

# 2012 ANNUAL MEETING

OF THE

## UK REGIONAL STUDENT CHAPTER



# SOCIETY FOR MARINE MAMMALOLOGY

**1<sup>st</sup> – 3<sup>rd</sup> FEBRUARY**

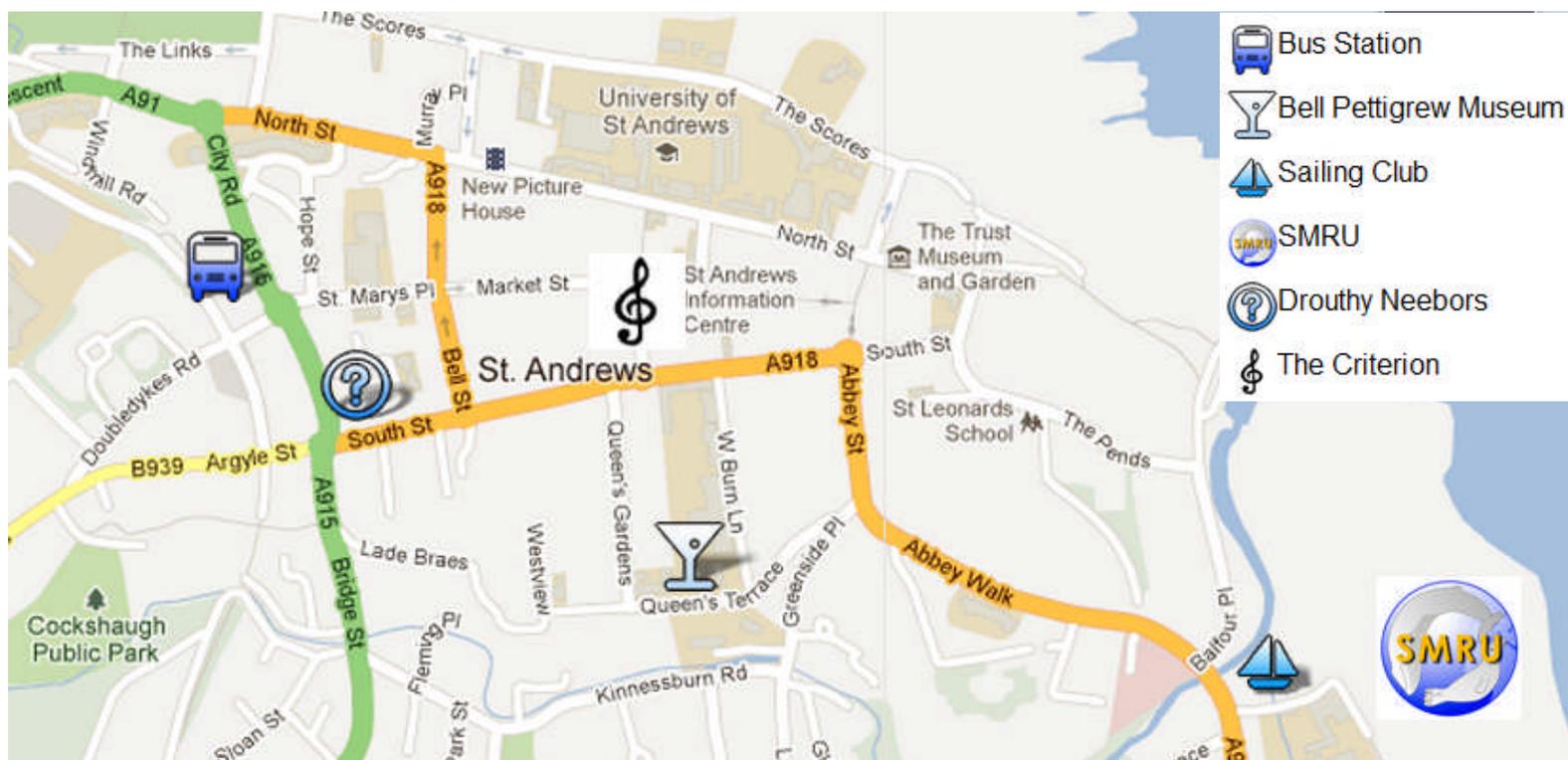
SEA MAMMAL RESEARCH UNIT  
UNIVERSITY OF ST ANDREWS

Contact: Lindsay Wilson 07724802852



# Map of St. Andrews

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## Icebreaker

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The Icebreaker will take place in the Bell-Pettigrew Museum of Natural History, Bute Building at 18:00 – 20:00 on Tuesday 31<sup>st</sup> January.

To get to the Bell-Pettigrew enter St Marys Quadrangle from South Street. The Bute building is straight in front of you; enter at Door D which is around to the right. The Bell-Pettigrew is down the corridor on the right. Drinks and nibbles will be provided.

