

individuals. Presumed secondary infection, likely bacterial or fungal, were seen, although none appeared to be lobomycosis (lacaziosis). We also photographed 7 individuals with traumatic deformation of dorsal fins or deep incisive scars, with most injury cases nearly or completely healed. The presence of skin disorders may indicate the deficiencies in immune system, which may be caused or exacerbated by anthropogenic factors. Large land-reclamation and construction works, frequent in PRE, lead to habitat degradation and, together with other anthropogenic impacts (e.g. sea traffic, acoustic noise, etc.), elevate the animals' stress levels. Pollutants might afflict natural skin barriers, thus aggravating the level of infection. The mutilations were most certainly resulted from direct vessel strikes or propeller hits (e.g. high-speed ferries, cargo ships, fast-moving speed-boats, etc.). The healing time and seasonal prevalence of these risk-factors and health-conditions can be estimated and used to inform management decisions. **Keywords:** *Sousa chinensis*, skin disorders, incisive traumata, developed estuarine environment, anthropogenic impacts

Nursing stage affects the ranging and social behavior of female Indo-Pacific humpback dolphins off Taiwan

Chang, Wei-Lun^{1,2}; Karczmarski, Leszek²; Chou, Lien-Siang¹
 (1) Institute of Ecology and Evolutionary Biology, National Taiwan University, Rm. 635 Life Sci Building, Taipei, Taiwan
 (2) The Swire Institute of Marine Science, The University of Hong Kong, Cape d'Aguilar, Shek O, Hong Kong, Hong Kong
 Corresponding author: hi.3000kimo@gmail.com, chouls@ntu.edu.tw

Indo-Pacific humpback dolphins (*Sousa chinensis*) off Taiwan form a small population consisting of two communities with distinct home ranges in the north and south of the population range. This study investigates the movement pattern and social behavior of female humpback dolphins during nursing and non-nursing period by quantifying their spatiotemporal pattern, modeling their site fidelity and social dynamics. During 2007-2011, a total of 40 adults and sub-adults were photo-identified and cataloged; 15 of them were females and seen in both nursing and non-nursing stage. The Mantel Z-test with 1,000 random permutations was used to compare the Half-Weight Index matrixes based on different nursing stages within the North and the South Community. In both communities, the higher site fidelity of nursing females over non-nursing females was shown by lagged identification rates. Nursing females also have stronger (Mantel Z-test, p-value < 0.001, matrix correlation of association matrices = 0.49523) and more stable relationships with all other analyzed dolphins than non-nursing females; particularly evident in the South Community. It is possible that nursing females maintain a higher site fidelity to areas with rich resources in order to minimize the energy cost of travelling, so that more energy can be invested on nursing calves to enhance their reproductive fitness. Maintaining stronger and more stable social bonds with other dolphins, especially females, may also benefit the nursing females by enhancing their social environment and increasing the supporting function of the group (e.g. availability of supporting resources). This study reveals that spatiotemporal and social strategies of female humpback dolphins are affected by their nursing stage. **Keywords:** *Sousa chinensis*, nursing, lagged identification rates, lagged association rates, Mantel test, reproductive behavior, reproductive fitness

Two species, same region but different genetic stories to tell: the tale of *Tursiops australis* and *T. truncatus* in south-east Australian waters

Charlton-Robb, Kate^{1,2}; Taylor, Andrea¹; McKechnie, Stephen W¹
 (1) Monash University, School of Biological Sciences, Wellington Rd, Clayton, VIC, 3800, Australia
 (2) Museum Victoria, 11 Nicholson Street, Carlton, VIC, 3053, Australia
 Corresponding author: kate.charlton@monash.edu

In the south-eastern region of Australia, two *Tursiops* species are known; *T. truncatus* (common bottlenose dolphin) and the newly described *T. australis* (Burrnun dolphin). *Tursiops australis* has been identified in inshore regions of Victoria, Tasmania and South Australia, but little is known about the population genetics in south-eastern Australia. Similarly, little is known about *T. truncatus* across the same region, although it is thought to be predominantly an 'offshore' species. A total of 248 samples were collected from *T. australis* (n= 165) and *T. truncatus* (n=83) from various locations across the Victorian and Tasmanian coastlines. Using ten microsatellite loci and two mitochondrial DNA sequences (control region ~450bp and cytochrome *b* ~1200bp) the genetic diversity and population genetic structure of *T. australis* and *T. truncatus* was described. Despite plausibly being parapatric, the two species have a very different genetic story to tell. *Tursiops australis* shows low genetic diversity at both mtDNA and nuclear regions, the cytochrome *b* region being monomorphic in the eastern animals (Gippsland Lakes & Tasmania). The concatenated mtDNA regions show only 10 haplotypes with network analyses revealing lineage sorting and private haplotypes specific to western (Port Phillip) and eastern regions. Significant genetic population differentiation at both maternal and bi-parental genetic markers suggests female philopatry and male-biased dispersal between the two regions. *Tursiops truncatus* showed greater levels of genetic diversity at mtDNA and nuclear regions, with 29 concatenated mtDNA haplotypes. The two differentiated genetic groups, coupled with the co-occurrence of mixed-species stranding with the oceanic species *Globicephala melas*, suggests the presence of separate 'coastal' and 'offshore' *T. truncatus* populations. Species status of delphinids is controversial, however regardless of this, population ecology and genetic structure of these taxonomic units need to be taken into account for correct management and conservation.

