

Scientific Committee Document Titles Received – May 23rd 2008

(* indicates paper received)

SC/60/AWMP

*1. WITTING, L. and SCHWEDER, T. Lower confidence bound on population status from catch sex ratio: applied to minke whales off west Greenland. 35pp.

We develop a frequentist statistical simulation framework to estimate the lower bound on the status of harvested populations from time series of the sex ratio of harvested individuals. The method is appropriate when the sex ratio of the harvest is biased relative to the sex ratio of the population, and the catch sex ratio depends upon the population sex ratio. It is applied to common minke whales (*Balaenoptera acutorostrata*) off West Greenland, where the female fraction in fetuses is around 1/2, and the fraction in the catches has varied around 3/4 since the beginning of the hunt in 1948, a difference that reflects segregation where females tend to occur in other areas than males. By fitting an age- and sex-structured population dynamic model with density regulation to the sex ratios of the historical catches, dependent upon the choice of ecological model, it is estimated that there is less than a 5% probability that the current abundance is below 10,000 to 12,000 whales, that the carrying capacity is below 16,000 to 20,000 whales, and that the current depletion ratio is below 0.72 to 0.50. The lower limit of the current abundance estimate obtained from our analysis is at least 2.4 times higher than the lower limit of the highest and fully corrected survey estimate for common minke whales off West Greenland. This suggests that the aggregation of common minke whales off West Greenland is only some fraction of a larger more widespread population.

*2. WITTING, L. Long-term safety of preliminary advice for large whales off west Greenland. 65pp.

Seven ad hoc Strike Limit Algorithms (SLA) - like 1% of the lower 90% confidence limit of the last abundance estimate - were applied to trial simulation for fin whales, humpback whales and bowhead whales off West Greenland. The trial structure was chosen to be conservative relative to the stock status of current assessments and abundance estimates, and nearly all trials incorporated demographic stochasticity to account for random processes at low abundance. It is shown that the SLAs provide a fair job of satisfying small needs of 20 fin whales, 10 humpback whales, and 5 to 25 bowhead whales per year, while at the same time they impose almost no risk that stocks below the Maximal Sustainable Yield Level (msyl) would not continue to increase to levels above the msyl.

*3. WITTING, L. A Bayesian assessment of west Greenland humpback whales. 27pp.

This paper uses the population perturbation caused by the whaling industry during the 19th and 20th centuries to examine whether the population dynamics of the summer aggregation of humpback whales off West Greenland is best described by direct density regulation and an abundance that returns monotonically towards an equilibrium state, or by inertia dynamics that include also delayed density dependence by density dependent selection generating a cyclic population response. When abundance data from the last two decades are combined with the historical catches from 1664 to the present, there is statistically decisive support for the rejection of the density-regulated model as an appropriate model for the long-term dynamics of humpback whales off West Greenland. The dynamics is instead most likely damped cyclic, although the density-regulated, as well as the exponential, model provide good fits for the short-term dynamics of humpback whales during the last two decades. It is suggested that the equilibrium population abundance is between 1,700 (90% CI: 1,500 – 2,000) and 2,700 (90% CI: 2,300 – 3,100) whales, that the current depletion ratio is between 0.88 (90% CI: 0.44 – 1.6) and 1.5 (90% CI: 0.71 – 2.4), that the current exponential growth rate is 0.09 (90% CI: 0.06 – 0.11), and that the current replacement yield is between 160 (90% CI: 72 – 370) and 220 (90% CI: 96 – 510) whales per year.

*4. WITTING, L. Assessment update for west Greenland fin whales. 19pp.

This paper uses the population perturbation caused by the whaling industry during the 20th century to examine whether the population dynamics of fin whales off West Greenland is best described by direct density regulation and an abundance that returns monotonically towards an equilibrium, or by inertia dynamics that include also delayed density dependence by density dependent selection generating a cyclic population response. Having only three reliable abundance estimates, the abundance data will not directly reveal the dynamics. But, when combined with the historical catches, it is shown that there is statistically strong support for the rejection of the density-regulated model as an appropriate model for the long-term dynamics of fin whales off West Greenland. The dynamics is instead most likely damped cyclic, although the density-regulated, as well as the exponential, models provide good fits for the short-term dynamics of fin whales during the last two decades. The equilibrium population abundance is estimated to 2,000 (90% CI: 1,400 – 3,700) whales, the 2008 depletion ratio to 1.5 (90% CI: 0.67 – 3.5), and the exponential growth rate to 0.07 (90% CI: 0.03 – 0.12). The probability that the population will continue to increase with an annual catch of 20 whales per year is estimated to 96%.

5. HEIDE-JØRGENSEN, M.P., LAIDRE, K.L. and RASMUSSEN, K. Fluctuating abundance of minke whales in West Greenland.

6. HEIDE-JØRGENSEN, M.P., LAIDRE, K.L., SIMON, M. and RASMUSSEN, K. Revised estimates of the abundance of fin whales in West Greenland in 2007.

*7. HEIDE-JØRGENSEN, M.P., LAIDRE, K.L., HANSEN, R.G., RASMUSSEN, K., BURT, M.L., BORCHERS, D.L., DIETZ, R. and TEILMANN, J. Revised abundance estimates of humpback whales in West Greenland. 35pp.

Aerial line transect surveys of humpback whales (*Megaptera novaeangliae*) conducted off West Greenland eight times between 1984 and 2007 were used to estimate the rate of increase on this summer feeding ground. The annual rate of increase was 9.4% yr⁻¹ between 1987 and 2007 and a similar estimate was derived when including surveys in 1984 and 1985 with partial coverage of the summer feeding ground. This rate of increase is higher than the increase observed at the breeding grounds in the West Indies, but is in same magnitude as the observed rate of increase at other feeding grounds in the North Atlantic. The survey in 2007 was used to make a fully corrected abundance estimate including corrections for whales that were submerged during the passage of the survey plane. The line transect estimate for 2007 was 1,020 (cv=0.35). When the estimate was corrected for perception bias with mark-recapture distance sampling (MRDS) methods, the abundance increased to 1,528 (0.50). Correction for availability bias was developed based on time-depth-recorder information on the time spent at the surface (0-4 m). However, used directly this correction leads to a positively-biased abundance estimate and instead a correction was developed for the non-instantaneous visual sighting process in an aircraft. The resulting estimate for 2007 was 3,299 (cv=0.57). An alternative strip census estimate deploying a strip width of 300 m resulted in 995 (0.33) whales. Correction for perception bias with a simple Petersen estimator resulted in 1418 (0.36) whales and corrected for the same availability bias as for the MRDS method resulted in a fully corrected estimate of 3,039 (0.45) humpback whales in West Greenland in 2007.

8. LAIDRE, K.L., HEAGERTY, P.H., HEIDE-JØRGENSEN, M.P., WITTING, L. and SIMON, M. Sexual segregation of common minke whales (*Balaenoptera acutorostrata*) and sex ratio of catches in Greenland.

SC/60/BC

1. ROBBINS, J., LANDRY, S. and MATTILA, D.K. Entanglement impacts on Gulf of Maine humpback whales.

2. BAKER, C.S., FUNAHASHI, N. and STEEL, D. Market surveys of whalemeat in Japan, 2007-2008, with reference to the number of fin whales for sale.

We report on species identification of whalemeat products purchased directly and via the internet from commercial markets of Japan from mid

September 2007 to late March 2008. A total of 92 products included seven species of baleen whale: humpback (n=5), fin (n=35), Bryde's (n=13), sei (n=19), North Pacific minke (n=15) and Antarctic minke whales (n=5). The individual identity of fin whales was considered by comparison to fin whale products purchased on Japanese markets from 1993 to 2006.

3. LEAPER, R. and DANBOLT, M. Use of Automatic Identification Systems (AIS) data to estimate patterns of shipping density for use in modelling collision risk with whales.

*4. PÉREZ MARTINEZ, D. and GUZMAN, J. Whales and the city: a southern right whale ship strike scenario in Península Valdés? 18pp.

From 1974 to 2004, southern right whale population of Península Valdés has grown at an annual rate of approximately 7%. Coincidentally, in the same time period, the human population of the city of Puerto Madryn and vessel activity in the bay in front of the city (Bahía Nueva) had the same average annual growth rate of 7%. As a consequence, in Bahía Nueva whales and vessels share a restricted space where social, economic and environmental interests come together. In this study the situation was examined through the use of physical attributes and the identification of a network of institutions and actors that constitute the social dimension. Geographic Information System (GIS) was used to integrate bathymetry, urban shoreline and coastal attributes, and vessel and whale use of the bay. Patterns of use of coastal waters were analyzed through whale and vessel sightings, tracks and paths at micro and meso scale level. A number of scenarios for the bay were generated, based on three main dimensions: vessel activity, abundance of whales in the bay, and the symbolic values of the whales. Paradoxically, against conservationist's efforts a trilemma emerges: In a scenario of whale population growth, ship strikes increase as well as the social conflicts related to the symbolic value of whales. These scenarios trigger a necessary debate about future plans of action that could affect southern right whale conservation, wildlife tourism and the regional economy. / Desde 1974 hasta 2004, la población de ballenas francas australes (*Eubalaena australis*) de la Península Valdés ha crecido a una tasa de aproximadamente 7 % anual. Coincidentemente, en el mismo período, han crecido en forma sostenida al 7% de promedio anual, tanto la población de Puerto Madryn como el movimiento de buques en sus puertos. La Bahía Nueva es en consecuencia un nuevo escenario de ballenas y buques compartiendo un espacio restringido donde confluyen intereses sociales, económicos y ambientales. Este trabajo presenta una caracterización del espacio mediante la cuantificación de sus atributos físicos y de la identificación de una red de relaciones de instituciones y actores que conforman su dimensión social. Mediante la utilización de un SIG (sistema de información geográfica) se ha integrado batimetría, atributos de playa y frente costero, y uso de la bahía por parte de buques y ballenas. Se analizaron los patrones de uso mediante censos de presencia y ausencia, recorridos y rutas utilizadas por barcos y embarcaciones a nivel de micro y meso escala. Con esta información se generaron varios escenarios potenciales para la bahía, basados en tres dimensiones principales: movimiento de embarcaciones, presencia de ballenas y valoración simbólica de las ballenas. Paradójicamente, en contra de los esfuerzos para la conservación, emerge un trilema: cuando el escenario contempla un aumento poblacional de ballenas, aumenta el riesgo de colisiones y se incrementan los conflictos sociales. Estos escenarios dejan planteado el debate sobre el futuro de la bahía y los posibles planes de acción para la conservación, el turismo y la economía regional.

*5. VAN WAEREBEEK, K. and LEAPER, R. Second report of the IWC Vessel Strike Data Standardisation Working Group. 8pp.

6. CARRILLO, M. and RITTER, F. Increasing numbers of ship strikes in the Canary Islands: proposals for immediate action to reduce risk of vessel-whale collisions.

The Canary Islands, known for an extraordinary high cetacean species diversity, have witnessed a rapid expansion of fast ferry traffic during the past few years. At the same time, ship strikes have been increasingly reported. A description of the quality and the quantity of the fast ferry traffic in the archipelago is presented. This is put in relation to ship strikes in the past. 556 cetacean carcasses, found ashore in the Canary Islands between 1991 and 2007, were examined. 59 strandings (11%) were found to be caused by vessel-whale collisions, many of them assumingly by large and fast moving vessels, as indicated by severe injuries like huge slashes, cuts or animals separated into halves. Species most affected were sperm whales (*Physeter macrocephalus*, N=24, 41%), pygmy sperm whales (*Kogia breviceps*, N=10, 17%), Cuvier's beaked whales (*Ziphius cavirostris*, N=7, 12%), short-finned pilot whales (*Globicephala macrorhynchus*, N=6, 10%) and at least three baleen whale species (N=9, 15%). The temporal distribution of strandings indicate that lethal strikes have dramatically increased during the past few years. Given these numbers and the widely accepted fact that only a portion of ship strikes will be recorded due to lack of reporting and carcasses drifting away or sinking, ship strikes appear to be a major threat to at least some cetacean populations in the Canary Islands. Moreover, the issue is a matter of human safety, as crew and passengers are at risk of being harmed, too. In this situation, a number of measures to mitigate the risk of ship strikes are recommended as a matter of urgency. These include the assignment of dedicated observers on fast moving vessels, a speed limitation within a number of high-risk areas where cetacean abundance is noticeably high, and the introduction of an obligatory reporting system of vessel-whale collisions.

*7. PANIGADA, S., DONOVAN, G. and HAMMOND, P. Work programme and protocols to assess human induced mortality on fin whales and ship strikes with large whales and smaller cetaceans in the ACCOBAMS area. 5pp.

8. WILLIAMS, R. Modelling ship strike risk to fin, humpback and killer whales in British Columbia, Canada.

SC/60/BRG

*1. FAILLA, M., VERMEULEN, E., CARABAJAL, M., ARRUDA, J., GODOY, H., LAPA, A., MORA, G., URRUTIA, C., BALBIANO, A. and CAMMARERI, A. Historical records of southern right whales (*Eubalaena australis*) of the province Rio Negro, north Patagonia, Argentina (1991-2008). 10pp.

The increase of the southern right whale (SRW *Eubalaena australis*) population might rise questions about the reoccupation of previous sites. This report is a compilation of historical records of SRWs along the coast of the Río Negro province, northeast Patagonia to evaluate the tendency of their occurrence in the area over the past decade. A total of 308 records (425 whales) were collected over distinct coastal regions in northeast Patagonia. The majority of sightings were concentrated between the months July-October with a peak in August-September as was observed similarly in south Brazil, Uruguay and central Patagonia. Groups consisted out of 2 individuals on average whereas mother and calf pairs could be observed in only 11% of the sightings. There was a general increase in sightings over the subsequent years possibly explained by a cause-response relation of increasing sightings and increasing effort. The information presented in this report could suggest a similar hypothesis of reoccupation in the province of Río Negro, Argentina as was suggested to be occurring along the south-eastern coast of Brazil, Uruguay and the Santa Cruz province of Argentina. Data are too preliminary however, to determine the importance of this area for the reproduction and/or migration of this species. Nevertheless, the presented data completes an evolving database of the presence of SRWs along the whole Patagonian coast as was recommended by the International Whaling Commission in 2001. More data and systematic effort is needed to obtain the information on the ecology of SRWs in the Río Negro province, needed for the implementation of conservation measurements in the waters of the provincial jurisdiction, specially in the touristic area of the Natural Protected Area Bahía San Antonio.

*2. CAMMARERI, A. and VERMEULEN, E. Southern right whales (*Eubalaena australis*): a new touristic attraction in the Natural Protected Area Bahía de San Antonio, northeast Patagonia? 7pp.

In Argentina, the southern right whale (SRW *Eubalaena australis*) was declared a "Natural Monument" in 1984, protecting the species in waters under national jurisdiction. In the northeast Patagonian province Río Negro, the SRW is being protected since 1997 by the provincial law 3130. Recently in 2006, this province declared the SRW as a "Natural Monument" in the waters under their jurisdiction by the provincial law 4066. With this law, a commercial whale-watching activity was approved and regulated strictly by provincial authorities, as was the first legalization on "immersion with whales" in Argentina. Data on the sighting frequency (SF), group size and group composition of SRWs were obtained during a preliminary study from

March 2007 to February 2008 in the Natural Protected Area Bahía de San Antonio (NPABSA), the most touristic town of this Northeast Patagonian province. Data indicate a peak SF in September with an explicit increase and decrease in the months before and after respectively. The majority of the whales visiting the area were solitary animals (47.7%) followed by non-surface active groups (non-SAG's; 25%), mothers and calves (M&C; 20.5%) and SAG's (4.5%). 2.3% of the whale groups could not be classified. Whales in the study area were mainly resting or in a slow travelling behaviour (63.4%). 22% of the whales were seen socializing in a non-surface active group (non-SAG) whereas only few groups were believed to be engaged in a courtship behaviour (4.9%). These data might suggest that the area is not a main reproductive area, possibly favouring the region for a whale-based tourism. On the other hand, the unpredictability of their daily presence and the average distance between the whale and the shore raises questions on the viability of such a whale-based business.

*3. WELLER, D.W., BRADFORD, A.L., LANG, A.R., KIM, H.W., SIDORENKO, G.A., TSIDULKO, G.A., BURDIN, A.M. and BROWNELL, R.L. Status of western gray whales off northeastern Sakhalin Island, Russia, in 2007. 9pp.

A collaborative Russia-U.S. research program on western gray whales (*Eschrichtius robustus*) summering off northeastern Sakhalin Island, Russia, has been ongoing since 1995 and has produced important new information on the present day conservation status of this critically endangered population. This paper reviews findings from 2007 research activities and combines such with data from previous years, in some cases ranging back to 1994. Photo-identification research conducted off Sakhalin Island in 2007 resulted in the identification of 83 whales, including nine calves and two previously unidentified non-calves. When combined with data from 1994-2006, a catalog of 169 photo-identified individuals has been compiled. Not all of these 169 whales can be assumed to be alive, however. The most current mark-recapture analysis conducted estimated the abundance for the population to be 99 (95% CI = 90-109) in 2003. A recent population assessment by Cooke et al. (2008) using a Bayesian individually-based stage-structured model fitted to the same photo-identification data as used in the mark-recapture studies, but also including data from 2004 through 2007, projected a median 1+ (non-calf) estimate of 130 (90% Bayesian CI = 120-142) in 2008 should current population and demographic trends continue. Of the 169 whales photo-identified, 142 (84%) have been biopsy sampled. From genetic analysis of samples (n = 142) collected through 2007, an overall sex ratio of 58% male and 42% female was determined. When the subset of whales sampled as calves (n = 59) was examined, 66% were male and 34% female. A minimum of 24 reproductive females has been observed since 1995. Of the 83 whales recorded in 2007, 7.2% (n = 6) were classified as "skinny". In addition to the biological difficulties that western gray whales are facing, the large-scale offshore oil and gas development programs near their summer feeding ground, as well as fatal net entrapments off Japan during migration, pose significant threats to the future survival of the population.

*4. BELGRANO, J., GRIBAUDO, C., ARCUCCI, D., KROHLING, F. and INIGUEZ, M. Recent increase in the number of southern right whales (*Eubalaena australis*) in Golfo San Jorge, Santa Cruz, Patagonia, Argentina. 4pp.

An increasing number of Southern right whales (SRW) has been recorded from May to September in the Golfo San Jorge, Patagonia, Argentina from La Lobería (46°07'S/67°38'W) to Caleta Olivia (46°26'S/67°31'W). Between 2004 and 2006, a total of 122 Southern right whales, including 10 calves, were recorded from shore and boats. The group size varied from 0 to 18 (Mode=2) in different groups. We used an ISRW Index (Index of SRW = number of SRW per hour and days of effort, to better compensate for differences in sampling efforts due to weather restrictions). We considered the years 2004, 2005 and 2006 and only systematic fieldwork (July, August and September). Compared with 2004 ($I_{SRW} = 0.0048$), in 2005 and 2006 we had an increase of 231.25% ($I_{SRW} = 0.0159$), and 6.46% ($I_{SRW} = 0.0051$) respectively. Interestingly we registered an $I_{SRW} = 0.013$ for July 2005, due to the presence of 18 SRW in two consecutive days. However because this sighting was made from shore and the whales were far from the observation site, it was not possible to identify the whales in order to verify if they were the same whales during both days. Nevertheless this I_{SRW} , may indicate that the number of SRW increased in the last years in the Golfo San Jorge. The increase in the number of SRW and the presence of mother with calves and mating groups suggest us that the La Lobería-Caleta Olivia region may be regarded as the southernmost wintering ground for Southern right whales in the Southwest Atlantic, extending the previous record more than 500km. Results presented in this paper show the relevance of this area for the species and the need of further researches.

*5. MELNIKOV, V.V. Duration of summer feeding period and number of calves for the California-Chukotka stock of gray whales (*Eschrichtius robustus*). 9pp.

Duration of the summer feeding period of gray whales in the waters of the Chukotka Peninsula and its correlation with number of calves are considered in this work. Feeding duration of gray whales was defined by the period between their first observation in the spring period and the last observation in fall. Average feeding duration of gray whales in the Chukchi Sea was 167 + 23 days. In coastal waters off the eastern Chukotka coast, feeding duration was on average 198+26 days. In the northern part of the Gulf of Anadyr gray whales were present for the most extended period, 219+26 days. The only significant correlation found between feeding duration and estimated number of calves the following spring was off the eastern Chukotka coast between Cape Dezhnev and Mechigmen Bay.

*6. RUGH, D., BREIWICK, J., HOBBS, R., SHELDEN, K. and MUTO, M. Eastern North Pacific gray whale abundance in the winter of 2006-2007. 12pp.

The southbound migration of the Eastern North Pacific stock of gray whales [*Eschrichtius robustus*] was documented by the National Marine Fisheries Service's Alaska Fisheries Science Center (AFSC) from 12 December 2006 to 22 February 2007. Research protocol was essentially identical to that used in previous surveys. This involved single observers independently searching for whales and recording data on environmental conditions and the time, location, count, and direction of travel for each sighting. The counting system and observer performance were tested through paired, independent observational effort. The timing of the 2006-2007 southbound migration seemed to be 1 week later than in previous years, with the median date close to 21 January instead of 15 January. Most (80%) of the sightings occurred in January, 17% were in February and only 3% were in December. Counts of gray whales pods during fair to excellent visibility conditions totalled 1,770 pods during the 73 days (651.6 hr) of the standard census. The estimated abundance for 2006-2007 was 20,110 (SE = 1,766), which is similar to abundance estimates made in 2000-2001 (19,448; SE = 1,882) and 2001-2002 (18,178; SE = 1,780). The unweighted rate of increase for the period 1967/68 – 2006/07 was 0.016 (SE = 0.0031), and the weighted rate (based on the variance of each abundance estimate) was 0.019 (SE = 0.0030).

*7. REEVES, R.R., SMITH, T.D. and JOSEPHSON, E.A. Observations of western gray whales by ship-based whalers in the 19th century. 19pp.

Animals belonging to the small, endangered population of western gray whales (*Eschrichtius robustus*) are observed today primarily during the summer open-water season in feeding areas off the north-eastern coast of Sakhalin Island, Russia. The migration route(s) and wintering area(s) used by this population are largely unknown. Gray whales once had a fairly extensive distribution in the Sea of Okhotsk but little detailed information has been published on when and where they occurred. Open-boat, ship-based whalers from the United States and a few other countries conducted an intensive hunt for bowhead whales (*Balaena mysticetus*) and North Pacific right whales (*Eubalaena japonica*) in the Sea of Okhotsk from the 1840s to 1870s. According to entries in voyage logbooks, the American whalers regularly encountered (and sometimes hunted) gray whales in the far north-eastern corner of the Okhotsk Sea (Shelikhov Bay, Gizhiginskaya Bay and Penzhinskaya Gulf) between early May-late August. They also observed gray whales in summer along the northern coast of the sea (especially Tauskaya Bay), around the Shantar Islands, in Sakhalin Bay, off Cape Elizabeth at the northern tip of Sakhalin Island and along the west coast of the Kamchatka Peninsula. No evidence was found in the logbooks studied of gray whales (and indeed of whaling effort) off north-eastern Sakhalin Island where most observations of gray whales occur in the present day.

*8. MATE, B. and BEST, P.B. Coastal and offshore movements of southern right whales on the South African coast revealed by satellite telemetry. 23pp.

Twenty-one satellite-monitored radio tags were deployed on southern right whales in South African coastal waters in September 2001, and transmissions were received for 25 - 161 days from 15 of them. Most coastwise movement after tagging in St Sebastian Bay on the south coast occurred in a westerly direction, with cow-calf pairs moving slowest. Two individuals travelled far enough west to round Cape Point and onto the west coast, where one was tracked as far north as St Helena Bay. Of the five whales tagged at Saldanha Bay on the west coast, one travelled rapidly south and east,

rounded Cape Point and reached St Sebastian Bay 10 days after tagging. Another also travelled south round Cape Point and into False Bay, while the remaining three animals moved north into St Helena Bay. These animals (and the one from St Sebastian Bay) remained within St Helena Bay for between 36 and 100 days, indicating the importance of this area as a probable feeding ground. Only six animals left the coast with their transmitters still functioning, departing from various sites along the coast and over dates ranging from 24 September to 8 January. All five whales subsequently tracked left the coast on a bearing of 201-220° before branching out over the southeast Atlantic. Each animal travelled between 3,800 and 8,200 km over the ensuing 53 – 110 days before transmissions ceased, covering the region from 37 to 60°S and between 13°W and 16°E. Locations were categorised as being ‘migrating’ or ‘non-migrating’ based on the relative orientation of the track and on the net speed. After removal of ‘migrating’ locations, there were 42 to 127 locations per whale that might represent other behaviour such as feeding. Of these 414 ‘feeding’ locations, 41.3% were between 37 and 45°S and 54.1% from south of 52°S, with only 4.6% in the intervening 7° of latitude. The more northerly group seemed to be associated with the Sub Tropical Convergence, and the more southerly with the Antarctic Polar Front: Soviet whaling data suggest feeding largely on copepods at the former and euphausiids at the latter. Switching between widely separate feeding grounds was a strategy, with obvious cost-benefit implications: two whales that migrated between high and low latitude zones had appreciably fewer ‘feeding’ locations (29.2 – 35.9%) than the three others that stayed either in low or high latitudes (60.3 – 74.7%).

9. KOSKI, W.R., MOCKLIN, J., DAVIS, A.R., ZEH, J., RUGH, D.J., GEORGE, J.C. and SUYDAM, R. Estimates of Bering-Chukchi-Beaufort bowhead whale (*Balaena mysticetus*) abundance from 2003-2005 photo-identification data.

*10. SUYDAM, R., GEORGE, J.C., ROSA, C., PERSON, B., HANNS, C., SHEFFIELD, G. and BACON, J. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos during 2007. 7pp.

In 2007, 63 bowhead whales (*Balaena mysticetus*) were struck during the Alaskan subsistence hunt resulting in 41 animals landed. Total harvest for 2007 was similar to recent years. The average number of whales landed in the 10 previous years was 41.1 (SD = 7.5). The efficiency (# landed / # struck) of the hunt was 65%, which is lower than the average during 1997-2006 (mean = 79%, SD = 7%). Challenging sea ice, weather conditions, equipment malfunctions, and struck whales diving under the short-fast ice contributed to a lower efficiency in 2007 compared to the previous 10 years. These conditions especially affected hunters at Point Hope and Barrow during spring. The spring hunting efficiency was 61% compared to 76% for the autumn. Of the landed whales 17 were males and 24 were females. Of the 23 females of known length, 12 were presumably mature (>13.4m in length). Four of the mature females were examined closely. Of these four, three were pregnant. Biologists could not closely examine the other mature females because the whales were harvested in more remote villages or were butchered in the water.

11. WELLER, D.W., BRADFORD, A.L., LANG, A.R., BURDIN, A.M. and BROWNELL, R.L. Calving intervals and sex ratio of western gray whales.

12. BURNELL, S.R. Population parameters of southern right whales off Australia.

*13. VALENZUELA, L.O., SIRONI, M., ROWNTREE, V. and SEGER, J. Isotopic and genetic evidence for site fidelity to feeding grounds in southern right whales (*Eubalaena australis*). 10pp.

Ocean warming will certainly affect the migratory patterns of many marine species, but specific changes can be predicted only where behavioural mechanisms guiding migration are understood. Southern right whales show maternally inherited site fidelity to near-shore winter nursery grounds, but exactly where they go to feed in summer remains mysterious. They consume huge quantities of copepods and krill, and their reproductive rates respond to fluctuations in krill abundance linked to El Niño Southern Oscillation (ENSO). Here we show that genetic and isotopic data, analysed together, indicate maternally directed site fidelity to diverse summer feeding grounds for female right whales calving at Peninsula Valdés, Argentina. Isotopic values from 131 skin samples span a broad range (-23.1 to -17.2‰ $\delta^{13}C$, 6.0 to 13.8‰ $\delta^{15}N$) and are more similar than expected among individuals sharing the same mitochondrial haplotype. This pattern indicates that calves learn summer feeding locations from their mothers, and that the time scale of culturally inherited site fidelity to feeding grounds is at least several generations. Such conservatism would be expected to limit the exploration of new feeding opportunities, and might explain why this population shows increased rates of reproductive failure in years following sea surface temperature anomalies off South Georgia, the richest known feeding ground for baleen whales in the South Atlantic.