## Food & Drink

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Complimentary coffee and hot drinks will be provided during breaks. However lunch is not provided; please feel free to bring a packed lunch or there are plenty of places within short walking distance of SMRU.

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# Conference Schedule

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Tuesday 31 <sup>st</sup> January	
18:00 – 20:00	Icebreaker @ Bell Pettigrew Museum, Bute Building

Wednesday 1 <sup>st</sup> February	
	Registration + copy talks to computer
09:00 – 09:15	<b>Professor Ian Boyd</b> – Welcome
09:15 – 10:30	Guest Speaker: <b>Peter Tyack</b> - Effects of anthropogenic noise on marine mammals
10:30 – 11:00	Coffee
Session: Behavioural Ecology <span style="float: right;">Chair: Helen Browning</span>	
11:00 – 11:15	<b>Amy Bishop</b> - Behavioural mechanisms of inter-male conflict and conflict resolution in mating grey seals ( <i>Halichoerus grypus</i> )
11:15 – 11:30	<b>Charlotte Cairns</b> - Pinniped personalities? Investigating the development of individuality in grey seal ( <i>Halichoerus grypus</i> ) neonates
11:30 – 11:45	<b>Hani James</b> - Investigating individual differences in social attentiveness of grey seal ( <i>Halichoerus grypus</i> ) mothers
11:45 – 12:05	<b>Kelly Robinson</b> - Behavioural and Endocrinological Evidence for Social Recognition in Newly Weaned Grey Seals ( <i>Halichoerus grypus</i> )
12:05 – 12:25	<b>Lucia López</b> - Gait changes in deep-diving Blainville's beaked whales ( <i>Mesoplodon densirostris</i> )
12:25 – 14:25	Lunch
Session: Population Ecology <span style="float: right;">Chair: Silje-Kristin Jensen</span>	
14:25 – 14:45	<b>Tilen Genov</b> - From no dolphins to dolphin SAC: ecology and conservation of bottlenose dolphins ( <i>Tursiops truncatus</i> ) in Slovenia
14:45 – 15:05	<b>Diane Claridge</b> - Abundance and density of beaked whales around Navy ranges in the Bahamas estimated using visual line transect surveys
15:05 – 15:25	Guest Speaker: <b>Marianne Marcoux</b> - Grouping patterns and age segregation in narwhals ( <i>Monodon monoceros</i> )
15:25 – 16:00	Coffee
16:00 – 16:20	<b>Wully Paterson</b> - Automated pattern-matching of grey seals ( <i>Halichoerus grypus</i> ) and a novel approach to the resulting capture-mark-recapture analysis
16:20 – 16:50	Guest Speaker: <b>Esther Jones</b> – Comparative spatial distributions of grey & harbour seals around the UK
Evening Suggestion	Pub Quiz @ Drouthy Neebors, South Street from 21:00

<b>Thursday 2<sup>nd</sup> February</b>	
09:15 – 09:30	Copy talks to computer
09:30 – 10:30	Guest Speaker: <b>Bernie McConnell</b> - Node Tags: Turning telemetry on its head.
10:30 – 11:00	Coffee
Session: Foraging Ecology <span style="float: right;">Chair: Marjolaine Caillat</span>	
11:00 – 11:15	<b>Samantha Cox</b> - Physical drivers of predator foraging in the marine environment
11:15 – 11:35	<b>Maria Quaggiotto</b> - The role of marine mammal carrion in the ecology of coastal marine systems
11:35 – 11:55	<b>Lindsay Wilson</b> – The diet of seals in Scotland
11:55 – 14:00	Lunch
Session: Acoustic <span style="float: right;">Chair: Jo Kershaw</span>	
14:00 – 14:20 CANCELLED	<del><b>Anneli Englund</b> – An acoustic approach to the study of bottlenose dolphin (<i>Tursiops truncatus</i>) community structure in Irish waters.</del>
14:20 – 14:40	<b>René Swift</b> – We know what you did last summer! Shedding light on the sensory and foraging ecology of humpback whales
14:40 – 14:50	<b>Charlotte Dunne</b> - New sounds identified in two different species of beaked whale
14:50 – 15:10	Coffee
Session: Health Assessment and Immunology <span style="float: right;">Chair: Lindsay Wilson</span>	
15:10 – 15:30	<b>Silje-Kristin Jensen</b> - A serological screening for Brucella sp. antibodies in Antarctic fur seal ( <i>Arctocephalus gazella</i> ), Weddell seal ( <i>Leptonychotes weddellii</i> ) and southern elephant seal ( <i>Mirounga leonina</i> )
15:30 – 15:50	<b>James Stewart</b> - Factors influencing population and individual pupping site selection in female grey seals ( <i>Halichoerus grypus</i> ), and the effects of a changing climate
15:50 – 16:10	<b>Helen Browning</b> - Investigating the aetiology of urogenital carcinoma in California sea lions ( <i>Zalophus californianus</i> )
16:10 – 16:25	<b>Joanna Kershaw</b> - Variability in the blubber lipid content of odontocetes with respect to body site and blubber depth: implications for estimating body condition
Evening Suggestion	Live music @ The Criterion Bar, South Street from 21:00

