract more information of the behaviour of the bottlenose dolphins and to diminish the impact with the fisheries.

H05 CETACEANS IN THE COASTAL WATERS OFF COUNTY MAYO NORTHWEST IRELAND: A FIRST INSIGHT INTO POPULATION SIZE AND HABITAT USE.

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Between May and September 2008, a cetacean survey was conducted in the coastal waters off Belmullet, County Mayo, northwest Ireland. Limited information exists on cetacean presence in this area, which holds two marine SAC's and is the location of a planned gas pipeline and refinery. In total 70 sightings of seven species of cetaceans were recorded using land- and vessel-based surveys: bottlenose dolphin (*Tursiops truncatus*; n=28), Risso's dolphin (*Grampus griseus*; n=6), harbour porpoise (*Phocoena phocoena*; n=15), common dolphin (*Delphinus delphis*; n=7), white-beaked dolphin, (*Lagenorhynchus albirostris*; n=1), killer whale (*Orcinus orca*; n=1) and minke whale (*Balaenoptera acutorostrata*, n=2). Additionally, sightings were recorded of basking sharks (*Cetorhinus maximus*; n=9), grey seals (*Halichoerus grypus*; n=37), harbour seals (*Phoca vitulina*; n=3) and sunfish (*Mola mola*; n=6). 85 individual bottlenose dolphins were identified using photo identification, including 10 mother-calf pairs. Low resighting rates of these individuals suggest the population using the area is larger than 85, and this area is only a small part of their geographic range. As such this may form a significant population within Irish waters. For the first time, Risso's dolphin individuals were photo identified in the area (n=20). Group composition consisted largely of mother-calf pairs (75%) including newborn calves showing birthmarks. Previous sightings in the area, dating back to the 1970's, were all recorded during the summer months, suggesting that Risso's dolphins use the area on a structural basis. The present survey shows that the coastal waters off northwest Ireland are being used by a large number of marine species which include at least nine species of marine mammals. The presence of (newborn) calves of bottlenose and Risso's dolphin suggests that the waters may be used as nursing area for these species. Continuing survey effort in 2009 will further investigate population size and habitat-use of marine mammals in the area.

H06 FIN WHALE IN LIGURO-PROVENCAL MEDITERRANEAN SEA: A POINT OF THE POPULATION STATE, THE DISTRIBUTION AND THE HABITAT USE.

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Because some elements of the fin whale (*Balenoptera physalus*) ecology in Mediterranean Sea remain still ignored, WWF-France, the Nicolas Hulot Foundation

and the Paul Ricard Oceanographic Institute launched "Objectif/Cap Cetacea": a multi-field program on this specie. The aim of this programme is consisted of the health characterization of the population and of the animal activities in liguro-Provence Mediterranean zone. Missions of several weeks were carried out during the summers 2006, 2007 and 2008 to collect information on the distribution and the behavior of the fin whales. In parallel, biopsies were collected in order to carry out genetic analyses and the contamination by Persistent Organic Pollutants (POPs). The sample present capture/recapture of some individuals during the same year or between two years and as well as a mother and her progeny. Those data made it possible to gauge and validate each step of the analysis. The analyzed fin whales show similar levels in PCBs and OCPs. The levels of contamination in PBDE are definitely lower. The difference in contamination between the sexes is very marked. The males are significantly 2 fold higher contaminated than the females for all the analyzed contaminants. Fin Whales present a low contamination for PBDEs and a residual medium contamination for PCBs and OCPs which seem in reduction in regards of the ten years data earlier. A panel of microsatellite markers was selected for the genetic studies on the biopsy fin whales. Microsatellites constitute particularly powerful nuclear markers to study the fine structuring of the populations. Analyses of Neighbor-Joining (NJ) were carried out with the Darwin software (<http://darwin.cirad.fr/darwin/Home.php>). The structuring of this tree highlights a classification of the animals in three groups with a homogeneous distribution of the males and females between the groups. In the same way, the individuals are rather well divided between the three groups whatever the year of the biopsy. The processing of these data with the software "Parenté" (<http://www-leca.ujf-grenoble.fr/logiciels.htm>), gives a probability of family tie between 64 to 81% for four individual pairs. In addition the results of sex ratio, behavior, size of group and distribution vary according to the years, which is probably the reflection of: - the availability of the trophic resource; - the potential use of the zone also for the reproduction. These preliminary results bring elements interesting for the improvement of knowledge on the ecology of this species in the Mediterranean. They involve also questionings on the operation and the evolution of the state of contamination of the ecosystem, in particular the prey of the fin whales.

H07 FEEDING AGGREGATION OF LARGE RORQUALS ALONG THE IRISH SHELF EDGE DURING AUTUMN 2008

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During Autumn 2008 aggregations of large rorquals were recorded on the slopes of the Irish Continental Shelf and the Porcupine Bank, to the west of Ireland. Sightings were collated from a number of sources including sea angling charters, whale watching vessels, a fisheries research vessel, dedicated cetacean surveys on board platforms of opportunity and Irish Air Corps Maritime Patrol aircraft. Sightings consisted predominantly of fin whales (*Balaenoptera physalus*), however a number of blue whale sightings (*Balaenoptera musculus*) were also recorded. Sightings occurred from mid-August to late September 2008. A number of fin whale aggregations were noted in association with feeding schools of albacore tuna (*Thunnus alalunga*). Both tuna and whales appeared to be feeding on Northern krill (*Meganyctiphanes norvegica*). These data are the first record of such aggregations off the west coast of Ireland in the Autumn months, though the occurrence of fin whales in inshore waters off the south coast of Ireland during late summer to January is well documented. This is also the first record of large rorquals feeding on krill along the Irish Shelf edge and the first record of blue whales feeding in Irish waters. The results presented show the value of maintaining a widespread and diverse network of contacts in the marine sector and of nurturing cooperation between NGO's, state agencies, the military and commercial vessel operators.

H08 OCCURRENCE AND ECOLOGICAL NICHE MODELLING OF BLUE WHALES (*BALAENOPTERA MUSCULUS*) WITHIN SKJALFANDI BAY, NORTH EAST ICELAND.

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Within the North Atlantic the distribution and habitat selection of blue whales (*Balaenoptera musculus*) remains poorly understood. In particular, within Icelandic waters, recent changes in the distribution and abundance of *B.musculus* observed have yet to be explained with respects to ecosystem parameters. During the period 2004-2008 data was collected through effort-based platform of opportunity surveys utilising whale watching vessels within Skjálfandi Bay, North East Iceland. Across the period Sightings per Unit Effort (SPUE) was observed to increase (0.004 – 0.018) for *B.musculus*. GIS and remote sensing techniques were employed to determine associations between *B.musculus* observed and co-occurring environmental variables (EVs). Results showed that *B.musculus* observations predominantly occurred within areas of high depth (mean = 139.472 ± 54.180), low temperature (mean = 7.643 ± 0.181) and high concentrations of chlorophyll-a (mean = 1.890 ± 0.595). Finally a habitat suitability (HS) map, utilising mean annual EVs for the study period, was produced using the ecological niche modelling

technique Maximum Entropy (MAXENT). Predictions were validated using a random seed process of 20 : 80 percent Training : Testing. Results interpreted through the use of a receiver operator characteristic (ROC) method gave a prediction area under the curve (AUC) of 0.885. Habitat suitability was predicted to occur most frequently within the central, deepest, part of the bay, with a decreasing trend outside. The results of this study highlight two important findings. Firstly that across the study *B.muscus* observations occurred within a particularly small range of temperature. Secondly areas of high predicted HS appear to be isolated within the bay. Therefore, with respects to changes in the sightings frequency of this species within Iceland waters, temperature change is considered to be prime factor in the habitat variation for *B.muscus* and that currently Skjálfandi Bay represents an increasing critical area of habitat for this species.

H09 SPERM WHALE WINTER PRESENCE IN THE TYRRHENIAN SEA, ITALY

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Little information is available about the dynamics of the sperm whale (*Physeter macrocephalus*) in the Mediterranean Sea during the winter season. In the Pontino-Campano Archipelago, an area characterized by complex submarine canyon systems, the sperm whale summer presence was documented since 1991. However, its residency and movements within the study area were regularly investigated using photo-identification data collected in the summer season over a 6 year period (2003–2008). In order to explore the occurrence of the species during winter months, the research effort was extended and 24 boat surveys were conducted from October 2007 to January 2008. Animals were detected using stereo towed hydrophones and Rainbow Click software and a total number of 1490 minutes of vocalizations were collected. We encountered four sperm whale groups (mean group size: 7,5; range: 4-11), one of them including a calf. Whales showed a preference for the deepest part (850 m) of the canyon of Cuma and close to the 700 m isobath off the northwest coast of Ventotene, where a mirror canyon system is located. While diving, whales appeared to be feeding on two occasions performing a large number of creaks and fast clicks. Socializing was the most relevant surface activity observed (63%), since whales spent up to two hours per sighting clustering at the surface. Moreover, during social behaviors sequences of codacreaks, squeals and codas were recorded. Only one identified whale was photographically re-captured and 9 new individuals were added to the existing catalogue (n=29), reaching a significant peak in the recruitment rate. It is unclear whether the species have regular movements and distribution patterns within the Mediterranean Sea due to different association models between individuals. Our data suggest that environmental (the "canyon" effect) and ecological features (prey

fluctuation) too may influence the distribution and movements of the sperm whale.

H10 THE MEDITERRANEAN MONK SEAL (*MONACHUS MONACHUS*) SURVEY IN ANTALYA REGION

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The current distribution of the Mediterranean monk seal (*Monachus monachus*) population in Mediterranean is becoming clearer with the recent studies. The region of Antalya, despite being acknowledged as an important Mediterranean monk seal habitat, has never been studied systematically. On the other hand, there were signals of existence of possible individuals living in the region regarding the structure of the coastal topography and the frequency of the recent news about monk seal observations. The studies carried out in the Eastern Coasts of the Turkish Mediterranean Sea and Northern Cyprus was addressing this part of the Turkish coasts as missing parts where the possible breeding areas and caves were unknown. Considering the mobility of the animals, it was necessary to find out the distribution of the species, and possible habitats. The west part of the Antalya with small islands and rocky cliff coast line appeared to be the most suitable area, including the cape Gelidonya where human disturbance seems minimal. Three surveys were carried out between June 20 and November 7. The research team was composed of 6 people – 5 scientists and 1 volunteer. The first phase of the study was surveying the entire coastline, and discovering the possible caves which have the possibility of being used by the seals. After completing the survey, second phase was installing infrared monitoring systems to the caves. And third phase was to check and reinstall the monitoring devices to the caves. Between Kemer (36°32'10"N – 30°33'40"E) and Finike(36°16'11" - 30°22'04"E) nearly 70km of coastline was completely covered. Although total of 37 caves were discovered 11 monitoring device was installed to 8 possible caves. More than 200 seal photographs were collected from 3 caves and 3 different individuals were identified. A GIS inventory was created with the results of surveys. The human disturbance was observed to be very high over the monk seal habitats, and most serious pressure was appeared to be the human intruders which were even observed with infrared monitors. The results of this study are not only important for conservation planning in the scale of studied region, but also enlightening for a better understanding of the seal population, their interaction and habitat use in the entire Turkish Mediterranean Sea.