Size doesn't matter! Northern elephant seal males do not use phenotype cues in vocalisations to assess their rivals.

Charrier, Isabelle¹; Mathevon, Nicolas^{1,2}; Casey, Caroline³; Fregosi, Selene⁴; Reichmuth, Colleen³
 (1) CNPS, CNRS-Univ Paris 11, Orsay, F-91940, France
 (2) ENES/CNPS, Université de Lyon/Saint-Etienne, Saint-Etienne, 42, 42100, France
 (3) Long Marine Laboratory, University of California Santa Cruz, Santa Cruz, CA, 95060, USA
 (4) Cooperative Institute for Marine Resources Studies, Oregon State University, Newport, Oregon, 2030, USA
 Corresponding author: isabelle.charrier@u-psud.fr

Vocal signals are used in many social contexts and may convey diverse information about the emitter (social rank, individual identity, body size/condition). To understand the biological relevance of these cues, it is not only important to decode information about the signaler, but also to determine if and how receivers use this information. In mammals, males produce vocalizations during the breeding season to defend a territory and/or access to females. Cues linked to phenotype (size, age, body condition) and social rank (dominant/subordinate) can be encoded in their vocalizations, and thus potentially assessed by rival males. Here, we experimentally investigated whether northern elephant seal (*Mirounga angustirostris*) males use phenotype cues embedded in their specialized threat calls to assess their rivals and thus adapt their behavior. We first determined that vocalization pulse rate, pulse number, and energy spectrum correlated with body size. We then separately manipulated these acoustic variables within the natural range of the study population to evaluate whether males actually use this information during competitive interactions. Using an acoustic playback paradigm, we exposed ten adult males to six experimental signals (fixed pulse rate with variable pulse numbers; fixed pulse number with variable pulse rates; higher or lower pitched calls) to simulate small or large males. The modified vocalizations were built from the calls of unknown males to avoid any potential individual vocal recognition. The responses of breeding males to the playback signals did not

change with modifications to pulse rate or energy spectrum. We observed stronger responses only when modified threat calls included a great number of pulses. These field experiments demonstrate that while the calls of northern elephant seal males contain reliable phenotypic cues, these cues are apparently not used during rival assessment. Such assessment seems to be mediated through direct or indirect (i.e., eavesdropping) social interactions only.

Testing the effectiveness of conservation education programmes: the dugong (*Dugong dugon*) as a case study in Johor, Malaysia.

CHEAH, JIUN XIANG¹; RAJAMANI, LEELA²; ESA, NORIZAN³; ABOO BACKER, MUNTAZ⁴; AFFENDI, YANG AMRI⁵

(1) Centre for Marine and Coastal Studies, Universiti Sains Malaysia, Georgetown, Penang, 11800, Malaysia

(2) Centre for Marine and Coastal Studies, Universiti Sains Malaysia, Jalan Sungai Dua, Georgetown, Penang, 11800, Malaysia

(3) School of Educational Studies, Universiti Sains Malaysia, Jalan Sungai Dua, Georgetown, Penang, 11800, Malaysia

(4) School of Arts, Universiti Sains Malaysia, Jalan Sungai Dua, Georgetown, Penang, 11800, Malaysia

(5) Faculty of Science, Institute of Biological Science, University of Malaya, Jalan Universiti, Kuala Lumpur, 50603, Malaysia

Corresponding author: jiuixiang_cheah@hotmail.my

Conservation education is the key to local coastal communities understanding the importance of marine resources especially if they are on the decline. Engaging these communities in conservation education programmes have been done but there have been few studies to assess their effectiveness. In this study which began in August 2011, the dugong is being used as a flagship species where we are attempting to engage the local community in Sibu Island, Johor, Malaysia using conventional and innovative education tools. Conventional education methods consisted of informal talks and formal talks with the local community, dugong poster distribution and seagrass field trips while the innovative education method will involve the local community in a processional performance installation. An installation of a dugong monument is constructed using inanimate objects found on the beach and surrounding village. A processional performance will commence from there onwards, in an area near seagrass habitat whilst a pictorial dugong conservation story book is narrated. The procession will return to the installation whereby it is dismantled and returned to earth, symbolizing the cycle of life. The information imparted to the community will include facts about dugongs and seagrass ecology and conservation as well as what the community can do to help in conservation. The effectiveness of the education programme will be tested by comparing the results of a pre-test (using individual, semi-structured interview surveys) to a post-test with the local community. Both pre-test and post-test will ask questions on general understanding on dugong, seagrasses and attitudes towards their conservation. The post-test will also include questions about community opinion, reaction and lifestyle changes. This paper aims to discuss the results of this study which will give key insights for conservation implementers and educators to effectively evaluate and improve their own programmes, bearing in mind community needs.