<b>Friday 3<sup>rd</sup> February</b>	
Session: Career Q&A <span style="float: right;">Chair: René Swift</span>	
09:00 – 11:00	Guest Speakers: <b>Christian Ramp, Luke Rendell, Gordon Hastie, Lars Boehme, Volker Deecke, Sascha Hooker, Valentina Islas and Nicola Quick</b> : PhD and Beyond – Q&A session
11:00 – 11:30	Coffee Break
11:30 – 12:00	Closing words – next year’s venue/ volunteers for the committee
Evening Suggestion	BioNetwork Party – School of Biology Postgraduate Society Party at the Sailing Club, East Sands from 20:30. There will be nibbles and some punch (small donation) but best BYOB.

# Abstracts

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## **Behavioural mechanisms of inter-male conflict and conflict resolution in mating grey seals (*Halichoerus grypus*)**

**Amy Bishop**

Durham University

An expanding breeding colony of grey seals, established on the North Lincolnshire coast at Donna Nook, is now one of the largest grey seal breeding colonies in England.

However, little is known about the details of the mating pattern at this expansive beach site, where topography and sex ratios are markedly different from the more 'typical' offshore breeding colonies. Also, seals at this colony are exposed to varying forms and levels of anthropomorphic disturbance (e.g. eco-tourism vs. military activities). This study aims to quantify patterns of aggressive behaviour for individually identified males and relate these to the local social and ecological environment including the availability of potential mates, inter-annual patterns of site-fidelity, neighbour identity, and level/type of disturbance in order to elucidate the mechanisms underlying inter-male conflict at this site.

## **Pinniped personalities? Investigating the Development of Individuality in Grey Seal Neonates.**

**Cairns, Charlotte** \* ; Twiss, Sean \* .

Biological and Biomedical Sciences, Durham University, Durham, DH1 3LE.

Research has shown that experiential and environmental factors can influence how 'personality' emerges and is canalised within the limits of an individual's genotype. However, the emergence of individual behavioural profiles is largely a neglected area, with only a few studies investigating this. Focus has tended to be temporal- assessing how behaviour changes over time- with a neglect to see if individual differences are *consistent* across ontogeny. Some studies have specifically investigated personality development in non-human animals, but these are rare. Regarding marine mammal species, there is some literature documenting changes in behavioural profiles over time, but as before, these neglect a 'personality' framework. There is a need to further investigate personality development in *wild* organisms in natural contexts, in order to assess the establishment of individual behavioural differences and how they relate to social and ecological circumstances. To current knowledge, there is no literature detailing the ontogeny of personality in any pinniped species. Only Twiss et al. (2010, 2011) have explicitly set out to test for evidence of behavioural types in marine mammals in the field (study species: Grey Seal, *Halichoerus grypus*). However, these studies pertain only to adult seals and nothing is known of behavioural variation in neonates, nor how it develops. My Masters project will contribute to this gap in knowledge by quantifying and recording the development of behavioural types in wild grey seal neonates.

## **Investigating individual differences in social attentiveness of grey seal mothers.**

**Hani James**

Durham University

Personality in animal species has become a topic of much interest in recent years, both in scientific research and in the media. In a range of taxa it has been noted that a wide variety of individual personalities co-exist within populations, suggesting that there is evolutionary benefit in maintaining differences. Personalities have also been observed in maternal behaviour - known as mothering styles. Mothering styles can be categorised into 3 types: Protective mothers, Rejecting mothers and Laissez-Faire mothers. In many cases, the behaviour of the mother while caring for offspring affects the behaviour of the offspring during juvenile and potentially adult stages. However, while this phenomenon has been studied regularly in primates and land-based mammals, little attention has been given to the study of personality in marine mammals - in particular pinnipeds.

## **Behavioural and Endocrinological Evidence for Social Recognition in Newly Weaned Grey Seals (*Halichoerus grypus*)**