H11 CORRELATION BETWEEN HARP SEAL DISTRIBUTION ON WHELPING PATCHES IN THE WHITE SEA AND ICE CONDITIONS

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On base of data which were got in harp seal (*Phoca groenlandica*) White Sea population on whelping patches researches in the White Sea during 10 last years (annually – before March 20) was carried out complex and system analyze of animals distribution and ice conditions, including correlated estimation between its. In accomplishment this scientific-applied work were used data of coastal observations (information about current ice conditions and harp seal distribution), materials of multispectral air surveys (current ice conditions and animals distribution), and also data of satellite remote sensing (current ice conditions only). The main result of carried out research was defined close correlation between harp seal distribution on whelping patches in the White Sea, from one side, and ice conditions (shape, concentration and ice formations structure), from other side. This circumstance can be use very effectively, reliably, and qualitatively in planning and carrying out of animals account multispectral air surveys in whelping patches directly. It can allow to reduce considerably expenditures in carrying out of preliminary reconnaissance air surveys and maximally optimize the tracks of main account air surveys that enable to increase economical effectiveness this research direction considerably.

MEDICINE / DISEASE

M01 CAPTURE MYOPATHY IN ACTIVE STRANDED CETACEANS

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Capture myopathy (CM) is a poorly characterized disease in cetaceans. CM is a metabolic muscle disease described in wild mammals and birds associated with stress of capture, restraint, and transportation. The pathologic findings include mild

to moderate rhabdomyolysis affecting the cardiac and skeletal muscle and myoglobinuric nephrosis. Spraker (1993) described four clinical syndromes in animals: capture shock, ataxic myoglobinuric, ruptured muscle and delayed peracute syndrome. In this communication we report a series of 51 active stranded cetaceans in Canary Islands since 1996 to 2008, in order to describe the skeletal, cardiac and renal lesions, which characterized this pathology in cetaceans. Selected tissue samples were fixed in 10% neutral buffered formalin, embedded in paraffin wax, and sections (4 µm) were stained with haematoxylin and eosin, PTAH, Masson's Trichome and PAS techniques. In addition, immunohistochemical examination to detect myoglobin and fibrinogen was performed. Type, severity and distribution of both muscular and renal lesions were related to the time to death and human interaction. Skeletal muscular lesions varied from marked hypercontraction and segmental necrosis of type 1 myofibres, to diffuse rhabdomyolysis with evidences of inflammatory reaction. Animals that were under close human contact, and died 24-48 hrs after to active stranding showed the most severe muscular lesions with affectation of both type 1 and type 2 muscular fibres. Degenerate myofibres showed depletion of myoglobin and an intracytoplasmic immunoreaction for fibrinogen, which is indicative of in vivo, acute ischemic muscular damage. Similar myocardial lesions were observed. Renal lesions also were related to muscular damage and time to death and varied from minimal changes to extensive myoglobinuric nephrosis. Granules and casts in Bowman's space, tubular lumens, and cytoplasm of degenerate tubular cells were strongly labelled by the antimyoglobin antibody.

M02 PATHOLOGY AND CAUSES OF DEATH OF CETACEANS STRANDED IN CANARY ISLANDS (1999-2005)

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In the Canary Islands waters, 28 cetacean species have been identified of which 24 species have been found stranded. During a 6 year-period (1999-2005) 233 stranded whales and dolphins of 19 different species were recovered for scientific studies. Using a systematic standardized necropsy protocol, 138/233 stranded cetaceans were subjected to a complete or partial necropsy. Of these, 71/138 (51.45%) carcasses were in a very fresh or fresh status, 28/138 (20.29%) in moderate autolysis and 39/138 (28.22%) in advanced autolysis. Pathological studies were conducted by the Institute of Animal Health (University of Las Palmas de Gran Canaria) in order to identify lesions and to determine a morphological diagnosis, identify aetiological agents, and, ultimately, to reach an etiological diagnosis. As a result of these processes, cause(s) of death (defined as pathological entities) were

identified wherever possible. From a total of 233 cetaceans stranded in the Canary Islands (1999-2005), in 59,23% of the cases a morphological diagnosis was done, in 56,22% an etiological diagnosis could be established and, finally, we were able to classify 51,07% within natural or anthropogenic pathological entities. Etiopathologically, 62,32% of the 138 studied cetaceans were diagnosed as natural (i.e. non-anthropogenic) pathological entities that included infectious diseases, neonatal pathology, intra- and interspecific interactions and typical mass strandings. Another 33,33% of cases were diagnosed as anthropogenic entities including fishing interaction (by-catch), atypical mass-stranding linked to naval exercises, ship collisions, and other anthropogenic-related pathology. A cause of death could not be ascribed in only 4,35% of the 138 animals examined.

M03 HUMAN-INDUCED CETACEAN MORTALITY IN THE ADRIATIC SEA

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Human influence on cetacean mortality is evident in many regions. Some human-cetacean interactions which result in high cetacean mortality, like by catch, can even impact the population dynamics of small or localized cetacean populations. The Adriatic Sea is inhabited by only one resident cetacean species - the bottlenose dolphin. There are no data on the population size, but it is estimated that there are around 250 bottlenose dolphins in the Croatian part of the Adriatic Sea. We studied the incidence and nature of human induced mortality of cetaceans stranded in the Croatian part of the Adriatic Sea from October 1990 till November 2008. Post-mortem examinations were performed on 158 cetacean carcasses consisting of 127 bottlenose dolphins (*Tursiops truncatus*), 18 striped dolphins (*Stenella coeruleoalba*), seven Risso's dolphins (*Grampus griseus*), four Cuvier's beaked whales (*Ziphius cavirostris*) and two fin whales (*Balaenoptera physalus*); while the cause of death was determined in 57.6% of cases. Human induced mortality was higher in the resident bottlenose dolphins (62.3% animals) than in the non-resident cetaceans (27.3% animals). In bottlenose dolphins, by-catch was the most prevailing human induced cause of death (22 animals), followed by larynx strangulation with gillnet parts (12 animals), gun wounds (4 animals), physical traumatic injuries (3 animals) and presumed blast trauma caused by dynamite fishing (2 animals). Human induced mortality in the non-resident cetaceans was represented by bycatch (4 animals) and physical traumatic injuries (2 animals).

Conservation measures likely to mitigate the problem of human induced cetacean mortalities remain to be identified and implemented.

M04 AGE- AND SEASONAL-DEPENDENT NUMERICAL VARIATIONS OF STRANDED STRIPED DOLPHIN (*STENELLA COERULEOALBA*) IN SICILY

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Variations in cetaceans stranding number are related to population consistency and/or to stressful factor which can act on populations. Age-dependent variations are usually considered as a marker of the presence of specific stress factors of pathogenic, toxicological or antropogenic origin. Seasonal-dependent variation are connected to use of habitat or movement of populations. Striped dolphin is widely diffused and abundant in Mediterranean Sea and has proved to be highly sensitive to infectious factor, e.g. Morbillivirus epidemics in the 90s, and contaminants. In the last three years stranding data collected at Centro Recupero Fauna Selvatica e Tartarughe Marine of Comiso, Sicily, seemed to underline an increase in the number of death young striped dolphins and the aim of the paper is to verify if there is any significant difference in years. Data collected directly in the centre from 2005 till September 2008 were compared with those available in Italian Stranding Database (<http://www-1.unipv.it/cibra/spiaggiamenti.html>) concerning Sicily from 1986 till 2004. From the two databases a 1.5 m length was retained as threshold to discriminate between adults and juveniles and the number per year were converted as relative percent values. Obtained data seems to confirm starting hypothesis as while during the period 1986-2004 mean number of young stranded dolphins was smaller than that of adult (4.6/year vs. 7.8/year respectively), from 2005 till 2008 an opposite trend was observed (9.75/year vs. 3.25/year). Excluding the great number of stranding observed in 1991 due to the *Morbillivirus* infection, affecting adults in particular, did not change results. Strandings are concentrated in the period from May to September with no significant variations between years. From collected data there seems to be a real changing in the age-dependent number of stranding and a special effort is prepared to verify next year the possible reason of such a large number of death animals.

M05 NON-SPECIFIC CHRONIC REACTIVE HEPATITIS IN CETACEANS STRANDED IN THE CANARY ISLANDS

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Chronic liver disease of unknown cause is a common ailment in dolphins. Hepatitis has been commonly found in wild, free-living and captive dolphins. However, non-specific reactive hepatitis has not been reported in dolphins in these studies, where non-purulent, interstitial hepatitis and subacute to chronic pericholangitis were described. Non-specific reactive hepatitis is a morphological entity widespread within the liver, representing either the residuum of previous inflammatory intrahepatic disease or a response to a variety of extrahepatic disease processes, especially febrile illnesses and inflammation somewhere in the splanchnic bed. In domestic animals, it is almost always related to systemic disease or diseases in the splanchnic bed. Liver and mesenteric lymph node tissue samples of 48 cetaceans of different age and sex stranded in the coast of Canary Islands (Spain) were used for this study. These cases were selected because they were well preserved among the total of dolphins necropsied. The histological appearance of this lesion was an inflammatory infiltrate in portal areas and in the parenchyma without evidence of hepatocellular necrosis; in the acute stage there was a slight to moderate infiltrate of mainly neutrophils in the stroma of the portal areas and slight to marked leukocytosis and kupffer cell proliferation in the sinusoids and some neutrophils in the stroma around the hepatic veins. In the chronic stage the inflammation became mixed with lymphocytes, mainly T lymphocytes (CD3+) and plasma cells in both the stroma of the portal areas and around the hepatic veins and also within the parenchyma in the sinusoids.

M06 MASS MORTALITIES OF DOLPHINS ON THE SOUTH-IRANIAN COAST

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Recently two major strandings of dolphins occurred on the Strait of Hormuz in Iran. The first group consisted of 73 dolphins; the second of 79 dolphins. Strandings of individual cetaceans occurs on different parts of the Iranian coast bordering the Persian Gulf and the Sea of Oman. The present mass strandings are the first recorded in this area. In the first case the animals washed up dead along approximately 12 kilometres of beach. Spinner dolphins were present in the group and extensive damage could be observed on some of the mandibles. The second

group consisted of striped dolphins and according to statements made by local people, they all stranded alive and closely together; covering approximately 300-500 meters of beach. This leads us to believe that the cause of the stranding might be different in both cases. Although no necropsies were performed in the first mass mortality; it should not be ruled out that the animals were by caught in the extensive offshore fisheries. In the second stranding, no significant lesions were observed at gross necropsy. Histopathology examination resulted in the identification of *Nasitrema* sp. in three dolphins which is mentioned to be a significant cause of stranding in a variety of odontocetes. It should be noted that the area in which the dolphins stranded is characterised by a very large difference between high and low tide. When the water starts to fall large areas fall dry in very short time, exposing extensive sand areas. For some reason the live dolphins did not move out of the area when the water started to fall, resulting in their death. These occurrences underline the importance of systematic research in the area. At the moment a stranding network is being established with response capability in case of dead as well as life stranded cetaceans.