*14. BANNISTER, J.L. Population trend in right whales off southern Australia 1993-2007. 13pp.

Aerial surveys for southern right whales have been undertaken annually close inshore off the southern Australia coast since 1976, at first along the southern coast of Western Australia, from Cape Leeuwin (34° 23'S, 115° 08'E) to as far east as Twilight Cove (32° 17'S, 126° 05'E). A significant increase in numbers was recorded for 1983-1992, but at a rather higher rate (ca 10%) than observed in recovering populations (at ca 7%) elsewhere off eastern South America and South Africa. Evidence of coastwise movement between South Australia and Western Australia led to an extension of the annual surveys to Ceduna, South Australia (32° 07'S, 133° 46'E) from 1993. They have continued annually since then, covering the area where the majority of the ‘Australian’ population seems to approach the coast in winter/spring: cows about to give birth appearing at an average of three years, others less predictably. The number recorded in 2007 (286 animals including 57 cow/calf pairs) was considerably fewer than in earlier years, although the ‘unaccompanied’ animals count was not unexpectedly low. Regression analysis, including inspection of residuals, of the data from 1993 (excluding numbers for 1996 and 1997 where there seems to have been some undercounting) gives, for ‘all animals’, no evidence of anything other than an exponential increase. But for cow/calf pairs, the 2007 data point is clearly an outlier. For the present the 1993-2006 cow/calf increase rate of 8.10% (95% CI 4.48, 11.83) has been taken as the current ‘best estimate’ of annual increase rate for that part of the Australian population that visits the southern Australian coast between C Leeuwin WA and Ceduna, SA. Current population size for animals visiting the area surveyed is estimated to be ca 2100, with a total Australian population of ca 2400.

*15. UHART, M., ROWNTREE, V.J., MOHAMED, N., POZZI, L., LA SALA, L., ANDREJUK, J., MUSMECI, L., FRANCO, M., SIRONI, M., SALA, J.E., MCALOOSE, D., MOORE, M., TOHUEY, K., MCLELLAN, W.A. and ROWLES, T. Strandings of southern right whales (*Eubalaena australis*) at Peninsula Valdés, Argentina from 2003-2007. 9pp.

More southern right whales die and strand each year on their nursery ground at Peninsula Valdés, Argentina than anywhere else in the world. The Office of Protected Resources of the US National Marine Fisheries Service (NMFS) has provided support to the Argentine Programa de Monitoreo Sanitario de Ballena Franca Austral (PMSBFA) since 2003 to develop a better understanding of the health risks and disease susceptibilities of right and other baleen whales. Between 2003 and 2007, the PMSBFA team photographed, measured and collected tissue samples from 192 dead southern right whales including 170 calves, 15 adults and 7 juveniles. Stranded calves ranged in length from 3.78-9.83 m, and the apparent mean growth rate, determined by calf length and estimated date of death, was 2.5cm/day. Ten calves less than 4.24 m were recorded from June through November possibly indicating a broad birthing period. In relation to the last 30 years, calf deaths increased sharply in 2005 and 2007. The population experienced an apparently severe mortality event in 2007 in Golfo Nuevo, the southern gulf of the Peninsula Valdés. Sixty calves died between October 4th and December 16th. Unfortunately, most calves died offshore and were in advanced states of decomposition when they stranded. With assistance from a team of specialists sent to Argentina by NMFS, a number of dead whales were thoroughly examined. Though harmful algal blooms in the area are hypothesized to be linked to these deaths, no conclusive evidence was found in our investigations.

16. BRADFORD, A.L., WELLER, D.W., IVASHCHENKO, Y., BURDIN, A.M. and BROWNELL, R.L. Seasonal and annual variation in body condition of western gray whales off northeastern Sakhalin Island, Russia.

*17. DA SILVA, C.Q. and TIBURCIO, J.D. Empirical Bayes estimation of the size of a closed population using photo-id data. 9pp.

Photo-id data is broadly used for estimating animal abundance using capture-recapture models. The natural and acquired marks of the photographed

individuals allow the construction of databases to be used for estimating the size N of an animal population. Animals that do not possess natural marks enough to allow reidentification are called unmarked. Those individuals are uncatchable, and when a substantial part of the population is composed of such individuals, the classical models described in the literature do not apply. In this paper we present an empirical Bayes capture-recapture analysis for estimating the size of an animal population including uncatchable individuals. Considering a Gibbs sampling approach we obtain Monte Carlo estimates for the posterior distribution of N .

18. KOSKI, W.R., MOCKLIN, J., DAVIS, A.R., ZEH, J., RUGH, D., GEORGE, J.C. and SUYDAM, R. An estimate of 2003-2004 Bering-Chukchi-Beaufort bowhead whale (*Balaena mysticetus*) abundance from photo-identification data.

*19. HEIDE-JØRGENSEN, M.P., LAIDRE, K.L., WIIG, Ø., BACHMANN, L., LINDQVIST, C., POSTMA, L., DUECK, L., LINDSAY, M. and TENKULA, D. Segregation of sexes and plasticity in site selection of bowhead whales. 8pp.

Skin biopsy samples from 333 bowhead whales (*Balaena mysticetus*) collected between 1995 and 2007 at four localities in the Eastern Canadian Arctic (Igloolik, Pelly Bay, Repulse Bay and Pangnirtung) and at one locality in West Greenland (Disko Bay) were used for determinations of sex and individual site fidelity of bowhead whales from the Baffin Bay stock. There was a pronounced dominance of females (81% female) in Disko Bay whereas a more balanced sex ratio (~50% female) was detected at localities in the Eastern Canadian Arctic. Observations on the length of whales suggest that it is primarily large mature whales without calves that are seen in Disko Bay and mother-calf pairs at Igloolik. Despite the large sample size, only three between year re-identifications of bowhead whales were detected, all from Igloolik. The results suggest that the population size is large and that there is limited annual individual site fidelity to specific localities. The reliable presence and high population site fidelity at specific localities throughout the range could be part of a larger cycle of movements that extends beyond the 12 yr extension of this study.

*20. HEIDE-JØRGENSEN, M.P., COSENS, S.E., DUECK, L., LAIDRE, K.L. and POSTMA, L. Baffin Bay-Davis Strait and Hudson Bay-Foxe Basin bowhead whales: a reassessment of the two-stock hypothesis. 36pp.

Examination of historic and current data on distribution patterns and movements of bowhead whales in Baffin Bay and Hudson Bay has identified several discrepancies with the two stock model currently accepted by the IWC. Too few calves have been found in the putative Baffin Bay-Davis Strait stock (BB-DS) to maintain a viable population and too few adults have been found in the putative Foxe Basin-Hudson Bay stock (HB-FB) to produce the calves as mostly sub-adults are seen in this area. Satellite tracking data have shown that there is no geographical separation between the two putative stocks. Whales occupying Foxe Basin move through Fury and Hecla Strait into Prince Regent Inlet, waters traditionally assumed to summering areas for the whales from the BB-DS stock. Prince Regent Inlet and Gulf of Boothia has also been identified as a major summering area for whales tagged in West Greenland in spring. Whales tagged in southeast Baffin Island have been shown to circumnavigate Baffin Island both clock-wise and counter-clockwise and thereby moving through all areas used as summering grounds for whales from both the HB-FB and the BB-DS stocks. Tagging data also show that whales from the two putative stocks occupy the same wintering areas in Hudson Strait. Furthermore, genetic data collected to date do not support the two-stock model. We suggest the most reasonable explanation for the observed segregation patterns and migratory movements is that bowheads summering in the eastern Canadian Arctic and wintering off West Greenland consist of a single Eastern Canada-Western Greenland population, segregated by age and sex. We propose this new stock to be called the Baffin Bay bowhead whale stock.

*21. HEIDE-JØRGENSEN, M.P., LAIDRE, K.L. and FOSSETTE, S. Re-analysis of the availability correction factor used in the aerial survey of bowhead whales in the Eastern Canadian Arctic 2002-2004. 7pp.

Abundance estimates obtained during an aerial survey of bowhead whales (%DODHQD_P\VVWLFHWXV) in the Canadian eastern Arctic (Dueck et al. 2008) were reanalysed to include availability bias data using a larger sample of diving whales, and hence a better estimate of the fraction of whales submerged during the passage of the plane (availability bias). The larger sample size of dive data from bowhead whales was collected in Disko Bay, West Greenland, in April and May between 2002 and 2006. Correction for the non-instantaneous sighting process in aerial surveys was included and fully corrected alternate estimates were developed. The estimates for the BBDS and FBHB stocks using the revised method presented here were 14196 (0.49) and 2125 (0.73), respectively. These are similar to those presented by Dueck et al. (2008) but are slightly more precise and include all variance components.

22. VERNAZZANI, B.G., BROWNELL, R.L. and CABRERA, E. Sightings of right whales off Chile and Peru from 1976-2007.

*23. ROWNTREE, V.J., VALENZUELA, L.O., FRANCO FRAGUAS, P. and SEGER, J. Foraging behavior of southern right whales (*Eubalaena australis*) inferred from carbon stable isotope ratios in their baleen. 10pp.

The isotopic composition of a whale's diet is recorded in its tissues including its baleen. The longest baleen plates of an adult right whale contain a 6- to 7-year record of the isotopic composition of its prey (copepods and krill). Because the stable isotope ratios of prey change with water temperature (latitude), depth, freshwater inputs and current systems, the isotopic signals in baleen provide information about the annual foraging paths of individuals. Baleen from five adult southern right whales (*Eubalaena australis*) that died and stranded on their nursery ground at Peninsula Valdés, Argentina, were sampled at 2cm intervals from the gum line to the tip of the baleen plate. The stable carbon isotope ratios ($\delta^{13}C$) in the baleen oscillate between high and low values on annual cycles. Higher values of $\delta^{13}C$ indicate feeding on warmer-water prey (Patagonian Shelf, -18 to -23‰) while lower values indicate colder-water prey (South Georgia, -24 to -29‰). Each annual cycle was analyzed to determine the distances (in centimeters of baleen growth) between peaks, the highest and lowest values of $\delta^{13}C$, the rates of change in $\delta^{13}C$ between peaks and troughs, and the $\delta^{13}C$ values at plateaus where signals remained approximately constant. Baleen grew an average of 31cm/yr with large interannual variation (sd 5.8cm) within individuals but no significant differences between individuals. Baleen growth rate was positively correlated with the lowest (most southerly) $\delta^{13}C$ value in a year. Individuals differed significantly in their mean isotopic ratios and in the ranges of their annual oscillations (latitudinal foraging ranges). Two whales had narrow ranges (3.0 and 2.7‰), but one fed in warm waters at higher latitudes (mean -18.2‰) while the other fed in cool waters at lower latitudes (-23.8‰). The other three whales had significantly broader ranges (5.1 to 6.8‰). $\delta^{13}C$ values consistently change more rapidly in spring (0.3‰/wk) than in fall (0.2‰/wk). We conclude that stable carbon isotope ratios in baleen record variations in the foraging behavior and distribution of right whales, and probably reflect their responses to changing abundances of copepods and krill.

*24. HILLMAN, G., TRASK, K., SWEENEY, K., DAVIS, A.R., KOSKI, W.R., MOCKLIN, J. and RUGH, D. Photo-identification software for bowhead whale images. 7pp.

A computer program has been developed for identification of individual bowhead whales in aerial photographs. The program enables the user to create a collection of images and to compare an image to the collection. The collection is ranked by the program based on similarity to the query image, facilitating identification of the individual in the image. The program has been tested by the developer (GRH) with 20 images and it appears to compute its matching functions correctly. Eleven successive versions of the program were provided to LGL Limited, who tested the program with a collection of 78 images and have provided reports on bugs in the system and feature requests to the developer. All known bugs have been fixed and many features have been added to make the program perform better. Additional modifications to the program are likely to improve matching performance and will be identified when larger numbers of images have been processed through the program.

25. BRANDON, J.R. and PUNT, A.E. Further notes on incorporating environmental data into the stock assessment of eastern Pacific gray whales.

26. POSTMA, L., LINDSAY, M., DUECK, L., COSENS, S.E., HEIDE-JØRGENSEN, M.P. and LAIDRE, K.L. Patterns of genetic differentiation and a single stock hypothesis for bowhead whales (*Balaena mysticetus*) from the eastern Canadian Arctic and Western Greenland.

27. IRELAND, D., KOSKI, W.R., THOMAS, T.A., JANOWSKI, M., FUNK, D.W., MACRANDER, A.M., HANNAY, D. and REA, C. Distribution and abundance of cetacean populations in the eastern Chukchi Sea in 2006 and 2007.

28. BACHMANN, L., LINDQVIST, C., WIIG, Ø., POSTMA, L., DUECK, L., LINDSAY, M., LAIDRE, K.L. and HEIDE-JØRGENSEN, M.P. Mitochondrial DNA diversity in the West Greenland stock of bowhead whales (*Balaena mysticetus*).

*29. SIRONI, M., LÓPEZ, J.C., BUBAS, R., CARRIBERO, A., GARCIA, C., HARRIS, G., INTRIERI, E., IÑIGUEZ, M. and PAYNE, R. Predation by killer whales (*Orcinus orca*) on southern right whales (*Eubalaena australis*) off Patagonia, Argentina: effects on behaviour and habitat choice. 18pp.

Predation can be a strong selective force affecting the social traits and habitat choice of prey species. Killer whales or orcas (*Orcinus orca*) and southern right whales (*Eubalaena australis*) coexist in the waters off Peninsula Valdés, Argentina. Over the last three decades, right whales have changed their distribution along the Peninsula by abandoning the area with the highest occurrence of orcas and moving into two adjacent bays. Between 1972 and 2000, 117 orca – right whale encounters were observed. From 112 encounters, 63 (56.3%; mean duration $x = 12.3$ min) involved no apparent changes in the behavior of either species; in 37 encounters (33%; $x = 27.6$ min) obvious behavioral changes were seen; and in 12 encounters (10.7%; $x = 81.1$ min) actual attacks were observed. The orca / right whale ratio was maximum (1.8 orcas per right whale) in actual attacks, and minimum (1.3 orcas per right whale) in the other two categories. Most encounters (90.6%) occurred along the Eastern Outer Coast of the Peninsula. Here, the overall number of encounters decreased with time, from 68 in 1972-1980, to 26 in 1981-1990, to 23 in 1991-2000. However, while encounters decreased along the Eastern Outer Coast they increased in other areas. Orcas may assess right whale group size and their own group size before approaching and attacking. During encounters, right whales showed behaviors (active calf protection, use of tail as a weapon, use of shallow waters, increased group size, rosette formation) that could be adaptive to decrease predation success. The aggregation of right whales on nursery grounds such as Peninsula Valdés has been proposed to be an adaptation to reduce individual predation risk. The abandonment of the Eastern Outer Coast by right whales has lowered the number of encounters with orcas with a subsequent decrease in the attack rate over time. At present it is not possible to determine whether predation pressure caused the change in habitat use by right whales in Valdés. However, our data suggest that the 'predation hypothesis' could partly explain the shift of southern right whales into the bays.

*30. SWARTZ, S., URBÁN-RAMÍREZ, J., GÓMEZ-GALLARDO, U., GONZÁLEZ C, S., TROYO V, B. and NÁJERA C, M. Preliminary comparison of winter counts of gray whale in Laguna San Ignacio, BCS, Mexico from 1978 to 2008. 19pp.

Laguna San Ignacio (LSI) is located in the west coast of Mexico's Baja California Peninsula and it is one of the four main calving-breeding lagoons of the eastern North Pacific gray whale (*Eschrichtius robustus*). Boat surveys utilizing standardized methodology to count the number of gray whale visiting LSI during the winter were conducted from 1978-1982 (Jones and Swartz 1984), 1996-2000 (Urbán et al. 2000), 2003 and 2005 (Urbán unpublished), 2006-2007 (Swartz et al. 2007) and 2008 (this paper). Counts from these surveys were compared as four distinct time series that corresponded to specific periods and events in the population's recent history: 1978-1982 the baseline period; 1995-1997 the pre-die-off period; 1998-2000 the period of the range-wide die-off; and 2003 to 2008 the post die-off period. Counts of the total number of adult whales, female-calf pairs, and single non-calf whales were greatest during the baseline period from 1978-1982. Counts of adult whales decreased during the pre-die-off and die-off periods to approximately two-thirds those seen during the baseline period and continued to decline during the post-die-off period. This post-die-off decline included counts of single non-calf whales and mother-calf pairs. Mother-calf pair counts declined during each time period and were the lowest recorded during the post-die-off period from 2003-2008. Overall counts in 2008 were the lowest ever recorded in LSI during winter. The length of the winter season of lagoon occupation also shortened approximately two weeks following the baseline period (1995-2008) as gray whales arrived later and departed sooner from the lagoon. There was also a general shift in the timing of the maximum counts of whales of approximately 7-12 days later than during the baseline period. The 2008 arrival and occupation of LSI was the latest and shortest ever recorded for gray whales this lagoon. Comparison of these trends with other breeding lagoons is needed to determine if these decreasing counts, shortening and shift in the timing of the winter lagoon occupation by gray whales reflect actual population declines or changes in gray whale distribution to other areas within their winter range.

31. ALTER, S.E., ROSENBAUM, H.C., POSMA, L.D., GAINES, C., WEBER, D., EGAN, M.G., LINDSAY, M., AMATO, G., DUECK, L., BROWNELL, R.L., WHITRIDGE, P. and HEIDE-JØRGENSEN, M.P. Genetic diversity and population differentiation in modern and Holocene bowhead whales from the eastern Canadian Arctic.

32. WIIG, Ø., BACHMANN, L., BERGE, J., JANIK, V.M., KOVACS, K.M., SWIFT, R. and LYDERSEN, C. Surveys of bowhead whales (*Balaena mysticetus*) in the northeast Atlantic in 2006 and 2008.

33. VAN WAEREBEEK, K., SANTILLÁN, L. and SUAZO, E. Incidental sightings of southern right whales off Peru, 1987-2008: heading north but recovery remains unclear.

34. DUECK, L., RICHARD, P. and COSENS, S.E. A review and re-analysis of Cosens *et al.* (2006) aerial survey assessment of bowhead whale abundance for the eastern Canadian Arctic.

Cosens *et al.* (2006) presented an analysis of aerial surveys for bowhead whales summering in Eastern Canada in 2002-2004. The final result provided a partial estimate for the population of 7300 (95% CI: 3160 - 16900), corrected for availability bias (diving animals) but not for perception bias (missed whales that were available to be seen). While the surveys were conducted with two observers on each side of the aircraft, sightings by front and rear observers were pooled in a single platform (observer) Distance analysis. The sighting distance detection functions were based on small sample size. The analysis of Cosens *et al.* (2006) was reviewed to identify potential sources of bias, and reassess the population estimate based on a more complete analysis. A modified dataset was used in the re-analysis, excluding sightings identified as potentially introducing bias. A global detection function for all surveys was calculated to improve estimation of sightability with distance. Analyses were performed to account for perception bias (using a double platform approach) and additional detection bias (using covariates). A single-platform analysis, comparable to that of Cosens *et al.* but using the revised dataset and global detection function, resulted in about half the numbers estimated by Cosens *et al.* (2006). A fully-corrected analysis, using a double platform mark-recapture approach with covariates resulted in an estimate of 14400 animals (95% CI 4811-43105). The sighting recapture rate between observers was low, demonstrating that observers missed significant numbers of animals available to be seen. Positive biases in the original analysis stem from data errors and use of an inaccurate detection function. The primary source of negative bias in the original analysis was the lack of accounting for perception bias. Potential positive and negative biases remaining in the re-analysis are discussed. We conclude that the results support the contention that numbers of bowhead whales in this population are larger than previously thought. While the large confidence intervals illustrate the uncertainties around the point estimate, estimates for both the original and the re-analysis are partial estimates, representing only a portion of the known summer range for the EC-WG population.

SC/60/DW

*1. MORENO, I.B., OTT, P.H., TAVARES, M., OLIVEIRA, L.R., BORBA, M.R., DRIEMEIER, D., NAKASHIMA, S.B., HEINSELMANN, L.S., SICILIANO, S. and VAN BRESSEM, M.F. Mycotic dermatitis in common bottlenose dolphins (*Tursiops truncatus*) from southern Brazil, with a confirmed record of lobomycosis disease. 11pp.

The lobomycosis or lacaziosis is a chronic localized, cutaneous and subcutaneous infection caused by a dimorphic fungus (*Lacazia loboi*), that naturally

affect humans and, at least, two dolphins species, the common bottlenose dolphin (*Tursiops truncatus*) and the boto-cinza (*Sotalia guianensis*). In cetaceans, the disease is widely distributed occurring from southern Brazil (Tramandai River) to Gulf of Mexico and Atlantic coast of Florida. In the Southwest Atlantic, lobomycosis was first reported in a *T. truncatus* beached in 1990 in Laguna (28°30'S, 48°45'W), Santa Catarina State, Brazil. Photo-identification land based surveys were conducted from October 1991 to April 2008 in the Tramandai estuary and from April 2003 to October 2004 in the Mampituba estuary. In addition to the photo-identification studies, regular monitoring beach surveys were conducted since October 1991 along the northern coast of the Rio Grande do Sul state. According to GEMARS database up to April 2008, 1,300 carcasses of marine mammals were collected. In Tramandai estuary we observed lobomycosis and lobomycosis like disease (LLD) in two (20%) of the ten dolphins photo-identified. In Mampituba estuary we observed LLD in one (16.67%) of the six dolphins photo-identified, but this prevalence is likely to high as this community may reach 15 dolphins. From the period October 1991 to February 2008 a total of 65 *T. truncatus* carcasses were recovered, representing the second most common small cetacean in the area (5% out of 1,300). Altogether, stranding data and photo-id studies have provided one particular case of lobomycosis and 6 cases of undetermined mycotic diseases, including LLD, in free ranging bottlenose dolphins from Rio Grande do Sul state coast. The recent and accelerated degradation process of the estuarine areas from southern Brazil may have contributed to enhance the pathogenicity of mycotic diseases. In addition, special attention is necessary towards the bottlenose dolphin populations affected by lobomycosis in Southern Brazil. These populations are relatively small and unique due to the cooperative behaviour with artisanal fishermen.

2. SANINO, G.P., VEN BRESSEM, M.F., VAN WAEREBEEK, K., FLACH, L., VIDDI, F., JEPSON, P.D., DUIGNAN, P., RAGA, J.A., DEAVILLE, R., DE OLIVEIRA SANTOS, M.C., CRESPO, E., KLAICH, J. and FÉLIX, F. Epidemiology of tattoo skin disease worldwide with a particular insight in South America.

Tattoo skin disease (TSD) in cetaceans is characterized by characteristic, irregular, grey, black or yellowish, stippled lesions that may occur on any part of the body but seem to show a preferential corporal distribution depending on the affected species. Tattoo skin disease is caused by poxviruses which are thought to belong to a newly recognized genus of the subfamily Chordopoxvirinae. TSD has been observed worldwide in Delphinidae, Phocoenidae, Ziphiidae and, rarely, Balaenidae with prevalence levels ranging from 1.4% to 62.3%. TSD is highly prevalent and likely endemic among small cetaceans from Peru. In South America the disease has been detected in nine species from both the Southeast Pacific and Southwest Atlantic: *Cephalorhynchus eutropia* (southern Chile), *Cephalorhynchus commersonii* (southern Argentina), *Delphinus capensis* (central Peru), *Delphinus delphis* (Ecuador), *Lagenorhynchus obscurus* (central Peru), *Lagenorhynchus australis* (southern Chile); *Phocoena spinipinnis* (central Peru, north and southern Chile), *Tursiops truncatus* (central Peru and northern Chile/inshore) and *Sotalia guianensis* (Brasil). In small cetaceans that had died a traumatic death in fisheries interactions, the prevalence of TSD was very low or null in neonates and young calves, peaked among juveniles and decreased in adults. On the opposite, prevalence remained high in adults that had died in poor health condition as well as in adult *P. spinipinnis* from Peru. While prevalence of TSD is high in coastal and neritic species, it is relatively low in pelagic species, we suggest because coastal cetaceans are living in a more contaminated environment that may depress their immune system. With the advance of photographic technologies and increased awareness, TSD may constitute a useful bioindicator of the general health of cetaceans and their aquatic environment, and as such needs to be monitored.

3. MATTILA, D.K. and ROBBINS, J. Incidence of raised and depressed ovoid skin lesions on humpback whales of American Samoa.

The high incidence of both raised and depressed oval-shaped skin lesions observed on humpback whales in American Samoa is described. The origin of the depressions is assumed to be from cookie cutter sharks, but that of the raised lesions is not clear. The raised lesions appear to be more prevalent on the ventral side and possibly the posterior end of individual animals. In addition, they are not apparent on calves, while the depressions are. Similar raised lesions have been observed in both the North Pacific and North Atlantic humpback whale populations, however their incidence appears to vary between regions and Oceans, and they are much less frequent in the Gulf of Maine.

*4. FLACH, L., VAN BRESSEM, M.F., REYES, J.C., ECHEGARAY, M., SICILIANO, S., SANTOS, M., VIDDI, F., CRESPO, E., KLAICH, J., MORENO, I.B., EMIN-LIMA, N.R., FÉLIX, F. and VAN WAEREBEEK, K. Miscellaneous skin lesions of unknown aetiology in small cetaceans from South America. 12pp.

We report on miscellaneous skin diseases or syndromes of unknown aetiology including whitish, velvety lesions (WVL, often associated with unrelated skin injuries, scars and tooth rakes), large, rounded lesions (LRL, large to very large lesions with an orange or dark outline and a light inner colour) and vesicular skin disease (VSD, small to medium vesicles) in *Megaptera novaeangliae*, *Cephalorhynchus commersonii*, *C. eutropia*, *Pseudorca crassidens*, *Sotalia guianensis* and *Tursiops truncatus* from marine waters of Argentina, Brazil, Chile, Ecuador, Peru and the Antarctic. No biopsy samples have been available yet for histopathology. WVL are now commonly recorded opportunistically through photo-identification studies in several coastal species and populations from South America. Mortality rates, if any, associated with these skin diseases is unknown. Though sometimes extensive and ulcerated WVL do not seem life-threatening and, at least in some individuals, may eventually heal. A calf *C. eutropia* with LRL died some weeks after being first sighted. While unknown bacteria or fungi superinfecting miscellaneous skin traumata and poxvirus tattoos are thought to cause WVL and LRL, vesiviruses are suspected as the aetiological agents of VSD. Importantly, all lesions were primarily seen in coastal cetaceans living in biologically or chemically contaminated waters. These various skin conditions may be indicative of a deteriorating coastal water environment and should be systematically monitored. Collection of biopsies or fresh samples for histopathology and microbiological analysis is urgently needed.

*5. VAN BRESSEM, M.F., RAGA, J.A., DI GUARDO, G., JEPSON, P.D., DUIGNAN, P., SIEBERT, U., BARRETT, T., DE OLIVEIRA SANTOS, M.C., MORENO, I.B., SICILIANO, S., AGUILAR, A. and VAN WAEREBEEK, K. Emerging and recurring diseases in cetaceans worldwide and the role of environmental stressors. 13pp.

Emerging and recurring infectious diseases known or suspected to have the potential to significantly impact cetacean populations, and possible synergistic effects of environmental factors are reviewed. Cetacean morbilliviruses and papillomaviruses and brucellosis may affect population densities through high mortality rates or interference with reproduction. Evidence is available for the role of environmental factors in the emergence/recurrence and severity of at least six infectious conditions i.e. lobomycosis, toxoplasmosis, tattoo skin disease, generalized bacterial infections, miscellaneous skin diseases and morbillivirus epizootics. Other micro-parasites of potential importance include rhabdo-, herpes- and parainfluenza-viruses as well as *Helicobacter* spp., *Streptococcus* spp., *Salmonella* spp. and *Mycobacterium marinum*. The population impact and aetiology of newly emerging skin diseases in South America are unknown and represent a cause of concern.

*6. SHIRAKIHARA, M., AMANO, M. and VAN BRESSEM, M.F. Skin lesions in a resident population of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) from Japan. 6pp.