**Kelly Robinson**

SMRU, Scottish Oceans Institute, University of St. Andrews, Scotland

Recognising individuals and behaving appropriately towards them is a crucial ability for many species. Aspects of pinniped reproductive behaviour, such as site fidelity, mean that individuals may encounter the same animals within and across seasons. However the ability to recognise non-related individuals has never been tested in pinnipeds outside of studies between territorial males. To investigate the recognition capabilities of grey seals, 12 weaned pups were penned in 2 groups of 6 during the 2010 breeding season on the Isle of May, Scotland. Over 14 days each pup took part in a series of paired pen trials with either individuals they had previously co-habited with (familiar) or ones they had never encountered before (stranger). As declines in investigative behaviour indicates familiarity in paired pen trials, the number of visual and olfactory 'checks' and the number of interactions between pups were recorded. Trials with paired strangers had significantly more 'checks' (mean increase: 22.4 checks/trial,  $p=0.026$ ) and interactions (mean increase: 17 interactions/trial,  $p=0.034$ ) than trials with familiars. Plasma samples were taken to detect peaks in the neuropeptide hormone oxytocin, which is released during positive social interactions with familiar individuals. Several individuals in familiar trials exhibited a significant rise in plasma oxytocin (basal: 11.1pg/ml, trial: 192.8pg/ml,  $p<0.01$ ) whilst none in stranger trials did. Previous studies show evidence of breeding female grey seals consistently affiliating over successive seasons, with potential energetic rewards for associating with animals that recognise and adjust their behaviour towards each other. The involvement of oxytocin indicates that individuals received a physiological benefit from associating with them as it acts on the hypothalamo-pituitary-adrenal axis to reduce anxiety and stress responses. This study begins to unravel the mechanism behind non-filial recognition in grey seals, showing that even newly weaned pups can recognise familiar individuals and respond differently to them.

## Gait changes in deep-diving Blainville's beaked whales

Lucia Martin López<sup>1,2</sup>, Patrick Miller<sup>2</sup>, Mark Johnson<sup>2,3</sup>

<sup>1</sup>BIOECOMAC, Dep. Animal Biology, La Laguna University, Tenerife, Canary Islands, Spain.

<sup>2</sup>SMRU (Sea Mammal Research Unit), University of St. Andrews, Scotland

<sup>3</sup>WHOI (Woods Hole Oceanographic Institute), Massachusetts, USA

Marine mammals modulate their swimming gaits (i.e. steady stroking, stroke-and-glide, prolonged gliding) to promote locomotor efficiency, and gliding patterns are influenced by animal buoyancy. Beaked whales are reported to produce extremely long and deep foraging dives which likely exceed their aerobic capacity, but little is known about their swimming behaviour during dives. Here, biomechanical data recorded with suction cup DTags attached to nine Blainville's beaked whales were analysed to provide the first report on swimming gait patterns and variability in the thrusting strokes for this species. Fluking versus gliding periods were identified as cyclic variations in the accelerometer and magnetometer signals. All three types of swimming gaits were apparent in the dive records, with the number of fluke strokes varying as predicted due to the effects of speed, body pitch, and dive depth on drag and buoyancy forces. Whales produced fewer strokes in the descent phase of shallow versus deep dives, suggesting that whales dove with less air volume during non-vocal shallow dives compared with foraging deep dives. All whales used two types of strokes, termed A and B. The variation in body pitch caused by Stroke B was twice as large as that of Stroke-A. While Stroke-B was always made before an ascent glide, Stroke-A was always used in a steady stroking gait. Nonetheless, overall forward speed was maintained during occurrence of Stroke-B suggesting they produce more thrust than Stroke-A. In 48 out of 52 deep dives, Stroke-B appeared during the ascent phase after a mean duration of  $34.7 \pm 5.1$  min had elapsed from the start of each deep dive, but only occurred in one of 223 shallow dives. The occurrence of Stroke-B may be related to physiological limitations associated with foraging dives with durations that are likely to be well in excess of their aerobic dive limit.

## **From no dolphins to dolphin SAC: ecology and conservation of bottlenose dolphins in Slovenia**

**Tilen Genov<sup>1</sup>**

<sup>1</sup>Morigenos – marine mammal research & conservation society.

Jarska cesta 36/a, 1000 Ljubljana, Slovenia

The ecology of bottlenose dolphins (*Tursiops truncatus*) in Slovenian and adjacent waters was studied between 2002 and 2011, with the aim to inform conservation. Prior to this study, cetaceans were not regarded as a regular component of Slovenian biodiversity. Surveys were carried out from vessels and land observation points. During each sighting, information on the position, time, group size, presence of calves, behaviour and interactions with fisheries or boat traffic was recorded. During most sightings standard photo-identification procedures were carried out. Photo-identification data was used to estimate population size using mark-recapture techniques and to calculate association indices for the analysis of social structure. A total of 434 boat surveys and 707 land observation sessions were carried out, resulting in 189 sightings and 123 photoidentified individuals. Based on sighting frequencies 15.5 % of identified dolphins were common, 13 % were occasional and 71.5% were rare. Between 40 and 100 bottlenose dolphins used this area annually, based on mark-recapture estimates. Population size estimate for 2008 (considered most robust) was 74 animals (95 % CI = 57–90). The calculated social differentiation was 1.52 (SE = 0.145), suggesting a highly structured social community. The most frequently observed dolphins showed strongest associations throughout the research period. Bottlenose dolphins used the area for a range of activities, including feeding, nursing, resting, social interactions and play. Based on the findings of this study, the Slovenian government decided to designate a candidate Special Area of Conservation (SAC) for bottlenose dolphins in Slovenian territorial waters. Future work will focus on spatial modelling of dolphin habitat use, in order to enable appropriate zoning of the SAC and propose potential management measures.