M07 FIRST CASE REPORT OF COMMON SEAL (*PHOCA VITULINA*) IN THE NORTHWEST MEDITERRANEAN SEA AND POST-MORTEM FINDINGS.

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A juvenile common seal (*Phoca vitulina*) was sighted at the delta of the river Ebro area (Catalonia, Spain, between Parallel 40°38' and 40°48' N) throughout some days in the middle September. It was seen on September the 19th by some fishermen, resting on the shore, apparently not showing any signs of harm or distress. The CRAM Foundation, as official organization responsible for the assistance and rehabilitation of marine animals in Catalonia, was alerted, but the seal returned to the water before the rescue team arrived at the site. On September 20th, the seal was finally located. It was in a very poor nutritional condition, displaying weakness, and abnormal behaviour and respiratory patterns. The veterinary team decided to take the seal to the CRAM rehabilitation centre, but the animal died during transport. A complete necropsy was performed immediately after death. The post-mortem examination revealed a 26 centimetre long intestinal impaction in the colon, with transit obstruction. Other findings were fibrinous enteritis in the small intestine, gastric parasitism by *Anisakis* spp, and focal haemorrhagic-necrotic pneumonia. Histologically, multifocal hepatic necrosis, chronic focal ulcerative gastritis and multifocal bacterial emboli in most of the

organs, compatible with bacterial sepsis, were found. This abstract describes the first case of common seal in the Western Mediterranean Sea in 14 years, and the second documented report of this species in this area (Mas J., Jimenez J., Raga J.A., 1996).

M08 MERCURY BIOACCUMULATION AND Na^+, K^+ -ATPASE ENZYME ACTIVITY IN THE KIDNEY OF BOTTLENOSE DOLPHIN (*TURSIOPS ADUNCUS*) FROM PERSIAN GULF

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More than 10 species of Cetacean have been identified in the Persian Gulf, but most of these are vagrant or seasonal visitors. Only two species of dolphin, the Indo-Pacific humpback (*Sousa chinensis*) and the Bottlenose (*Tursiops aduncus*) are thought to be common residents of the Persian Gulf. During September of 2007, more than 176 dolphins have been died on the Jask beach (South of Iran). The mercury bioaccumulation and Na^+, K^+ -ATPase enzyme activity in the kidney of 10 dying bottlenose dolphins were investigated. A portion of the kidney of each sample was obtained after careful dissection with the aid of stainless steel knife. The kidney portions were washed with distilled water, dried in tissue paper and weighed and they were kept in the capped vials in a freezer until analysis. In the first experiment, for mercury concentration measurement, the kidney (2 g) of each sample homogenized in to a rough pasty state in glass vial after cutting into fine pieces with dissection scissors. Results showed that we can divide the dolphins to two groups: one group (n=4, main length=132 cm), with low mercury concentration (36.43 mg/kg w.w.) and another group (n=6, main length=235 cm), with height mercury concentration (57.82 mg/kg w.w.). Na^+, K^+ -ATPase enzyme activity was measured in the kidney of each samples. Mean Na^+, K^+ -ATPase activity was 348 ± 10 and 253 ± 12 (mmoles ATP $\text{h}^{-1} \text{g}^{-1}$ wet weight) for low and height mercury concentration groups, respectively. Our result showed that, there was relationship between kidney mercury concentration and Na^+, K^+ -ATPase activity. Although our results can not be the reason for this mass mortality, but we can conclude that, mercury bioaccumulation can affect the osmoregulatory and excretory function of kidney by Na^+, K^+ -ATPase activity decreasing, in this marine mammals which have to possess elevated kidney to product a hypertonic urine (1200-1500 mOsm).

M09 DISTRIBUTION OF MERCURY AND SELENIUM IN STRIPED DOLPHINS (*STENELLA COREULEOALBA*) FROM SICILY CHANNEL

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Mercury and selenium concentrations were analyzed in the liver, kidney, muscle, lung and heart of six specimens of *Stenella coeruleoalba* stranded in the Sicily Channel between 2007 and 2008. Age and total length of the specimens were measured. Results of mercury and selenium concentrations measured in the different organs and tissues of the studied specimens show considerable variations of concentrations. As far as the mercury is concerned, liver is characterise by the highest concentrations (15,3-455,6 $\mu\text{g}\cdot\text{g}^{-1}$ dw) followed by lung (2,4-71 $\mu\text{g}\cdot\text{g}^{-1}$ dw), kidney (0,3-24,5 $\mu\text{g}\cdot\text{g}^{-1}$ dw), muscle (up to 16,6 $\mu\text{g}\cdot\text{g}^{-1}$ dw) and heart (up to 9,8 $\mu\text{g}\cdot\text{g}^{-1}$ dw). On the other hand, selenium shows the highest levels in the liver (15,7-171,8 $\mu\text{g}\cdot\text{g}^{-1}$ dw). Mercury and selenium concentrations in liver shows an evident effect of concentration with age and length confirming the well-known processes of biomagnification. A similar pattern, although in a less amplified way, can be observed in all the analysed organs. Overall, the two elements appear positively correlated in liver, lung, heart and muscle suggesting potentially comparable bioaccumulation processes and load of contaminants in seawater. It is noteworthy that selenium and mercury molar ratios calculated in liver of the studied specimens is close to 1, confirming results of previous authors. This confirm the existence of a detoxification process in which methylmercury is converted into the less toxic inorganic form with formation of granules of mercury selenide. The same significant correlation is not observed if we consider only the immature specimens. This suggests that in the immature specimens the detoxification process is not developed, yet.

M10 CONTRIBUTION OF DIET TO HEAVY METAL BURDEN OF BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) FROM THE NORTHERN ADRIATIC SEA

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Being it a closed sea, with a reduced hydric exchange, Mediterranean is particularly exposed to risks derived from chemical pollution. Knowing pollution degree of this sea by estimating contaminants concentrations in marine species placed at the top of food chains, including marine mammals and cetacean, is thus mandatory. Despite the high number of studies focusing on heavy metals in tissues of different cetacean species, little information is available concerning contaminants transfer

along their trophic chains, thus defining which could be main diet components contributing to toxicant body burden for each of the metal considered. Present work focuses on the evaluation of heavy metals (Pb, Cd, Cu, Zn) presence in some components of bottlenose dolphin diet from Northern Adriatic Sea, trying to define which could be the contribution that each of them give to the body burden of predators. A theoretical diet composition was created starting from the literature and heavy metals (Pb, Cd, Cu, Zn) content was analyzed from samples of each species included in the diet. Starting from analytical results, a maximum allowable concentration (MAC) and a risk quotient (RQ) were calculated, in order to evaluate if each metal considered represented a risk for bottlenose dolphins. Obtained data seems to be indicative of a reduced risk originating from fish species when As and Cd are considered (RQ always lower than 1, indicating no risk for the dolphins), while crustaceans and cephalopods present a RQ higher than 1. When Pb and Hg are considered, all species present a RQ higher than 1, so are to be considered a risk for dolphins. Starting from obtained data crustaceans and cephalopods are be considered as the most important risk factor in the diet of bottlenose dolphins, while fish species represent a risk only for some metals.

M11 POP CONTAMINATION OF TEUTHOPHAGEOUS ODONTOCETES IN THE NORTH-WESTERN MEDITERRANEAN SEA

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The north-western Mediterranean Sea presents important direct and indirect discharges, combined to a negative water budget, leading to very high Persistent Organic Pollutant (POP) contamination. In this area the POP contamination of Risso's dolphin *Grampus griseus*, pilot whale *Globicephala melas*, Cuvier's beaked whale *Ziphius cavirostris* and sperm whale *Physeter macrocephalus* has been rarely described, although these teutophageous species are long-living top predators. Therefore, we evaluated their contamination in PCBs, DDTs and other organochlorine pesticides, in muscle and blubber samples from stranded animals and blubber biopsies from free ranging individuals. The concentrations observed varied between 47.8 and 281.4 $\mu\text{g}\cdot\text{g}^{-1}$ lw for Σ PCBs and from 23.9 to 233.1 $\mu\text{g}\cdot\text{g}^{-1}$ lw for Σ DDTs. The pp' -DDE/ Σ DDTs ratios ranged between 0.87 and 1, showing the ageing of the initial product of DDT. The Σ ICES7/ Σ PCBs ratios varied from 0.47 to 0.83 and well corresponded to the importance of these congeners in original industrial mixtures and to their high transfer in environment. The very high

concentrations observed were 5 to 10 times more important than for the same species in the Atlantic. Furthermore, PCB concentrations seemed higher than the threshold over which PCBs provoke some physiological effects. As the species studied here stranded rarely in the area, blubber biopsies could be useful to determine the toxicological risk caused by POPs.

M12 HIGH PILOT WHALE (*G. MELAS*) MORTALITY DUE TO MORBILLIVIRUS IN THE MEDITERRANEAN SEA

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Morbilliviruses have emerged as significant pathogens of cetaceans and pinnipeds worldwide. Two cetacean morbilliviruses have been identified and named porpoise morbillivirus (PMV) and dolphin morbillivirus (DMV). PMV was isolated from harbor porpoises that died along the Irish coast. DMV was first identified in striped dolphins from the Mediterranean. Although, morbillivirus outbreaks have not been previously reported in pilot whales, antibodies to morbilliviruses have been reported in 86% of two species of pilot whales (*Globicephala melas* and *macrorhynchus*) in the western Atlantic. Barrett et al. (1995) found that 93% of stranded long-finned pilot whales (*Globicephala melas*) were morbillivirus seropositive, providing further evidence that cetacean morbilliviruses are widespread. Interestingly, molecular evidences from one pilot whale (PW) stranded in New Jersey (USA), which died with encephalitis, suggested that the long-finned pilot whale is host of a different, novel type of cetacean morbillivirus (called pilot whale morbillivirus or PWMV), and distinct from both PMV and DMV. We report the first unusual high mortality event of lethal morbilliviral infection in long-finned pilot whales that occurred in the Mediterranean Sea. Sequence analysis of a 426 bp conserved fragment of the morbillivirus phosphoprotein (P) gene suggests that the virus involved in this whale mortality event is phylogenetically more closely related to DMV rather to the novel PWMV identified by Taubenberger in a pilot whale. (Accepted, in Emerging Infectious Diseases Journal)

M13 LABORATORY DIAGNOSIS OF MORBILLIVIRUS AND TOXOPLASMA SPP. INFECTIONS IN STRANDED DOLPHINS

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Morbillivirus and - to a lesser extent - *Toxoplasma* spp. infections may exert a dramatic impact on cetacean health and conservation, with morbilliviruses causing at least 10 epidemic outbreaks among free-living sea mammal populations throughout the world within the last 20 years. On the basis of what above, it is of paramount importance to achieve a proper diagnosis of *Morbillivirus* and *Toxoplasma* spp. infections in aquatic mammals. We review herein some of the currently available techniques for the laboratory diagnosis of such infections in cetaceans. We investigated 10 striped dolphins (*Stenella coeruleoalba*) found stranded between August 2007 and February 2008 on the Western Ligurian Sea coast of Italy. Following necropsy, detailed histopathological examinations were carried out on all of them, along with specific immunohistochemical (IHC), indirect immunofluorescence (IIF), biomolecular (reverse transcriptase-PCR, RT-PCR) and serological investigations against *Morbillivirus* and *Toxoplasma gondii*. Serological, IHC, IIF and RT-PCR investigations for *Morbillivirus* yielded negative results in all 4 dolphins affected with inflammatory brain lesions, whereas 5 out of the remaining 6 cetaceans showed evidence of virus-neutralizing antibodies in their blood sera, with positive titres ranging from 1:10 to 1:64. On the contrary, serological examinations against *Toxoplasma gondii*, that were performed by a suitable immunofluorescence antibody test (IFAT), yielded high positive titres (1:320) only among encephalitis-affected dolphins. In conclusion, while serology may provide a valuable option to assess whether *Morbillivirus* and/or *Toxoplasma* spp. exposure has occurred, IHC, IIF and biomolecular (RT-PCR) techniques should be regarded as extremely powerful and reliable tools for the laboratory diagnosis of morbilliviral infection, a potentially fatal and highly devastating disease condition in free-living cetaceans.