A year-round resident Indo-Pacific bottlenose dolphin *Tursiops aduncus* population inhabits the coastal waters off Amakusa-Shimoshima Island (130°07'E, 32°33'N), western Kyushu, Japan. A total of 172 dolphins, representing most of the members of this population, have been identified. In summer 2007, a likely mature male was observed with extensive, in relief, nodular skin lesions. The disease looks like lobomycosis caused by the yeast-like organism known as *Lacazia loboi* and reported in *T. truncatus* and Guiana dolphins (*Sotalia guianensis*) from the Americas, though other fungi may be involved. Small lumps that may represent the beginning of the disease were observed on this dolphin a year before. Three other dolphins had similar lumps.

*7. BERMÚDEZ-VILLAPOL, L.A., SAYEGH, A.J. and VAN BRESSEM, M.F. Lobomycosis-like disease in a bottlenose dolphin (*Tursiops truncatus*) from Venezuela. 3pp.

We report on a case of severe lobomycosis-like disease (LLD) in an emaciated common bottlenose dolphin (*Tursiops truncatus*) stranded on a beach of Margarita Island, Venezuela, in 2004. Though evolving slowly LLD may eventually cause the death of extensively affected dolphins and hence negatively affect the growth of coastal populations. The role of biological and chemical contamination in the emergence and severity of this disease should be explored.

*8. VAN BRESSEM, M.F., VAN WAEREBEEK, K., FLACH, L., REYES, J.C., DE OLIVEIRA SANTOS, M.C., SICILIANO, S., ECHEGARAY, M., VIDDI, F., FÉLIX, F., CRESPO, E., SANINO, G.P., AVILA, I.C., FREIJIA, N. and CASTRO, C. Skin disease in cetaceans. 11pp.

Micro-organisms that are known or suspected to cause skin diseases in cetaceans are briefly reviewed. Viruses belonging to four families i.e. *Caliciviridae*, *Herpesviridae*, *Papillomaviridae* and *Poxviridae* were detected by electron microscopy, histology and molecular techniques in vesicular skin lesions, black dots perceptible by the touch, warts and tattoos in several species of odontocetes and mysticetes. Herpesviruses, poxviruses and likely a cutaneous papillomavirus are cetacean specific. Among bacteria, *Dermatophilus* spp., *Erysipelothrix rhusiopathiae*, *Mycobacterium marinum*, *Pseudomonas* spp., *Streptococcus iniae* and *Vibrio* spp. were isolated from ulcerative dermatitis, pyogranulomatous dermatitis and panniculitis, diamond skin disease and slow-healing ulcers and abscesses. *Aeromonas* spp., *Mycobacterium marinum*, *Pseudomonas* spp. and *Vibrio* spp. are normally present in the marine environment while *Erysipelothrix rhusiopathiae* and *Streptococcus iniae* are fish pathogens that may also infect captive dolphins. Most seem to be opportunistic pathogens, exploiting some break-down in the host's defenses to initiate an infection. Selection of antibiotic-resistant bacteria through the prophylactic use of antibiotics in aquaculture is suggested to be a growing problem in South America and may account for the emergence of unusual cutaneous conditions. At least four groups of fungi i.e. *Candida albicans*, *Fusarium* spp., *Trichophyton* spp. and *Lacazia loboi* cause skin diseases. Candidiasis occurs predominantly in captive odontocetes. The lesions are often localized around the body orifices and may become extensive, granulating and ulcerated. Fusariosis is characterized by firm, erythematous, cutaneous nodules. *Trichophyton* spp. was isolated from widespread superficial nodules in an Atlantic *T. truncatus* kept in captivity in Japan. Lobomycosis or lacaziosis is distinguished by grayish, whitish to slightly pink, verrucous lesions, often in pronounced relief that may ulcerate. While initially described only in *Tursiops truncatus* and *Sotalia guianensis* from the Americas, lobomycosis seems to be expanding to other continents. The role of ballast water in transporting fungi worldwide should be investigated. Finally, ciliated protozoans, likely *Kyaroikeus cetarius*, caused invasive dermatitis in small cetaceans from the USA and Korea. The aquatic environment of cetaceans is naturally home to bacteria and fungi but cetacean skin has several mechanisms to impede invasion. Chemical contaminants may affect natural skin barriers and depress the immune system. Wounds and specific viral infection (poxvirus, herpesvirus) may provide routes of entry.

9. PANIZ-MONDOLFI, A., SANDER-HOFFMAN, L., REYES-JAÍMES, O. and PEREZ-ÁLVAREZ, A. Epidemiology of Lobomycosis in humans and its possible emergence in other animal species.

Lobomycosis is a chronic insidious subcutaneous and rarely systemic infection, caused by *Lacazia loboi*, a closed related agent to *Paracoccidioides brasiliensis*. Since first described in 1931 in Recife, Brasil, lobomycosis was believed to be an infectious disease restricted to the human species. The first reports in dolphins date from 1955 and the late sixties; since then, the number has increased rapidly, probably because of the awareness of the presence of this disease in marine species, and also, due to major efforts on surveillance strategies. Although thought to be limited to humid tropical forests of South America, the presence of infection in dolphins has broadened the geographical distribution of the disease to the subtropical areas of Florida, Gulf of Mexico, and to the coast of France. In humans, soil and vegetation are considered ecologic habitats of the fungus; and there is no doubt that the aquatic environment provides an ecologic niche to the fungus as well. We recently confirmed the first human case of lobomycosis in the Venezuelan coast region on a fisherman who referred to have had contact with lobsters that exhibited severe verrucous lesions similar to those observed by other local fishermen on dolphins and turtles. The presence of infection by *Lacazia loboi* in dolphins raises many questions: Is the disease extensively geographically distributed, or are infected animals migrating from endemic areas in South America? Are climatic changes influencing the appearance of new habitats for this agent? Could the disease be present in other marine species? And if so, could marine animals to human transmission of lobomycosis be possible? These questions add more uncertainties to many of the unknown pathobiological aspects of this agent; thus, it is necessary that biologists, veterinarians and physicians share their thoughts and findings in order to start deciphering the intricacies of this complex and enigmatic disease.

*10. KISZKA, J. and VAN BRESSEM, M.F. Lobomycosis-like disease in Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) from the southwest Indian Ocean. 8pp.

Lobomycosis is a chronic mycotic disease of the skin and sub-dermal tissues caused by a yeast-like organism known as *Lacazia loboi*. This disease has been identified in humans and Delphinidae i.e. *Tursiops truncatus* and *Sotalia fluviatilis*. It is endemic to South America and Florida. Here we report the first case of lobomycosis-like disease in Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) from the tropical lagoon of Mayotte, in the southwest Indian Ocean (12°50'S, 45°10'E). From July 2004 to June 2006, daylight boat-based surveys were conducted in the territorial waters of the island, including in the 1,100km² closed lagoon where Indo-Pacific bottlenose dolphins are resident. During the surveys, at least 45 dolphins were photo-identified. Among them, 6 had skin lesions very similar to lobomycosis. However, no histological investigations confirmed the clinical observations. This is the first report of lobomycosis-like disease in *T. aduncus* from this region of the world.

11. DA SILVA, V.M.F., MARTIN, A.R. and MIKESH, E. Skin disease and lesions of the boto *Inia geoffrensis* in the central Amazon.

Skin lesions and other external pathologies of botos (*Inia geoffrensis*) were inspected on photographs of the body, head and flippers of 385 live-captured animals from the Mamirauá Reserve in the central Amazon. The dolphins were examined between 1994 and 2007. The photographs were originally taken to record the quality and position of unique marks (freeze-brands); their use for skin disease assessment was therefore opportunistic and not always fully representative of the complete body. Photographs of 120 botos did not show any apparent skin problems and for 116 individuals the images were not of sufficient quality to allow assessment of skin condition. Skin lesions were found in 107 individuals, comprising open wounds, ulcers, abscesses, cobblestoning and other pathology. 58% showed large cuts and healed scars and 79% unidentified spots, marks or irregular skin. Open wounds, ulcers and abscesses were together responsible for 87% of skin conditions, while the pathogenic disease Golf-ball-disease, caused by *Streptococcus iniae* alone represented 24%, and healed scars a further 40%. Twisted, broken and deformed mandibles as well as dental caries and tooth anomalies are also very common in the boto.

12. KLAICH, J., PEDRAZA, S.N., VAN BRESSEM, M.F. and CRESPO, E.A. Preliminary results from skin lesions study in Commerson's dolphin (*Cephalorhynchus commersonii*) from the northern Patagonian Sea.

A skin lesion study was carried out in a local population of *Cephalorhynchus commersonii* from the Northern Patagonian Sea, Argentina. Data were obtained from digital pictures taken during seasonal sampling in 2006 and 2007 at the estuarine of Chubut river-Patagonia Argentina. Pictures were classified in four quality levels: bad, regular, good and very good. Only good and very good images were used. Here we report on the seasonal and annual variation of prevalence (P) of tattoo skin disease (TSD) and orange marks (OMD) possibly caused by diatoms in this species. Presence and absence of TSD and OMD were recorded for each dolphin. The number of identified dolphin for 2006 and 2007 were 69 and 88, respectively. For TSD and OMD a comparison for P between 2006 and 2007 was carried out by means of confidence interval estimation. The mean annual prevalence levels were 15.43% (TSD) and 4.53% (OMD) for 2006 and 23.81% (TSD) and 11.92% (OMD) for 2007. The P of TSD and OMD showed a significant correlation with time and temperature while the difference between annual P for TSD of 2006 and 2007 tended to be significant. The results obtained during this work will be used to set the basis for a long-term skin lesion study using digital pictures in combination with capture-recapture methods.

13. SICILIANO, S., VAN BRESSEM, M.F., MORENO, I.B., OTT, P.H., TAVARES, M., FLORES, P.A.C., FLACH, L., CESAR REYES, J., ECHEGARAY, M., DE OLIVEIRA SANTOS, M.C., VIDDI, F., CRESPO, E., KLAICH, J., FÉLIX, F., SANINO, G.P. and VAN WAEREBEEK, K. Review of lobomycosis and lobomycosis-like disease (LLD) in cetacea from South America.

*14. BERTELOTTI, M., VARISCO, A., AGUADO, G. and FRANCISCO, E. Skin lesions in southern right whales (*Eubalaena australis*) off the coast of Valdés Peninsula, Argentina. 3pp.

Adults and calves of Southern Right Whale (*Eubalaena australis*) showed different type of lesions on their back, including large injuries produced by kelp gulls's attacks (*Larus dominicanus*), and other no specific wounds. Kelp gulls usually aggravate lesions taking pieces of skin and bubbler, increasing then the injuries. However, many lesions are of unknown origin. Wounds usually healed after several months, but specimens develop other lesions again on successive years. Injuries are more common in calves, but adults are more severely affected, being their lesions larger and deeper. Lesions usually appear as circular patches, like skin moulting patches, but the severely pale devalitized and wrinkled appearance suggests a skin disease. Same sort of lesions were also recently described in Northern Right Whales (*Eubalaena glacialis*).

15. ROSA, C., BRACHT, A.J., BLAKE, J.E., O'HARA, T.M., ROMERO, C.H. and SHEFFIELD, G.M. Histological characterization of a newly discovered poxvirus in mysticetes.

*16. PEREIRA, C.S., SICILIANO, S., MORENO, I.B., OTT, P.H. and DOS PRAZERES RODRIGUES, D. Occurrence of enteropathogens isolated from marine mammals from coastal regions in Brazil. 6pp.

The marine ecosystem is recognized as natural habitat of pathogenic microorganisms and infectious diseases caused by these bacteria are dangerous to marine animal's health and could potentially affect several species as well those are endangered. In the other hand the investigations conducted to characterize diseases causative agents and their risks to animal and human health are difficult to carry out, especially due the migratory habits of some marine mammals' species. Aquatic environment is the habitat of microorganisms including *Plesiomonas shigelloides*, *Vibrio* and *Aeromonas* species which are pathogenic to human and animals. In the present investigation we evaluated the occurrence of these pathogens from swabs collected of marine mammals beached or accidentally captured by fishing net in southeastern (RJ) and southern (RS) coastal regions of Brazil. A total of 198 swabs were collected by DEENSP, GEMARS/UFRGS and CECLIMAR institutes and sent to LRNCEB/IOC/FIOCRUZ. The samples were enriched in Alkaline Peptone Water (APW) added with 1% of sodium chloride (NaCl) and APW plus 3% NaCl, incubated at 37°C for 18-24 hours. Following, the samples were streaked onto Pseudomonas-Aeromonas Selective Agar Base (GSP Agar) and the suspected colonies were characterized biochemically. The results showed two hundred and twenty two isolates were characterized being *Vibrio alginolyticus*, *V. parahaemolyticus*, *V. vulnificus*, *V. fluvialis* *Aeromonas veronii* biogruo *veronii*, *A. caviae*, *A. hydrophila*, *Aeromonas* sp. and *Plesiomonas shigelloides* the main pathogens isolated. These data appoint the importance of epidemiological surveillance and microbiological monitoring and reinforce the need to implement environment protection programs especially related to endangered cetacean species.

*17. MOUTON, M., REEB, D., THORNTON, M., BOTHA, A. and BEST, P.B. Cutaneous fungi on southern right whales (*Eubalaena australis*) from South Africa as a possible indicator of health risks. 1pp [abstract].

A number of fungal species have evolved as opportunistic pathogens of humans and animals. These infections, that can be systemic and/or cutaneous, mostly affect immuno-compromised individuals. In animals, most cutaneous infections are caused by fungi that have adapted to utilize keratin and can cause dermatophytosis. These fungi parasitize the keratinized layer of the epidermis, hair, feathers and horn, without affecting the deeper tissue. However, records on dermatophytosis in marine mammals, especially in cetaceans, are relatively rare. We were therefore interested to obtain an indication of the fungal taxa associated with the skin of the southern right whale, *Eubalaena australis*. Consequently, skin samples were collected from freshly beached whales, along the coast of South Africa, to test for the presence of pathogenic fungi associated with these (presumably) debilitated animals. The control group for this study consisted of biopsies collected under sterile conditions from free-swimming individuals in St Helena Bay, South Africa. To determine the presence of fungal dermatophytes, skin samples were cultivated on a series of isolation media using classical mycological isolation methods. The fungal isolates were identified using classical, as well as molecular identification techniques. In addition, the ability of the isolates to degrade keratin was determined using simple plate assays. It was found that a range of fungi occur on the skin of beached whales, including opportunistic pathogens belonging to the yeast genera *Candida* and *Cryptococcus*. Filamentous fungi belonging to the families Chaetomiaceae, Hypocreaceae and Trichomaceae were also found. In contrast to the host of fungi on the three beached whales so-far investigated, no fungi were recovered from five of the six animals in the control group. However, two filamentous fungal species were isolated from the sixth, an apparent healthy individual. One fungus belongs to the family Sclerotiniaceae, and the other is an undescribed black yeast. The filamentous fungi isolated during this study were all able to degrade keratin and belong to fungal groups known to harbor opportunistic fungal pathogens. As a result of the variety of cutaneous fungi found on the beached whales, and the apparent lack thereof on healthy free-swimming individuals, we hypothesize that the presence of these fungi on the skin of southern right whales may act as an indicator of health risk in these animals. This hypothesis should be tested in future studies.

18. CASTRO, C., GROCH, K., MARCONDES, M. and VAN BRESSEM, M.F. Miscellaneous skin lesions of unknown aetiology in humpback whales *Megaptera novaeangliae* from South America.

SC/60/E

1. STACHOWITSCH, M., PARSONS, E.C.M. and ROSE, N.A. State of the cetacean environment report (SOCER).

*2. GEORGE, J.C., WETZEL, D., DEHN, L., O'HARA, T.M., ROBERTSON, K., LEDUC, R. and REYNOLDS, J. An analysis of ancient bowhead whale *mangtak* from Gambell Alaska: what can it tell us? 11pp.

A hunter in Gambell Alaska discovered a frozen section of bowhead whale epidermis with attached blubber or *mangtak* (in the Yupik Eskimo language) from a site within the village about 3.5 m underground. The *mangtak* was dated using radiocarbon dating techniques at approximately 1,000 year BP but was still in relatively "good" condition. Subsequent analyses of a piece of bowhead whale *mangtak* estimated to be approximately 1,000 years old is unique in cetacean science. The people of Gambell felt that it confirmed their oral traditional knowledge, which indicates they have hunted bowhead whales since "time immemorial". Scientifically the analysis suggests that: a) the ancient whale is genetically closely related (identical mtDNA haplotype) to whales living within the Bering-Chukchi-Beaufort Seas Stock today (near Alaska); b) bowhead whales 1,000 years ago and today appear to have foraged at the same trophic level (stable isotopes), but specific dietary constituents *may* have differed (fatty acids); and c) very low concentrations of mercury in the skin of the ancient (pre-industrial) whale are similar to those found in current day bowhead whale skin.

3. TYNAN, C.T. and RUSSELL, J.L. Assessing the impacts of future two-degree C global warming on Southern Ocean cetaceans.

Predicting the impact of global warming on polar marine ecosystems will require the combined efforts of climate modelers and marine ecologists. A subset of IPCC AR4 climate model output for emission scenario A1B was used to identify the time period at which globally averaged surface air temperature increases by 2 C above pre-industrial levels. The impacts of the predicted change in Southern Ocean sea-ice extent, concentration and seasonality, ocean circulation and frontal positions on resident cetacean populations (i.e. Antarctic minke whales) and migratory cetaceans are examined for the time of 2 C warming.

4. MOON, H.B., CHOI, H.G., AN, Y.R., CHOI, S.G. and KIM, Z.G. Concentrations and profiles of persistent organic pollutants (POPs) in cetaceans from Korean coastal waters.

*5. DOLMAN, S., REID, B., BARLEY, J.P., DEAVILLE, R., JEPSON, P.D., O'CONNELL, M., BERROW, S., PENROSE, R., PINN, E., STEVICK, P., CALDERAN, S., ROBINSON, K.P., DOYLE, T.K., BROWNELL, R.L. and SIMMONDS, M.P. A preliminary note on the unprecedented strandings of 45 deep-diving odontocetes along the UK and Irish coast between January and April 2008. 9pp.

Between 13 January and 14 April 2008, 14 Cuvier's beaked whales (*Ziphius cavirostris*), five Sowerby's beaked whales (*Mesoplodon bidens*), four unidentified beaked whales and 22 long-finned pilot whales (*Globicephala melas*) were reported stranded in Scotland, Ireland and Wales. Concerns that an unusual mortality event had taken place prompted further investigations although most carcasses were deemed to be too decomposed for necropsy.

Preliminary findings are presented here and some potential causes of death considered. Although the event had some similarities with atypical mass stranding events linked in time and space to mid frequency sonars, there were also two important differences. First, the geographic range of the event was very wide and second, the strandings occurred over a prolonged period of about three months. Both of these factors could be related to the fact that the mortalities occurred offshore and the carcasses drifted ashore. The cause(s) of these high number of offshore mixed-species cetacean strandings during this period remains undetermined at this time.

*6. BROWN, V. and SIMMONDS, M.P. An update on the extent of marine renewable energy developments in the northeast Atlantic. 11pp.

There has been a rapid expansion of Marine Renewable Energy Developments (MREs) – predominantly windfarms - in Northern Europe. Concerns have been raised that their potential impacts are not being adequately taken into account. This paper provides further information about the extent of MREs in the region, revealing that there are at least 50 existing, under construction or planned windfarms.

7. JEPSON, P.D. and SIMMONDS, M.P. Disappearing dolphins - is there a link to chemical pollution?

The work of the UK's stranding network has shown using a large sample size that there is a correlation between high burdens of PCBs (i.e. more than 17 ppm lipid weight) and poor health status in harbour porpoises. There is evidence that bottlenose dolphin populations declined in Europe at certain times when PCBs in the marine environment were at relatively high levels. We consider the potential relationship between these two variables and also other confounding variables.

8. WELLER, D.W., PERRYMAN, W.L. and BROWNELL, R.L. Will climate change influence migratory timing and predation rates on eastern gray whales?

9. GEDAMKE, J., FRYDMAN, S. and GALES, N. Risk of baleen whale hearing loss from seismic surveys: the effect of uncertainty and individual variation.

*10. DI GUARDO, G., PROIETTO, U., DI FRANCESCO, C.E., MARSILIO, F., BAFFONI, M., ZACCARONI, A., SCARAVELLI, D., MIGNONE, W., CAROGGIO, P., GARIBALDI, F., BALLARDINI, M., KENNEDY, S., FORSTER, F., PODESTÁ, M., BOZZETTA, E., IULINI, B. and CASALONE, C. Exposure occurred, but *Morbillivirus* was not the likely cause of striped dolphin deaths in the Ligurian Sea during 2007. 4pp.

We report herein the results of *post-mortem*, parasitological, microbiological, histopathological, immunohistochemical (IHC), indirect immunofluorescence (IIF), biomolecular (RT-PCR) and serological investigations carried out on 8 (1 male calf, 1 subadult female, 5 adult females, 1 adult male) striped dolphins (*S. coeruleoalba*) found stranded from August to November 2007 on the Ligurian Sea coast of Italy. A (broncho-interstitial) pneumonia occurred in 6 animals, with numerous parasitic bodies in both pulmonary and extra-pulmonary locations. Histologically, a multifocal, subacute to chronic, non-purulent meningo-encephalitis occurred in 1 adult male and 3 adult females, with more or less prominent perivascular cuffs of inflammatory mononuclear cells and peri-paravascular macrophage accumulations. A mild choroid plexus lymphocytic-plasmacytic infiltration was also present, along with moderate neuronal damage, although no viral inclusions were seen in any brain cell (nor in any other cell type). The blood sera from 4 dolphins (1 calf, 1 subadult, 2 adults) had anti-*Morbillivirus* neutralizing antibodies, with positive titres ranging from 1:10 to 1:40. Nevertheless, IHC, IIF and RT-PCR investigations gave negative results in all animals. On the basis of the above findings, we conclude that one or more factors other than *Morbillivirus* likely were the primary cause of these dolphin mortality episodes.

11. FOSSI, M.C., MARSILI, L., CASINI, S. and BUCALOSSI, D. First detection of CYP1A1 and CYP2B induction in Mediterranean cetacean skin biopsies and cultures fibroblasts by western blot analysis.

In the last 20 years there has been growing concern about the potential risk to Mediterranean cetaceans of high bioaccumulation of organochlorines (OCs) (Fossi *et al.*, 1992; Fossi *et al.*, 2003) and emerging contaminants, such as polybrominated diphenyl ethers (PBDEs) (Alaee *et al.*, 2003; Fossi *et al.*, 2006). While levels of organochlorine compounds are decreasing, concentrations of PBDEs seem to be increasing in the environment, including the Mediterranean sea. The need to develop powerful new tools to detect exposure and effects of OCs and emerging contaminants in Mediterranean cetaceans led us to develop a suite of sensitive non-lethal biomarkers in integument biopsies of free-ranging animals. In order to propose induction of CYP1A1 and CYP2B, detected by western blot analysis, as biomarkers of exposure to OCs, PAHs and PBDEs, a three phase experimental protocol (*in vitro* experiments, calibration experiments and field applications) was followed using fibroblasts cell cultures and biopsies of Mediterranean *Stenella coeruleoalba* and *Tursiops truncatus*. This methodology applied to skin biopsies and tissue of stranded cetaceans was confirmed to be sensitive and stable in comparison to previous methods used to detect CYP1A1 in biopsies (enzyme methods (Fossi *et al.*, 1992; Fossi *et al.*, 2003) and immunohistochemistry), enabling analysis of several inducible proteins in non-lethal samples and analysis of material from stranded animals. Future development of more sensitive techniques (such as RT-PCR and proteomics) with chemical data (OCs, PBDEs, PAHs) will provide more complete information (in a small sample) about cetacean "toxicological stress syndromes". References: Alaee, M., Arias, P., Sjödin, A. & Bergman, A., 2003. *Environ. Int.* 29:683-689; Fossi, M.C., Marsili, L., Leonzio, C., Notabartolo di Sciarra, G., Zanardelli, M. & Focardi S., 1992. *Mar. Poll. Bull.* 24(9): 459-461; Fossi, M.C., Marsili, L., Neri, G., Natoli, A., Politi, E. & Panigada, S., 2003. *Mar. Poll. Bull.* 46, 972-982; Fossi, M.C., Marsili, Casini, S., Bucalossi D., 2006. *Mar. Environ. Res.* 62, 200-204; Godard, C.A.J., Smolowitz, R.M., Wilson, J.Y., Payne, R.S., Stegeman, J.J., 2004. *Toxicol. Sci.* (80), 268-275. This project was supported by the Italian Ministry for Environment and Territory (Pelagos project, ACCOBAMS project).

*12. SMITH, B.D., STRINDBERG, S., AGUILAR, A. and MOWGLI, R.M. Swimming against the rising tide: the use of cetaceans for evaluating the ecological impacts of declining freshwater supplies and global climate change in Bangladesh. 17pp.

The effects of climate change are extremely difficult to predict and monitor because they are complex and operate on broad ecological scales. In biological monitoring, the assessment of complex processes is commonly approached through the use of indicator case-populations or species. These are assumed to integrate changes over time and space, thus reducing random variance of physical measurements, and to be sensitive enough to warn about changes earlier than the usual "spot" measurements. Cetaceans are normally considered to be poor indicators species due to their generalist capacity for adapting to environmental changes. However, the manner by which these large, mobile predators respond to environmental changes (e.g., by altering their movement patterns and foraging behaviour) may be particularly informative for identifying biologically significant environmental attributes, and for monitoring alterations in the spatial and temporal availability of these attributes. These responses may then be used to generate targeted and testable hypotheses, prioritize investigative efforts and identify local aggregations of biological productivity for site-based protection. The community of cetaceans inhabiting the inshore waterways of the Sundarbans mangrove forest and adjacent coastal waters in Bangladesh is composed of species that distribute themselves according to the physical characteristics in their environment (e.g. salinity, turbidity, depth, and channel configuration). Cetaceans farther offshore in the Swatch-of-No Ground, a 900m+ deep submarine canyon, may also show distinct distributional responses to a decline in the availability of nutrients associated with reduced freshwater discharge and alterations of current patterns that could suppress upwelling. Given that these waters support a diverse and relatively abundant cetacean community that will be dramatically affected by declining freshwater flows and climate change, it is concluded that the animals may be an efficient model for gauging the effects of these anthropogenic threats on the same species elsewhere in their range, and possibly other cetaceans subject to similar environmental pressures. In addition, studies of this cetacean community may provide fundamental insights on the nature and magnitude of more general ecological effects (e.g. changes in the abundance and species composition of lower-level trophic communities) and a basis for developing appropriate management responses. Baseline information and trained local expertise is available, thus offering a solid ground for long-term studies and monitoring.

13. MACRANDER, A.M., CHILDS, S., SMITH, P.R., FUNK, D.W., KOSKI, W.R. and IRELAND, D. Planning and conducting marine seismic surveys to minimize impacts on marine mammals and subsistence use of marine resources in

the Chukchi and Beaufort Seas in 2006-07.

14. KOSKI, W.R., FUNK, D.W., IRELAND, D., LYONNS, C., MACRANDER, A.M. and VOPARIL, I. Feeding by bowhead whales near an offshore seismic survey in the Beaufort Sea.

SC/60/EM

MORISSETTE, L., KASCHNER, K., MELGO, J.L. and GERBER, L. Food web models and data for studying the interactions between marine mammals and fisheries.