## Abundance and density of beaked whales around Navy ranges in the Bahamas estimated using visual line transect surveys

Diane Claridge<sup>1,2</sup>, John Durban<sup>1,3</sup>, Len Thomas<sup>4</sup> & Phil Hammond<sup>2</sup>

<sup>1</sup>Bahamas Marine Mammal Research Organisation, Sandy Point, Abaco, Bahamas

<sup>2</sup>Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, UK

<sup>3</sup>Protected Resources Division, NOAA Southwest Fisheries Science Center, La Jolla, CA

<sup>4</sup>Centre for Research into Environmental & Ecological Modelling, University of St Andrews, UK

Atypical strandings of beaked whales have been correlated with naval sonar exercises, highlighting a need for a better understanding of beaked whale population ecology. Using standardized line-transect methods, three ship-based visual surveys covered 7,615 km, to assess abundance and densities in the Great Bahama Canyon, allowing the comparison in densities on and off the US Navy's Andros-AUTEC Operating Areas. Transect lines were randomly placed within four rectangular strata (NE Providence Channel, NW Providence Channel, Tongue of the Ocean and the Cul de Sac) using a saw-tooth pattern to allow equal area coverage. Seventy-five sightings of three species of beaked whales were used to model detection probabilities for analysis of abundance and density using multiple-covariate distance sampling methods. The half-normal function with a cosine adjustment provided the best fit for the detection function when distances to sightings were truncated at 3000m (Kolmogorov-Smirnov test:  $p=0.93$ ), resulting in an effective strip width of 1540m. Ship platform did not affect detection probability, but sea state did. Thirty-five sightings occurred while on the transect line and were used to estimate abundance and densities. Mean cluster size was small (2.71 whales,  $SE=0.22$ ). Abundance estimates were adjusted to account for availability and perception bias ( $g(0)$ ) which was allowed to vary by sea state. The estimated abundance and densities were similar for both genera of beaked whales found in the Great Bahama Canyon: 1,426 *Mesoplodon* beaked whales or 51.1 whales/1000 km<sup>2</sup> (CV 0.40) and 1,380 *Ziphius cavirostris* or 49.5 whales/1000 km<sup>2</sup> (CV 0.49). However, densities varied throughout the canyon with the lowest densities found on the AUTEC Weapons Range, an area used for fleet readiness training involving the regular use of mid-frequency active sonars. The highest estimates were found in the NW Providence Channel, the area with the highest mortality of beaked whales during the anti-submarine warfare GAP exercise on 15<sup>th</sup> March 2000 and in the southernmost part of the Andros-AUTEC Operating Area, an area currently used by the Navy for passive acoustic testing only. This study is providing key data on abundance and density of beaked whales on and around the US Navy ranges in the Bahamas, information which is critical to future mitigation and monitoring.

## **Automated pattern-matching of grey seals and a novel approach to the resulting capture-mark-recapture analysis**

Hiby, Lex R<sup>1</sup>; **Paterson, William D**<sup>2</sup>; Redman, Paula<sup>2</sup>; Watkins, John<sup>2</sup>; Twiss, Sean D<sup>3</sup>; Pomeroy, Paddy P<sup>2</sup>

<sup>1</sup>Conservation Research Ltd., 110 Hinton Way, Great Shelford, Cambridge, CB22 5AL, UK

<sup>2</sup>Scottish Oceans Institute, Sea Mammal Research Unit, University of St. Andrews, St. Andrews, Fife, KY16 8LB, UK

<sup>3</sup>School of Biological and Biomedical Sciences, South Road, The University of Durham, Durham, DH1 3LE, UK

Photographs of individually distinct animal markings can be used to generate capture-mark-recapture data. However, when searches of photo-ID catalogues are prohibitively time-consuming an automated search is required. We have developed software to search a catalogue containing over 25,000 photographs of grey seals for potential matches using pattern matching algorithms. Patterns are scanned from different regions of the body via a 3D surface model to compensate for differences in camera angle and posture between photographs of the same seal. The software presents 0.5% of the top-ranked algorithm results for visual confirmation. Error rates for missed matches were assessed using photographs from a breeding site on the island of North Rona, Scotland to estimate local population size and survival. A novel technique of data analysis was used to allow for the possibility of multiple capture histories resulting from missed matches and animals identified from left, right or both sides. The risk of failing to match a randomly selected pair of photographs showing at least the neck region of an individual depended on the quality of the images and the pattern in the visible region/s. Filtering out images of low quality reduces this risk but introduces biases towards well-marked individuals and those that pup closer to the hide from where photographs were taken. Therefore subsequent analyses did not filter images with respect to quality. Based on 1286 encounters showing at least the neck region, 709 potentially different seals were identified. Annual apparent survival of grey seal females using the North Rona breeding site from 2004-08 was 0.87 (95% CI = 0.83, 0.92). The average ratio between local female breeding population estimates and peak counts was 1.29. Our results are consistent with previous studies on the demography of grey seals at North Rona demonstrating our novel approach to capture-mark-recapture to be a robust technique