M14 HERPESVIRUS DISEASE IN A BEAKED WHALE STRANDED DURING NAVAL EXERCISES IN CANARY ISLANDS

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On April 18, 2005, one female adult beaked whale (*Ziphius cavirostris*) was found dead on Fuerteventura Island. Necropsy was performed "in situ" after an estimated post-mortem time of 48–72 h (code 3). NATO naval maneuvers, designated as "Noble Javelin 2005," took place between the Fuerteventura and Gran islands over several days and ended on April 16, 2005. This exercise was designed to demonstrate the capabilities of the new Response Force to attending news media. The Canary Islands government and military authorities assured that sonar testing was not included during the exercises because of environmental reasons. The stranded whale exhibited a relatively good body condition. The main external findings consisted of post-mortem shark bites in the melon and in the dorsal and ventral abdomen. The stomach contained some foodstuffs. The main histological results were negative for lung fat emboli. The lymph nodes and spleen had severe, diffuse, coagulative necrosis and fibronecrotic vasculitis with prominent thrombi. A large number of monocyte-like cells had intranuclear inclusion bodies consistent with those of herpesviral or adenoviral infection. PCR techniques for Morbillivirus and Herpesvirus demonstrated to be negative for morbillivirus and positive for Herpesvirus in lymphoid tissue samples. The sequence obtained was classified within the cetacean alpha-herpesviruses group. This report describes pathological findings in a single, female adult BW stranded in temporal and geographic association with naval exercises in the Canary Islands. The pathological findings indicated that this whale died with a severe systemic herpesviral infection and clearly exhibited lesions different from those of the fat and gas embolic findings described in BW mass strandings linked to sonar exposure (Fern ndez *et al.* 2005).

M15 DETECTION OF *TOXOPLASMA GONDII* DNA AND SERUM ANTIBODIES IN STRANDED CETACEANS FROM THE COASTS OF TUSCANY (TYRRHENIAN SEA, WESTERN MEDITERRANEAN)

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Toxoplasmosis is recently emerged as an important water-borne infection responsible for outbreaks in humans and in several marine mammal species. In particular, concerns have been raised that *T. gondii* may be a major cause of mortality in sea otters, and alarmingly high seroprevalence values have been detected in dolphins. All these data suggest that *T. gondii* is widely spread in marine environment affecting the health status and, thus, limiting the growth of many marine mammal populations, including odontocetes. Therefore, the occurrence of the infection in odontocetes from geographically distinct areas needs to be accurately evaluated. Here we report detection of *T. gondii* DNA in tissues of cetaceans found stranded along the Tuscany coasts in the northern area of the Tyrrhenian Sea, an arm of the Mediterranean Sea located on the western coast of Italy. Two species of cetaceans found stranded during 2006/2007 were examined, including *Stenella coeruleoalba* (n=6) and *Tursiops truncatus* (n=7). Two pairs of oligonucleotide primers directed against the B1 gene of *T. gondii* were used to perform a nested PCR. An agglutination test was performed on the only three available blood samples (2 from *T. truncatus* and 1 from *S. coeruleoalba*). The nested reaction was able to detect a PCR product of about 100 bp from the lowest amount of DNA extracted (from 0.69 tachyzoites). *T. gondii* DNA was detected in the brain of 5 *T. truncatus* and 4 *S. coeruleoalba* as well as in the liver of 2 *T. truncatus* and 2 *S. coeruleoalba*. All blood samples showed antibody titers of 1:25. Other serologic and pathologic reports of toxoplasmosis in stranded odontocetes from Spanish and Italian coasts along with the present findings suggest that *T. gondii* infections might be more widespread in dolphin populations living in the Mediterranean Sea than it was previously thought.

M16 ULTRASOUND AND MAGNETIC RESONANCE IMAGING OF A TUMOROUS GROWTH IN THE URINARY BLADDER OF AN ADULT MALE COMMON DOLPHIN (*DELPHINUS DELPHIS*)

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The diagnostic imaging techniques: ultrasound, computed tomography (CT) and magnetic resonance imaging (MRI) are increasingly being used with clinical and anatomical purposes in marine species. We present here the first description by these techniques of a tumorous growth located into the urinary bladder of a common dolphin (*Delphinus delphis*). During a clinical and anatomical study, we performed ultrasound (3.5 MHz), CT, and MRI (0.2 Tesla) examinations of a dead adult male common dolphin at the Veterinary Faculty of Leon (Spain). After the examinations, the animal was frozen and one centimetre cross-sectioned in its transverse plane. The images of the abdominal cavity caudal zone showed an abnormal, invasive and irregular growth from the lateral and bottom walls to the urinary bladder lumen. The growth could be visualized by means of ultrasound, MRI T2-weighted and MRI T1-weighted, producing isoechoic, hyperintense and isointense images, respectively. The irregular margins were clearly remarked due to the contrast among tissue and urine images. An examination of the caudo-cranial and lateral extension of the tumour was possible by means of sagittal and transversal plane images, revealing a very invasive and extended growth. Moreover, nearby rectal lymphatic nodes were observed enlarged and reactive, showing hyperintense images (MRI T2-weighted). Hystopathological analysis confirmed the malignant appearance of the growth, but it was not possible to differentiate the type of carcinoma. However, this case represents the first ultrasound and MRI description of an urinary bladder carcinoma in cetaceans. We conclude that the imaging techniques could be considered a very interesting choice to visualize the urinary bladder and its associated lesions.

M17 POST-MORTEM EVIDENCE FOR *TURSIOPS TRUNCATUS* (BOTTLENOSE DOLPHIN) INTERACTIONS WITH OTHER DOLPHIN SPECIES IN SW ENGLAND

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Reports of violent interactions between bottlenose dolphins (*Tursiops truncatus*) and harbour porpoises (*Phocoena phocoena*) in UK coastal waters are well documented. A small resident population of bottlenose dolphins off southwest England has been reported since 1991 and several harbour porpoises, that stranded in the region and were examined by Cornwall Wildlife Trust's Marine Strandings Network and the UK Cetacean Strandings Investigation Programme, have had pathology consistent with bottlenose dolphin attack. A number of other

species found stranded in southwest England have also had pathology consistent with bottlenose dolphin interaction, including four common dolphins (*Delphinus delphis*), one pilot whale (*Globicephala melas*), one striped dolphin (*Stenella coeruleoalba*) and one Risso's dolphin (*Grampus griseus*). Although traumatic lesions recorded in these cases were often not as severe as those found in harbour porpoises, it is probable that the interactions did contribute to stranding and/or death in all four juvenile animals examined. These included one common dolphin and one pilot whale that live stranded with fresh rake marks. A second juvenile common dolphin, that possibly live stranded, had multiple fresh rake marks and extensive musculoskeletal trauma observed previously in live dolphin strandings but also seen in attacked harbour porpoises. Finally, a malnourished juvenile Risso's dolphin had multiple fresh rake marks and minor thoracic trauma also consistent with bottlenose dolphin interaction. In two of the adult animals, the small numbers of rake marks present appear to be incidental findings; the third was not necropsied. A number of causes have been suggested for these interactions in UK stranded harbour porpoises, including misdirected infanticide, resource competition, protection of conspecifics and play, sexual or aberrant behaviour. It is possible that any combination of these factors may also be implicated in the cases described.

M18 PECULIARITIES OF CONDUCTING IN FIELD CONDITIONS OF THE MICROBIOLOGICAL AND IMMUNOLOGICAL RESEARCHES DURING THE STUDYING A HEALTH STATUS OF NATURAL POPULATIONS OF MARINE MAMMALS.

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It is of interest ecologically to investigate the parameters of immune status and the compositions of microbial associations of the body in wild marine mammals in a natural ecosystem. In this case the given methods make it possible to reliably assess not only the physiological condition of each individual but the welfare of the population as a whole. We determined the optimal methods of selection, preservation, preservation and study of biological materials with a minimal set of equipment and materials available, i.e., under field conditions. In case of live sampling of material, the most informative proved smears from the upper airways in cetaceans and from the nasal cavity from pinnipeds. When storing the material in transport media (Stuart) all the identified species of bacteria and fungi retain good viability up to two months and longer, however, the most reliable picture of the ratio of species of microorganisms in the microbial associations of the animals

under study was recorded in inoculation not later than 5 hours after sampling. The investigation of the biological properties of the isolated pure cultures of microorganisms was performed by us both under field conditions and in a stationary laboratory. It was revealed that the primary species identifications of the main species of *Enterobacteriaceae*, *Staphylococcus*, etc. and also some factors of pathogenicity are also possible with a minimal set of equipment and materials. The optimal informative immunological tests under field conditions are determinations of the total and absolute number of blood lymphocytes in the peripheral blood (PB), 2.the total and absolute number of T- and B-subpopulations of PB lymphocytes, 3.the phagocyte activity of PB leucocytes, 4.the level of immunoglobulin of the classes G and M. The set of those tests will provide an insight in the immune status of individuals in the populations.

M19 PATHOLOGIC FINDINGS IN CETACEAN SKELETAL MUSCLE

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Incidence and characterization of skeletal muscle lesions in stranded cetaceans is unknown. The purpose of the current study was to determine the prevalence and nature of skeletal muscle lesions in cetaceans. Histopathologic evaluation of skeletal muscle was performed in 162 stranded cetaceans belong to 21 different species, undergoing post-mortem examination in Canary Islands between 1996 and 2008. Skeletal muscle samples were taken from the middle portion of *Longissimus dorsi* (near the last thoracic vertebrae). Muscle samples were fixed in formalin, processed routinely, and stained with haematoxylin and eosin, Phosphotungstic Acid Haematoxylin, periodic acid-Schiff for glycogen, and Von Kossa for calcium. Samples were also postfixed in Osmium tetroxide for lipids. In addition, immunohistochemical examination was performed using primary monoclonal (fast and anti-slow myosin heavy chain) and polyclonal antibodies (myoglobin and fibrinogen). Skeletal muscle lesions were common in stranded cetaceans examined at post-mortem (88.8%). In our opinion, consecutive longitudinal and transverse sections stained with a combination of different histological, histochemical and immunohistochemical techniques were necessary to establish a definitive morphologic diagnosis in muscular pathology of stranded cetaceans. Acute to subacute segmentary myonecrosis represented the main finding (51.8%) and it was related to the stress of active stranding. Other common causes included septicaemia, fishery interactions and ship collision. Chronic myopathic changes including excessive fibre size variation, internal nuclei, yuxtannuclear lipofuscin-like pigment, and different stages of myofibre regeneration were also a frequent group

of muscular changes (13.5%). These are non-specific findings and can be associated with a variety of neuromuscular disorders, and also with increasing age in cetaceans. Generalized or focal atrophy represented the 11% and was related to a poor body condition or senility. Other findings were myositis (1.8%), ring fibres (1.23%), fibre splitting (2.46%) and presence of intramyofibre sarcocystis sp. (8%). Finally, intramyofibre protozoa (*Toxoplasma* sp.) were only detected in one animal.