We are developing ecosystem models to examine the trophic interactions between marine mammals and fisheries in (1) Northwest Africa, (2) the Caribbean, and (3) the tropical South Pacific. Food web models are being constructed using the Ecopath and Ecosim software (EwE, www.ecopath.org) to examine the potential impact of a reduction in the abundance of great whales on fishery yield. An extensive literature search is being conducted to synthesize available data about ecological parameters and trophic interactions for marine mammals, fish and invertebrates to parameterize models for our three study areas. Models will allow us to characterize the structure and function of these ecosystems in terms of biomass, mortalities, consumption rates, food habits, general ecosystem indicators and fisheries. Faced with sparse data for our study regions, we are explicitly accounting for uncertainty in input data, ecosystem structure, model accuracy, and basic assumptions about marine mammal feeding rates, abundance estimates, or consumption in breeding areas. In addition, we are conducting an extensive sensitivity analysis to examine the effects of model parameters and changes in model assumptions. The predictability of our models is validated with time series of biomass for important species of the system. We then use our model as a predictive framework for examining the ecosystem impacts of changes in the abundance of large whales, including possible increases or decreases of fisheries catches. We present preliminary results from our Northwest Africa model, which includes the Large Marine Ecosystem (LME) of the Canary Current, located on the eastern part of the Atlantic Ocean, and bounded by the coasts of Morocco, Mauritania, Senegal, Guinea-Bissau, the Canary Islands (Spain), Gambia, Cape Verde and Western Sahara. The model includes 8 marine mammals groups and 17 additional groups comprised of fish, seabirds, invertebrates, benthos, and plankton. Both local and foreign fleets are also included in the model. Preliminary results indicate that: 1) The overlap between prey species consumed by marine mammal and species targeted in fisheries is low; and 2) Given a wide range of assumptions about whale abundances, diet composition and food consumption in breeding areas, we consistently found that: (a) Whale consumption is several orders of magnitude lower than total fishery catches; (b) Food intake of whales in our study area is two orders of magnitude lower than the amounts taken by other trophic groups (e.g. pelagic fishes); (c) Indirect impacts of great whale consumption on fisheries yield are positive in some cases (beneficial predation); and (d) In preliminary simulations, reducing whale biomass does not influence the biomass of commercially important fish, nor any other species of the food web. While our results are preliminary, we expect that our modeling approach will begin to answer questions about the competition between whales and commercial fisheries in these regions, and will allow the identification of data gaps and additional research needs.

2. LEAPER, R., BEST, P.B., BRANCH, T.A., DONOVAN, G., MURASE, H. and VAN WAEREBEEK, K. Report of review group of data sources on odontocetes in the Southern Ocean in preparation for IWC/CCAMLR workshop.

3. ZERBINI, A., BANNISTER, J.L., BRANCH, T.A., CLAPHAM, P., DONOVAN, G., LEAPER, R. and REILLY, S. A review of abundance, trends and foraging parameters of baleen whales in the Southern Hemisphere.

SC/60/IA

*1. ENSOR, P., MINAMI, K., MORSE, L., OLSON, P. and SEKIGUCHI, K. 2007-2008 International Whaling Commission-Southern Ocean Whale and Ecosystems Research (IWC-SOWER) Cruise. 51pp.

We conducted the 30th annual IWC-SOWER (formerly IDCR) Cruise in the eastern part of Antarctic Area IV aboard the Japanese Research Vessel Shonan Maru No.2. The cruise departed Fremantle, Australia on 24 December 2007 and returned to Benoa, Bali, Indonesia on 26 February 2008. The cruise had three main objectives: 1) survey waters outside the pack ice for minke whales in collaboration with an aerial survey of waters inside the pack ice conducted by the Australian Antarctic Division; 2) continue research as in previous years on blue whales, and; 3) continue research as in previous years on fin, southern right, and humpback whales. After transiting to the research area, we carried out a whale survey including several method experiments designed to improve and interpret estimates of Antarctic minke whale abundance from previous cruises and to inform the design of future SOWER cruises. From 31 December to 13 January a systematic survey for minke whales was conducted west to east (105°-120°E), in two survey strata. This portion of the survey was intended for collaborative, synchronized coverage with a 15-day Australian aerial survey, however the aerial survey was cancelled. The same research area was re-surveyed, east to west, 13 January to 13 February. During the intended collaborative survey (west to east), a total of 1269.8 n.miles were surveyed in two modes: SS-II Mode (660.5 n.miles) and IO Mode (609.3 n.miles). During the re-survey a total of 1049.5 n.miles was covered (481.6 n.miles in SS-II Mode and 567.9 n.miles in BT-Option II Mode). The total number of minke whales sighted during the entire coverage of the research area was 35 groups, 71 animals. Humpback whales were the most frequently sighted species in the research area, with 283 groups, 483 animals observed. One group of two Antarctic blue whales was sighted adjacent to the ice edge on 10 February at 64°29'S 105°27'E. Identification photos, video, and acoustic recordings were collected. Sightings of other large baleen whales included fin whales (14 groups, 42 animals) and southern right whales (7 groups, 8 animals). An additional, solitary southern right whale was observed during the transit from Fremantle to the research area at 40°29'S 112°41'E. Nine groups (62 animals) of killer whales were sighted in the research area. One group (11 whales) was assessed to be type A and one group (2 animals) was assessed to be Type B. The remaining 7 groups were of undetermined type. Notable sightings during the cruise included 5 groups, 6 animals of spectacled porpoise. During the cruise biopsy samples were collected from 3 fin, 7 humpback, 9 right, and 1 killer whale. Photo-ID images of 2 blue, 3 fin, 56 humpback, 9 right, 28 minke, and 16 killer whales were obtained. Acoustic recordings were conducted at a total of 48 stations using sonobuoys. Sounds attributed to blue whales were recorded during 8 opportunistic stations and 1 station conducted in the vicinity of the sighted blue whales. During SOWER 2007-08 the Estimated Angle and Distance Training Exercise and Experiment was completed as in previous years.

*2. PUNT, A.E. and POLACHEK, T. Further analyses related to application of statistical catch-at-age analysis to Southern Hemisphere minke whales. 46pp.

The statistical catch-at-age approach developed by Punt and Polacheck (2005, 2006, 2007) is updated to allow selectivity for the JARPA indices of relative abundance to differ from uniform and to include ageing bias as well as ageing imprecision. The approach is applied to catch, catch-at-length, and age-length keys as well as indices of relative and absolute abundance for minke whales in Antarctic Areas III-E, IV, V and VI-W. The results again confirm the result from earlier studies that the recruitment of Southern Hemisphere minke whales in Areas III-W, IV, V and VI-W increased until about the early- to mid-1960s and declined thereafter. Sensitivity tests show that the estimator is more stable and the results more biologically realistic when parameters are shared between the W and E stocks and that the results are insensitive to leaving the JARPA indices of abundance out of the analysis. The results from an initial analysis of the impact of allowing for (time-invariant) ageing bias depend on whether the parameters which determine growth, natural mortality, resilience and changes over time in carrying capacity are shared between the W and E stocks. Estimates of natural mortality and the ability of the model to yield biologically realistic estimates are sensitive to level of random ageing error assumed. A preliminary application of the MCMC algorithm to characterize uncertainty was unsuccessful, perhaps because of the complexity of the model. An initial evaluation of the estimation approach using simulation suggests that trends in abundance and natural mortality are generally captured even if some key assumptions are violated, but that estimates of some model outputs can be biased if assumptions are violated. The results also suggest that asymptotic variance estimates are too low. Future simulation evaluation needs to explore a broader range of operating model scenarios and estimation procedures. The results presented remain preliminary because of a number of currently unresolved questions about the model input and structure, including abundance estimates, and ageing error.

3. PALKA, D. and SMITH, D. Description of the simulated IWC IDCR/SOWER line transect data.
4. KELLY, N., PEEL, D., PIKE, D., BRAVINGTON, M.V. and GALES, N. Aerial survey of minke whales off East Antarctica: report on 2007/08 test survey and future plans.
5. KELLY, N., PEEL, D., HEDLEY, S. and BRAVINGTON, M.V. Design of future SOWER cruises: an update.
- *6. LEAPER, R., BURT, L., GILLESPIE, D. and MACLEOD, K. Comparisons of measured and estimated distances and angles from sighting surveys. 12pp.
Photo-grammetric systems using video cameras were used to measure radial distances to sightings during the SCANS-II, CODA and SOWER surveys. These surveys included sightings of a variety of species from harbour porpoise at distances of a few hundred metres to large baleen whales at distances greater than 10km. A total of 885 initial sightings with estimated distances from reticles and measured distances from video, using 7x50 binoculars (610) or 25x 'Big Eyes'(275), were compared. Bearings to sightings were also measured from still images on the SCANS-II and CODA surveys. The CV of the Root Mean Square (RMS) error in distances varied between 0.18 and 0.33. For all data sets there was a significant linear regression between $\log(\text{estimated})-\log(\text{measured})$ and $\log(\text{measured})$ indicating that when using reticles, closer distances were over-estimated and further distances under-estimated. Bearing data showed around 5% of estimates had gross errors greater than 20° that were attributed to mistakes. For the remaining values, RMS errors were 6-7°. Analysis of distance estimates to small cetaceans using naked eye from SCANS-II, based on simultaneous surfacings, also suggested a tendency to over-estimate close distances and under-estimate larger ones. In this case, fitted detection functions to estimated and measured distances gave estimated strip widths that differed by 29%. There still remain technological challenges in operating complex electronic systems at sea to measure distances and bearings, but where these have been successfully used there has been a considerable improvement in data quality.
- *7. BURT, L. and BORCHERS, D.L. Analysis of the BT mode experiments conducted on the IWC-SOWER 2005/06 and 2006/07 cruises. 14pp.
IWC sightings surveys have taken place in the Antarctic since 1978/79. In order to interpret the minke whale abundance estimates obtained from data collected on these surveys and to improve the survey design of future cruises, BT mode experiments were conducted during the IWC-SOWER 2005/06 and 2006/07 cruises. The BT mode combines mark-recapture and distance sampling methods to overcome two difficulties associated with conventional distance sampling survey methods (i.e. ensuring that animals on the trackline are certain to be seen and that they are seen before they have moved in response to the vessel). This report describes the search protocol, analysis and results from these BT mode experiments. The BT method allows the probability of detection on the trackline for the 'primary' observer to be estimated. Two configurations of BT mode were implemented; BT-NSP and BT-option 2. In BT-NSP mode, the primary observer was the topman in the barrel who searched as on a standard SOWER cruise. The estimates of $g(0)$ for the topman for the different years and combinations of data and models, ranged between 0.39 (%cv=32) to 0.69 (%cv=23). In BT-option 2, the primary observer was on the independent observer platform and searched with naked eye. The estimates of $g(0)$ for two different models were 0.25 (%cv=59) and 0.32 (%cv=49). One of the requirements for a BT mode survey to succeed is a separation of search regions between the different observers. This seemed to be more successfully achieved in BT-option 2.
- *8. OKAMURA, H. and KITAKADO, T. Abundance estimates of Antarctic minke whales from the historical IDCR/SOWER survey data using the OK Method. 19pp.
This document presents the specifications of the OK method and the results on the estimation of the abundances of Antarctic minke whales from the historical IDCR/SOWER survey data. The method is based on a design-based approach with the revised hazard probability model, which was applied to the data obtained by the surveys from 1985/86 to 2003/04. The averaged values of $g(0)$ over all school sizes by taking heterogeneity into account were 0.47 for CPII and 0.53 for CPIII. The abundance for each management area was estimated using the "survey-once" method. The total abundances in the survey areas were 1,048,801 for CPII and 720,526 for CPIII without the common northern boundaries (CNB), and 1,086,588 for CPII and 665,074 for CPIII with introducing the CNB. Obviously, the advanced method with consideration of $g(0)$ estimation reduced the difference in comparison with the abundance estimates with $g(0) = 1$. In terms of the area-specific estimates, the differences between CPII and CPIII were quite small for Areas III, IV and VI, while those for Areas I, II, and V were large. These results clearly warrant necessity of future area-specific investigation.
- *9. OKAMURA, H. and KITAKADO, T. Graphical diagnosis for the IDCR/SOWER abundance estimates using the OK Method. 67pp.
This document presents the diagnostic plots of the Antarctic minke whales abundance estimation using the Okamura and Kitakado method. All the plots generally showed good fits.
10. OKAMURA, H. and KITAKADO, T. Summary of simulation trials of Antarctic minke whale abundance surveys using the OK Method.
11. ZENITANI, R. Examination of the changes in sexual status of the Antarctic minke whales in relation to ice formation, as a means to understand yearly variation in proportion of the population in polynyas.
12. MATSUOKA, K. Tendency in abundance estimate and density of Antarctic minke whales through the three sets of IDCR/SOWER circumpolar cruises.
- *13. MORI, M. and BUTTERWORTH, D.S. Some modifications to the current ADAPT-VPA Model for Antarctic minke whales. 5pp.
The current ADAPT-VPA model of Mori et al. (2007) for Antarctic minke whales in Areas III-E to V-W is modified in two respects. One is the revision of the stock-recruitment relationship, and the other is the simplification of the functional form of the carrying capacity. AIC indicates that the model which includes the above two modifications is better compared to the "Reference case" scenario of Mori et al. (2007). Thus, future analyses will regard this modified version as a new "Reference case" scenario, which has the incidental advantage of corresponding more closely to the assumptions made in the SCAA (Statistical Catch at Age) approach of Punt and Polacheck (2006) to analysis of these data.
- *14. POLACHECK, T. and PUNT, A.E. Age estimation of Southern Hemisphere minke whales: issues and error models based on data from the 1984 IWC Aging Workshop. 26pp.
Age estimates for 360 Southern Hemisphere minke whale earplugs by nine independent readers done in conjunction with the 1983 IWC minke ageing workshop (IWC 1984) are analyzed to provide insights into issues related to the accuracy and precision of the age estimates from the commercial and JARPA catches. Some preliminary models of biases and variances in age estimates are developed based on the comparative age readings as a way to explore the robustness of the population modelling results to errors in the ageing data. Cross comparison of the age estimates by the different readers indicates that systematic inconsistency (i.e. ageing bias) exists for at least some of the readers, and that the amount of bias is related to the estimated (and hence true) age. However, comparisons of this type do not allow the biased readers to be identified, but only to conclude that the readings by at least one, if not all, of the readers are not unbiased. The results also suggest that there is also likely to be a substantial amount of "random" (non-systematic) error in the age estimates of experienced readers. There is also substantial variability among readers in their assessment of the readability of an earplug. Some readers considered that a substantial proportion of the 360 earplugs were unreadable or attached qualifications to their estimates (i.e. as high as 42%). If those readers' estimates are unbiased then increased bias may be associated with the estimates by other readers for these "unreadable" earplugs based on limited data and analyses. Evaluation of the readability of earplugs is a problem requiring further investigation. There is a need for further work to develop appropriate ageing error models for the existing and future age reading readings underpinned by adequate data.
- *15. BEEKMANS, B.W.P.M., FORCADA, J., MURPHY, E.J., DE BAAR, H.J.W. and BATHMANN, U.V. Antarctic

minke whale (*Balaenoptera bonaerensis*) density distributions in the Southern Ocean: a preliminary analysis. 19pp.

There is a need to characterise the physical environment associated with minke whale density in order to understand long-term changes in Antarctic minke whale distribution and density in the Southern Ocean in austral summer months. We developed spatial models for Antarctic minke whale densities using generalised additive models (GAMs) based on line transect data collected for the IDCR (International Decade of Cetacean Research) and SOWER (Southern Ocean Whale Ecosystem Research) programmes. The GAMs were fitted independently by survey year. Selected GAMs included combinations of the following covariates: distance from the sea ice edge, bathymetric depth and distance from the shelf edge, distances from the Southern Antarctic Circumpolar Current Front (SACCF) and the Southern Boundary of the Antarctic Circumpolar Current (SBACC), Optimally Interpolated Sea Surface Temperature (OISST) and latitude. Explained deviances ranged between 24.5% and 66.8%. The spatial models did not show consistent relationships between the covariates and their effect on densities, although in most models Antarctic minke whale densities tended to be higher close to the sea ice edge and/or in colder surface waters. Predicted mean densities were in most regions lowest for the most recent surveys. In four out of ten regions, this coincided with a change in the relationship between at least one year-specific covariate and its effect on Antarctic minke whale density, with those relationships becoming non-significant over time. These changes in ecological relationships may reflect changes in the sea ice environment, which are not captured by the covariates we considered for the spatial models. Further work will investigate the variability in relationships between covariates and their effect on minke whale densities by focusing on overall environmental features that characterised the surveyed regions, such as changes in sea ice extent.

16. KITAKADO, T. and ZENITANI, R. Evaluation of statistical power of a test for examining bias in age-reading experiment for Antarctic minke whales.

SC/60/NPM

1. AN, Y.R., CHOI, S.G., KIM, H.W. and KIM, Z.G. Cruise report of the Korean sighting survey in the East Sea in 2007.

2. PARK, K.J., AN, Y.R., CHOI, S.G. and KIM, Z.G. Abundance estimation of northwest Pacific minke whales using the Korean sighting survey in 2007.

3. AN, Y.R., PARK, K.J., CHOI, S.G. and KIM, Z.G. Plan for the Korean sighting survey in the East Sea in 2009.

4. MIYASHITA, T. Cruise report of the minke whale sighting survey in the Japan and the Okhotsk Sea off the northern Hokkaido in 2007.

SC/60/PFI

*1. SKAUG, H.J. Lack of spatial genetic substructure in the 2003-2006 catches of NA-minke whales. 8pp.

At its annual meeting in Berlin in 2003 the Scientific Committee conducted an Implementation Review for North Atlantic minke whales (IWC, 2004). Based on genetic (and other) information it was decided to leave the definition of Medium Areas unchanged, while the definitions of Small Areas (SMA) within the eastern Medium Area were changed (Fig. 1). The genetic data available at the time were primarily the Norwegian catches from the years 1997-2002, as contained in Norwegian minke whale DNA-register, but studies based on other markers and samples from earlier years were also reviewed (IWC, 2004). The present paper complements the genetic analyses conducted as part of the Implementation Review, with analyses based on data from the years 2003-2006.

*2. SHIMADA, H., OKAMURA, H., KITAKADO, T. and MIYASHITA, T. Abundance estimate of western North Pacific Bryde's whales for the estimation of additional variance and CLA application. 34pp.

This paper presents the abundance estimates by survey block to finalize the abundance estimate with additional variance of western North Pacific Bryde's whales for the Catch Limit Algorithm application which is dealt in Kitakado et al. (2008). Two sets of abundance estimates from the recent sighting surveys (1998-2002) and the past ones (1988-1996) are obtained using the conventional line transect method assuming $g(0)=1$. During the recent period only, the surveys were conducted following the Guidelines Within the RMS and under oversight by SC. Due to the recommendations and suggestions from the last 59th SC, cut-off of the area with biased efforts, and modification of sampling units were conducted. For the recent period, the sighting data was stratified by sub-area. The effective search half width (esw) was estimated using hazard-rate probability model without adjustment terms. The esw and the mean school size stratified by sub-area were selected as the best case with minimum AIC and Bonferroni's multiple t-tests respectively. It is necessary to estimate an additional variance to estimate abundance in each sub-area because the surveys were conducted in multi-year and covered in part of management area in each year. The abundance in the past survey (1988-1996) was estimated to compare with the recent one to estimate the additional variances.

*3. KITAKADO, T., SHIMADA, H., OKAMURA, H. and MIYASHITA, T. CLA abundance estimates for western North Pacific Bryde's whales and their associated CVs with taking the additional variance into account. 27pp.

This paper aims at providing recent information on abundance of western North Pacific Bryde's whales, which could be used in the Catch Limit Algorithm (CLA). The estimation procedure consists of a total of three stages: 1) get sets of underlying abundance estimates in 1988-1996 and 1998-2002 surveys (dealt in Shimada et al., 2008), 2) estimate the process error (additional variance) in a mixed-effect model by a restricted maximum likelihood method based on the underlying abundance estimates, and then 3) provide point estimates for abundances in 1998-2002, by integrating the information from two different survey modes in 1998-2002 surveys, as well as their associated CVs by taking the extent of the process error into account. Note that abundance estimates from 1988-1996 surveys, which were not subject to oversight by IWC because of no oversight system at that time, did not affect the point estimates of abundances for CLA but was used only for the estimation of the process error. To assess the impact of model assumptions and data utilized on the estimation of the process error and abundances, computation were made under nine different run sets in total. Under the selected case in a base scenario, where the effective strip widths and mean school sizes were estimated by the sub-area and survey period and a log-normal mixed effect model was employed in the estimation of the process error, the estimated value of the additional CV was 0.447 (CV=43.1%). Taking the additional CV into account, the abundance estimates in sub-areas 1W, 1E and 2 were 4,957 (CV=39.8%), 11,213 (CV=49.8%) and 4,331 (CV=55.3%), respectively, and that in the whole area was 20,501 (CV=33.7%). The value of the additional CV under a count-based model was 0.535 (CV=50.2%) and was greater than the above value, which implied that the resultant CVs in abundance estimates were also higher than those in the log-normal model; CV=43.9%, 55.1%, 60.0% and 36.6% for sub-areas 1W, 1E and 2, and the whole area, respectively.

4. BØTHUN, G., SKAUG, H.J. and ØIEN, N. Towards an estimate of minke whale abundance in the northeast Atlantic based on survey data collected over the period 2002-2007.

*5. BØTHUN, G., ØIEN, N. and SKAUG, H.J. Measurement error in survey and experiment, Norwegian minke whale surveys 2002-2007. 8pp.

As part of the Norwegian multiyear surveys to estimate minke whale abundance in the Northeast Atlantic, experiments to evaluate naked eye distance estimation and angle board reading are conducted. Several error models for the experimental data collected over the recent six-year period 2002-2007 are explored and these results are also compared to information from survey duplicate data. The duplicate observations from the survey show a smaller variance in radial distance than the same values from the experiments, while the situation is opposite for angle readings. The mean radial distance and angle are larger in the experiments than in the surveys but it is unclear how this may effect variance.

*6. ØIEN, N. Report of a Norwegian 2007 survey for minke whales in the Small Management Area EB in the northeast Atlantic. 6pp.

As part of the six-year program over the period 2002-2007 with the aim to get a new estimate of minke whale abundance in the Northeast Atlantic, the eastern Barents Sea, comprising the Small Management Area EB, was surveyed with two vessels during the summer 2007. There were five blocks with a planned basic coverage of about 2,000 nautical miles. In total about 2,300 nautical miles were searched with primary effort. The most common species sighted were Lagenorhynchus dolphins (99 groups seen from the primary platform), minke whales (88 groups seen from the primary platform), harbour porpoises (37 groups), fin whales (15 groups) and humpback whales (11 groups). Opportunistic collections were made of biopsy samples from one minke whale, two fin whales and 52 humpback whales, and photo IDs were collected from 57 humpback whales, three fin whales and three minke whales.

7. ØIEN, N. and BØTHUN, G. Planning of surveys 2008-2013 to estimate abundance of minke whales in the northeast Atlantic.

*8. ØIEN, N., BØTHUN, G. and KLEIVANE, L. VHF and Satellite tagging of minke whales at Svalbard in 2007 - update on minke whale surfacing rates. 6pp.

We present results from a dive time experiment on a minke whale off Spitsbergen in August 2007 and compile a table summarizing all such data collected by radio tagging methodology over the years 1989-2007. The 2007 minke whale was followed over a period of five days showing mean half-hour intersurfacing intervals varying over the range of about 30-100s and a mean blow rate of 62 blows/hour, which is in accordance with data collected previously. One minke whale was also satellite tagged in the same general area and both whales seemed to adopt a pattern of rapid movement between several possible feeding areas within a larger general area.

9. PASTENE, L. Research proposal accompanying management variant 2 of the RMP *Implementation* for western North Pacific Bryde's whale.

*10. PAMPOULIE, C., DANÍELSDÓTTIR, A.K. and VÍKINGSSON, G.A. Genetic structure of the North Atlantic common minke whale (*Balaenoptera acutorostrata*) at feeding grounds: a microsatellite loci and mtDNA analysis. 17pp. The common minke whale (*Balaenoptera acutorostrata*) is widely distributed in the North Atlantic and is frequently observed along the Icelandic, Norwegian and Portugal coasts, in eastern Canada, North Sea and Greenland, and around Jan Mayen and Svalbard islands. Traditionally, the management of the North Atlantic common minke whales has been based on four geographical subdivisions partitioned by the international Whaling Commission, namely the Canadian East coast stock, the West Greenland stock, the Central stock (Iceland) and the Northeastern stock (Norway). These management regions have been primarily established through studies based on catch statistics, biological characteristics and tagging. Lately, genetic studies tend to confirm the established subdivisions. The primary goal of the present study was to assess the genetic variation of North Atlantic common minke whales collected at different geographical regions using 16 microsatellite loci and mtDNA sequencing. Both genetic markers gave congruent results and did not show significant genetic signals among the samples collected. In addition, two distinct groups of haplotypes were detected and there was a lack of concordance between geographic and phylogenetic position of mtDNA haplotypes. Together these results suggested the presence of two breeding sites based on the two haplotypes groups detected but a lack of genetic structure of the North Atlantic minke whale at feeding grounds.

*11. PAMPOULIE, C., DANÍELSDÓTTIR, A.K., BÉRUBÉ, M., PALSBOELL, P.J., ÁRNASON, A., GUNNLAUGSSON, T., ÓLAFSDÓTTIR, D., ØIEN, N., WITTING, L. and VÍKINGSSON, G.A. Lack of genetic divergence among samples of the North Atlantic fin whale collected at feeding grounds: congruence among microsatellite loci and mtDNA in the new Icelandic dataset. 17pp.

The main objective of this study was to confirm the level of genetic differentiation observed among samples of fin whale collected at feeding grounds using a new dataset composed of 500 selected individuals genotyped for 15 microsatellite loci and the mtDNA was sequenced. New methods of amplification have been used (especially for the microsatellite loci) to successfully genotype these selected individuals. Both types of genetic markers employed revealed a lack of genetic differentiation among samples collected and therefore suggest that extensive gene flow might prevail among fin whale population and/or that a recent population expansion of the species occurred. The signal of population expansion detected with the mtDNA might suggest that population of fin whale are not at equilibrium and that further analyses based on this information should be carried out (calculation of potential time of expansion and divergence). However, the comparison of these results to the allozyme data that have been recently submitted revealed that the observed *F_{ST}* values at the allozyme loci are likely to be due to diversifying selection at different breeding sites that accentuates differences not readily apparent at neutral loci. At neutral markers such as microsatellite loci, in the absence of gene flow, genetic differentiation among populations due to drift and/or mutation will rise given enough time, while selection on non neutral markers (allozyme) in the absence of gene flow will accentuate differences among populations in a shorter time period, depending on the strength of the selective processes.

*12. PIKE, D.G., GUNNLAUGSSON, T. and VÍKINGSSON, G.A. T-NASS Icelandic aerial survey: survey report and a preliminary abundance estimate for minke whales. 29pp.

The Icelandic aerial survey component of the T-NASS project is a continuation of a series of surveys covering Icelandic shelf waters, using nearly identical design and methodology, conducted in 1987, 1995 and 2001. The primary target species is the common minke whale (*Balaenoptera acutorostrata*) with humpback whales (*Megaptera novaeangliae*) and harbour porpoises (*Phocoena phocoena*) as secondary targets. Cue counting methods are used for baleen whales while standard line transect procedures are used for other species. The latest survey was conducted in June – July 2007 and achieved 79% of planned coverage under acceptable conditions. A total of 431 unique sightings were made, including 70 groups of minke whales, 119 of harbour porpoises, 58 of humpback whales and 109 of white-beaked dolphins (*Lagenorhynchus acutus*). The general distribution pattern of most species was similar to that seen in previous surveys, with some exceptions. Minke whales occurred in lower numbers and were absent from some nearshore areas where they were abundant in previous surveys. The abundance estimate for minke whales using unique sightings from all observers and standard cue counting methods is 10,680 (95% CI 5,873, 17,121), only 24% of the estimate from 2001, a significant decrease. This decrease is almost certainly not an artefact of changes in survey methods. Several factors that may have contributed to the apparent decrease are presented but the proximate cause remains uncertain. Harbour porpoise sightings were made in all nearshore blocks in much higher numbers than previously seen: this is probably primarily because an experienced harbour porpoise observer was employed on the survey. Humpback whales were absent from eastern Iceland where they have been abundant previously, but this may have been the result of gaps in coverage. Recommendations to improve future surveys in the area are presented.

*13. PIKE, D.G., GUNNLAUGSSON, T., VÍKINGSSON, G.A. and MIKKELSEN, B. Estimates of the abundance of fin whales (*Balaenoptera physalus*) from the T-NASS Icelandic and Faroese ship surveys conducted in 2007. 18pp.

The Trans North Atlantic Sightings Survey (T-NASS) was conducted in June/July 2007 and covered a large area of the northern North Atlantic. The fin whale (*Balaenoptera physalus*) was a target species in all areas and a main target species of the Icelandic ship surveys.

14. VÍKINGSSON, G.A., GUNNLAUGSSON, T., MIKKELSEN, B. and DESPORTES. TNASS (Trans North Atlantic Sightings Survey), cruise report for the Icelandic and Faroese vessels.