## **Physical drives of predator foraging in the marine environment**

**Samantha Cox<sup>1</sup>**

<sup>1</sup>University of Plymouth

Heterogeneity throughout the marine environment has been well documented and is reflected not only through the distributional patterns of marine resources, but also in the behaviour of the species that rely on such materials. This observed patchiness is often driven by underlying physical processes that result in areas of increased primary productivity or plankton accumulation. Such locations are limited both in space and time and often include aggregations of seabird and marine mammal prey items, therefore representing profitable foraging opportunities for such higher trophic level species to exploit. However, currently there is a distinct gap in our knowledge of the physical processes driving the creation of these foraging habitats. To gain further insight toward the foraging behaviour of predator species, it is essential that interactions between predators and their surrounding environment are better understood.

This PhD will focus on both seabird and cetacean species with the aim to determine the range of physical parameters driving foraging behaviour. Using a combination of survey observations, telemetry and passive acoustic data obtained primarily at the wave hub site off North West Cornwall, physical oceanographic mechanisms controlling fine-scale top predator habitat use will be incorporated into statistical models of predator foraging and behaviour. Not only will changes in the horizontal distributions of foraging predators be considered, but also how the vertical and temporal distributions of foraging predators respond to changing conditions.

With increasing pressure placed on the marine environment it is vital we understand the consequences of resource extraction, both on large and fine scales. The limited occurrence of foraging locations means they often constitute critical areas within a species range, and it is therefore essential they are identified for effective marine spatial planning.

## The role of marine mammal carrion in the ecology of coastal marine systems

**Maria Quaggiotto<sup>1</sup>**

<sup>1</sup>Institute of Biodiversity, Animal Health and Comparative Medicine, University of Glasgow

Despite an extensive knowledge on marine mammals is available nowadays, their role on the intertidal ecosystem is often considered of limited relevance and some ecological processes of intertidal environments in which marine mammals are involved are understudied. The seal *Halichoerus grypus*, which periodically haul out in the British isles, represents a significant importer and exporter of energy and nutrients across the marine/terrestrial interface, both as alive specimen and potentially as carrion.

Mortality in seals breeding sites occurs normally and carcasses of neonate seals might attract scavenging birds and mammals that would transfer marine-derived energy inland. Moreover, other organisms from all phyla and all marine ecosystems consume carrion, thus consequently changes in benthic habitats and communities are expected.

Marine mammals are top predators and their position in the trophic chain makes them susceptible to pollutants biomagnification. Since pinnipeds have a high body fat content and are long lived, they are useful sentinel species for monitoring lipid-soluble contaminants. However, as they become prey of scavengers, trophic transfer of material with elevated pollutant residues may occur again. Processes associated with this transfer, are poorly understood. Therefore, understanding the utilisation of dead biomass by scavengers will provide insights into the trophic transfer of nutrients and pollutants.

My PhD project will evaluate the inputs of *H. grypus* pup carrions in the Isle of May coastal environments and it will investigate the scavenging communities feeding on them. Moreover the transfer of POPs from top predators to scavengers will be assessed for a better understanding of hypothetically different bioaccumulation in species.

## **The Diet of Seals in Scotland**

**Lindsay Wilson**

SMRU, Scottish Oceans Institute, University of St. Andrews, Scotland

A significant decline in harbour seal numbers in Scotland was detected from aerial surveys in 2001 – 2006. The most recent data suggest that all major harbour seal colonies in Scotland have been affected, except for those in the Inner Hebrides which appear to be stable. The Seal Diet Project is part of a larger programme of work to explore the causes of the harbour seal decline. Outputs will include the first description of harbour seal diet around Scotland, including spatial and regional variation and will attempt to identify any overlap in diet with grey seals.

To better estimate prey composition in the wild, feeding experiments have been conducted with captive harbour seals. My goal was to determine which otoliths pass through harbour seals and to determine how much they are digested. This will allow me to improve the accuracy of diet and prey size estimates for free-ranging harbour seals.

This study is being used to compare digestion parameters between harbour seals and grey seals and determine if a full suite of feeding experiments are required. I will present preliminary results from the pilot feeding study.

**An acoustic approach to the study of bottlenose dolphin community structure in Irish waters**

**Anneli Englund<sup>1</sup>**

<sup>1</sup>University College Cork

Whistle variation of bottlenose dolphin communities in Irish waters, looking at variation between habitat types (estuarine, coastal and offshore) and comparing with similar communities in North Carolina waters in the US.