M20 PLASTIC DEBRIS IN A STRANDED ADRIATIC SPERMWHALE *PHYSETER MACROCEPHALUS*

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All around the world marine wildlife is affected by debris and Mediterranean Sea is one of the most impacted. Different materials coming from inland and offshore dump activity reach the marine ecosystems and most of them are non-biodegradable plastic. The possible entanglement and ingestion of these plastic parts appears to be an important risk for many different life forms from smaller to bigger cetaceans. Here we report the plastic findings in a stomach of a stranded spermwhale found in northern Adriatic Sea. An approximately 9 meters long young male was found washed ashore on 29/01/2005 near Rimini. The carcass was largely decomposed. Necropsy showed a bad nutritional status: many old cephalopods beaks were found in the gut but the thin blubber suggested that the animal was starved since long time. An interlacement of various plastic materials was present in stomach and intestine. The bad conservation conditions of the animal did not allow to understand if the numerous lesion of the mucosa were related to the non degradable items or not. Founded materials are reported. The total calculated plastic surface is approximately 4 m². The relevance of these findings is still underestimate as the presence of such a quantity of foreign bodies can hamper absorption, motility and functionality of digestive system.

M21 THE BRAIN AND NOSE IN DOLPHINS: TOPOGRAPHICAL CORRELATIONS

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The so-called facial depression of the odontocete skull houses the epicranial (nasal) complex, which consists of an ensemble of soft-tissue structures and was shown to be the generator and emitter of echolocation clicks. However, the shape of the facial depression, i.e., its depth, varies in different taxa of odontocetes. The skull of some river dolphins, e.g., the La Plata dolphin (*Pontoporia blainvillei*), does virtually not have a facial depression while dolphins (delphinids) and porpoises (phocoenids) exhibit marked depressions. In the latter species, the cranial vault extends further dorsally due to brain enlargement which may cause the steep profile of the forehead bones. To provide evidence for this potential correlation between brain size and the shape and dimensions of the epicranial complex, we compared metric measurements of the nasal complex and brain case in individuals of five small odontocete species using sagittal magnetic resonance scans: Ganges river-dolphin (*Platanista gangetica*; n=1), La Plata dolphin (n=3), Amazon river-dolphin (*Inia geoffrensis*; n=1), harbour porpoise (*Phocoena phocoena*; n=3), bottlenose dolphin (*Tursiops truncatus*; n=2). In these toothed whales we found that shorter and steeper (higher) epicranial complexes (i.e. deeper facial depressions) are correlated with larger brains. In this respect, the Ganges river-dolphin seems to be specialised in this group. Here the shape of the epicranial complex is unique due to a surplus in dorsal extension caused by additional shell-like bony structures (maxillary crests) which flank the facial depression laterally and dorsally to supporting the vestibular air sacs. In conclusion, the shape of the epicranial complex as a whole in these 'dolphin-sized' odontocetes seems to correlate with brain size (encephalisation quotient) rather than with specialisations regarding the mechanism of sonar signal generation.

M22 FATAL MYCOTIC ENCEPHALITIS IN A NORTHERN BOTTLENOSE WHALE [*H. AMPULLATUS*] CAUSED BY *ASPERGILLUS FUMIGATUS*.

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The Northern bottlenose whale is a deep-diving species found in the North Atlantic Ocean and some of its adjacent seas. Mycoses in marine mammals, although considered rare, are being diagnosed and reported with increasing frequency and are critically important amongst the fatal infectious diseases as they may be indicative of underlying immunosuppression. A juvenile male Northern bottlenose whale was seen cycling in extremis in shallow water, it subsequently live-stranded and died at Noth Kessock on the East coast of Scotland UK. The carcase was transported to SAC Veterinary Services in Inverness, Scotland UK and was necropsied as part of the DEFRA/RERAD funded UK strandings project [reference

number M216/06]. Gross post mortem examination revealed foul smelling yellow/green tenacious purulent material in the trachea and airways of the left lung. The meninges of the brain were congested and a focal roughly circular area of haemorrhage approximately 2 cm in diameter was present immediately beneath the leptomeninges of the left cerebrum. Sectioning of the brain revealed focal haemorrhagic lesions up to 3 cm in diameter throughout the grey and white matter. A profuse growth of *Aspergillus fumigatus* and two types of *Fusobacterium* sp. And mixed coliforms and pseudomonads were recovered from the purulent bronchial material. A scant growth of *Asperillus fumigatus* was recovered from the fore-brain but no other tissues. Histological examination of HE stained sections confirmed the haemorrhagic nature of the lesions in the brain and showed them to be predominantly suppurative. A severe vasculitis was present with fungal hyphae infiltrating the blood vessel walls. Sections of brain stained with Grocott-Gomori methenamine silver enabled classification of the fungal hyphae as septate and dichotomously branching, consistent with *Aspergillus fumigatus*. This paper describing severe mycotic encephalitis is the first to describe a disease related cause of death in a stranded Northern bottlenose whale, despite the accounts of numerous previous strandings.

M23 FIBROBLAST CULTURES FROM SKIN BIOPSIES OF LONG-BEAKED COMMON DOLPHIN (*DELPHINUS CAPENSIS*) AND BRYDE'S WHALE (*BALAENOPTERA EDENI*) FROM GULF OF CALIFORNIA (MEXICO): POTENTIAL USE IN ECOTOXICOLOGICAL STUDIES.

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The aim of this study was to develop fibroblast cultures from skin biopsies of two free-ranging cetaceans from the Gulf of California (Sea of Cortez, Mexico): long-beaked common dolphins (*Delphinus capensis*) and Bryde's whales (*Balaenoptera edeni*), for use in ecotoxicological studies. A regular aluminium biopsy dart equipped with a modified stainless steel collecting tip was used. In the case of whales (n = 2), the dart was shot from a 150-lb crossbow. For dolphins (n = 2) the biopsy was obtained using the dart mounted at the end of a 2-m long pole. The tissue was kept in culture medium at ambient temperature and processed within 72 h. The main result of the study was successful culture of fibroblasts from the two species. Although growth of the first fibroblasts was observed after 10 days for both species, a species-specific difference was observed. Dolphin cultures reached 90% confluence in 50 ml Falcon flasks in 15 days, whereas whale cultures grew too

slowly to reach confluence in 50 ml flasks. Dolphin fibroblasts were trypsinized, washed and placed in 250 and 550 ml flasks, after two and three trypsinizations, respectively. These cultured cells can be used for many purposes, including genetic, biochemical and toxicological studies. In particular, fibroblasts can be used to test the susceptibility of cetaceans to different environmental contaminants, such as organochlorine compounds (OCs) and polybrominated diphenyl ethers (PBDEs). Fibroblast cultures of the two Mexican cetaceans will be treated with different mixtures of OCs, PBDEs and PAHs, and then analysed by immunofluorescence (both species) and western blot (only dolphin) for qualitative and quantitative evaluation of target proteins such as CYP1A1-1A2 and CYP2B4.

M24 PRIMARY HEPATOCYTE PREPARATION AND CHARACTERISATION FOR TOXICOPROTEOMIC STUDIES ON HARBOUR SEALS (*PHOCA VITULINA*)

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In vitro systems using hepatocytes from various organisms are often used to reflect *in vivo* responses to xenobiotics. Our aim is to use primary hepatocytes from harbour seals (*Phoca vitulina*) in toxicoproteomic studies to identify a specific set of proteins with pollutant-induced protein expression. After reconfirmation of this protein pattern in blood samples, it may be used for optimisation of a non-invasive effect-oriented monitoring strategy of the influence of pollutants on harbour seals. Hepatocytes are mostly prepared by a liver perfusion method on small, anesthetized lab animals. Valuable *in vitro* studies with marine mammals are often limited to cell types which can be obtained by a rather non-invasive sampling, such as lymphocytes or epithelial cells. Therefore we focussed on the preparation of primary hepatocytes using liver samples taken shortly after death from stranded animals. We adopted a biopsy perfusion method. The blood vessels of the liver samples were cannulated and the tissue perfused with a collagenase solution to disaggregate the tissue within 30 min. The cell suspensions were further purified by Percoll density-gradient centrifugation. Approximately 1×10^6 cells/g liver were obtained with an average viability of 95% determined by Trypan blue exclusion. The method is much more time-effective, less harsh and allows isolating more cells than our earlier described non-perfusion method including mechanically mincing the tissue. For the subsequent toxicoproteomic studies it is crucial that the hepatocytes maintain their specific metabolism after isolation. Their viability was assessed by determination of the release rate of the intracellular enzyme Lactate dehydrogenase (LDH) as well as of hepatocytes specific urea synthesis. The activity of the mitochondrial dehydrogenases (XTT assay) referred to the overall functional

cell viability. All tests clearly showed that the hepatocytes can be used in subsequent *in vitro* studies offering the possibility to consider species-specific effects.

M25 IMMUNOHISTOCHEMICAL AND SPECIAL STAINING TECHNIQUES FOR THE INVESTIGATION OF INFLAMMATORY AND DEGENERATIVE CHANGES IN THE EAR OF THE HARBOR PORPOISE (*PHOCOENA PHOCOENA*)

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To facilitate detailed investigation of inflammatory and degenerative changes of harbor porpoise (*Phocoena phocoena*) ears immunohistochemical and special staining techniques were implemented. Therefore, two monoclonal markers as well as three polyclonal antibodies of different species specificities directed against different antigens were tested for immunohistochemical cross-reactivity on formalin-fixed, paraffin-embedded middle and inner ear sections of a harbor porpoise with *Stenurus minor* infection. Additionally, von Kossa, Luxol Fast Blue, Bielschowsky and Cresyl violet special stainings for the detection of degenerative changes of nerve fibers and neurons rather chromatolysis, respectively, were performed. All investigated antibodies showed specific immunoreactivities with leukocytes in harbor porpoise ears. Lymphocytes were labeled by a polyclonal human-specific anti-CD3 antibody and a monoclonal CD79 α -marker. Cells of the histiocytic lineage were recognized by a human polyclonal anti-lysozyme-antibody and the monoclonal MAC 387-antibody. The MHC class II-antigen was labeled by a bovine-specific monoclonal antibody. Mineralization was detected in tissue sections by von Kossa silver staining. Myelin and myelinated axons, respectively, were stained by Luxol Fast Blue staining. Furthermore, axons were visualized by Bielschowsky special staining and Nissl substance was detected in the cytoplasm of neurons by Cresyl violet staining. This study showed the applicability of leukocyte markers for the characterization of inflammatory responses in formalin-fixed, paraffin embedded tissue sections of the ear of the harbor porpoise by immunohistochemistry. Additionally performed special staining techniques enable the detection of neuronal structures and degenerative changes, respectively, in harbor porpoises ears.