SC/60/RMP

*1. PUNT, A.E. A note regarding how to model MSY-related parameters when population dynamics are stochastic. 13pp. A method is outlined for calculating the values for the parameters which determine MSYR and MSYL in the types of population dynamics models on which *Implementation Simulation Trials* are based in the face of environmental variability. The method is illustrated using a minke whale-like biology in which MSYR is defined in terms of harvesting of the mature female component of the population. Results are shown for various levels of environmental

variation in survival and fecundity.

SC/60/SD

1. MORIN, P.A., MARTIEN, K.K., ARCHER, F.I., TAYLOR, B.L. and CIPRIANO, F. A template for quality control and reporting of genetic data used in management.

Genetics studies are playing a substantial role in defining units to conserve in cetaceans. These definitions in turn affect conservation and management with significant impacts on not only the animals but also the human enterprises that depend upon or impact the animal populations. There have been full or partial fisheries closures, and debates of the merits and uses of genetic data used to define conservation units. Efficient use of genetic data when sample sizes are expected to increase through time also needs planning to make current datasets compatible with expected future data, which requires careful documentation of laboratory protocol. For these reasons, genetic data and their application in management decisions should be as transparent as possible, and data quality be clearly described and controlled. In this paper, we outline the major quality control and quality analysis steps that we believe should be applied to two of the most common types of genetic data, mitochondrial DNA haplotypes and microsatellite genotypes, though many of these steps can and should also be applied to any type of genetic data. We present these steps both as guides to conservation geneticists, and as an initial protocol to be used by managers and others to evaluate genetics studies to determine whether they may hold up against legal and scientific challenges.

*2. MARTIEN, K.K., GREGOVICH, D., BRAVINGTON, M.V., PUNT, A.E., STRAND, A.E. and TAYLOR, B.L. TOSSM: an R package for assessing performance of genetic analytical methods in a management context. 5pp.

TOSSM (Testing of Spatial Structure Methods) is a package for testing the performance of genetic analytical methods in a management context. In the TOSSM package, any method developed to detect population genetic structure can be combined with a mechanism for creating Management Units (MUs) based on the genetic analysis. The resulting Boundary-Setting Algorithm (BSA) dictates harvest boundaries with a genetic basis. These BSAs can be evaluated with respect to how well the MUs they define meet management objectives.

3. GREGOVICH, D., MARTIEN, K.K., PUNT, A.E. and TAYLOR, B.L. Evaluating the performance of the CLA when population structure is not correctly identified.

4. MARTIEN, K.K. and GREGOVICH, D. Comparative performance testing of spatially explicit genetic analytical methods.

5. OKLAND, J.M., HAALAND, O.A. and SKAUG, H.J. A boundary setting algorithm based on genetically determined close relatives.

*6. ROSS, H.A. and SHEARMAN, H. Validation of mtDNA control-region sequences in GenBank for large baleen whales. 16pp.

The phylogenetic methods in DNA Surveillance, in conjunction with the curated reference sequence alignments known as Witness for the Whales, were used to assign species identities to the 922 sequences from baleen whales published in Genbank prior to 2007. Of these, 42 sequences were identified as belonging to a different species, and 44 to a different subspecies, from that recorded in Genbank. Fourteen blue whale sequences could not be assigned to a subspecies. A species identity could not be assigned unambiguously to seven sequences. A small number of sequences had evidence of poor or unreliable quality, but in each case the species identity as recorded in Genbank was confirmed here. Taxonomic revision is probably the greatest source of disagreement in the identities given by Genbank and DNA Surveillance. To provide better validation of sample origin, all major geographic regions need to be represented for each species in the reference data sets.

*7. STEVICK, P.T. Quantifying rates of inter-area movement using capture-recapture results: a comparison of methods. 12pp.

The extent to which individual animals move between habitat units determines population spatial structuring, influences social and reproductive systems and has important implications for management. However, the extent of inter-area movement may be difficult to infer from available data. In order to compare the behavior of five indices which may be used to quantify rates of inter-area movement using capture-recapture data, these were applied in simulations to data generated from a simple model. The results suggest that some of the methods that have been presented for estimating movement of individual marine mammals between habitats are poor predictors of the underlying biological processes and that the Interchange Index in particular should not be used. The simulations provide considerable support for use of Hilborn's estimator of transition probability and indicate that it is the most powerful and useful technique over a broad range of circumstances. The Movement Index is more limited in predictive ability, but may be of use in those situations in which comparison of observation with a specific expectation is of interest.

SC/60/SH

1. FRANKLIN, W., FRANKLIN, T., JENNER, C., JENNER, M., GONCALVES, L., LEAPER, R., BROOKS, L. and CLAPHAM, P. Photo-identification comparison of humpback whale (*Megaptera novaeangliae*) flukes from Antarctic Area IV with western and eastern Australian fluke catalogues.

*2. FRANKLIN, T., FRANKLIN, W., BROOKS, L., GIBBS, N., CHILDERHOUSE, S., SMITH, F., BURNS, D., PATON, D., GARRIGUE, C., CONSTANTINE, R., POOLE, M., HAUSER, N., DONOGHUE, M., RUSSELL, K., MATTILA, D.K., ROBBINS, J., OSTERMANN, A., LEAPER, R., BAKER, S. and CLAPHAM, P. Migratory movements of humpback whales (*Megaptera novaeangliae*) between eastern Australia and the Balleny Islands, Antarctica, confirmed by photo-identification. 12pp.

This report is an update of SC/59/SH18. We report here migratory movements of three humpback whales (*Megaptera novaeangliae*) between Eastern Australia (E1 breeding grounds) and the Area V Antarctic feeding area in the vicinity of the Balleny Islands. Using photo-identification techniques, comparisons between a Balleny Island fluke catalogue (n = 11 individuals), and existing fluke catalogues from Eastern Australia (n = 3120 individuals) and Oceania (n = 725 individuals), yielded three matches to Hervey Bay, Byron Bay and Ballina in Eastern Australia and no matches to Oceania. The Eastern Australia catalogue (n = 3120) was made up of Hervey Bay (n = 1556), Byron Bay, (n = 916) and Ballina (n = 648). The Oceania catalogue (n = 725) is made up of Tonga (n = 282); New Caledonia (n = 160); French Polynesia (n = 159); New Zealand (n = 41); Cook Islands (n = 36); American Samoa (n = 31); Vanuatu, Niue, Samoa and Fiji (n = 11) and Norfolk Island (n = 5). Only three previous individual photo-identification matches have been reported between Eastern Australia (E1 breeding area) and Antarctic Area V feeding grounds and one genotype match has been reported between Antarctic Area V feeding grounds and Oceania breeding grounds. An analysis of the frequencies of whales seen and not seen in the Balleny Islands, Oceania and Eastern Australia, relative to the expected frequencies, based on the estimated population sizes and the sizes of the catalogues was used to inform a discussion of the implications of the matches between the Balleny Islands and Eastern Australia and the failure to find any matches between the Balleny Islands and Oceania. Based on the available information the evidence reported here supports the hypothesis that the migratory destination of the Area V humpback whales feeding around the Balleny Islands in Antarctica may be Eastern Australia.

*3. FRANKLIN, W., FRANKLIN, T., BROOKS, L., GIBBS, N., CHILDERHOUSE, S., BURNS, D., PATON, D., GARRIGUE, C., CONSTANTINE, R., POOLE, M., HAUSER, N., DONOGHUE, M., RUSSELL, K., MATTILA, D.K.,

ROBBINS, J., ANDERSON, M., OLAVARRÍA, C., JACKSON, J., NOAD, M., HARRISON, P., BAVERSTOCK, P., LEAPER, R., BAKER, S. and CLAPHAM, P. Evidence that eastern Australia (Breeding Area E1) may be a wintering destination for Area V humpback whales (*Megaptera novaeangliae*) migrating through New Zealand waters. 14pp.

Investigation of the migratory movement of humpback whales past New Zealand in the 1950s and early 1960s suggested that the primary factor influencing the migratory flow past New Zealand was behaviour associated with breeding and feeding. To the north humpback whales gathered in concentrated breeding assemblages, along the Great Barrier Reef, Australia and nearby islands of the Western Pacific, at locations with suitable coastal conditions. To the south humpback whales dispersed widely across the Antarctic Area V feeding areas. Discovery Tag marks provided the first evidence of linkages between Eastern Australia, New Zealand and Oceania and Antarctic Area V feeding areas and also revealed low levels of intermingling of individual humpbacks between isolated tropical breeding grounds in Western Australia, Eastern Australia and Oceania. A simultaneous, near total collapse of the Eastern Australian, Norfolk Island, New Zealand and Oceania stocks occurred in the early 1960's as a result of commercial whaling, particularly the illegal whaling conducted by the Soviets in the Area V feeding areas. Recent photo-identification and genetic studies have identified at least 5 discrete breeding sub-populations in Australia and Oceania; Western Australia (D), Eastern Australia (E1), New Caledonia (E2), Tonga (E3) and Cook Island's and French Polynesia (F). Also evident are low levels of intermingling amongst breeding sub-populations consistent with the degree of genetic differentiation. Photo-identification has confirmed linkages between Antarctic Area V feeding areas and Eastern Australia and one genotype match has been reported between Antarctic Area V feeding areas and Oceania breeding grounds. Recent abundance estimates show steady increases of the Eastern Australian population, some recovery in the New Caledonia and Tonga population with little evidence of recovery at other known Oceania breeding areas and in New Zealand. Studies to date have provided no conclusive evidence of the migratory destination of the New Zealand population traveling from Antarctic Area V feeding areas to tropical breeding grounds. Here we use recent photo-identification data to investigate and discuss the migratory destination of humpback whales traveling through New Zealand waters and suggest the hypothesis that humpbacks with site fidelity to Eastern Australia may migrate past the South Island of New Zealand including through the Cook Strait and Foveaux Strait.

*4. HERMAN, D.P., YLITALO, G.M., ROBBINS, J., STRALEY, J.M., GABRIELE, C.M., CLAPHAM, P., BOYER, R.H., TILBURY, K.L., PEARCE, R.W. and KRAHN, M.M. Age determination of humpback whales (*Megaptera novaeangliae*) through blubber fatty acid compositions of biopsy samples. 20pp [Not on website].

The ability to age individual humpback whales and to estimate population age distributions is critical to accurate assessments of status and long-term viability. Existing methods of ageing large whales rely either on limited longitudinal sighting studies of individual whales from the birth year or on post-mortem procedures to extract tissues suitable for age determination. Here, we describe a potential method for ageing live, free-ranging humpback whales using low-impact biopsy sampling techniques. Specifically, shallow outer-blubber samples were obtained from known-age whales from two distinct populations (North Atlantic, Gulf of Maine, n=39) and (North Pacific, Southeast Alaska, n=17) and analyzed for their fatty acid (FA) compositions. Of these, approximately one-half from each of the two populations had "exact" known ages, and one-half "minimum" ages. Multilinear FA-age models were then derived for these known-age whales and serve as the basis from which the age of unknown-age whales can be estimated. Four FA-age models were developed, including one for each humpback population analyzed separately, and an additional two by combining both populations into a single dataset and deriving models based on exact known-age and exact plus minimum known-age whales independently. Each of these empirical models was based on a linear combination of FA ratios (two specific FA ratios per model) rather than their individual FA compositions and each appears to be largely independent of sex, diet and nutritional status. Although the precision of these models was somewhat variable, preliminary results suggest that it may be possible to estimate the age of an individual humpback whale with better than decadal resolution using this approach. Moreover, with further analyses and testing, it is conceivable that when the data reported herein are supplemented by FA data for additional known-age humpback whales inhabiting widely distant populations, a single updated FA-age model can be derived allowing humpback whale age to be estimated over broad expanses of the globe.

5. ROBBINS, J., DALLA ROSA, L., ALLEN, J.M., MATTLA, D.K. and SECCHI, E.R. Humpback whale photo-identification reveals exchange between American Samoa and the Antarctic Peninsula, and a new mammalian distance record.

Humpback whales are seasonal migrants that mate and calve at low latitudes and feed at mid- to high latitudes. Migratory connections between specific Southern Hemisphere breeding and feeding areas are not well understood, but critical for assessing the impact of historic and proposed whaling activities. In this study, photo-identification was performed to identify the feeding grounds of humpback whales that winter at American Samoa, a low-density breeding area in Oceania. Between 2003-2005, fluke photographs were obtained from 57 individuals that were subsequently compared to 1,208 individuals from feeding grounds represented in the Antarctic Humpback Whale Catalog. A single individual (AHWC#2950) was successfully matched to a sighting made 3.74 years earlier at the Antarctic Peninsula. This is the first feeding area identified for American Samoa and the first live recapture between Oceania and the Antarctic Peninsula. At over 9,400-km, this displacement is the largest on record for a mammal, although the movement did not necessarily occur during a single migration. Whales from Oceania were previously assumed to follow a predominantly southward migration to Areas V or VI, whereas the Antarctic Peninsula (eastern Antarctic Area I) is a known destination for whales that winter off areas of western Central and South America. The intensity of photo-identification research at the Antarctic Peninsula likely increased the probability of detecting exchange there relative to other Antarctic areas. However, the large horizontal component of this match reinforces the need to further study humpback whale movement in the South Pacific and Southern Oceans.

*6. BRANCH, T.A. Biological parameters for pygmy blue whales. 13pp.

The basic biological parameters of blue whale populations are poorly known. To fill this gap, new estimates of the length-at-age relationship and natural mortality, and female age at sexual maturity and inter-birth interval were obtained for pygmy blue whales (*Balaenoptera musculus brevicauda*). The analyses are based on Soviet and Japanese ovarian corpora data and earplug data, assuming that one growth layer is added to earplugs each year. Length-at-age is estimated from Soviet length and earplug data in a Bayesian framework; the best fit equation is $l = 21.9(1 - \exp[-0.080(t + 16.2)])$ for females and $l = 21.1(1 - \exp[-0.089(t + 15.5)])$ for males; 95% credibility intervals are additionally presented for each age. Female length at sexual maturity was estimated to be 9.9 yr (95% credibility interval 9.0–11.0) from Soviet data and 9.9 yr (95% CI 8.0–11.8) from the less numerous Japanese data. A regression of earplug layers against ovarian corpora provided an estimate of 2.6 yr (95% CI 2.2–3.0) for the inter-ovulation interval, which is argued to be close to the inter-birth interval for pygmy blue whales. Natural mortality, estimated from age frequencies, is about 0.06 yr⁻¹ (95% CI 0.05–0.07), with inconsistent variability between sexes and data sources. Taken together, these estimates of the biological parameters imply that the natural rate of increase for pygmy blue whales was less than 2% per annum in the 1960s.

7. BRANCH, T.A. Current status of Antarctic blue whales based on Bayesian modeling.

*8. BRANCH, T.A. Biologically plausible rates of increase for Antarctic blue whales. 7pp.

Basic biology limits the possible rate of increase in natural populations. Simply put, no population closed to immigration can increase more rapidly than is allowed by survival rates, pregnancy rate, age at first parturition, and the proportion of female births. Using a basic equation that relates values of these parameters to the implied rate of increase, a biologically plausible distribution and an upper bound are estimated for rates of increase in Antarctic blue whales (*Balaenoptera musculus intermedia*). The literature is reviewed to obtain distributions for each of the input parameters: adult survival $S \sim N(0.963, 0.022)$, calf survival $S_j \sim N(0.84, 0.152)$, annual pregnancy rate $p \sim U(0.33; 0.5)$, age at first parturition $t_p \sim N(10, 22)$, and the proportion of births that are female $q_f \sim N(0.473, 0.0012)$. Lower and upper bounds were also placed on S , S_j , and t_p ; most important of these is the restriction that $S_j < S$. The resulting distribution for the instantaneous annual rate of increase is $\sim N(0.040, 0.0192)$ with an upper 99th percentile of 0.082, corresponding to annual rates of increase $\sim N(0.041, 0.0192)$ and 0.085 respectively. Estimated rates of increase from surveys of Antarctic blue whales (7.4% from JARPA, 8.2% from IDCR/SOWER) are close to this theoretical maximum of 8.5%, and have 95% confidence intervals that exceed the biological maximum possible rates.

*9. BRANCH, T.A., ALLISON, C., MIKHALEV, Y.A., TORMOSOV, D. and BROWNELL, R.L. Historical catch series for Antarctic and pygmy blue whales. 11pp.

Worldwide catch series are presented for blue whales during the modern whaling period (1868–1878), divided into five populations. There are only a handful of documented catches of blue whales prior to this period, and none afterwards. The data come from the IWC summary annual catch database and the IWC individual whale catch database, and correct for Soviet misreporting of blue whale catches in the late 1950s to early 1970s. Greatest emphasis is placed on obtaining updated catch series for Antarctic and pygmy blue whales, splitting them according to recent estimates of the proportion of each subspecies in different areas of the Southern Hemisphere and northern Indian Ocean. The total worldwide catches of blue whales were 382,595, of which 90.4% were Antarctic blue whales (345,775), 3.4% were pygmy blue whales (13,022), 1.4% were from the South-east Pacific (5,383), 2.1% were from the North Pacific (7,973) and 2.7% from the North Atlantic (10,442). These catch series are preliminary and no adjustment is made for struck and lost whales, except for a small fraction of the total that were reported to the IWC.

*10. BRANCH, T.A. and JACKSON, J.A. Minimum bottleneck abundance of Antarctic blue whales based on current mtDNA diversity. 7pp.

A lower bound for the bottleneck population size of Antarctic blue whales is estimated using the current mitochondrial DNA haplotype diversity in the extant population. The method relies on the observation that each of the 26 haplotypes in the current population represents at least one surviving female at the time of the bottleneck. Conservative correction factors are used to extrapolate from these 26 haplotypes to a lower bound on the bottleneck population. Correcting for low sample effort increases the number of haplotypes to 51, to which are applied multiplicative factors of 1.29 for haplotypes missed because of short mtDNA sequences, 2.11 for the sex ratio in the bottleneck population, 1.50 for overlapping generations in the bottleneck population, and 1.03 for haplotypes that went extinct after the bottleneck. The resulting lower bound of 214, if included in a revised assessment of Antarctic blue whales, would probably increase the estimated bottleneck population size, reduce the estimated population rate of increase and increase the estimated pre-exploitation abundance, resulting in a lower ratio of current abundance to pre-exploitation abundance for Antarctic blue whales.

11. RASMUSSEN, K., PALACIOS, D.M., CALAMBOKIDIS, J. and STEIGER, G.H. Bathymetric and thermal characteristics of humpback whale breeding habitat off Pacific Central America: comparison of Northern and Southern Hemisphere populations.

Humpback whales (*Megaptera novaeangliae*) have long been known to breed in warm, shallow waters. However, little work has been done to characterize their breeding habitat in terms of depth and temperature, or to determine whether breeding habitat can be predicted from a combination of these parameters at local and global scales. Two distinct humpback whale populations use coastal waters of Pacific Central America for breeding: whales from feeding areas off California are present there during boreal winter and whales from feeding areas off Antarctica and Chile during austral winter. This situation provides a unique opportunity for investigating whether these two populations have similar breeding habitat requirements. We used eight years of survey effort and sighting data collected at several sites along Central America during the Northern Hemisphere breeding season (December-March of 1996-2003) and six years of data for the Southern Hemisphere season (July-October of 2001-2004 and 2006-2007). For the midpoint of each 1.5km of search effort (n=19,800; total effort=29,672 km) and for each sighting location (n= 403), we extracted 1km resolution bathymetry data (SRTM30_PLUS v.3.0) and 4km resolution surface temperature data (AVHRR Pathfinder). We found that mother/calf pairs (n=158) were distributed near island groups and showed a clear preference for specific depth and temperature regimes, regardless of season, indicating that both populations have identical habitat requirements. These results have implications for predicting and managing sensitive areas for the species worldwide.

*12. RASMUSSEN, K. Humpback whales off the Pacific coast of Panama during the 2007 austral winter season. 7pp.

Humpback whales have previously been reported off the Pacific coast of Central America during the austral winter season. Photo-identification studies have shown that these whales are primarily migrating from feeding areas off the Antarctic Peninsula and Chile (breeding stock G). In this study, surveys were conducted in 2007 in the Gulf of Chiriquí, western Panama (7°18'-8°18'N, 82°54'-81°36'W), with the objectives of collecting identification photographs, documenting the presence of mother/calf pairs and other group types, and recording song. A total of 18 surveys were conducted between 28 July and 2 October 2007, covering 2,100km. Humpback whales were detected on all surveys either visually or acoustically. Sixty-two sightings of 125 humpback whales were made, and identification photographs of 34 individuals were obtained. No matches were found between these and the 46 whales identified in previous years off Central America, which indicates that much of this population remains unsampled. Of 86 hydrophone deployments, song was heard 58 times (67%). Of the 62 sightings, 29 were groups containing calves (47%), 13 (21%) were single animals, and 14 (23%) were pairs. Based on the high number of calf sightings, western Panama appears to be an important nursery area for humpback whales migrating from the Southern Hemisphere.

13. STEEL, D., GARRIGUE, C., POOLE, M., HAUSER, N., OLAVARRÍA, C., FLÓREZ-GONZÁLEZ, L., CONSTANTINE, R., CABALLERO, S., THIELE, D., PATON, D., CLAPHAM, P., DONOGHUE, M. and BAKER, C.S. Migratory connections between humpback whales from South Pacific breeding grounds and Antarctic feeding areas demonstrated by genotype matching.

Humpback whales congregate during the austral winter near island groups throughout the South Pacific. These islands range from New Caledonia in the west to the Society and Austral Islands of French Polynesia in the east, and lie directly north of the humpback Antarctic feeding grounds referred to by the International Whaling Commission (IWC) as Areas V and VI. For this reason, it has generally been assumed that humpbacks that winter in Oceania are part of the so-called Group V and VI stocks; however there is little direct evidence connecting breeding grounds of Oceania to Antarctic Areas. Here we present new records of migratory connections based on genotype matching (17 microsatellite loci, sex and mitochondrial DNA) between non-lethal samples collected throughout Oceania and those collected from Antarctic feeding Areas. A total of n = 1,756 samples were collected from six winter breeding grounds: (New Caledonia, Tonga, Samoa, Cook Islands, French Polynesia and Pacific coast of Colombia) and a total of n = 214 samples were collected from Antarctic feeding Areas I-VI. Comparison between the n = 1,065 unique genotypes from the breeding grounds and n = 175 from the feeding areas revealed 5 matches representing migratory connections: two between Tonga and Area I (western edge), one between Tonga and Area VI, one between Colombia and Area I (Antarctic Peninsula) and one between New Caledonia and Area V. Despite the relatively small number of samples from the Antarctic feeding areas, our genotype survey has doubled the number of connections previously documented by Discovery marking and recovery, and provides the first direct evidence of migration between New Caledonia and Area V. Further evidence is also provided for a relatively strong connection between Tonga and Areas VI and I, as well as for the previously established connection between the Pacific coast of Colombia and the Antarctic Peninsula.

14. JACKSON, J., ZERBINI, A., CLAPHAM, P., CONSTANTINE, R., GARRIGUE, C., HAUSER, N., POOLE, M. and BAKER, C.S. Progress on a two-stock catch allocation model for reconstructing population histories of east Australia and Oceania.

Humpback whales breeding along the coast of east Australia (E1) and near the islands of Oceania, South Pacific (E2+E3+F) are thought to feed in Antarctic Areas V and VI (110W to 120E). These breeding stocks were subject to intensive exploitation by pelagic and coastal whaling operations throughout much of the 20th century and have shown apparently variable rates of recovery. While east Australia has shown high rates of population increase, breeding stocks of Oceania, including those around Fiji and those that migrate past New Zealand, virtually disappeared and have yet to show signs of strong recovery. Reconstructing the history, and subsequent recovery of these populations is hampered by the difficulty of allocating historical feeding ground catch to each breeding ground population. Here we present progress on a two-stock Bayesian density-dependent logistic population model, developed to explore the influence of different catch allocations on the recovery of east Australia and Oceania. Within-stock feeding ground catch allocation was varied with the ratio of yearly abundance estimates from the breeding ground stocks. Probability distributions of carrying capacity (K), growth rate (rmax) and current abundance (N2008) were determined for all whales breeding throughout eastern Australia and Oceania

(E1+E2+E3+F), and within east Australia (E1) and Oceania (E2+E3+F). Estimates of current abundance were provided by capture-recapture modeling, using individual identification photographs collected from 1999-2004 (SPWRC 2007). Sensitivity of the population model estimates to prior distribution choice, catch allocation (Naïve, Fringe and Overlap) and estimates of current abundance was investigated. Median posterior estimates of combined carrying capacity for east Australia and Oceania ranged from 40,595-44,476. Recovery estimates (N2008/K) for the two-stock model with variable catch provided median stock recovery estimates of 21-23% (E1) and 8-9% (E2+E3+F).

15. ALBERTSON-GIBB, R., ANTOLIK, C., OLAVARRÍA, C., GARRIGUE, C., HAUSER, N., POOLE, M., BRASSEUR, M., STEEL, D. and BAKER, C.S. Using mitochondrial DNA and mixed-stock analysis to describe migratory allocation of humpback whales from Antarctic feeding areas to South Pacific breeding grounds.

Here we present mixed-stock analysis of mtDNA haplotypes as a method for allocating humpback whales from feeding areas in the Antarctic to low latitude breeding grounds. These breeding grounds include Western Australia, New Caledonia, Tonga, Cook Islands, French Polynesia and Colombia. We used an updated and expanded dataset of mtDNA haplotypes from breeding grounds of the South Pacific and Western Australia (Olavarria et al. 2007) and a more limited number of samples from Antarctic feeding Areas IV, V, VI and I to estimate migratory allocation using the Statistics Program for Analyzing Mixtures (SPAM). Assuming that the breeding grounds represented the 'pure stocks' and the feeding areas represented the 'mixed stocks'; the analysis allocated the largest proportion of the Antarctic Peninsula to Colombia (78.3%); as expected from previous photo-identification. The second highest allocation (15.6%) was to Cook Islands while Western Australia did not display any connection to the Antarctic Peninsula. For Antarctic Area VI, the highest allocation was to Tonga (78.9%), followed by New Caledonia (12.7%). Interestingly, neither Area I or Area VI were strongly allocated to French Polynesia. The number of available samples for Area V was insufficient for any meaningful comparison with breeding grounds. For Area IV, allocation was roughly equal to Western Australia (33.1%) and New Caledonia (31.0%).

16. JENNER, C., JENNER, M., BURTON, C., STURROCK, V., SALGADO KENT, C., MORRICE, M., MOLLER, L. and DOUBLE, M.C. Mark recapture analysis of pygmy blue whales from the Perth Canyon, Western Australia 2000-2005.

17. GEDAMKE, J. Regional differences in southern hemisphere fin whale vocalizations.

18. GEDAMKE, J. Use of an acoustic survey to assess blue whale abundance in eastern Antarctica: an initial attempt.

*19. ALLEN, J.M., CARLSON, C., VIECHNICKI, J. and STEVICK, P. Interim report: IWC Research Contract 16, Antarctic Humpback Whale Catalogue. 8pp.

College of the Atlantic (COA) has maintained a collection of humpback whale (*Megaptera novaeangliae*) identification photographs from the Antarctic since 1987. In 1998 the International Whaling Commission (IWC) approved funding to support the expansion of this catalogue to members of the IWC, with an aim to substantially improve the accessibility and organization of the database. The collection has been internationally collaborative from its beginning, with photographic contributions from 233 researchers and opportunistic sources. During the contract period, the Antarctic Humpback Whale Catalogue (AHWC) catalogued 332 photo-identification images representing 183 individual humpback whales from Antarctic and southern hemisphere waters. These images were submitted by 37 individuals and research organizations. Photographic comparison of submitted photographs to the AHWC during the contract period yielded 48 previously known individuals. These submissions bring the total number of catalogued whales identified by fluke, right dorsal fin/flank and left dorsal fin/flank photographs to 2,858, 409 and 405 respectively. This report details these findings, as well as other recent advances in the AHWC.

20. ACEVEDO, J. Migratory destination of humpback whales from the eastern South Pacific population as revealed by photo-identification analysis.

21. SOUTH PACIFIC WHALE RESEARCH CONSORTIUM. Report of the Annual Meeting of the South Pacific Whale Research Consortium.