## **We know what you did last summer! Shedding light on the sensory & foraging ecology of humpback whales**

**Rene Swift**

SMRU, Scottish Oceans Institute, University of St. Andrews, Scotland

What do you eat? How do you detect the food that you consume? Two fundamentally important questions that humans need to answer in order to manage our impacts on other species. You'd think it would be easy, but when your study species weighs 36 tonnes, measures 16m and lives in the ocean, answers are a little difficult to come by. Cue the Inspector Gadget of the Oceans, his faithful side kick Simrad, the Minging Island Cetacean Study and the oldest lady on the books.

Humpback whales (*Megaptera novaeangliae*) are summer visitors to the Gulf of St. Lawrence, where they make use of the abundant food resources to fatten up before making their annual migration to winter breeding grounds. To understand the three dimensional foraging behaviour of these animals Little Leonardo 3MPD3GT data loggers were deployed on 14 animals of known age and sex. Focal follows of tagged animals allowed subsurface behaviour to be linked to surface behaviours, and simultaneous estimates of prey type and density recorded using a Simrad ES120-7G split beam echosounder. Field observations and a preliminary analysis of tag and echosounder data suggest that humpbacks switched from feeding on pelagic prey early in the 2011 season to benthic prey in the mid and late season. Observations of scarring and weeping flesh wounds on the right side jaws confirmed bottom feeding.

## New sounds identified in two different species of beaked whale

Charlotte Dunn<sup>1,2</sup>; Hilary Moors<sup>3</sup>

<sup>1</sup>Sea Mammal Research Unit, University of St Andrews, Scottish Oceans Institute, Gatty Marine Lab, St Andrews, Fife KY16 8LB, U.K.

<sup>2</sup>Bahamas Marine Mammal Research Organisation, P.O. Box AB-20714, Marsh Harbour, Abaco, Bahamas

<sup>3</sup>Department of Biology, Dalhousie University, 1355 Oxford Street, Halifax, Nova Scotia, Canada

While echolocation in beaked whales has been studied extensively, the use of sound for communication in these animals is largely unexplored. We present analyses of acoustic recordings from two species of beaked whale describing a vocal pattern we term the ‘double-click’ – a pair of clicks with inter-click intervals (ICIs) much smaller than those of immediately following clicks. We analysed opportunistic recordings of northern bottlenose whales (*Hyperoodon ampullatus*) from field efforts in 2006 and 2007 in the Gully, South of Nova Scotia, and recordings of Blainville’s beaked whales (*Mesoplodon densirostris*) from DTAGs placed on animals off Andros Island in the Bahamas in 2007. Double-clicks were produced by *Hyperoodon* at the start of regular echolocation click trains both when at the surface and after individuals began foraging dives, and were produced by *Mesoplodon* at the start of regular click trains, while foraging at depth. DTAG data for the *Mesoplodons* shows that all click trains may commence with a double-click. The double-clicks of both species have a mean ICI less than half the duration of a regular click ICI (172.14ms (SE = 20), double-click ICI versus 388.53ms (SE = 18.24) regular ICI for *Hyperoodon*, and 124.59ms (SE = 1) versus 353.30ms (SE = 7.4) for *Mesoplodon*). We can speculate on the function of this vocal pattern, but double-clicks are unlikely to be directly used for foraging, as they show no correlation with buzzes thought to indicate prey capture attempts. It is possible that the double-click serves some initiation function for echolocation click trains, either psycho-physically by recalibrating an acoustic-scene or physiologically associated with air circulation and sound production. It is also possible that double-clicks may serve a social communication function, as in sperm whale codas, and may act as cues on the age/sex class of the vocalising animal.

**A serological screening for *Brucella* sp. antibodies in Antarctic fur seal (*Arctocephalus gazella*), Weddell seal (*Leptonychotes weddellii*) and southern elephant seal (*Mirounga leonine*)**

**Silje-Kristin Jensen<sup>1,2</sup>**, Ingebjørg Helena Nymo<sup>1</sup>, Jaume Forcada<sup>3</sup>, Ailsa Hall<sup>2</sup> and Jacques Godfroid<sup>1</sup>

<sup>1</sup>Norwegian School of Veterinary Science, Section for Arctic Veterinary Medicine, N-9010 Tromsø, Norway

<sup>2</sup>Sea Mammal Research Unit, Scottish Oceans Institute, University of St. Andrews, St. Andrews, KY16 8LB, UK

<sup>3</sup>British Antarctic Survey, High Cross, Madingley Road, Cambridge, CB3 0ET, UK

Brucellosis is a worldwide zoonotic infectious disease caused by gram-negative bacteria from the genus *Brucella*. Recently *Brucella* has emerged as pathogens and as a potential zoonotic agent for marine mammals in the wild. In this study serum samples were tested for the presence of anti-*Brucella* antibodies with an indirect ELISA and Rose Bengal test. *Brucella* antibodies were detected in two of the three pinnipeds investigated, with the following prevalence: Weddell seal (*Leptonychotes weddellii*) 27.3 % for iELISA and 63.6 % for Rose Bengal and southern elephant seal (*Mirounga leonine*) 4.7 % for iELISA and Rose Bengal. Seropositivity was seen in the adults, but more rarely in pups. No sign of *Brucella* was seen in Antarctic fur seal (*Arctocephalus gazella*). To date isolation of *Brucella* sp. has not yet been documented. Potential impact of *Brucella* exposure in Antarctica is unknown, but *Brucella* is known to cause abortion and sterility in cattle and hoofed animals. This is the first documentation of anti-*Brucella* antibodies in southern elephant seal. Our findings together with previous studies indicate presence of *Brucella* antibodies in pinnipeds from the Antarctic territory.