M26 SKIN LESIONS OBSERVED IN CETACEANS FROM THE STRAIT OF GIBRALTAR

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The Strait of Gibraltar is an important habitat for a large number of cetaceans, including four resident and three migratory species. It also represents the second busiest shipping area in the world, with approximately 90,000 ships per year transiting towards the Atlantic Ocean or the Mediterranean Sea. This study intends to catalogue the skin lesions observed in cetaceans of the Strait of Gibraltar and to determine their most probable cause. Our research took place in the Strait of Gibraltar and the Bay of Algeciras from April to October 2003 through 2008. Data was collected from platforms of opportunity, i.e. whale-watching vessels. During this period, a total of 3,837 sightings were recorded, including species such as the bottlenose dolphin (*Tursiops truncatus*), long-finned pilot whale (*Globicephala melas*), striped dolphin (*Stenella coeruleoalba*) and sperm whale (*Physeter macrocephalus*). All of these species are resident or semi-resident in the studied area and showed clear skin lesions. These included discoloration, scratches, polyps, skin abrasions, blunt traumas, cuts, ulcerations, amputations, and white cauliflower-like growths. We classify the observed skin lesions in three categories, according to the probability of influence of anthropogenic activities in the studied area: possible, probable, and certain. Most of the lesions observed can be grouped in the two latter classes. Therefore, according to our study, it can be concluded that many of the skin lesions present in the cetaceans studied may be the consequence of anthropogenic causes, probably due to the high level of human activity in the Strait of Gibraltar.

M27 SARCOPLASMIC MASSES RELATED TO A POSSIBLE MUSCULAR DYSTROPHY IN A STRANDED PYGMY SPERM WHALE (*KOGIA BREVICEPS*)

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Sarcoplasmic masses (SMs) are areas of myofibrillar disorganization in muscle fibres that, in human and animals, have been proposed as a characteristic lesion of muscular dystrophies, a diverse group of genetically transmitted myopathies, characterized by progressive, degenerative changes leading to a loss of muscle fibres. Less frequently, SMs have also been described in other neuromuscular disorders including inflammatory and metabolic myopathies, and in denervated muscles. Morphologically, SMs may be identified as single or multiple homogenous areas, devoid of myofibrils, located either under the sarcolemma and central area of myofibres, which show a diffuse red colour with the PTAH stain. Although, the significance of SMs is still unknown, the presence of ribosomes, rough endoplasmic reticulum and wide Z disk suggests attempts at regeneration, and myofilament disarray could be due to a faulty interaction between cytoskeletal and myofibrillar elements. A pigmy sperm whale (*Kogia breviceps*) adult male stranded death on the coast of Fuerteventura (Canary Islands, Spain) on August 2008. The animal showed intense parasitic infection and a poor body condition. Tissue samples were fixed in 10% buffered formalin and embedded in paraffin, sectioned and stained with Haematoxylin and Eosin, periodic acid-Schiff (PAS) and Phosphotungstic Acid Haematoxylin (PTAH) for a routine light microscopical study. Distinctive histologic muscle changes included formation of peripheral and central sarcoplasmic masses, variation in fibre size, including atrophy, slight increase in perimysial and endomysial connective tissue, and increased number of nuclei with tendency of the central nuclei to form chains. The peripheral nerves appeared normal. The skeletal lesions described in this case are consistent with progressive degenerative muscular changes, highly related to those described in both human and animal pathology for muscular dystrophy. This represents, to our knowledge, the first report of degenerative, dystrophy-like myopathy in cetaceans.

M28 CHRONIC NON-SUPPURATIVE MENINGOENCEPHALITIS ASSOCIATED WITH *BRUCELLA* SP. INFECTION IN A LIVE-STRANDED STRIPED DOLPHIN (*STENELLA COERULEOALBA*) IN CORNWALL UK

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A chronic non-suppurative meningoencephalitis and choroiditis was found in an adult male striped dolphin (*Stenella coeruleoalba*). Lesions involving the brainstem,

cerebrum, cerebellum, peri-ventricular encephalon and choroid plexus were found during routine neuropathological examination. These lesions were associated with gross evidence of hydrocephalus at necropsy and the isolation of *Brucella* sp. in pure and heavy culture from the brain. Moreover, antibodies to *Brucella* sp. were detected in the pericardial fluid and blood of this animal when subjected to serological examination. Papers have been published showing that meningoencephalitis associated with *Brucella* sp. infection has been the cause of death in live stranded striped dolphins from Scotland and Spain. Although *Brucella* sp. infection in marine mammals has been well documented in recent years, its association with lesions and disease is less well understood. This poster describes the first confirmed case of *Brucella* sp. infection identified in a live- stranded striped dolphin from the coast of Cornwall, England UK.

M29 IATROGENIC DEADLY PULMONARY TRAUMA AND PNEUMOMEDIASTINUM IN A YOUNG SEA LION.

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A young male South American sea lion (*Otaria byronia*) of three years old died eight days after starting of molting hair. Along those days the animal did not eat showing weakness and dehydration. Treatment consisted on glucose serum orally and subcutaneously, antibiotics and cortisone. The previous day to its death, subcutaneous emphysema was clearly noticed in the head and the thorax. A complete necropsy was carried out only 4 hours *postmortem*. Tissue samples were fixed in 10% buffered formalin and embedded in paraffin, sectioned and stained with Haematoxylin and Eosin for a routine light microscopical study. During necropsy, distension of the pulmonary visceral pleura associated with a severe pneumomediastinum which extended cranially, as well as subcutaneous emphysema, was observed. No inflammatory, degenerative or neoplastic lesions were detected. Virological and bacteriological analysis were negative. Gas samples were taken with a five millilitres vacutainer without additives and analyzed using the same method as described previously by Pierucci G. & Gherson G. in 1968 for the corresponding analysis. Microscopical studies revealed severe interstitial and alveolar emphysema in both lung lobules involving some subpleural areas. Results

from gas analyses were similar to the definition of air embolism established by (Pierucci G. & Gherson G.,1968; Pedal et al., 1987; Bajanowski et al., 1998). Morphological diagnosis was defined as a severe diffuse pneumomediastinum caused by the distension of the pulmonary visceral pleura during forced intraesophagic intubation when trying to feed the sea lion. Pneumomediastinum and subcutaneous emphysema due to intubation have been previously described in humans, dogs and cats. We report a case of diffuse severe deadly interstitial emphysema and pneumomediastinum iatrogenically caused in a young sea lion. In order to demonstrate the air nature of the gas trapped in those mentioned anatomical areas, gas analysis was additionally done.

NATURAL HISTORY

N01 EVIDENCE OF GENETIC SUBSTRUCTURE OF BOTTLENOSE DOLPHINS, *TURSIOPS TRUNCATUS*, IN GALICIAN WATERS (NW SPAIN)

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The bottlenose dolphin, *Tursiops truncatus*, is recorded in the Habitats Directive as a Species of Special Interest, protection of which requires the designation of Special Areas of Conservation (SACs). The existence of a resident population in Southern Galicia (NW Spain) coastal waters has been recognized although bottlenose dolphins in the area show high dynamism with frequent movements between inshore and offshore waters and even long distance migrations such as the ones recorded between Galicia and the Basque Country. The aim of this study is to explore potential genetic relationships between this resident community and dolphins inhabiting neighbouring areas. This research includes a total of sixty-six skin samples from animals stranded in Southern Galicia (N=33), Northern Galicia (N=16), Portugal (N=8), The Basque Country (N=4) and The Canary Islands (N=5) between 1994 and 2008. Individuals were genotyped at 10 microsatellite loci and sequenced at the highly variable mitochondrial control region. Twenty-seven

different mtDNA haplotypes were identified. The most common haplotype was found exclusively in Southern and Northern Galician dolphins although previous publications showed that it is also a common haplotype among UK bottlenose dolphins. Both pairwise estimates of genetic differentiation (F_{st}) and Analyses of MOlecular VAriance (AMOVA) revealed the existence of differences between dolphins from different geographical locations, mainly between Southern Galician bottlenose dolphins and animals stranded elsewhere. Indeed, when inferring population structure using genotype data, Southern Galician dolphins were clearly differentiated and assigned to a single genetic population. From such analyses, six Galician animals were consequently identified as possible migrants between the Northern and Southern populations as their genetic makeup did not correspond with their geographical stranding location. The existence of population substructure should be considered in the future designation of SACs for the species in the study area.

N02 INSIGHTS INTO THE POPULATION STRUCTURE OF BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) RESIDENT IN THE SHANNON ESTUARY, WESTERN IRELAND, AS REVEALED BY NUCLEAR GENETIC MARKERS

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The Shannon estuary (western Ireland) is home to a resident population of approximately 140 bottlenose dolphins. Genotypes of 14 microsatellite loci were determined from skin samples obtained from 26 individuals from the Shannon estuary (including 24 biopsies of free-ranging dolphins and two stranded dolphins) and from six stranded individuals from other locations along the west coast. The number of alleles per locus ranged from three to eight and no evidence of linkage between pairs of loci was found. The Shannon sample appeared to be in Hardy Weinberg Equilibrium (HWE) and showed no evidence of inbreeding ($F_{IS} = -0.10$). However, a significant deviation from HWE expected proportions (Fisher's test, $p < 0.05$) was found when incorporating all stranded individuals into the Shannon sample, which could be due to the mixing of individuals from different populations (Wahlund effect). Furthermore, most loci (12 out of 14) showed alleles that were unique (private) to either inside or outside the estuary. Four individuals that stranded outside the estuary exhibited 20 private alleles (30% of total number of alleles) in nine out of 14 loci. In contrast, the two individuals that stranded in locations close to the Shannon estuary (approximately 30km and 50km north east) showed no private alleles, suggesting they may be part of the Shannon aggregation. The presence of a relatively high number of private alleles between the Shannon

and other locations along the west coast and the possible detection of a Wahlund effect suggests possible population structure in Irish waters. This is the first genetic insight into the population structure of the Shannon bottlenose dolphins. With further investigation of population and social structure (through analysis of genetic and survey data) these results will provide a basis for conservation and management of dolphins along the west coast of Ireland.