Members of the South Pacific Whale Research Consortium met at the University of Auckland from 5-8 February, 2008 to discuss (i) the results of fieldwork and analysis conducted during 2007 and, (ii) conservation initiatives in the region. As with previous synoptic surveys dating back to the austral winter of 1999, surveys of humpback whales were conducted to collect genetic samples, individual identification photographs and song recordings in the four primary regions: New Caledonia, Tonga (Vava'u), Cook Islands and French Polynesia (Society Islands). Other regions surveyed in 2007 included Samoa, American Samoa, New Zealand, Hervey Bay, Norfolk Island and Tuvalu. Satellite tagging was conducted in the Cook Islands and New Caledonia revealing patterns of movement between breeding grounds and documenting the early stages of migration. A comparison of quality-controlled fluke photo-ID catalogues from the years 1999-2004 revealed only limited interchange between eastern Australia and Oceania (and only to New Caledonia, the closest breeding ground of Oceania) and further evidence of interchange among breeding grounds of Oceania. A large-scale comparison of microsatellite genotypes from samples collected throughout the South Pacific provided new records of interchange between Oceania and the Antarctic and, for the first time, between French Polynesia and Colombia (breeding stocks F and G). Song analysis for the years 2002-2006 showed a pattern of sequential movement of unique song types from eastern Australia, east across the breeding grounds of Oceania. Members once again expressed their opposition to Japan's continued lethal research programme in the Antarctic and their concern that the ongoing or planned hunt of fin and humpback whales could negatively impact small, recovering populations that are the subject of long-term non-lethal research by the Consortium.

*22. CASTRO, C., FORESTELL, P., KAUFMAN, G., SCHEIDAT, M., GIBSON, Q. and FERINA, D. Photo-identification of humpback whales *Megaptera novaeangliae*, in the Puerto Lopez part of Machalilla National Park in the Ecuadorian coast - South America: 1996 to 2007. 11pp.

Between 1996 and 2007 a photo-identification study of Southeastern Pacific Humpback Whales (*Megaptera novaeangliae*) was carried out on the Ecuador mainland (1°S, 80°W). During 11 years, 1172 whales were identified. A total of 79 (6.74%) humpback whales were resighted in Ecuador between years. The longest span between capture and recapture was one individual which was observed after 10 years of first photo-ID in the same place photographed the first time. Eighty two humpbacks whales (6.99%) were individually identified within the same year. The maximum period within season between first and last recapture was 98 days, while the minimum was one day.

*23. CASTRO, C., ACEVEDO, J., ALLEN, J.M., DALLA ROSA, L., FLÓRES-GONZÁLEZ, L., AGUAYO-LOBO, A., RASSMUSEN, K., LLANO, M., GARITA, F., FORESTELL, P., SECCHI, E., GARCÍA-GODOS, I., FERINA, D., KAUFMAN, G., SCHEIDAT, M. and PASTENE, L. Migratory movements of humpback whales (*Megaptera novaeangliae*) between Machalilla National Park, Ecuador and southeast Pacific. 6pp.

This paper investigates migratory movements of humpback whales (*Megaptera novaeangliae*) from Ecuador within their breeding area in the tropical southeast Pacific to their feeding area in Antarctic waters. The Ecuadorian photo-identification catalogue was compared to catalogues of Costa Rica, Panama, Colombia and Peru as well as with the Antarctic Whale catalogue (including Magellan Strait). Results show that 15 individuals present in the Ecuadorian catalogue were also found in the catalogues of Costa Rica, Panama and Colombia. 60 individuals were also identified in the feeding grounds, representing about 15% of the identified humpback whales in the Ecuadorian catalogue. This study demonstrates the importance of combining the photo-identification effort of different countries to increase our knowledge on migration patterns of Southern Hemisphere humpback whales.

24. VERNAZZANI, B.G., CARLSON, C.A., CABRERA, E. and BROWNELL, R.L. Status of blue whales off Isla de Chiloe, Chile, during 2008 field season.

25. BROWNELL, R.L., CARLSON, C.A., VERNAZZANI, B.G. and CABRERA, E. Skin lesions on blue whales off

southern Chile.

26. VERNAZZANI, B.G., CARLSON, C.A., CABRERA, E. and BROWNELL, R.L. Recent humpback whale sightings off Isla de Chiloe during 2008 field season.

*27. ACEVEDO, J., HUCKE-GAETE, R., SECCHI, E., ALLEN, J.M., AGUAYO-LOBO, A., DALLA ROSA, L., HARO, D. and PASTENE, L. Photo-identification analysis of humpback whales from three high latitude localities of the Eastern South Pacific population (Stock G). 5pp.

The Eastern South Pacific humpback whale population (or stock G) winters primarily off Colombia and Ecuador and spend the summer in feeding areas in the Magellan Strait and around the Antarctic Peninsula. In recent years humpback whales have been observed in the northern part of the Chilean Patagonian channels (Corcovado Gulf) during the summer and fall seasons. To investigate whether the Corcovado Gulf represent a feeding area destination for part of the Eastern South Pacific population, or alternatively, a migratory corridor to the more southern Magellan Strait or Antarctic feeding areas, photo-id pictures from the three relevant localities (Corcovado Gulf, Magellan Strait and Antarctic Peninsula), were examined. The absence of matches between the Corcovado Gulf and the Magellan Strait and Antarctic Peninsula suggest that the Corcovado Gulf might be a summer migratory destination for at least part of the Eastern South Pacific population. This result should be considered as preliminary due to the small number of pictures examined for the Corcovado Gulf. More photo-id and genetic studies are recommended for humpback whales in this locality.

28. COLLINS, T., CERCHIO, S., POMILLA, C., NGOUESSONO, S. and ROSENBAUM, H.C. Estimates of abundance using mark-recapture data for breeding stock 1B: Gabon.

*29. OLSON, P. Status of blue whale photo-identification from IWC IDCR/SOWER cruises 1987-1988 to 2007-2008. 7pp.

Over 21,000 identification photographs of blue whales were collected during 19 IWC IDCR/SOWER Antarctic cruises conducted from 1987-1988 to 2007-2008. Archiving and analysis of these photographs has been undertaken at SWFSC to aid in the assessment of Southern Hemisphere blue whales. Photographs were obtained from all six IWC Management Areas and represent a minimum of 311 individuals. Film images from earlier cruises have been digitized to facilitate archiving, analysis and the creation of a photo-ID catalogue. 95% of the currently available photographs have been examined, yielding 203 individuals. Photographs from five cruises in Area III have been crossreferenced to identify re-sighted individuals, locations and re-sighting rates for that region. Four whales were re-sighted in Area III in multiple years, including one whale with a 12-year sighting interval. The within season re-sighting rates for 2005-2006 and 2006-2007 were 11% and 17%, respectively. Two whales were photo-identified in 2007-2008 in Area IV, but did not match to the three other whales identified from Area IV during a previous cruise.

30. ZERBINI, A.N., CLAPHAM, P.J. and WADE, P.R. Plausible maximum rates of population growth in humpback whales.

*31. NOAD, M.J., DUNLOP, R.A., PATON, D. and CATO, D.H. An update of the east Australian humpback whale population (E1) rate of increase. 13pp.

A six week land-based survey was conducted at Pt Lookout on the east coast of Australia, in June and July 2007. Over the peak four weeks of the northward migration, an average of 70.7 whales passed per 10h. This was compared with a similar metric from previous surveys at this site yielding a long-term rate of increase of 10.9% per annum (95% CI 10.5 – 11.4%), slightly higher than our previous estimate from a survey in 2004 (Noad et al., 2006). This indicates that the long-term rapid increase in the size of the east Australian population of humpback whales continues without any apparent slowing. Aerial surveys were also conducted concurrently with the land-based surveys during which 249 groups of humpbacks containing an estimated 399 whales were seen from the air. Analysis confirms that only about 3% of groups pass more than 10km of the headland which is consistent with Bryden's (1985) estimates despite an approximately 15-fold increase in the population over this time. Further, the offshore distribution of whales was characterised with no significant difference being found between the patterns of distribution whether measured from land or air. Approximately 89% of groups passed within 5km of land and the mean distances offshore for both aerial and land-based surveys were less than 2.5km. This supports one of the key assumptions of the land-based counts, that they are not greatly affected by whales missed as a function of increasing distance offshore. An estimate of absolute abundance for 2007 was made by extrapolating from the 2004 absolute abundance estimate. Using the land-based correction factor for groups available but missed estimated in 2004, 2007 absolute abundance is estimated at 9,683 whales (95% CI 8,556 – 10,959).

32. CERCHIO, S., ERSTS, P., POMILLA, C., LOO, J., RAZAFINDRAKOTO, Y., LESLIE, M., ANDRIANRIVELO, N., MINDON, G., DUSHANE, J., MURRAY, A., COLLINS, T. and ROSENBAUM, H.C. Revised estimation of abundance for breeding stock C3 of humpback whales, assessed through photographic and genotypic mark-recapture data from Antongil Bay, Madagascar, 2000-2006.

33. CERCHIO, S., FINDLAY, K., HERMAN, O., ERSTS, P., MINDON, G., RAZAFINDRAKOTO, Y., MEYER, D., KOTZE, M.A., LESLIE, M., ANDRIANRIVELO, N. and ROSENBAUM, H.C. Initial assessment of exchange between breeding stocks C1 and C3 of humpback whales in the western Indian Ocean using photographic mark-recapture data, 2000-2006.

34. CLAPHAM, P., GARRIGUE, C., HAUSER, N., GEYER, Y. and ZERBINI, A. Movements of satellite-monitored humpback whales from New Caledonia and the Cook Islands.

35. PASTENE, L. Bryde's whales off Chile: a note on distribution and population genetic structure.

SC/60/SM

*1. VERMEULEN, E., CAMMARERI, A. and MAURICIO, F. A photo-identification catalogue of bottlenose dolphins (*Tursiops truncatus*) in northeast Patagonia, Argentina: a tool for the conservation of the species. 11pp.

A photo-identification study of bottlenose dolphins (*Tursiops truncatus*) was performed in the northern Gulf of San Matias, Patagonia Argentina, during the period 2006-2008. In total, 199 surveys were conducted with an average observation effort of 4.2h (SD=1.5) per survey. These surveys resulted in a total observation effort of 824.7h of which 105.7h was spent with 158 dolphin groups. Over 12,500 pictures were analysed using the automatic identification systems FinEx and FinMatch (EuroPhlukes Initiative, Leiden University, The Netherlands), resulting in the first identification catalogue of 47 dolphins for the North Patagonian region. The catalogued dolphins were re-identified up to 13 days with 57% (n=47) showing a degree of residency for the Natural Protected Area Bahía de San Antonio (NPABSA; resighting frequency (RF)≥4). At least 6 dolphins, including one mother with her calf, were additionally re-identified inside the estuary of the river "Rio Negro", 250km east, indicating that their home-range includes at least the whole northern region of the Gulf of San Matias. Data suggest that it concerns a stable but yet unknown population of bottlenose dolphins with a high turistic potential and an urgent need of conservation measurements. The obtained photo-identification catalogue is meant to serve as a tool for the conservation of the species and the realization environmental education projects in the region.

2. PALKA, D., ROSSMAN, M., VANATTEN, A. and ORPHANIDES, C. Effect of pingers on harbor porpoise and seal bycatch in the US northeast gillnet fishery.

*3. JARAMILLO-LEGORRETA, A. and ROJAS-BRACHO, L. Passive acoustic assessment of vaquita. 7pp.

4. PALACIOS, D.M., GERRODETTE, T., GARCÍA, C., AVILA, I.C., SOLER, G.A., BESSUDO, S. and TRUJILLO, F. Distribution and relative abundance of oceanic cetaceans in Colombia's Pacific EEZ from survey cruises and platforms of opportunity.

We compiled cetacean sighting data collected under various programs in Colombian Pacific waters with the goal of assessing the distribution and abundance patterns of the most common species throughout the exclusive economic zone (EEZ). Distribution maps are presented for 18 species, based on 617 sightings collected between 1986-2008. Concentrations of sightings were observed in two areas: the continental shelf (depths <2,000m) and over the Malpelo Ridge, an oceanic bathymetric feature. Ordered by sighting frequency, these species were: *Stenella coeruleoalba*, *Physeter macrocephalus*, *Tursiops truncatus*, *Grampus griseus*, beaked whales (*Mesoplodon* spp. and unidentified ziphiid whales), *Stenella attenuata*, *Delphinus delphis*, *Steno bredanensis*, *Megaptera novaeangliae*, *Globicephala macrorhynchus*, *Peponocephala electra*, *Kogia sima*, *Ziphius cavirostris*, *Balaenoptera edeni*, *Stenella longirostris*, *Feresa attenuata* and *Orcinus orca*. In inshore waters, the most frequently seen species were *T. truncatus*, *S. attenuata* and *M. novaeangliae*. For several of the data sets, we provide encounter rates as indices of relative abundance, but urge caution in their interpretation because of methodological limitations and because several factors that affect sightability were not accounted for in these estimates. Our results provide useful information for ongoing regional research and conservation initiatives aimed at determining population status and connectivity within adjacent EEZs. Future activities should focus on conducting dedicated surveys designed for estimating abundance and monitoring trends in areas of special interest (i.e. the continental shelf and the Malpelo Ridge). More research is also needed in terms of quantifying the sources and impact of anthropogenic mortality on population size. Finally, studies characterizing genetic diversity and stock discreteness in coastal species (i.e. *S. attenuata* and *T. truncatus*) would help inform local management strategies.

5. LESCRAUWAET, A.-K. and GIBBONS, J. A review of the crab bait related exploitation of small cetaceans in Magallanes and Tierra del Fuego with an update on the current situation.

We provide an update on the evolution of the crab fishery and the crab bait related exploitation of small cetaceans of this fisheries in southern Chile. We give a brief overview of other human activities in the coastal zone and their potential impact on small cetaceans, such as the large-scale re-orientation of Chile's salmon farming towards the Magallanes and Tierra del Fuego region from 2008 onwards. We summarize the efforts on behalf of the Chilean authorities in the last 15 years to reduce the impact of crab fishery on small cetaceans and marine birds and provide information on current knowledge. We use the results of surveys on the abundance and spatial distribution of small cetaceans and pinnipeds conducted in the last 15 years in the region to comment on the impact of this direct take. We use official data on the need of bait and the availability of legally obtained bait for use in the crab fishery between 1996 and 2006, and we extrapolate and compare with the previously reported estimates of bait and the related exploitation of small cetaceans in the crab fishery, given by independent authors. Landings of centolla (*Lithodes santolla*) and centollón (*Paralomis granulosa*) have increased by 123% since 1992 and (5,594t in 2006). Simultaneously, the total number of employed traps as reported by fishermen increased by a factor 6.5 since 1996, while the reported amount of bait used increased from 596t in 1996 to 3,152t in 2006. Except for 2006, the total requirement of bait over the last decade was covered by legally obtained bait mainly from the fishing industry itself. Dependency of sources of fish wastes imported from other regions of Chile increased from 30% in 1996 to 70% in 2006. Meanwhile, the proportion of bait generated by the fishermen in the crabbing areas has never exceeded 20% of the reported total use of bait in any given year and tended to decrease over the last decade in spite of the increasing prices of commercially available bait. We conclude that our 1992 estimates of the total amount of bait closely approached reality, while our estimate of the proportion of illegal bait (10%) herein may be regarded as under-estimation. Official data suggest that the take of marine wildlife as bait in this fishery has ceased or is currently close to zero (2006). However, the degree of uncertainty associated to the data, the current shifts in the bio-economics of this fishery, the steady increase in the price of available bait and the drastic decrease in availability of bait obtained from salmon and trout farms are a cause of concern and caution.

*6. AVILA, I.C., GARCÍA, C. and BASTIDAS, J.C. Dolphins use for bait in the artisanal fisheries of Bahía Solano, Chocó, Colombia. 7pp.

We evaluated dolphin hunting for bait in Bahía Solano, Chocó, Colombia, from July 2005 to April 2006. We interviewed 122 fishermen (18.2% of the registered fishermen in the zone) and obtained data from landings at a fishing company. Only fishermen using longlines (n=94; 37.3%) confirmed using dolphins for bait. One adult dolphin was reported to provide enough bait for two fishing bouts, capturing between 75 kg and 152 kg of fish. We could not obtain additional information about date, specific location or dolphin species, but the most probable captured species are *Tursiops truncatus* (common bottlenose dolphin) and *Stenella attenuata* (pan-tropical spotted dolphin), since these are the most commonly encountered species in coastal waters. A minimum of nine dolphins were reported killed during the study period (1 dolphin/month). Extrapolating these numbers to all fishermen using longlines in the region (250), an absolute minimum of 24 dolphins might have been taken during the study period (2.7 dolphins/month). Presumably many fishermen even while they also took dolphins, did not communicate this to the interviewers, considering dolphins are legally protected in Colombia. Fish species captured with dolphin bait include *Brotula clarkae*, *Cephalopholis acanthistius*, *Epinephelus cifuentesi*, *Mustelus lunulatus* and *Lobotes pacificus*.

7. PALACIOS, D.M. and FORNEY, K.A. Cetacean abundance on the western side of the Galápagos Islands during April 2000.

We conducted a visual line-transect survey to estimate cetacean abundance on the western side of the Galápagos Islands (0°30'S, 91°30'W), where a localized but quasi-permanent productive habitat is generated by topographic upwelling. We used the R/V Odyssey (a 28-m ketch) as the research platform to survey 1,770 km of trackline inside an area of 72,400km² during the 15 day cruise (5-19 April 2000). A total of 176 cetacean sightings involving 12 species and two genera were collected. In terms of densities, four species of small dolphins were numerically dominant: common dolphins *Delphinus delphis* (2.886 animals km⁻²), pan-tropical spotted dolphins *Stenella attenuata* (0.248 animals km⁻²), striped dolphins *S. coeruleoalba* (0.235 animals km⁻²) and spinner dolphins *S. longirostris* (0.067 animals km⁻²). Three medium-sized cetaceans had intermediate densities: short-finned pilot whales *Globicephala macrorhynchus* (0.040 animals km⁻²), bottlenose dolphins *Tursiops truncatus* (0.025 animals km⁻²) and the beaked whales (0.007 animals km⁻²). Two large cetaceans occurred at low densities: Bryde's whales *Balaenoptera edeni* (0.0014 animals km⁻²) and sperm whales *Physeter macrocephalus* (0.0009 animals km⁻²). Dwarf sperm whales *Kogia sima*, had the lowest density (0.0005 animals km⁻²). The geographic distribution of encounter rates for common and striped dolphins, the two most frequently encountered species, showed distinct patterns, suggesting that segregation between these two species is occurring within the study area. Our results provide useful information for the assessment of top predator populations within the Galápagos Marine Reserve and the Eastern Tropical Pacific Seascape.

8. BOLAÑOS-JIMÉNEZ, J., FERTEL, D. and IÑIGUEZ, M. Killer whale (*Orcinus orca*) occurrence in Venezuelan waters 2001-2008.

Records for the killer whale (*Orcinus orca*) off Venezuela are scarce. The revision of the status of killer whales was set as a high priority by the IWC during its 58th Annual Meeting held in St. Kitts and Nevis during 2005. Here we present a review of recent occurrences of killer whales in Venezuelan waters. In the absence of dedicated survey effort, a request for information was sent during 2006 to an environmental discussion list and colleagues working on marine mammals in Venezuela. Twelve records were collected for February 2001 to January 2008. Four records were accompanied by still photographs or video. Noteworthy is a videotaped attack by two killer whales on a leatherback turtle (*Dermodochelys coriacea*) off northeastern Venezuela on 15 April 2007. Records not accompanied by photo-documentation were accepted if: 1) confirmed by a marine biologist aboard, or 2) provided by an observer who demonstrated familiarity with diagnostic characteristics of the species. Sightings were recorded off central and northeastern Venezuela (n=9 and 3, respectively). At least an adult male has notches in its dorsal fin that could be used for photo-identification. Bottom depth was 10-1500 m (mean=519 +/- SD= 470; n=12). Group size ranged from 1-5 animals (mean =3 +/- SD= 1.76; n=12). Adult males were present in 92% of reported sightings. Juveniles were present in 17% of reported sightings. Four sightings recorded in the same general area during two consecutive days of two consecutive weekends could be of the same pod. This pod was reported to be comprised of three adult males and two females. Interestingly, most records

are from December through May. There is currently not enough information to speculate on any seasonality to the occurrence of this species in Venezuelan waters. Dedicated research effort is strongly recommended to evaluate the presence of killer whales and other cetacean species in offshore areas.

***9. COBARRUBIA, S. and BOLAÑOS-JIMÉNEZ, J. Western range extension (from northeastern to central Venezuela) of the long-beaked common dolphin (*Delphinus capensis*). 5pp.**

Records of the long-beaked common dolphin (*Delphinus capensis*) in north-eastern Venezuela are abundant. Here, we present information on this species' presence in central Venezuela, based on two sightings made during cetacean surveys in the State of Aragua during July 2004 and June 2007. Bottom depth for the sightings was inshore of the 100 m isobath. The general area has been routinely surveyed since 1996, with no previous sightings of this species. Though these sightings confirm the occurrence of *D. capensis* in areas other than northeastern Venezuela, the scarcity of sightings relative to survey effort in central Venezuela suggests that the species is not a regular inhabitant of this area.

10. SANTILLÁN, L. Morphological comparison of skulls of common bottlenose dolphins *Tursiops truncatus* from Peru and Ecuador.

Tursiops truncatus polymorphism in Peruvian waters imply the existence of an inshore and an offshore form which were described mainly based on skull shape. In the same base Ecuadorian specimens also seemed to be morphologically different but it was not previously confirmed. Skulls of *Tursiops truncatus* from Peru and Ecuador were examined to explore geographical variation by traditional morphometrics. Skulls belong to Peruvian Centre for Cetacean Research (CEPEC) and Ecuadorian Foundation for the Study of Marine Mammals (FEMM). Total sample size was 85 skulls (27 from Ecuador and 58 from Peru). In order to avoid differences related to growing; the sample size was reduced to 52 mature skulls (12 from Ecuador and 40 from Peru). Sexual dimorphism was found in skull width, males were wider. Sexual analysis was performed only to Peruvian skulls because of sexual information was not available for Ecuadorians skulls, we assumed that sexual differences were similar in both groups. A principal components analysis (PCA) extracted 8 principal components. Components 1 to 3 explain 50% of the variability. A scatter plot for the extracted components indicated three groups, one of Ecuadorian skulls (EC), one of Peruvian inshore skulls (PI) and one of Peruvian offshore skulls (PO). There is an overlap between EC and PI. Proximities between some EC and PO seem to be similar as between some EC and PI. EC seem to establish two aggregations, one closer to PI and another far from them. A Cluster analysis using Ward linkage method established two main groups. The first one included most of EC; most of PI and two PO; this cluster included three sub-groups one with only EC and the others with a mix of PI and PO. The second main cluster included mainly PO and some EC and PI. Three sub-groups were inside the second cluster; one with only PO; one with PO and EC and one (the largest) with most POs, one PI and two EC. There is a clear separation between Peruvian and Ecuadorian skulls. Ecuadorian skulls indicate a degree of variability in relationship to Peruvian ones. At least an inshore and an offshore form exist in Ecuador; Ecuadorian skulls seem to be most related to PI skulls than to PO. The evidence suggests that between some EC and PI there would not be strong differences. Additionally, morphological affinities between some EC and PO would confirm the existence of this group in Ecuador. Increasing sample size would help to confirm those findings.

11. KISZKA, J. Interactions between short-finned pilot whales (*Globicephala macrorhynchus*) and longline fisheries: a new case report in the Mozambique Channel (SW Indian Ocean).

[Draft abstract] Interactions between cetaceans and longline fisheries occur in all oceans of the world. These interactions essentially consist in depredation, as these whales are attracted by hooked fishes and feed on. Here, I report the first evidence of interactions between longline fisheries and short-finned pilot whales (*Globicephala macrorhynchus*) in the Mozambique Channel (southwest Indian Ocean). In order to characterise these interactions, we examined photographs taken during three separate encounters with pilot whales around the island of Mayotte (12o50'S, 45o10'E) from 2004 to 2007. Marks on the dorsal fin were characterised and eventually associated to longline fisheries. In addition, we conducted in 2008 a small interview survey with longline fishermen based on the island and fishing within the EEZ of Mayotte. The analysis of photographs (n=345) resulted in the identification of 35 individuals. Among these, 14% showed probable fishing line interactions due to characteristics of scars on the dorsal fin. This rate is certainly over biased by the low rate of identification of these whales. Questionnaire surveys indicated that short-finned pilot whales were regularly interacting with longline fisheries around the island, and that a probable light increase of these interactions occurred from 2004 to 2007. This study underlines the existence of the depredation problem in the northern Mozambique Channel, involving the short-finned pilot whale. It also shows the importance of the use of body scars as an indicator of fishery expose in small cetaceans.

12. KISZKA, J., CHARLIER, F. and RIDOUX, V. Individual and group behavioural reactions of delphinids to remote biopsy sampling.

[Draft abstract] Biopsy sampling in small cetaceans is extensively used to collect skin and blubber samples, for different topics including genetic, feeding ecology, toxicology, and histopathology. However, despite rare lethal consequences, it is clearly needed to assess whether biopsy sampling impact dolphin behaviour (both on the short and long term), at individual and group levels. From 2004 to 2007, 171 biopsy samples were collected (204 attempts: 85% success rate) on eight dolphin species in the waters surrounding the island of Mayotte, in the Mozambique Channel (12o50'S, 45o10'E): spinner dolphin (*Stenella longirostris*, n=92), pantropical spotted dolphin (*Stenella attenuata*, n=39), melon-headed whale (*Peponocephala electra*, n=14), Indo-Pacific bottlenose dolphin (*Tursiops aduncus*, n=14), Fraser's dolphin (*Lagenodelphis hosei*, n=7), Indo-Pacific humpback dolphin (*Sousa chinensis*, n=2), common bottlenose dolphin (*Tursiops truncatus*, n=2) and short-finned pilot whale (*Globicephala macrorhynchus*, n=1). Biopsy equipment used was Finn Larsen bolts and tips (40 mm) and a crossbow (Barnett Panzer V). Behavioural reactions were collected during sampling for the hit individual and for the group (or subgroup for large aggregations), as we hypothesized a potential reaction of both. Individual behavioural reactions were noted for 193 attempts, and group reactions for 152. For individuals, the commonest reaction was an acceleration of the animal followed by an immediate dive (39%). For groups/subgroups, the absence of reaction was mostly observed (54%) followed by the "synchronous dive" reaction (32%). Individual reactions were similar for all species, except for *T. aduncus*, being the most sensitive one. On 4 occasions, hit dolphins were observed returning to the bow within the first minute after being sampled (for *S. attenuata* only). This study underlines that remote biopsy sampling is an acceptable technique to sample small cetaceans.

***13. KISZKA, J., MUIR, C., AMIR, O.A., DROUOT-DULAU, V., POONIAN, C., RAZAFINDRAKOTO, Y. and WAMBIJI, N. Incidental catch of marine mammals in the southwest Indian Ocean: a preliminary review. 11pp.**

Incidental catch in fishing gears is a serious threat to marine megafauna (sea turtles, sharks and marine mammals) at the global scale. In order to manage this threat, it is critical to assess its extent, both spatially and quantitatively. In the southwest Indian Ocean (from 0 to 25°S, from eastern Africa to 60°E), there is a paucity of information on marine mammal bycatch. This report reviews the marine mammal bycatch issue in this region in the following countries: Mozambique, Tanzania (including Zanzibar), Kenya, the Seychelles, the Comoros, Mayotte, Madagascar, Reunion Island and Mauritius. For each country, status of marine mammals, fishing effort, bycatch information and mitigation measures are reviewed. It appears that quantitative information (number of bycaught animals per species, impact on local populations) is limited (except for Zanzibar). However, it is clear that several fisheries incidentally catch marine mammals in the region, most notably gillnets catching dugong (*Dugong dugon*) and coastal dolphins (*Tursiops aduncus* and *Sousa chinensis*), in Zanzibar, southwest Madagascar and probably Kenya. Mitigation measures are limited, particularly efforts to reduce the use of these gears. It is now critical to quantify the extent of bycatch in gillnets and its impact on local marine mammal populations and to implement relevant and effective mitigation measures as necessary.