**Factors influencing population and individual pupping site selection in female grey seals, and the effects of a changing climate.**

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Fine-scale topography is important in grey seal (*Halichoerus grypus*) pupping-site choice and behaviour, but its influences have not been fully quantified. This project utilises GIS to integrate individual seal data with fine spatial scale habitat and environmental data for the N.Rona (Scotland) colony. High-resolution aerial photographs of this colony provide detailed data on the, temporally- and spatially-variable, availability of water pools, proximity to which is a primary determinant of habitat quality. The project will use these data to examine (i) inter-annual changes in seal distribution in relation to water availability and other topographical variables (ii) inter-individual variation in site use. This is important as N.Rona has experienced increasing inter-annual variation in climate, and projections suggest this will continue. This study will be amongst the first to combine the study of behavioural types with individual-level responses to rapid environmental change. We discuss the project background, implications, methodology and some preliminary results.

## Investigating the Aetiology of Urogenital Carcinoma in California Sea Lions

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The California Sea Lion (*Zalophus californianus*) has a high occurrence of urogenital carcinoma with one study revealing metastatic carcinoma in 18% of animals admitted to a rehabilitation centre over a 15 year period. It is likely that the aetiology of this disease is multi-factorial and this study concentrates on two priority areas; genetic factors and infectious disease.

In an initial study the microsatellite marker Pv11 appeared to be significantly associated with the development of cancer. Based on the dog genome this marker is located within an intron of the heparanase 2 (HPSE2) gene. This gene shares approximately 40% homology with the heparanase 1 gene (HPSE1). Expression of the HPSE1 gene is involved with cancer metastasis and a gene which demonstrates homology to it, is of potential clinical interest. In addition a previous study had found infection with a gammaherpes virus to be significantly associated with the development of this cancer.

This follow-up study has now demonstrated, using a much larger sample size, that animals which were homozygous for certain alleles at the Pv11 microsatellite loci were significantly more likely to have cancer than those that were either heterozygotes or homozygous at other alleles ( $n=113$ ,  $p=0.014$ , Fisher's exact test). The relationship between genotype and cancer therefore offers an important starting point for investigating the role of the HPSE2 gene in urogenital carcinoma. Further work will involve sequencing the Pv11 loci in different individuals and investigating spliced variants of heparanase 2 expression in cancer tissues compared with healthy tissues.

Our investigations into the involvement of herpesvirus, has so far indicated no relationship between the presence of the virus and cancer. Screening for herpesvirus was undertaken using pan-herpes PCR primers and a high prevalence was found in both cancer and non-cancer animals (8/19 positive for herpes with cancer and 24/38 positive without ( $p=0.1631$ , Fisher's exact test). However, characterisation of the viruses present in these samples to species level is still to be carried out.

## **Variability in the blubber lipid content of odontocetes with respect to body site and blubber depth: implications for estimating body condition**

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The body condition of mammals can be defined in several ways, one of the most common of which is nutritive condition. Nutritive condition can be specifically quantified as the fat stores of the animal, which in cetaceans, are principally in their blubber. The way in which these lipid energy stores are distributed through the blubber depth and across the body can vary by species, gender, reproductive status and season, and this variation must be taken into consideration when trying to estimate the body condition of free-ranging cetaceans using remote dart biopsy samples. This project thus aimed to identify how the lipid content of the blubber can vary across the body through the analysis of necropsy blubber samples taken from 5 species of stranded odontocetes. Lipid was independently extracted from the blubber samples using a modified version of Folch *et al.*'s (1957) protocol. Analysis of the blubber lipid content using a generalized linear model revealed that there was no relationship between blubber thickness and lipid content. Blubber thickness is thus not a good indicator of nutritive condition. Using the same modelling approach, it was seen that the middle blubber layer is the most lipid-rich part of the blubber, and attempts should therefore be made to sample this layer when estimating body condition using remote dart biopsy samples from free-ranging cetaceans. The models also revealed that there was significant variation in the blubber lipid content across the body, and that it varied more from the dorsal to ventral regions than across the anterior to posterior of the animal. Due to this variation, species-specific comparisons should be made using a larger number of individuals in both good and poor body condition to determine where blubber biopsy samples should be taken from to best represent the fat stores of an individual.