N03 MICROSATELLITE ANALYSIS OF COMMON DOLPHIN *DELPHINUS DELPHIS* IN THE CENTRE/NORTH REGION OF PORTUGAL: PRELIMINARY RESULTS

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The increase of human activities impact in marine habitats has lead to a necessity of establish efficient management and conservation decisions towards marine mammals. In order to implement legislation on cetacean protection, it is necessary to obtain data on population genetics (structure and diversity), ecology (abundance, distribution, rates of survival, reproduction, mortality and migration) and morphology, as well as the impact of human activities on these wildlife species. Despite of the occurrence of a large number of cetacean species in Portuguese waters there is a lack of information about their genetic and ecological characteristics. Therefore, the main goal of the present study was to assess the level of genetic population diversity and structure of short-beak common dolphin (*Delphinus delphis*) in the centre/north of Portugal. With this purpose, 70 stranded animals in this region were analysed with 6 microsatellites. Levels of heterozygoty and an analogue measure of FST (RST) were calculated in order to compare possible sub-populations based on the number of different alleles. Furthermore, samples from Portugal were compared with 15 animals from Galicia, in order to investigate the genetic relation between these populations. Since more than 50% of the strandings occurred in the centre/north region of Portugal presents evidence of accidental captures, the results of the present study will be essential to know the genetic characteristics of the northern portuguese population of this species in order to support management and conservation strategies.

N04 WHAT IS BRYDE'S WHALE?

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Since Junge (1950) synonymized *Balaenoptera brydei* Olsen 1913 with *Balaenoptera edeni* Anderson 1878, baleen whales of about 10 to 13 m in body length with three longitudinal ridges on the head are collectively identified as Bryde's whales (*B. edeni*). This situation has puzzled numerous workers working on Bryde's whales. Confusion raised by the term such as "pygmy Bryde's whale" for *Balaenoptera omurai* made the situation worse. As was indicated by Sasaki et al (2006), *B. omurai* is fundamentally different from other Bryde's whales in morphology and in molecular biology and *B. omurai* was excluded from this problem. In order to solve the remaining problems we examined about 100 specimens preserved in Taiwan, China, Korea, Thailand, the Philippines, Malaysia, India and Japan. Based on skeletal morphology mainly of the skulls, we recognized three different populations of Bryde's whale, namely *B. edeni*, North Pacific Bryde's whale and Indo-Pacific Bryde's whale. MtDNA sequences were also compared whenever DNA extraction from available soft or bone samples was possible and these molecular results available support the morphological conclusions. For skull morphology comparison, we established a standardized skull photography, because direct side-by-side morphological comparison is virtually impossible for the species in question. Eco-type considerations are necessary for this issue as Best (2002) pointed out, but unless we establish each morpho-type step by step, fundamental understanding of the Bryde's whale as a whole would be impossible.

N05 EPIBIOTIC MACROFAUNA ON MINKE WHALES (*BALAENOPTERA ACUTOROSTRATA*) IN ICELANDIC WATERS

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The study is the first systematic investigation on epibiotic macrofauna on cetacean in Icelandic waters. The aim is to give basic information on species composition and

abundance of the epibiotic macrofauna on minke whales in Icelandic waters. In the light of tentative environmental changes in the worlds' oceans in the coming decades due to increased temperature, the information may become valuable as basis for future comparison. Epibiota was examined on 185 minke whales caught in May to September in 2003-2007. The fluke and one lateral side of each whale were examined for epibiotic macroorganism. Intensity for each species was recorded and qualitative subsample taken for later species identification. Where data was sufficient relationship between parasite intensity and body length was analysed using least square regression. Difference in prevalence between sexes and time periods were examined with chi-square test. Seven epibiotic species were observed: *Caligus elongatus* (Copepoda: Caligidae) (prevalence (p):11.9%, mean intensity (m.i):95.5); *Cyamus balaenopterae* (Amphipoda: Cyamidae) (p:6.5%, m.i:37.0); *Pennella balaenopterae* (Copepoda: Pennellidae) (p:10.3%, m.i:1.6); *Conchoderma virgatum* (Cirripedia Lepadidae) (p:0.5%, m.i:4.0); *Conchoderma auritum* (Cirripedia: Lepadidae) (p:0.5%, m.i:1.0), *Xenobalanus globicipitis* (Cirripedia: Balanidae) (p:1.6%, m.i:5.3) and *Petromyzon marinus* (Pisces: Petromyzontidae) (p:2.7%, m.i:1.0). No significant relationship was observed between parasite intensity and host body length for *C. balaenopterae* nor *C. elongatus*. Proportion of infested hosts was higher in August-September than earlier in the summer for *C. balaenopterae* ($\chi^2 = 13.69$; $p < 0.01$: d.f.=1) and *C. elongatus* ($\chi^2 = 28.88$; $p < 0.01$: d.f.=1) that may be linked to the parasites' life cycles. Prevalence of *C. balaenopterae* was significantly higher on male than female hosts ($\chi^2 = 4.86$; $p < 0.05$: d.f.=1) indicating different migration routes of the sexes. Relatively frequent observations of *P. marinus* are probably linked to rising sea temperature in the area. The study probably presents the first record of *C. elongatus* on a cetacean host.

N06 STUDYING NORTHERN BOTTLENOSE WHALES (*HYPEROODON AMPULLAS*) IN EYJAFJÖRDUR, ICELAND DURING A MARINE MAMMAL FIELD COURSE

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Northern Bottlenose whales (*Hyperoodon ampullas*) are normally considered to be deep diving whales. They are often sighted in areas with water depth of more than 1000 m. We have very limited information about the distribution of Northern Bottlenose whales in Icelandic waters. A total of six different Northern Bottlenose whales came into the shallow fjord, Eyjafjörður with water depth up to 30 m and two individuals stayed in the fjord for almost two months (August – October 2008) The question is: why did the Northern bottlenose whales come to stay inside Eyjafjörður? The Northern Bottlenose whales were intensively studied during a

Marine Mammal Field course, a joint course between the University of Iceland and the University of Saint Andrews. The course was held from 9th - 21st of September 2008. The students were doing projects on different aspects of the biology of the Northern Bottlenose whales. Two boats were used for the studies and the students did land- and boat-based tracking. Land-based tracking was done using a theodolite from a top of a hill. The students were able to track the Northern Bottlenose whales and to document which habitat they were mainly using. Fish transects using the fish finder on board a small fishing vessel was done as well and the presence of small fish on the fish finder, which could be either herring (*Clupea harengus*) or saithe (*Pollachius virens*) was documented. In addition we also recorded the sound of bottlenose whales using a towed hydrophone array, with both regular clicks and buzzes recorded. The Northern Bottlenose whales were tracked visually and dive times were measured. Maximum dive time was 14 min and 30 sec. In conclusion the whales seemed healthy and they swam out of the fjord again when the weather changed and it started to be colder.

N07 *This poster was cancelled*

N08 *This poster was cancelled*

N09 **WHAT IS THE BIRTHRATE OF LONG-FINNED PILOT WHALE
(*GLOBICEPHALA MELAS*) IN THE STRAIT OF GIBRALTAR?**

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Since 1996 abundance, trend, survival rate, spatial distribution, diet and conservation issues have been studied on the resident long-finned pilot whales (*Globicephala melas*) in the Strait of Gibraltar. However no previous studies focused on mother-calf associations to estimate pilot whale's birth rate, a critical parameter for the reproduction and the population dynamics of the species. The objective of this study was to calculate the inter-birth interval for the population of long-finned pilot whales in the Strait of Gibraltar. Distinction was done between inter-birth interval and inter-calving interval for viable calf (where both calves survived at least one year). A total of 122 potential mother-calf pairs were identified between 1999 and summer 2006 with photo-identification techniques. Up to 26 mother-calf pairs (13 mothers) were finally used to calculate the inter-calving interval because of the strict conditions to confirm a potential mother-offspring pair and the low number of females having two calves in the period. The mean inter-birth interval was found to be 3.6 years (range 1-7) while the mean

inter-calving interval for viable calf was 4.5 years (range 2-7). The percentage of females giving birth each year was therefore calculated to be 27.8% using the inter-birth interval and 22.2% using the viable calves' interval. These values were lower than the results of studies realized on pilot whale carcasses from the Faroe fishery. This study provides for the first time the inter-birth interval for live pilot whales in the Strait of Gibraltar.

N10 THE MATING SYSTEM OF THE MEDITERRANEAN MONK SEAL IN THE WESTERN SAHARA

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The mating system of the Mediterranean monk seal, *Monachus monachus*, at the Peninsula of Cap Blanc, was studied from 1994 to 1999 by combining a series of methodologies (photo-identification surveys, length measurements, monitoring, video-camera observations, theodolite and GPS recordings, and molecular analysis). The species presented a slight sexual dimorphism in size, since birth: adult males being 5% longer than females and newborn males being 10% longer than females. The bulk of the colony – females, pups and males – aggregate inside two breeding caves (Cave 1 & 3), whose entrances were controlled by a single (occasionally two) 'dominant' males that aggressively defended an aquatic territory surrounding them (average area 4741m² in front of Cave 1). Inside the caves no sexual activity was detected and the level of aggression was almost inexistent. Sexual behaviour and mating was observed to occur, exclusively, in the water. The rest of adult males, referred as to 'non-dominant' males, also defended aquatic territories, that were located either 10 km to the north (in Zone 4-Tarf el Guerguerat) or 20 km to the south (Tip of Cap Blanc) of the breeding caves. The tenure of aquatic territories was long lasting (spanning several years) but the presence of males in their aquatic territories was not permanent: a monthly average of 14 non-dominant territory-holding males was detected inside the breeding caves during all year. No temporal trend was detected in their number. The level of relatedness among cohorts of pups was low or null, indicating that the degree of polygyny is low, a result not surprising for an aquatically-mating phocid with a protracted reproductive season. Besides, relatedness stratified with a remarkable periodicity unravelling the existence of a complex reproductive structure.

N11 WINTER OBSERVATIONS OF THE BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*) IN THE BLACK SEA NEAR-COASTAL WATERS OF THE CRIMEAN PENINSULA

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The short of information about the distribution of the Bottlenose dolphin (*Tursiops truncatus*) on the Crimean Peninsula at winter period defines the importance of this subject. Our research covers two winter periods: 2006-2008. The pedestrian routes lied on the most area of the Black Sea coast of the Crimea (from the Tarkhankut Cape on the western extremity of the peninsula to the Kerch region on its eastern extremity, Kerch Strait inc.). Also the local inhabitants were interviewed. During 35 observational days 52 sightings of the Bottlenose dolphin were documented basically at 0,05-2 km from the shore. In the near coastal zone their typical behavior was traveling and foraging. The most of sightings (more than 60%) took place between Sevastopol and Alushta areas (chiefly near Sevastopol and its adjoining territories). On the length of the whole routes we observed the dolphins frequently between the Alushta and Theodosia, near the Tarkhankut Cape, between Okuniovka and Shtormovoye villages. It was registered regular foraging of this species in the salt water Donuzlav Lake. Few sightings took place near Eupatoria and the Calamita Gulf. We didn't meet any representatives of this species near the Crimean coast of the Kerch Strait and Gulf of Theodosia. The groups numbered 2-10 (3,7) individuals (44 cases). In 8 cases we observed the collective foraging of several groups (12-65 individuals), mostly in the region of Sevastopol. During the whole winter season the local inhabitants were reporting about the boat observations of dozens dolphins of this species not far from the sea shore (between Yalta and Sevastopol). The high concentration of the Bottlenose dolphin in the near coastal waters of the South and South-West Crimea was typical for winter season. This conclusion agrees with the interviews data.