14. BORDINO, P., WELLS, R.S. and STAMPER, A.M. Satellite tracking of franciscana dolphins, *Pontoporia blainvillei* in Argentina: preliminary information on ranging, diving and social patterns.

The Franciscana dolphin is one of the most threatened small cetaceans in the Southwestern Atlantic. It is estimated that about 1,000 dolphins are by-caught in gillnets each year, representing over 2% the estimated abundance for the coastline of Argentina. Currently, all Franciscanas in Argentina are considered to belong to a single stock. However, knowledge about movement patterns is scarce; such data are critical for evaluating impacts and establishing effective protection measures. With the objective of providing information about their ranging patterns and building upon the results of

tagging with VHF transmitters during 2005, small satellite linked transmitters were attached to the dorsal fins of Franciscana dolphins captured and released in Bahia Samborombon in March 2006 and in Bahia San Blas in March 2007. These two Argentine bays are protected areas separated by about 700 km from each other. Four dolphins in each bay were tagged with Wildlife Computers SPOT tags, and individuals were tracked via CLS/Argos for up to 261 days in Bahia Samborombon (two females and two males) and up to 189 days in Bahia San Blas (three females and one male). Home ranges were calculated using Kernel methods. Contrary to previously accepted descriptions of a single stock moving along the entire coast of Argentina, all tagged individuals exhibited localized movements, with an average home range of 150 km² in Bahia Samborombon (53% of locations within the protected area), and 345 km² in Bahia San Blas (100% of locations within the protected area). Satellite-linked transmitters with time-depth recording capabilities (Wildlife Computers SPLASH tags) were also deployed on three franciscana dolphins (two males and one female) in March 2008. Even though the dive data are still very preliminary as this is ongoing research, the consistency of patterns across the three dolphins after a month appears striking. Typically, the dolphins are swimming at a depth of less than 15 meters, and a typical dive lasts less than 1.5 minutes. The dolphins have been recorded to dive to 30 to 35 m, which would approximate the deepest points in the range they have used to date. Each dolphin has demonstrated an ability to make occasional dives lasting in excess of 4-5 minutes. Satellite-linked transmitters with position capabilities were attached to two pairs of dolphins (a SPOT tag in addition to the 3 TDRs described above) in 2008. Each pair caught together consisted of a female and a male. Duty cycles were identical for all four dolphins, so distances between them could be measured. Both pairs remained tightly together, but mostly separate from the other pair, for the first month of tracking. One pair has separated during the subsequent 2 weeks of tracking. Based on body size, all tagged dolphins were considered to be large subadults or adults. Findings from tracking and recent genetic studies suggest that the current designation of a single population ranging over the entire Argentine coastline is incorrect. The suggestion of small ranges in areas of heavy artisanal fishing pressure increases the urgency with which more effective protective measures need to be implemented for the species, and may allow different approaches from those applied to widely-ranging populations.

15. CREMER, M.J. and SIMÕES-LOPES, P.C. Status and conservation of franciscana (*Pontoporia blainvillei*) in Babitonga Bay estuary, South Brazil.

In Babitonga bay estuary, Southern Brazil (26° 28'S, 48°50'W) occurs the only estuarine population of franciscana known so far. Information about biology, behavior, distribution and abundance are reviewed in the attempt to analyze the conservation status of this population. Franciscanas are found year-round inside the estuary where they are sympatric of a *Sotalia guianensis* resident population. Comparing the data of franciscana recovered inside the bay and that of the coastal zone, the animals that live in the bay showed lower prevalence and intensity of intestinal parasites infestation and differences in prey items. Distribution pattern shows a little change over the seasons and the years, and the animals show preference on specific areas, located in the central region of the bay. Group size varied from one to 22 individuals (mean = 7.1 ± 5.4 SD). The specie exhibits a reduced repertoire of surfacing behavior and whistles where registered for the first time in the repertoire of the specie. Abundance was estimated in 50 individuals (CI = 28 - 89) and density in 0.46 ind./km² (CI = 0.26 - 0.82). Information regarding distribution, diet and parasitology give us some indications that this can be a resident population in the estuary and further studies related to isotopes and genetic will be conducted to a better understanding of this question. Conservation of this population is threatened by many human activities that represent direct and indirect impacts over it. However, habitat lost can be considered the great problem that affects these animals in the present and can extinct this population in a very near future. Private enterprises aim to develop many harbors in the innermost region of the bay. That will compromise the sustainability of this ecosystem, because of the many impacts intrinsic to harbor activity, like dredging, rocks explosion, water contamination, noise pollution and destruction of mangrove areas. The conservation of this franciscana population depends on an integrated management of the entire estuary. The proposal is the creation and implementation of a conservation unity that will protect all the habitat of Babitonga bay, and the maintenance of harbor activities near the entrance channel of the bay. The creation of the "Reserva de Fauna Baía da Babitonga" was proposed by ICMBio (Government Environmental Agency). This constitutes a reserve category of sustainable development and politic efforts are needed for the establishment of it.

16. FLORES, P.A.C., BAZZALO, M., CABALLERO, S., SANTOS, M.C.O., TRUJILLO, F., AZEVEDO, A.F., CREMER, M.J., SIMOES-LOPEZ, P.C., CALLADO, L.M., FLACH, L., BARRIOS, H., MONTIEL, M.G., ROSSI-SANTOS, M.R., MEIRELLES, A.C.O. and BOLAÑOS, J. Proposed English common name of *Sotalia guianensis* to the IWC List of Recognised Cetacean Species.

The separation of the genus *Sotalia* into two species have been recently recommended based on skull morphology and genetic evidence: *S. fluviatilis* for the Amazon Basin and *S. guianensis* for the coastal South and Central America. For the later, common or vernacular names whether in Spanish, Portuguese or English vary depending on local denominations across its distribution. Several common names have tentatively been adopted, but authors usually do not use the same terms or names. During its last Annual Meeting in 2007, the IWC recognized that *S. guianensis* should be listed as a separate species and added it to the IWC List of Recognized Cetaceans Species (LRCS). However, a common name was not chosen. We propose the name Guyana dolphin as the English common name of *S. guianensis* to the IWC LRC. The main reason is to respect the common name associated with the geographic location where this species was first described.

17. FLORES, P.A.C., TRUJILLO, F., C.C., R.-C., MARINI-FILHO, O.J., DA SILVA, V.M.F., MARTIN, A.R. and BOLAÑOS, J. The status of 'piracatinga' fishery using Amazon botos as bait in South America.

The catfish (*Calophysus macropterus*) known mostly as "piracatinga" in Brazil and "mota", "simi" or "mapurite" in Colombia, Peru and Venezuela, is a scavenger species largely consumed and recently commercially important in Colombia, mostly replacing another catfish known as "capaz" (*Pimelodus grosskopfii*) due to its over fishing. The catch of this species has increased over the last decade, becoming an important resource for export to Colombia, though a national market has been more recently developed in Brazil. The main concern regarding cetacean conservation is the apparently considerable high number of botos *Inia geoffrensis* illegally killed to be used as bait for "piracatinga" fishery, about 1,650 dolphins in only one area in the central Brazilian Amazon (da Silva & Martin, 2007). Efforts have been made in 2008 by governmental agencies and NGOs of Brazil and Colombia through two meetings held in each of these countries to update the status of this problem, to establish a collaborative agenda and to elaborate bi-national action and conservation plans to mitigate and hopefully stop this illegal hunting. The geographical occurrence of the fishery is largely spreading in the Brazilian Amazon, and it was also recorded in some rivers in Colombia, Peru and Venezuela. In the same way, the fish trade has expanded to as far as the Northeastern, Southeastern and Center-West (including the Federal Capital) regions of Brazil. The conservation scenarios discussed have included 1) improving the fishery statistics; 2) implementing adequate law enforcement plans for the illegal hunting of dolphins; 3) banning the fishing cages, 4) developing alternative baits and chemical attractive to replace the use of botos; 5) as well as establishing an one-year "piracatinga" fishery moratorium in order to more appropriately regulate it later. The collaborative agenda between the two countries should also cover the search for adequate political involvement and funding as well as the participation of Peru and Venezuela.

18. SANINO, G.P. and VAN WAEREBEEK, K. A note on the southern distribution limit of common bottlenose dolphins *Tursiops truncatus* in the southeast Pacific Ocean.

Both inshore and offshore forms of *T. truncatus* occur off Peru and Chile. The inshore form in Chile is best documented from a single community resident around coastal islands at ca. 29°S, while there is genetic evidence for a large, wide-ranging Peru-Chile offshore population. After Oliver (1946) indicated *T. truncatus* for the Gulf of Arauco (centred at 37°06'S, 73°20'W), albeit an unknown form, for half a century it has been the accepted southernmost range in the SE Pacific. On 2 August 2004 two common bottlenose dolphins stranded, trapped by a fast receding tide in a sound (estero) at Isla Quenu (41° 49' 41 S, 73° 9' 01 W), Los Lagos region. One died and the other was successfully re-floated. Viddi et al. (2005) reported a mother-calf pair inside a fjord at ca. 42°22'S, 72°24'W. From habitat and small group size an inshore form was suspected. However, three recent sightings of large groups of *T. truncatus* between 43°-45°S (Région de los Lagos), documented by GPS in January and December 2007, compelled us to reevaluate southern distribution range of the species and of each form/ecotype. The latter sightings were morphologically (very large, stocky bodies with short snout) and behaviourally (large group size) attributable to an offshore form, despite being encountered deep inside fjords of Chilean Patagonia, one at ca.

50 nmiles from open water. Estimated group size ranged from 40-120 individuals. All groups were actively attracted to the large rigid-hull inflatable and both video and still photographs were collected as voucher material. Our records extend the summer range of *T. truncatus* in the SE Pacific south to 45° 05' 597S, 73° 19' 996W, i.e. just south of Magdalena Island, however additional survey effort may extend this even farther. The population will need to be identified to allow management recommendations. .

*19. SHIGUETO, J.A., MANGEL, J.C. and VAN WAEREBEEK, K. Small cetacean captures and CPUE estimates in artisanal fisheries operating from a port in northern Peru, 2005-2007. 13pp.

This work provides the first direct, at-sea monitoring of small cetacean interactions with Peruvian artisanal drift gillnet and longline vessels. A total of 253 small cetaceans were observed captured during 66 fishing trips (480 sets) monitored from March 2005-July 2007 in the port of Salaverry in northern Peru, southeast Pacific. Interactions consisted of 231 animals caught in gillnets, 1 in a longline and 21 direct takes by harpooning for use as bait. The most commonly captured species were common dolphins *Delphinus capensis* dusky dolphins *Lagenorhynchus obscurus*, common bottlenose dolphins *Tursiops truncatus* and Burmeister's porpoises *Phocoena spinipinnis*. Overall bycatch CPUE (catch per unit effort) was estimated to be 0.677 animals/set and .007 animals/set for gillnet and longline vessels, respectively. Based upon total fishing effort for the port we estimated the average of small cetacean captures at 2649.2 animals/year (95% CI: 2051.5-3246.9) for 2001-2006. This work indicates that, in at least one Peruvian port, bycatch and harpooning of small cetaceans persist at high levels and on a regular basis, particularly in driftnet vessels, despite the existence since the mid-1990s of a national ban on the capture of small cetaceans and commerce in their products. The formerly unknown practice of at sea discarding of carcasses stands in sharp contrast with current, high small cetacean discard rates (49%) found in this study. That, combined with high prices for traditional bait fish suggest that small cetacean bycatch and harpooning could now potentially be reduced through the implementation of bycatch mitigation measures and greater accessibility to preferred bait.

*20. PINELA, A.M., AGUILAR, A. and BORRELL, A. Occurrence of long-beaked and short-beaked forms of *Delphinus* spp. off NW Africa appears to reflect differential use of habitat rather than taxonomy. 8pp.

The common dolphin has a widespread distribution and is present in all oceans of the world, where it occupies from cold to temperate and subtropical waters. This wide distribution range has led to the differentiation of a number of morphotypes. Little information is available on this regard from the tropical and subtropical waters of the northeastern Atlantic Ocean. From 1993 to 2006, bone samples (n=66) and skulls (n=41) from stranded common dolphins (*Delphinus* spp.) were collected from the segment of Mauritanian coastline extending from the Western Sahara to the Senegal River. Skull morphometrics and isotopic relative abundance of nitrogen and carbon were investigated to assess potential population structuring as well as position in the trophic web and preferred habitats. Morphometrics showed large variation, and the distribution of the RL/ZW ratios, the most indicative measurement to discriminate between long-beaked and short-beaked forms, followed a cline and it was not possible to differentiate, as in other oceans, two distinct clusters. Large variability was also observed for both isotopes: nitrogen isotope ratios (δN) ranged between 10.8 and 14.3, a difference of about one trophic level, while carbon isotope ratios (δC) ranged between -14.4 and -10.9, both indicating substantial heterogeneity in habitat use. Regression analysis between δN and δC revealed that individuals feeding at higher trophic level were more pelagic and prone to feed over the continental slope, whereas those foraging at lower trophic level were feeding over the continental shelf or around the shelf edge. More importantly, a joint analysis between RL/ZW ratios and stable isotopes revealed that the shorter-beaked animals were feeding at a lower trophic level than the longer-beaked animals. We conclude that the waters off Mauritania are inhabited by common dolphins with beak lengths that range from the typically short-beaked form to the typically long-beaked form, although it does not appear that these morphotypes can be ascribed to two separate species (*D. delphis* and *D. capensis*) or even populations. Dissimilarities in isotopic signature would suggest that the length of the beak would be more indicative of habitat use rather than of taxonomic segregation.

21. GOODALL, R.N.P., BENEGAS, L.G. and BOY, C.C. Review of small cetaceans stranded or incidentally captured on the coasts of Tierra del Fuego, Argentina, over 33 years.

22. RICCIALDELLI, L., NEWSOME, S. and GOODALL, R.N.P. Trophic ecology of eight small cetaceans of the southwestern South Atlantic as revealed by stable isotope analysis: preliminary results.

SC/60/WW

*1. SCARPACI, C., PARSONS, E.C.M. and LÜCK, M. Recent advances in whalewatching research: 2007-2008. 35pp.

Whalewatching research encompasses a wide variety of disciplines and fields of study, including monitoring the biological impacts of whalewatching activities on cetaceans and assessments of the effectiveness of whalewatching management and regulations, to the sociological and economic aspects of whalewatching on communities hosting such activities. This article is the latest in a series of annual digests, which describes the variety and findings of whalewatching studies published over the past year, since June 2007.

*2. DAHOOD, A., WÜRSIG, B., VERNON, Z., BRADSHAW, I., BUURMAN, D. and BUURMAN, L. Tour operator data illustrate long term dusky dolphin (*Lagenorhynchus obscurus*) occurrence patterns near Kaikoura, New Zealand. 9pp.

In Kaikoura, New Zealand, dusky dolphins (*Lagenorhynchus obscurus*), also termed "duskies", support a thriving tourism industry. The dolphin tour operator Encounter Kaikoura has been collecting dusky group locations using GPS coordinates since October 1995. These data describe the first group of dolphins encountered each tour, which is not a full indication of the location of all dolphin groups in the Kaikoura area. However, as the longest continuous record of dusky sightings near Kaikoura, the Encounter Kaikoura dataset provides a unique opportunity to assess dusky occurrence patterns over several temporal scales. Despite variance across seasons and years, there is a recurring seasonal pattern. In summer, duskies occur in near-shore shallow waters, frequently close to the Kaikoura Canyon head. In winter, dolphins occur farther offshore, often associated with the deeper waters of the Kaikoura Canyon axis and widely scattered throughout the study area. This onshore/offshore pattern is stable across the 12 years. The duskies' distribution along shore, particularly during summer months, changes during the study period. There is a greater incidence of duskies in the southernmost regions of the study area during the late 1990's than in later years. Duskies' affinity for the Kaikoura Canyon may reflect a strategy to maximize access to prey; duskies in Kaikoura feed at night on the Deep Scattering Layer as it rises to the surface. We are presently investigating the role of predators such as killer whales, prey availability and human activities on dusky dolphin daytime occurrence patterns. Because of its greater than 10 year duration and ability to collect information at times when researchers are not in the field, the Encounter Kaikoura data are a valuable asset to these ongoing studies.

*3. LUNDQUIST, D., SIRONI, M., WÜRSIG, B. and ROWNTREE, V. Changes in the movement patterns of southern right whales in response to simulated swim-with-whale tourism at Peninsula Valdés, Argentina. 12pp.

Movement patterns of southern right whales (*Eubalaena australis*) in proximity of swimmers at Peninsula Valdés, Argentina were recorded from September to November 2005 and July to October 2006. Whales were observed before, during, and after interactions with swimmers that approached the whales from a boat. Changes in movement patterns were quantified relative to group composition of whales (mother/calf pairs, juveniles or adult/mixed-age groups). The whales changed their reorientation rate significantly when the boat approached within 500 meters. Whales swam faster, reoriented more often, and followed a less linear path during interactions than when not exposed to the boat and swimmers. Responses were greater for mother/calf pairs than juveniles, while adult/mixed groups showed no significant changes in movement. The initial reaction of whales to the approach of the boat and swimmers was a good predictor of the magnitude of response. Increased levels of activity are a concern for whales on the nursery ground where they spend much of their time resting and rarely feed. Disruption of socialization among adults, juveniles and mother/calf pairs has unknown long-term consequences. Additional research is needed to determine the long-term effects of boat and swimmer activities on the movement patterns of whales.

*4. LUNDQUIST, D., SIRONI, M., WÜRSIG, B. and ROWNTREE, V. Behavioural responses of southern right whales to simulated swim-with-whale tourism at Peninsula Valdés, Argentina. 15pp.

Guidelines for sustainable tourism involving swimming with large whales are not well-developed, as most researchers have focused on programs involving swimming with delphinids. From September to November of 2005 and July to October of 2006, we collected behavioral data on southern right whales (*Eubalaena australis*) exposed to controlled interactions with swimmers at Peninsula Valdés, Argentina. Whales were observed before, during, and after a series of directed interactions with three swimmers, and behavioral responses were quantified relative to group composition of whales (mother/calf pair, juvenile or adult/mixed group) and activity level of swimmers (calm or noisy). Resting and socializing decreased and traveling increased during interactions with swimmers. The composition of whale groups had a significant effect on the behavioral response of whales to swimmers. Responses were greater for mother/calf pairs than juveniles, while adult and mixed-age groups showed no significant changes in behavior. Swimmer activity level did not affect the whale's reactions. Increased levels of tourism activity are a concern for females that spend much of their time resting and rarely feed in this nursery ground. Additional research is needed to determine long-term effects of boats and swimmers on whales and to provide effective management guidelines for swimming with large whales. .

*5. SIMMONDS, M.P., EISFELD, S. and STANSFIELD, L. A short update on the solitary sociable dolphin situation in the UK. 4pp.

The last remaining solitary sociable bottlenose dolphin, *Tursiops truncatus*, in the UK disappeared in November 2007 shortly after receiving a serious tail injury. Observations of this animal show that she conformed to the typical pattern of behaviour for solitary sociable cetaceans, including becoming increasingly dominant in her interactions with swimmers. Her rest and feeding behaviour were found to be interrupted by the presence of people in the water.

6. ROBBINS, J. Humpback whale displacement, fecundity and survival relative to commercial whale watching in the Gulf of Maine.

*7. CHILVERS, L. and WILLIAMS, C. An update of management and increased protection for bottlenose dolphins of the Doubtful Sound Complex, Fiordland, New Zealand. 8pp.

In the 2007 Report of the IWC Scientific Committee, the New Zealand delegation undertook to report to this year's Whale Watching subcommittee on actions taken to increase the protection of the bottlenose dolphin (*Tursiops truncatus*) population of the Doubtful Sound Complex in Fiordland, New Zealand. Recent abundance estimates indicate that there were 44 adult and sub-adult bottlenose dolphins in the Doubtful Sound Complex population in the summer of 2006/2007. A decline of 34-39% has been reported over the past 12 years (Currey *et al.* 2007). In New Zealand, marine mammals are protected under the Marine Mammals Protection Act 1978. The Department of Conservation (DOC) administers this Act and is the Government agency responsible for marine mammal welfare in New Zealand. In early 2007, DOC commenced a public process in order to circulate the current scientific information available regarding this population. The public discussion paper released also sought comments and suggestions on possible options to increase the protection of this population. In January 2008, a management strategy was implemented, based on the feedback received from this process.

*8. SCHAFFAR, A. and GARRIGUE, C. Exposure of humpback whales to unregulated tourism activities in their main reproductive area in New Caledonia. 6pp.

Whale and dolphin watching activities are demonstrating a strong growth worldwide, while raising the issue of their potential effect on cetacean populations and emphasising the need for management. Humpback whales have recently become the focus of an important tourism industry in the South Pacific, particularly popular in New Caledonia where observations focus on a small population of humpback whales in their main breeding ground. Despite considerable growth since its start in 1995, the industry remains unregulated. Between 2005 and 2007, a specific study was conducted in order to assess whale watching activities in New Caledonia. All data was collected from a land-based research station, using a theodolite. On average, whales were in the presence of 3.4 boats for 2 hours. Each boat spent an average of an hour with the same whales, but the cumulative observation time per pod was over 2 hrs 33% of the time. The number of boats with whales proved to be particularly high over weekends. While groups of humpback whales were mostly observed between 100 and 300 metres, boats were within 100 metres of groups with calves 40% of the time. These results indicate that humpback whales are highly exposed to whale watching boats in New Caledonia, to a level exceeding the limits most commonly stated by management measures worldwide. This could be particularly problematic for groups with calves. With the strong site fidelity characteristic of this breeding ground, such exposure also raises the question of cumulative impact. Management measures should be implemented in order to regulate whale watching activities and to ensure the conservation of humpback whales in New Caledonia.

*9. LUSSEAU, D., WILLIAMS, R., BEJDER, L., STOCKIN, K.A., BAIN, D., AUGER-MÉTHÉ, M., CHRISTIANSEN, F., MARTINEZ, E. and BERGGREN, P. The resilience of animal behaviour to disturbance. 24pp.

The concept of resilience is now widely used to understand the vulnerability of complex systems to disturbances. It is emerging that more diverse systems are more resilient to disturbances. Here we develop a conceptual understanding of the resilience of behavioral systems and assess how this measure is related to the diversity of behavioral sequences modeled using Markov chains. We show that the resilience of behavior is related to its unpredictability, a diversity measure, using simulations and empirical data collected at ten study sites over 30 years. The more predictable behavior is, the less resilient it becomes. Such influences on behavioral resilience cannot be related to the effect size of disturbances in inter-population comparisons. However, we show that such measures are meaningfully related to the influence of disturbances when comparing the same population exposed to different ecological conditions. We show that behavior predictability can be driven by ecological conditions. For example, an increase in food availability can increase the duration of foraging bouts, hence constraining the dynamics of the population's behavior. Such constraints increase behavioral predictability and in turn weaken its resilience to disturbance. This empirically-driven theoretical study offers a framework to manage exposure of animal populations to disturbance.

SC/60/Progress Reports

*Australia. 27pp.

*Brazil. 36pp.

*Croatia. 8pp.

*Denmark. 6pp.

*Germany. 15pp.

*Italy. 34pp.

*Japan. 27pp.

*Mexico. 15pp.

*Netherlands. 7pp.

*Norway. 7pp.

*Spain. 18pp.

*USA. 44pp.

SC/60/Rep

*1. SIMMONDS, M.P. Report of the Scoping Group Meeting for the proposed IWC Workshop on Climate Change. 8pp.

SC/60/O

1. KISZKA, J., ALLONCLE, N., ROSENBAUM, H.C., BERGGREN, P., ROWAT, D. and RAZAFINDRAKOTO, Y. Cetaceans in the southwest Indian Ocean: a review of status, distribution and threats.

[Draft abstract] The coastal waters of southwest Indian Ocean (SWIO, i.e. Mozambique, Tanzania, Kenya, Seychelles, Comoros, Mayotte, Madagascar, Mascareign archipelago and their oceanic waters) countries are characterized by a high marine biodiversity generally associated with various biogeographical environments. The diversity of marine mammals is also very high, which can be interpreted by the presence of a high diversity of potential habitats for these organisms. To date, 30 species of marine mammals have been recorded in this region (29 cetaceans and 1 sirenian): 16 delphinids (*Sousa chinensis*, *Tursiops aduncus*, *Tursiops truncatus*, *Stenella longirostris*, *Stenella attenuata*, *Stenella coeruleoalba*, *Delphinus capensis*, *Delphinus delphis*, *Peponocephala electra*, *Grampus griseus*, *Orcinus orca*, *Globicephala macrorhynchus*, *Feresa attenuata*, *Pseudorca crassidens*, *Steno bredanensis*, *Lagenodelphis hosei*), 6 large toothed whales (*Physeter macrocephalus*, *Kogia sima*, *Kogia breviceps*, *Ziphius cavirostris*, *Mesoplodon densirostris*, *Mesoplodon pacificus*) 7 baleen whales (*Balaenoptera musculus*, *B. physalus*, *B. edeni*, *B. borealis*, *B. acutorostrata*, *Eubalaena australis*, *Megaptera novaeangliae*) and the dugong (*Dugong dugon*). However, very little is known on the ecology, biology and behaviour (distribution, abundance, diet, habitat preferences and use, etc.) of these species, especially to answer questions related to management and conservation. Marine mammals are exposed to various anthropogenic threats in the coastal waters of the southwest Indian Ocean, including disturbance, habitat degradation, acoustic and chemical pollution, deliberate catches and bycatch. The most severe could be bycatch in fishing gears (especially gillnets). This paper aims to review the status (diversity, distribution, and occurrence) and threats of marine mammals from the coastal waters of the SWIO region. It also presents observed and potential threats facing to marine mammals in this area.

2. MACLEOD, K., BURT, L., CAÑADAS, A., ROGAN, E., SANTOS, B., URIARTE, A., VAN CANNEYT, O., VAZQUEZ, T. and HAMMOND, P. Preliminary abundance estimates of cetaceans in offshore European Atlantic waters.

3. PIMPER, L.E., GOODALL, R.N.P. and GIBBONS, J. Strandings of sperm whales, Strait of Magellan to Cape Horn, 1975-2008.

4. ISHIKAWA, H. Cruise report of the second phase of the Japanese Whale Research Program under special permit in the Antarctic (JARPA II) in 2007/08.

5. MATSUOKA, K. Cruise report of the second phase of the Japanese Whale Research Program under special permit in the western North Pacific (JARPN II) in 2007 (part I) - offshore component.

6. BANDO. Cruise report of the second phase of the Japanese Whale Research Program under special permit in the western North Pacific (JARPN II) in 2007 - coastal component off Sanriku.

7. KISHIRO, T. Cruise report of the second phase of the Japanese Whale Research Program under special permit in the western North Pacific (JARPN II) in 2007 - coastal component off Kushiro.

8. KATO, H. Status report on the conservation and research on the western gray whales in Japan, May 2007-May 2008.

*9. KOCK, K.-H., CLARK, J.M. and MORENO, C.A. Interactions between cetaceans and fisheries in the Southern Ocean - progress report 2008. 12pp.

Depredation by killer whales (*Orcinus orca*) and Sperm whales (*Physeter macrocephalus*) has been a significant problem in longline fisheries in the Southern Ocean for more than 10 years and until recently there was no apparent solution. Modifications to longline gear have been trialed by three different countries participating in the longline fishery for Patagonian toothfish (*Dissostichus eleginoides*) in waters adjacent to the Southern Ocean and have been found to bear the potential of reducing depredation substantially. These modifications involve the use of net sleeves, weights at the end of vertical lines, and clusters of 10 hooks fixed 30 cm above the weight, it is likely that this method will be introduced in longline fishing in the Southern Ocean from the season 2007/08 onwards.

10. SHOLL, T.G.C., NASCIMENTO, F.F., MOURA, J.F., OTT, P.H., BONVICINO, C.R. and SICILIANO, S. Genetic sequencing of baleen whales carcasses washed ashore the Brazilian coast.