Variations in the songs of humpback whales (*Megaptera novaeangliae*) during a winter season in the Northwestern and Main Hawaiian Islands

Chen, Jessica¹; Lammers, Marc Olav^{1,2}; Au, Whitlow W.L.¹

(1) Hawaii Institute of Marine Biology, University of Hawaii at Manoa, 46-007 Lilipuna Rd., Kaneohe, HI, 96744, USA

(2) Oceanwide Science Institute, P.O. Box 16192, Honolulu, HI, 96839, USA

Corresponding author: jchen2@hawaii.edu

A study of humpback whale songs recorded in the Northwestern Hawaiian Islands (NWHI) and the Main Hawaiian Islands (MHI) during the 2009 season suggests that humpback whale song may be more variable than previously suggested. Data from five autonomous acoustic recorders on duty cycles, deployed at locations in the NWHI and MHI, were analyzed to

compare the frequency of occurrence of song units produced by whales throughout the island chain. Files were randomly selected from a group of recordings determined to have a good signal-to-noise ratio for audio and visual analysis. Song units were classified as one of 23 units and counted to compare between sites. Unit frequencies were compared and a cluster analysis was conducted. There appears to be a gradient of differences in song units throughout the Hawaiian Island chain, rather than the previously assumed, more discrete differences between breeding areas. Changes in the frequency of occurrence in some of the more abundant units suggest a gradual change throughout the island chain. This suggests that whales in the NWHI and MHI are currently one continuous breeding population, with some wintering in only one area and others traveling through the whole island chain. However, the results may be confounded by changes that occur in song through the season, throughout the entire ocean basin. Further work examining variation both between and within humpback whale breeding populations should be conducted to better quantify the differences observed in the songs of Hawaiian humpback whales. If these humpback whales split into two breeding populations, there will be implications for managing the entire recovering species.

Selection of Reference Genes for Quantitative RT-PCR Studies in Blood of Beluga Whales (*Delphinapterus leucas*) and Bottlenose Dolphins (*Tursiops truncatus*)

Chen, I-Hua¹; Li, Tsung-Hsien²; Zhan, Molly³; Chang, Wen-Been²; Jen, I-Fan⁴; Wang, Jiann-Hsiung¹; Chou, Shih-Jen¹; Wu, Yeong-Huey⁵; Yang, Wei-Cheng¹

(1) Department of Veterinary Medicine, National Chiayi University, No.580, Xinmin Rd., West Dist., Chiayi, 600, Taiwan

(2) National Museum of Marine Biology and Aquarium, No.2, Houwan Road, Checheng, Pingtung, 944, Taiwan

(3) Hi-Scene World Enterprise Co., LTD., No.2, Houwan Road, Checheng, Pingtung, 944, Taiwan

(4) Farglory Ocean Park, No.189, Fude, Yanliu Tsuen, Shoufeng Shiang, Hualien, 974, Taiwan

(5) National Pingtung University of Science and Technology, No.1, Shuefu Road, Neipu, Pingtung., 912, Taiwan

Corresponding author: belugahua@gmail.com, jackywc@gmail.com

Quantitative RT-PCR is often used for research in gene expression, and it is vital to choose appropriate housekeeping genes (HKGs) as reference genes to obtain correct result. To date, there is no study on selection of reference genes in cetacean blood. The purpose of this study is to determine stably-expressed HKGs in blood, which can be the appropriate reference genes in relative quantification in gene expression research. Thirty-two and 36 EDTA-anticoagulated blood samples were taken monthly from 4 beluga whales (*Delphinapterus leucas*) in National Museum of Marine Biology and Aquarium and 7 bottlenose dolphins (*Tursiops truncatus*) from Farglory Ocean Park, respectively. Total RNA was extracted and RNA concentration was adjusted to 100 µg/mL following by cDNA synthesis. Sequences of 13 candidate HKGs (ACTB, B2M, GAPDH, HPRT1, LDHB, PGK1, RPL4, RPL8, RPL18, RPS9, RPS18, TFRC, YWHAZ) of cetaceans were obtained from GenBank. Primers and corresponding probes from Roche Universal ProbeLibrary of the genes mentioned above were designed using Roche UPL design software (ProbeFinder, v.2.49). The quantitative gene expression analysis of the candidate genes of each sample were performed using real-time PCR, and the stability values of the HKGs were determined by *geNorm* and *NormFinder* software. Surprisingly, ACTB and RPL4 are the most stable HKGs in beluga whale blood, while RPS18 and RPL18 in bottlenose dolphin blood. Blood can serve as an indication of health status in cetaceans because changes of gene expression in blood is prior to hematology and chemistry findings. This research provides recommendation of reference gene selection, which may contribute to further mRNA relative quantification research in the peripheral blood leukocytes in captive cetaceans.