N12 PRELIMINARY ANALYSIS OF THE SOCIAL STRUCTURE OF SHORT-BEAKED COMMON DOLPHIN (*DELPHINUS DELPHIS*) IN THE TYRRHENIAN SEA, ITALY

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The social structure of a population - usually measured through interactions or associations of individuals - plays a key role in many aspects of its ecology and

biology. The social organization of the short-beaked common dolphin (*Delphinus delphis*) in the Mediterranean Sea is largely unknown due to the rarity of the species. Our purpose was to identify and quantify the re-sightings of individuals and associations formed among them to provide insights into the social organization of common dolphin around Ischia Island (Italy). In this study, the "half-weight index" (HWI) was used to describe the association patterns. We conducted photographic-identification surveys in the June-October period, 2003-2008, identifying a total number of 91 dolphins in 17 sightings. Many of these animals were re-sighted in 2 or more occasions, indicating a high level of site fidelity for at least part of the population. After frequency of occurrence of individuals in focal schools were taken into consideration (animals recaptured at least 3 times), 38 dolphins were retained for association analysis. Overall, the community showed a highly stable association patterns, with a mean HWI>0.5. We also identified dyads having preferred associations (HWI increased of 30% than the mean HWI), discovering several individuals (females in more than 50% of the occasions) with five-years-lasting associations. In this population, pattern and level of association among females in different reproductive states (females from late pregnancy to the first year of their calves' life or females from early pregnancy to their calves' newborn period, females with older calves or without calves) seemed to be very strong. We suggest that several selective pressures, including ecological features of the area (i.e. localization of food resources) as well as eto-ecological constrains (i.e. the overlap with striped dolphin *Stenella coeruleoalba* in habitat use and distribution), may be of importance in determining such associations.

N13 RESEARCH OF A GROUP STRUCTURE OF THE SOLOVETSKY (WHITE SEA) LOCAL HERD OF BELUGAS (*DELPHINAPTERUS LEUCAS*): THE MODEL OF A POPULATION

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The research of the animals' population structures allows to estimate its place and a role in the ecosystem. For finding-out the demographic status of the local herd of belugas, in 1997-2005 there were realized a visual supervision in the reproductive gathering (RG) near Solovetsky island. It was registered the behavior of animals, the dynamic of their quantity and the age-sexual structure of the herd. For the analysis of Solovetsky herd like a population model (on Colly) as a criterion served the general number of belugas, the number of adult females, the number of subadultus individuals and number of juvenalis. The total number was in 1997 – 88, in 1998 – 84, in 1999 – 98, in 2000 – 111, in 2001 – 69, in 2002 – 92, in 2003 – 61, in 2004 – 78 and in 2005 – 84 belugas. The survival rate $L(x_n)$ equaled in the same years accordingly 1,0, 0,9545, 1,1140, 1,261, 0,7840, 1,0454, 0,6932, 0,8864 and 0,9545.

Survival rate changes on years and was undulating. The annual quantity of juvenalis – 10, 11, 13, 15, 14, 20, 4, 12 and 15. Specific survival rate $P(x_n)$ was in the period of 1997-2005 - 0,9545, 1,1671, 1,1320, 0,6220, 1,3332, 0,6631, 1,2787, – 1,0768. Fruitfulness vectors equaled $m_{x(1,2,3,4,5,6,7,8,9)} = 0,0770, 0,0833, 0,0818, 0,0877, 0,1346, 0,1493, 0,0444, 0,0984, 0,1181$. The observable speed of the reduction $RG \langle r \rangle = -2,12 \approx -3$ belugas in a year or on the average $\langle r \rangle / \langle N \rangle = -0,0353 \approx 3,5\%$ that approximately coincides with an average of final speed of reduction on multiplier growth λ , $\langle \lambda \rangle = 0,9631 \approx 3,69\%$. The possible reasons of it may be changing of an ecosystem and the influence of an ecological tourism.

N14 FIRST RECORD OF A HUMPBACK WHALE (MEGAPTERA NOVAEANGLIAE) IN THE GULF OF TRIESTE (NORTHERN ADRIATIC SEA)

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A humpback whale (*Megaptera novaeangliae*) was recorded in Slovenian territorial waters (Gulf of Trieste, northernmost part of the Adriatic Sea) in February 2009. This is the first confirmed and documented record of a humpback whale in the Gulf of Trieste, the second one in the Adriatic Sea and the 14th in the whole Mediterranean Sea, where the humpback whale is considered a visitor species. The whale was observed from the coast and from an inflatable boat on two consecutive days. It appeared to be an adult, about 10-12 m long, apparently in good body condition. Photographs of right and left side of the dorsal fin, the tail fluke, rostrum, blowhole and tail stock were taken for the purposes of photo-identification. Time and position were recorded throughout the sighting, while dive times were recorded with a stopwatch and noted onto the research forms. Short video footage was taken. The animal performed a series of 2-3 short dives, lasting a few seconds, followed by a long dive, lasting between 3 and 10 minutes. It performed one breach, where the whole body except the tail fluke left the water. It approached the coast up to 150 m from the shore. The animal would often change the direction of swim, but sometimes followed the same course for periods of up to one hour. Humpback whales are common in the north-east Atlantic, but rare in the Mediterranean and even rarer in the Adriatic Sea. The reason for the occurrence of this species in the northern Adriatic remains unknown.

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Tips for enjoying your stay in Istanbul - a practical guide for Turkish

Turkish alphabet

Letters		How to pronounce	Letters		How to pronounce
A	a	As u in funny	M	m	As m in man
B	b	As b in bat	N	n	As n in nay
C	c	As j in job	O	o	As a shortened o in no
D	d	As c in cello	Ö	ö	As e in her
E	e	As e in red	P	p	As p in put
F	f	As f in far	R	r	As the r in rapid
G	g	As g in gap	S	s	As s in sand
Ğ	ğ	Silent	Ş	ş	As s in sugar
H	h	As h in hot	T	t	As t in top
I	ı	As e in open	U	u	As oo in boot
İ	i	As i in hit	Ü	ü	ü in German über
J	j	As g in montage	V	v	As v in valve
K	k	As in k Kangaroo	Y	y	As y in you
L	l	As l in let	Z	z	As z in zip

Useful Turkish phrases

English	Turkish (Türkçe)
Welcome	Hoş geldin (sg) Hoş geldiniz (pl/polite)
Hello	Merhaba, Selam, İyi günler Alo, Efendim (on the phone)
How are you?	Nasılsınız? (polite) Nasılsın? (inf)
I'm fine, thanks. And you?	İyiyim teşekkür ederim, siz nasılsınız (polite) İyiyim sağol, sen nasılsın (casual)
What's your name? My name is ...	İsminiz nedir? (polite) Adın ne? (casual) İsmim ... (polite) Adım ... (casual)
Where are you from? I'm from ...	Nerelisin? (casual) Nerelisiniz? (polite) ...lıyım / ...liyim / ...den / ..dan
Pleased to meet you	Memnun oldum
Good morning	Günaydın
Good afternoon	Tünaydın, İyi günler
Good evening	İyi akşamlar
Good night	İyi geceler
Goodbye	Hoşça kal
Good luck	İyi şanslar!
Cheers/Good health!	Şerefe! (to honour) Sağlığına! Sağlığınıza! - to your health
Have a nice day	İyi günler!
Bon appetit	Afiyet olsun!
Bon voyage	İyi yolculuklar! Güle, güle!
I don't understand	Anlamıyorum, Anlamadım
Please	Lütfen
Please write it down for me	Lütfen yazınız
Excuse me	Pardon, geçebildirmiyim? (to get past) Pardon, bakarmısınız? (to get attention)
How much is this?	Ne kadar? Kaça?

Sorry	Pardon, Özür dilerim
Thank you	Teşekkür ederim, Çok teşekkür ederim Teşekkürler, Sağol, Sağolun
Response (You're welcome)	Bir şey değil / Rica ederim
Where's the toilet?	Tuvalet nerede?
Would you like to dance with me?	Bu dansı bana lütfeder misiniz? (frm) Benimle dans eder misiniz? (inf)
I love you	Seni seviyorum
Get well soon	Geçmiş olsun
How do you say ... in Turkish?	Türkçe'de ... nasıl denir?
Help! Fire! Stop! Pay attention!	İmdat! Yangın! Dur! Dikkat!
Call the police!	Polis çağırın!
Happy Birthday	Doğum günün kutlu olsun
If God wishes	<i>İnşallah</i>

Numbers

Bir(1) , iki(2), üç(3), dört(4), beş(5), altı(6), yedi(7), sekiz(8), dokuz(9), on(10), onbir(11), oniki(12) , yirmi(20), yirmibeş(25), otuz(30), otuzüç(33), kırk(40), kırkaltı(46), elli(50) , ellibeş(55), altmış(60), altmışiki(62), yetmiş(70), yetmişsekiz(78), seksen(80), seksenbir(81), doksan(90), doksanyedi(97), yüz(100), yüzdokuz(109), yüzellibir(151), ikiyüzonbeş(215), üçyüzotuz(330), bin(1000), bin dokuz yüz doksan altı(1996), milyon(milion), milyar(billion).

Other useful words

<i>Su</i>	water	<i>Fincan</i>	cup
<i>Portakal suyu</i>	Orange-juice	<i>Bardak</i>	glass
<i>Et suyu</i>	meat-broth	<i>Tabak</i>	plate
<i>Süt</i>	milk	<i>Bıçak</i>	knife
<i>Şeker</i>	sugar, candy, sweet	<i>Büyük</i>	big, large
<i>Kahve</i>	coffee	<i>Küçük</i>	small, little
<i>Sade</i>	no sugar	<i>Erkek</i>	man, male
<i>Az şekerli</i>	a little sugar	<i>Kadın</i>	woman
<i>Çok şekerli</i>	a lot of sugar	<i>Kız</i>	girl
<i>Çay</i>	tea	<i>Çocuk</i>	child
<i>Ayran</i>	yogurt drink	<i>Oğlan</i>	boy
<i>Bira</i>	beer	<i>Kız</i>	daughter
<i>Şarap</i>	wine	<i>Ogul</i>	son
<i>Beyaz</i>	white	<i>Anne</i>	mother
<i>Kırmızı</i>	red	<i>Baba</i>	father
<i>Buz</i>	ice	<i>Kardeş</i>	sibling
<i>Biber</i>	pepper	<i>Kız kardeş</i>	sister
<i>Tuz</i>	salt	<i>Erkek kardeş</i>	brother
<i>Ekmek</i>	bread	<i>O</i>	he , she, it, that

<i>Tereyađı</i>	butter	<i>Bu</i>	this
<i>Peynir</i>	cheese	<i>Arkadař</i>	friend, colleague
<i>Meze</i>	appetizers	<i>Sođuk</i>	cold
<i>Et</i>	meat	<i>Tavuk</i>	chicken
<i>Balık</i>	fish	<i>Pilav</i>	pilaf
<i>Salata</i>	salad, lettuce	<i>Meyva</i>	fruit
<i>Sebze</i>	vegetable	<i>Çorba</i>	soup
<i>Sandviç</i>	Sandwich	<i>Tatlı</i>	dessert
<i>Dondurma</i>	ice cream, sorbet	<i>Çatal</i>	fork
<i>Kařık</i>	spoon	<i>Pahalı</i>	expensive

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