Carcasses provide a number of valuable information on natural history of species. However, many carcasses are washed ashore in advanced decomposition preventing further investigations. In several occasions, even positive identification is not possible due to its advanced condition. In these cases, the identification can be done using the sequencing of the mitochondrial DNA which is present in many copies in all vertebrate cells, showing more resistance to mechanical and enzymatic degradation. In this study, the DNA was extracted and the mitochondrial cytochrome b gene was amplified by PCR and sequenced for four carcasses of possible mysticeti (GEMM 075, GEMM 088, GEMM 135, GEMARS?). A blast search using the nucleotide-nucleotide basic local alignment (blastn) search tool was done using the sequences generated. Samples GEMM075 and GEMARS showed 98% identity to one sequence of *Balaenoptera acutorostrata* (AP006468). Samples GEMM 088 and GEMM 135 showed 99% identity to sequences from *Balaenoptera edeni* (X75583) and *Megaptera novaeangliae* (AP006467), respectively. A neighbor-joining tree was generated using sequences from GenBank from all species of balaenopterid that occurs in the coast of Brazil. The results corroborated to the one found using blastn, showing that all carcasses analysed showed a correspondence to species of *Balaenoptera* already recorded in Brazil. The registration of marine mammal species that strand on coastlines helps to increase relevant informations for conservation, i.e. new area of distribution of a species, and migration routes. This study shows the importance of using the DNA as a forensic tool to identify carcasses found on the beaches.

11. GOODALL, R.N.P., GIBBONS, J. and BENEGAS, L.G. Baleen whale strandings on the coasts of Tierra del Fuego and the Strait of Magellan.

*12. BEST, P.B. Sightings of right and humpback whales in the South Atlantic from nineteenth century whaling logbooks - a preliminary note. 7pp.

Sightings of humpback and southern right whales on three voyages to the South Atlantic by two nineteenth-century whaleships are presented as an indication of how such data can provide information on distributions and migration routes in areas otherwise infrequently surveyed.

13. VIKINGSSON, G.A. Research programme on common minke whales (*Balaenoptera acutorostrata*) in Icelandic waters. A progress report, May 2008.

14. MIZROCH, S.A., TILLMAN, M.F., MOORE, K.E., JURASZ, S., VON ZIEGESAR, O., HERMAN, L., PACK, A., BAKER, S., DARLING, J., GLOCKNER-FERRARI, D., FERRARI, M., SALDEN, D., JACOBSEN, J. and CLAPHAM, P. Long-term survival of humpback whales radio-tagged in Alaska from 1976 through 1978.

15. INDIAN OCEAN COMMISSION. Indian Ocean Commission report of activities January 2007 - May 2008.

SC/60/ForInfo

*1. YANG, W.C., CHOU, L.S., JEPSON, P.D., BROWNELL, R.L., COWAN, D., CHANG, P.H., CHIOU, H.I., YAO,

C.J., YAMADA, T.K., CHIU, J.T., WANG, P.J. and FERNÁNDEZ, A. 2008. Unusual cetacean mortality event in Taiwan, possibly linked to naval activities. *The Veterinary Record* 162: 184-186.

*2. GARCÍA-GODOS, I. 2007. Revisión de las interacciones entre cetáceos y la pesquería marina peruana: perspectivas para la conservación de cetáceos en Perú [Interactions between cetaceans and the marine fishery in Peru and perspectives for their conservation]. pp. 77-82 in Félix, F. *Memorias del Taller de Trabajo sobre el Impacto de las Actividades Antropogénicas en Mamíferos en el Pacífico Sudeste*, Bogotá, Colombia. 98pp.

Interactions between cetaceans and marine fishery are an issue of raising concern for public and private organizations in Peru. If compared with the 1980s and early 1990s landings, nowadays a decrease of at least one order of magnitude is clear in landings of small cetaceans. However, current catches are impossible to be estimated due to a black market caused by non-coordinated punitive campaigns; it is supposed that annual takes may be between 1000 and 3000 individuals. Competition for food between small cetaceans and fishery and by-catch are issues that must be investigated. With the end of whaling in Peru, no important direct impact has been reported on large cetaceans. However, the effects of food competition, habitat use overlapping, marine traffic, etc., are causes of growing concern. Research on trophic relationships of Sperm Whales, as well as habitat use of Humpback Whales, in relation to fishery are priority. Government efforts to monitor the Peruvian fishery operations towards a better implementation of control measures of by-catching and to improve the research on this issue has increased in the last years. / [Original Spanish] Diferentes aspectos de las interacciones entre cetáceos con la pesquería peruana son revisados. Se ha observado una marcada disminución en la captura de cetáceos menores con respecto a las década de 1980 e inicios de 1990, a pesar de no poder ser calculada en la actualidad. Los efectos de la captura incidental, la competencia por alimento, el traslape en el uso del hábitat, el tráfico marítimo, etc., no han sido establecidos, pero son motivo de creciente preocupación. El incremento del monitoreo oficial de la pesquería peruana es un avance en la implementación de las medidas de control y la investigación.

*3. BRANCH, T.A., ABUBAKER, E.M.N., MKANGO, S. and BUTTERWORTH, D.S. 2007. Separating southern blue whale subspecies based on length frequencies of sexually mature females. *Marine Mammal Science* 23(4): 803-833.

When sexually mature, Antarctic (true) blue whales are substantially longer than pygmy blue whales. To estimate the proportions of these two subspecies in various regions, Bayesian mixture models were fitted to catch length frequencies of sexually mature females. The extent of rounding to 5-ft intervals was also estimated. Antarctic blue whales dominated (99.2%) pelagic catches south of 52°S, while pygmy blue whales dominated (99.9%) north of 52°S and in 35°-180°E. South of 60°S only 0.7% (95% credibility interval 0.5-1.0%) were pygmy blue whales, lower than the 7% upper bound currently assumed. Shore-based catches from SW Africa and those before 1937 from South Georgia and the South Shetlands were estimated to contain 90-92% Antarctic blue whales. Actual proportions were probably higher, but these data show evidence of rounding (up to 19% of records), poor length estimation methods and other problems. The mean length of sexually mature female Chilean blue whales (77.1 ft, 23.5 m) was intermediate between pygmy (68.9 ft, 21.0 m) and Antarctic blue whales (83.4-86.3 ft, 25.4-26.6 m). A good fit to these data was obtained only by assuming that the Chilean whales are a separate subspecies or distinctive population. This finding is also consistent with their discrete distribution, and genetic and call type differences compared to Antarctic and pygmy blue whales.

*4. KANDA, N., GOTO, M., KATO, H., MCPHEE, M.V. and PASTENE, L. 2007. Population genetic structure of Bryde's whales (*Balaenoptera brydei*) at the inter-oceanic and trans-equatorial levels. *Conservation Genetics* 8: 853-864.

*5. KANDA, N., GOTO, M. and PASTENE, L. 2006. Genetic characteristics of western north Pacific sei whales, *Balaenoptera borealis*, as revealed by microsatellites. *Marine Biotechnology* 8: 86-93.

Genetic characteristics of sei whales, *Balaenoptera borealis*, inhabiting the western North Pacific were analyzed at 17 microsatellite loci in a total of 89 whales obtained from the area between 37°N-45°N and 147°E-166°E in 2002 (N = 39) and 2003 (N = 50). All the loci analyzed were polymorphic over the samples, some of the loci had more than 10 alleles, indicating a high level of genetic variation within samples. No significant deviation from the expected Hardy-Weinberg genotypic proportion was observed at the 17 loci in the samples. No evidence of genetic heterogeneity in allele frequencies was observed between sexes within samples as well as between the two temporally different samples, indicating a single population of sei whales inhabiting the western North Pacific. We finally tested and demonstrated that the population appeared not to suffer from genetic bottleneck as a result of population decline from past commercial whaling.

*6. PASTENE, L.A., GOTO, M., KANDA, N., ZERBINI, A.N., KEREM, D., WATANABE, K., BESSHO, Y., HASEGAWA, M., NIELSEN, R., LARSEN, F. and PALSBOELL, P.J. 2007. Radiation and speciation of pelagic organisms during periods of global warming: the case of the common minke whale, *Balaenoptera acutorostrata*. *Molecular Biology* 16(7): 1481-1500.

How do populations of highly mobile species inhabiting open environments become reproductively isolated and evolve into new species? We test the hypothesis that elevated ocean-surface temperatures can facilitate allopatry among pelagic populations and thus promote speciation. Oceanographic modelling has shown that increasing surface temperatures cause localization and reduction of upwelling, leading to fragmentation of feeding areas critical to pelagic species. We test our hypothesis by genetic analyses of populations of two closely related baleen whales, the Antarctic minke whale (*Balaenoptera bonaerensis*) and common minke whale (*Balaenoptera acutorostrata*) whose current distributions and migration patterns extent are largely determined by areas of consistent upwelling with high primary production. Phylogeographic and population genetic analyses of mitochondrial DNA control-region nucleotide sequences collected from 467 whales sampled in four different ocean basins were employed to infer the evolutionary relationship among populations of *B. acutorostrata* by rooting an intraspecific phylogeny with a population of *B. bonaerensis*. Our findings suggest that the two species diverged in the Southern Hemisphere less than 5 million years ago (Ma). This estimate places the speciation event during a period of extended global warming in the Pliocene. We propose that elevated ocean temperatures in the period facilitated allopatric speciation by disrupting the continuous belt of upwelling maintained by the Antarctic Circumpolar Current. Our analyses revealed that the current populations of *B. acutorostrata* likely diverged after the Pliocene some 1.5 Ma when global temperatures had decreased and presumably coinciding with the re-establishment of the polar-equatorial temperature gradient that ultimately drives upwelling. In most population samples, we detected genetic signatures of exponential population expansions, consistent with the notion of increasing carrying capacity after the Pliocene. Our hypothesis that prolonged periods of global warming facilitate speciation in pelagic marine species that depend on upwelling should be tested by comparative analyses in other pelagic species.

*7. ACEVEDO, J., RASMUSSEN, K., FÉLIX, F., CASTRO, C., LLANO, M., SECCHI, E., SABORÍO, M.T., AGUAYO-LOBO, A., HAASE, B., SCHEIDAT, M., DALLA ROSA, L., OLAVARRIA, C., FORESTELL, P., ACUÑA, P., KAUFMAN, G. and PASTENE, L.A. 2007. Migratory destinations of humpback whales, *Megaptera novaeangliae* from the Magellan Strait feeding ground, southeast Pacific. *Marine Mammal Science* 23(2): 453-463.

*8. LEDUC, R.G., DIZON, A.E., GOTO, M., PASTENE, L.A., KATO, H., NISHIWAKI, S., LEDUC, C.A. and BROWNELL, R.L. 2007. Patterns of genetic variation in Southern Hemisphere blue whales, and the use of assignment test to detect mixing on the feeding grounds. *J. Cetacean Res. Manage.* 9(1): 73-80.

A total of 111 samples from Southern Hemisphere blue whales were sequenced for 420 base pairs of the mitochondrial control region and all but one of those were genotyped over seven microsatellite loci. Comparisons were made between samples from three broad geographic regions: the southeast Pacific Ocean; Indian Ocean; and around the Antarctic continent. Each of these strata was found to be highly differentiated from the others, in both mitochondrial and nuclear data. The genetic differentiation between the geographic ranges of the nominal subspecies (i.e. true blue whales in Antarctica vs. pygmy blues in Pacific and Indian Oceans) was not markedly greater than between the populations of pygmy blue whales. Assignment tests using the microsatellite data provide some insight into detection of feeding-season mixing, although existing methods have some limitations.

*9. MURASE, H., TAMURA, T., KIWADA, H., FUJISE, Y., WATANABE, H., OHIZUMI, H., YONEZAKI, S., OKAMURA, H. and KAWAHARA, S. 2007. Prey selection of common minke (*Balaenoptera acutorostrata*) and Bryde's (*Balaenoptera edeni*) whales in the western North Pacific in 2000 and 2001. *Fisheries Oceanography* 16(2): 186-201.

A study of common minke and Bryde's whales was conducted in the western North Pacific in the 2000 and 2001 summer seasons to estimate prey selection of cetaceans as this is an important parameter in ecosystem models. Whale sighting and sampling surveys and prey surveys using quantitative echosounder and mid-water trawl were carried out concurrently in the study. Biomasses of Japanese anchovy, walleye pollock and krill, which were major prey species of common minke and Bryde's whales, were estimated using an echosounder. The results suggested that common minke whale showed prey selection for Japanese anchovy while they seemed to avoid krill in both the offshore and coastal regions and walleye pollock in the continental shelf region. Selection for shoaling pelagic fish was similar to that in the eastern North Atlantic. Bryde's whale showed selection for Japanese anchovy in August 2000 and July 2001, while it showed prey selection for krill in May and June in 2001.

*10. EVANS, P.G.H. 2008. Proceedings of the ASCOBANS/ECS workshop on offshore wind farms and marine mammals: impacts and methodologies for assessing impacts. Held at the European Cetacean Society's 21st Annual Conference, The Aquarium, San Sebastian, Spain, 21st April 2007. *ECS Special Publication Series* 49: 68pp.

*11. ROHLAND, N. and HOFREITER, M. 2007. Ancient DNA extraction from bones and teeth. *Nature Protocols* 2(7): 1756-1762.

This method is designed to maximize recovery of PCR-amplifiable DNA from ancient bone and teeth specimens and at the same time to minimize co-extraction of substances that inhibit PCR. This is achieved by a combination of DNA extraction from bone powder using a buffer consisting solely of EDTA and proteinase K, and purification of the DNA by binding to silica in the presence of high concentrations of guanidinium thiocyanate. All steps are performed at room temperature (20–23 °C), thereby reducing further degradation of the already damaged and fragile ancient DNA and providing an optimal trade-off between DNA release and degradation. Furthermore, the purification step removes most of the various types of PCR inhibitors present in ancient bone samples, thereby optimizing the amount of ancient DNA available for subsequent enzymatic manipulation, such as PCR amplification. The protocol presented here allows DNA extraction from ancient bone and teeth with a minimum of working steps and equipment and yields DNA extracts within 2 working days.

*12. BRANCH, T.A., MIKHALEV, Y.A. and KATO, H. 2008. Separating pygmy and Antarctic blue whales using long-forgotten ovarian data. *Marine Mammal Science*: submitted. 19pp.

Pygmy blue whales (*Balaenoptera musculus brevicauda*) are ≤ 79 ft (24.1 m) and are generally north of 54°S in summer, while the more southerly Antarctic blue whales (*B. m. intermedia*) may reach 100 ft (30.5 m). Previous assessments have assumed that catches and recent surveys south of 60°S recorded Antarctic blue whales, but these may have included pygmy blue whales. Here we use ovarian corpora, which accumulate with ovulations and hence with length, to separate these subspecies. The resulting Bayesian mixture model, applied to 1378 pygmy and 3844 Antarctic-region blue whales, estimated that only 0.1% (95% credibility intervals 0.0–0.4%) of the Antarctic-region blue whales were pygmy blue whales, and unexpectedly found significantly lower lifetime ovulation counts for pygmy than for Antarctic blue whales (7.7 vs. 13.7). Over four decades, despite substantial depletion of Antarctic blue whales, there was no trend in the estimated proportion of pygmy blue whales in the Antarctic. Several lines of investigation found no evidence for substantial numbers of pygmy blue whales in ovarian corpora data collected in the 1930s, as was previously hypothesized. The ovarian corpora model developed here could also be applied to other whale species and to data such as testes weight.

*13. BRANCH, T.A. 2008. Abundance of Antarctic blue whales south of 60°S from three complete circumpolar sets of surveys. *J. Cetacean Res. Manage.* 9(3).

Sightings from the IDCR and SOWER austral summer surveys were analysed to provide abundance estimates for Antarctic (true) blue whales (*Balaenoptera musculus intermedia*) south of 60°S. The IDCR/SOWER ship-borne surveys have completely circled the Antarctic three times: 1978/79–1983/84 (CPI), 1985/86–1990/91 (CPII) and 1991/92–2003/04 (CPIII), covering strata totalling 64.3%, 79.5% and 99.7% of the ocean surface between the pack ice and 60°S. During the surveys, blue whales were only rarely sighted but were present around the Antarctic. Average sighting rates (schools per 1,000 km of primary search effort) were 0.24 (CPI), 0.36 (CPII) and 0.78 (CPIII). Respective circumpolar abundance estimates were 453 (CV=0.40), 559 (CV=0.47) and 2,280 (CV=0.36), with mid-years of 1980/81, 1987/88 and 1997/98. When adjusted simply for unsurveyed regions, the circumpolar rate of increase was 8.2% (95% CI 3.8–12.5%) per year, although they are still under 1% of their pre-exploitation abundance. These abundance estimates are negatively biased because they exclude some Antarctic blue whales that are north of 60°S, and because a low number of blue whales on the trackline may be missed. Additionally, estimates may include a small proportion of pygmy blue whales, probably less than 1%. Abundance estimates were also provided for each IWC Management Area and for each individual survey, but these have high associated uncertainty.

*14. BRANCH, T.A. and MIKHALEV, Y.A. 2008. Regional differences in length at sexual maturity for female blue whales based on recovered Soviet whaling data. *Marine Mammal Science*: in press. 11pp.

New blue whale ovarian corpora data from illegal Soviet catches in the Southern Hemisphere and northern Indian Ocean were recovered from the original logbooks. Catches north of 52°S were assumed to be pygmy blue whales (*Balaenoptera musculus brevicauda*, $n = 1,272$); those south of 56°S were assumed to be Antarctic (true) blue whales (*B. m. intermedia*, $n = 153$). Three probable Antarctic blue whales north of 52°S were excluded. Lengths at which 50% and 95% of females become sexually mature (L_{50} and L_{95}) were estimated from a Bayesian logistic model. These estimates are more precise than previous Japanese estimates because Soviet catches below the legal minimum of 70 ft (21.3 m) were 32 times greater. For pygmy blue whales L_{50} was 19.2 m (95% interval 19.1–19.3 m) and L_{95} was 20.5 m (95% interval 20.4–20.7 m). Antarctic L_{50} (23.4 m, 95% interval 22.9–23.9 m) was much longer than L_{50} for pygmy blue whale regions (18.4–19.9 m). The median L_{50} for the northern Indian Ocean was 0.5–0.6 m shorter than for pygmy blue whales from other regions; although statistically significant, these small length differences provide little support for northern Indian Ocean blue whales being a separate subspecies, *B. m. indica*.

*15. OKEANOS FOUNDATION FOR THE SEA. 2008. International Workshop on Shipping Noise and Marine Mammals, Hamburg, Germany, 21-24 April 2008 - Statement of Participants. 1pp.

*16. INTERNATIONAL MARITIME ORGANIZATION MARINE ENVIRONMENT PROTECTION COMMITTEE. 2007. Any other business - shipping noise and marine mammals, submitted by the United States. 6pp.

*17. SIMMONDS, M.P. and STANSFIELD, L. 2007. Solitary-social dolphins in the UK. *British Wildlife* December 2007: 96-101.

*18. PANIZ-MONDOLFI, A., REYES JAIMES, O. and DÁVILA JONES, L. 2007. Tropical medicine rounds: Lobomycosis in Venezuela. *International Journal of Dermatology* 46: 180-185.

*19. ALDRIN, M., HUSEBY, R.B. and SCHWEDER, T. 2008. A note on turning the catch limit algorithm for commercial baleen whaling. *J. Cetacean Res. Manage.* Submitted. 9pp.

*20. WILLIAMS, R., LUSSEAU, D. and HAMMOND, P.S. In review. Killer whale habitat use and the mixed blessing of critical habitat: the role of social aggregations and protected areas in cetacean conservation. 20pp.

Protected areas are often proposed as tools for protecting endangered 15 populations of marine megafauna. Our study area includes a voluntary no-entry reserve included in proposed critical habitat for Threatened „northern resident killer whales (NRKW, *Orcinus orca*) under Canada's Species at Risk Act. After a decades-long moratorium, proposals are pending either to allow oil tankers to transit this narrow passageway or a longer route around Vancouver

Island in open waters. We recorded summertime activities of whales, which are individually recognisable, from 1995 to 2002. Whales were observed on 397 of 530 days (74.9%) of observation. Whales showed strong preference for the reserve over adjacent waters, and used the reserve preferentially for feeding and beach-rubbing. While the study area comprises only 0.001% of the whales range, an average of 6.5% of the population of ~200 individuals was present whenever whales were seen. Frequently, >50% of the population was aggregated in this restricted and heavily trafficked waterway. We calculated potential annual mortality limits (ML) of 2.2 animals. Mean group size exceeded ML on 55.8% of days overall, and 98.8% of days when conditioning on presence. The whales high reliance on a trivial fraction of their range means that opportunities are routine for one stochastic, catastrophic event to cause population decline. On 20 August 2007, a barge loaded with 10,000L of diesel fuel sank in the study area, exposing 25% of the population to fuel. This underscores the importance of identifying critical habitat for threatened populations, and protecting it.

*21. WILLIAMS, R., HALL, A. and WINSHIP, A. In press. Potential limits to anthropogenic mortality of small cetaceans in coastal waters of British Columbia. *CJFAS*. 19pp.

Small cetaceans are by-caught in salmon gillnet fisheries in British Columbia (BC) waters. In Canada, there is currently no uniform method to identify when management action is necessary to reduce cetacean bycatch below sustainable limits. We estimated potential anthropogenic mortality limits (ML) for harbour and Dall's porpoise and Pacific white-sided dolphins using quantitative objectives from two well-established frameworks for conservation and management (the United States' Marine Mammal Protection Act and the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas), which are similar to management objectives developed for marine mammal stocks elsewhere in Canada. Limits were calculated as functions of: a minimum estimate of abundance (2004/2005); maximum rate of population increase; and uncertainty factors to account for bias in abundance estimates and uncertainty in estimates of mortality. Best estimates of bycatch mortality in 2004 and 2005 exceeded only the most precautionary limits, and only for the porpoise species. Future research priority should be given to determining small cetacean stock structure in BC and refining species-specific probabilities of entanglement. While results are preliminary, the approach offers a quantitative framework for Canada to meet its stated objectives to maintain favourable conservation status of small cetacean populations.

*22. BALLANTYNE, K.N., VAN OORSCHOT, R.A.H. and MITCHELL, R.J. 2007. Comparison of two whole genome amplification methods for STR genotyping of LCN and degraded DNA samples. *Forensic Science International* 166: 35-41.

The analysis of LCN or highly degraded DNA samples presents a challenge for forensic science. Improving the quantity and/or quality of samples would greatly increase the profiling success rate from LCN and degraded samples. Whole genome amplification (WGA) is one method that has such potential. Two commercially available WGA kits, GenomePlex and GenomiPhi, were investigated for use on LCN and degraded DNA samples. Both kits amplified genomic DNA, producing microgram quantities from sub-nanogram templates. Profiling success of LCN DNA samples was increased, with improvements of over 700% from 10 pg template DNA compared to non-WGA-amplified control samples. The amplification success with degraded DNA was also improved by WGA. Degraded DNA was simulated using restriction enzymes to demonstrate that the application of WGA can result in the typing of STR loci that could not previously be amplified. An increase in artefacts, such as stutter alleles and amplification biases, were observed in many samples. Results show that WGA is capable of increasing both the quality and quantity of DNA, and has the potential to improve profiling success from difficult samples in forensic casework.

*23. MEUDT, H.M. and CLARKE, A.C. 2007. Almost forgotten or latest practice? AFLP applications, analyses and advances. *TRENDS in Plant Science* 12(3): 107-117.

Amplified fragment length polymorphism (AFLP) DNA fingerprinting is a firmly established molecular marker technique, with broad applications in population genetics, shallow phylogenetics, linkage mapping, parentage analyses, and single-locus PCR marker development. Technical advances have presented new opportunities for data analysis, and recent studies have addressed specific areas of the AFLP technique, including comparison to other genotyping methods, assessment of errors, homoplasy, phylogenetic signal and appropriate analysis techniques. Here we provide a synthesis of these areas and explore new directions for the AFLP technique in the genomic era, with the aim of providing a review that will be applicable to all AFLP-based studies.

*24. ROHLAND, N. and HOFREITER, M. Comparison and optimization of ancient DNA extraction. *BioTechniques*. 42(3): 343-403.

Ancient DNA analyses rely on the extraction of the tiny amounts of DNA remaining in samples that are hundreds to tens of thousands of years old. Despite the critical role extraction efficiency plays in this field of research, no study has comprehensively compared ancient DNA extraction techniques to date. There are a wide range of methods currently in use, which rely on such disparate principles as spin columns, alcohol precipitation, or binding to silica. We have compared a number of these methods using quantitative PCR and then optimized each step of the most promising method. We found that most chemicals routinely added to ancient DNA extraction buffers do not increase, and sometimes even decrease, DNA yields. Consequently, our optimized method uses a buffer consisting solely of EDTA and proteinase K for bone digestion and binding DNA to silica via guanidinium thiocyanate for DNA purification. In a comparison with published methods, this minimalist approach, on average, outperforms all other methods in terms of DNA yields as measured using quantitative PCR. We also found that the addition of bovine serum albumin (BSA) to the PCR helps to overcome inhibitors in ancient DNA extracts. Finally, we observed a marked difference in the performance between different types of DNA polymerases, as measured by amplification success.

*25. DALLA ROSA, L., SECCHI, E., MAIA, Y.G., ZERBINI, A. and HEIDE-JØRGENSEN, M.P. 2008. Movements of satellite-monitored humpback whales on their feeding ground along the Antarctic Peninsula.

*26. REIF, J.S., M.M., P.-A., ROMANO, T.A., RICE, C.D., FAIR, P.A. and BOSSART, G.D. 2008. Immune dysfunction in Atlantic bottlenose dolphins (*Tursiops truncatus*) with lobomycosis. *Medical Mycology*. 11p.

Lobomycosis (Lacaziosis) occurs only in humans and dolphins under natural conditions. We evaluated the immune status of eight dolphins with lobomycosis and 40 healthy dolphins from the Indian River Lagoon (IRL), Florida. Lobomycosis cases had multiple abnormalities in their immunologic parameters when compared to healthy dolphins. The absolute number of circulating lymphocytes and serum albumin concentration were reduced (PB0.05) while the segmented neutrophils, alpha 1, total beta, total gamma and total globulins were increased (PB0.05). Although innate immunity was relatively intact and phagocytosis and natural killer cell activity were not affected, the plasma lysozyme concentrations were elevated in dolphins with lobomycosis (PB0.05). Adaptive immunity was depressed with statistically significant decreases found in the absolute numbers of CD4₊ helper T cells and CD19₊ and CD21₊ B cells. The ratios of CD2₊ T cells to CD4₊ cells and CD2₊ to CD21₊ cells were increased (P < 0.05 and PB0.05, respectively) and the numbers of lymphocytes expressing MHC class II molecules was decreased in dolphins with lobomycosis (PB0.05). Lymphocyte proliferation was reduced in response to stimulation with lipopolysaccharide and concanavalin A (PB0.05). Antibody titers to *Erysipelas rhusiopathiae*, a common marine micro-organism, were decreased (PB0.05). In summary, dolphins with lobomycosis exhibit significant impairment in adaptive immunity.

*27. BOSSART, G.D., MEISNER, R., VARELA, R.A., MAZZOIL, M.S., MCCULLOCH, S.D., KILPATRICK, D., FRIDAY, R., MURDOCH, E., MASE, B. and DEFTRAN, R.H. 2003. Pathologic findings in stranded Atlantic bottlenose dolphins (*Tursiops truncatus*) from the Indian River Lagoon, Florida. *Florida Scientist* 66(3): 226-238.

*28. REIF, J.S., MAZZOIL, M.S., MCCULLOCH, S.D., VARELA, R.A., GOLDSTEIN, J.D., FAIR, P.A. and BOSSART, G.D. 2006. Lobomycosis in Atlantic bottlenose dolphins from the Indian River Lagoon, Florida. *JAVMA* 228(1): 104-108.

*29. MURDOCH, E., REIF, J.S., MAZZOIL, M.S., MCCULLOCH, S.D., FAIR, P.A. and BOSSART, G.D. 2008.

Photo-identification for estimation of prevalence, spatial distribution and temporal trends of lobomycosis in bottlenose dolphins from the Indian River Lagoon, Florida. Southeast and Mid-Atlantic Marine Mammal Symposium, Charleston, SC, March 27-28 2008. 1pp.

*30. REIF, J.S., MURDOCH, E., MAZZOIL, M.S., MCCULLOCH, S.D., FAIR, P.A. and BOSSART, G.D. 2006. Lobomycosis in bottlenose dolphins: spatial aggregation of an emerging infectious disease. *Epidemiology* 17: S434-435.