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While contemporary studies of cetaceans provide a snapshot of current conditions, data from past historical studies may illuminate trends in distribution and behavior over longer time scales. During the breeding seasons of 1979-1981 (January to April) for humpback whales (*Megaptera novaeangliae*), P. Tyack and colleagues undertook one of the first multi-year studies of these whales' distribution and behavior in the Au'au Channel between the Hawaiian islands of Maui and Lana'i. Whale positions were determined by observers using a theodolite from a hilltop observation point, as were positions for many boats moving through the study area. While some analysis based on Tyack's field work appeared near the time of data collection (e.g. Tyack 1981, 1982), much additional information embodied in his data has been hard to access or analyze until now. But with support from NOAA's Climate Data Modernization Program and data entry assistance from SourceCorp (Mount Vernon, KY), we have now created updated and expanded computer data files based on the handwritten log books from this study. Both these files and scans of the original data pages are to be made available on the Web for reference by other researchers. In one analysis based on these data, we looked at minimum distance offshore for mother-calf pairs. Cows with calves have been thought to favor shallow areas near shore (Craig & Herman 2000, Green & Green 1990), but some authors have proposed that increasing watercraft traffic near Maui in the early 1980's drove mother-calf pairs away from these preferred areas (Glockner-Ferrari and Ferrari 1985, Salden 1988). Our findings, in which a Monte Carlo simulation suggested that the distances from shore of mother-calf pairs at first sighting became *more variable* in 1981 than in 1979 (though mean distances were not significantly different), might represent a transitional state between "inshore" and "offshore" behaviors.

### Assessing the potential effects of near shore hydrocarbon exploration on ringed seals in the Beaufort Sea region, 2003-2006

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We studied ringed seals, *Phoca hispida*, in their fast ice breeding habitat 30-40 km offshore in the Beaufort Sea, Northwest Territories, Canada. Our objectives were to identify and evaluate any potential impacts of offshore industrial activity on the resident seal populations. Work in 2003, 2004, and 2005 was conducted prior to industry activity, and our fourth season was conducted during the latter part of a single exploratory drilling project from 5 December 2005 to 8 April 2006. Using detection dogs, we found the mean density of subnivean seal structures to be 1.02 to 2.17 structures/km<sup>2</sup>. The rate of natural abandonment of seal structures ranged from 21-26% in 2003, 2004 and 2005, with a lower rate (10%) in 2006 being attributed to the significantly later date of freeze up in that year. The mean distance of all types of seal structures to the Paktoa drilling site were not significantly different between the non-industry and industry years. In 2006, the distances of seal structures from the ice road, the airstrip and from our 9-person research camp showed no evidence of avoidance, or attraction of seals. The movements and size of the territories used by the satellite tagged seals in 2005 and 2006 were not different, despite ice conditions that were vastly different in the two years. With the methods and approach used, we did not detect any effect of one season of drilling by industry at the Paktoa site on ringed seals in the study area.

### Using multiple marking methods in an integrated analysis of grey seal survival

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We report the results of an integrated analysis of mark-recapture data obtained from long-term observational studies at 2 UK grey seal breeding colonies on: North Rona, and the Isle of May. Various methods were used to mark seals in this study: brands, tags, and natural pelage patterns. We analyse data from animals marked using a single method, and also from animals that carry several types of mark. In order to reliably estimate survival rates, we address the following potential sources of bias: mark loss, and mark-dependence in recapture rates. We use Bayesian methods and a mark-recapture model based on a simple CJS approach. A hidden-process model is used to account for the uncertain states of tags and animals in years where observations were missing or incomplete. Estimates of annual tag-loss rates are 3.85% at North Rona (95% Bayesian credible interval = (3.02, 4.69)) and 6.37% (4.60, 8.90) at the Isle of May. We also find evidence that the loss of tags in double-tagged animals does not occur independently. Using the same analytical framework we estimate the relative recapture rates obtained using the 3 types of mark, and find considerable differences e.g. a recapture rate of 0.684 (0.649, 0.717) for pelage-marked animals at North Rona, similar to the recapture rate for branded seals of 0.634 (0.568, 0.689) and in contrast to a recapture rate of 0.385 (0.302, 0.469) for tagged animals. Estimates of adult female survival at each colony suggest that survival rates at North Rona vary with time, and are also on average lower (mean=0.847, (0.831, 0.862), based on years 1979-2006) than at the Isle of May (mean=0.942 (0.926, 0.955), based on years 1988-2006). These differences are consistent with observed trends in pup production at the 2 colonies.

### Feasibility of aircraft-based methodology to monitor cetacean behavior in conjunction with Navy training events involving mid-frequency active sonar

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We developed/implemented/evaluated aircraft-based protocol to monitor marine mammals before, during and/or after US Navy training events involving mid-frequency active sonar (MFAS) in waters within or adjacent to these events. In 2008/2009, two surveys were completed in Hawaii and two in Southern California. Goals were to (1) identify potential stranded/near-stranded/distressed/unusually behaving animals, (2) collect data on species occurrence, distribution, group size, group cohesion, orientation and general behavior, and (3) perform focal behavior follows on priority species. Protocol involved 3 survey modes: (1) search, (2) focal follow and (3) shoreline. When surveying on the range during some military exercises, search involved flying elliptical shapes ahead of a Navy vessel while searching for marine mammals. Otherwise, line transect was the primary search method. When priority species were encountered, a focal follow was implemented by flying circles at a radial distance of ~0.5-1 km and an altitude of ~350-450 m. Shoreline surveys were conducted after training events to search for stranded marine mammals. Observations were conducted by 3 experienced observers and a pilot from a twin-engine Partenavia and Robinson 44 helicopter (shoreline surveys only). Data collection methods included customized software used with a palm pilot and iPhone, handheld GPS, and/or handwritten notes. Still photographs and high-definition video were used to confirm species and record behavior. Scan-, zero-one and continuous behavioral sampling were applied. Behavior of 8 cetacean species was successfully tracked at higher altitude for periods of ~15-70 min at/sub-surface before/during/after exercise periods. Results indicate that aerial observation is a feasible platform for collecting data on species occurrence, distribution, group size, group cohesion, heading and general behavior, in a relatively short period of time over a large area. Conducting aerial surveys

before, during, and immediately following Naval training events can be a useful tool for monitoring potential effects of MFAS on marine mammals.

### First insights into population demographics of dwarf minke whales involved in swim-with activities, using a photo-identification network

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Dwarf minke whales are regarded as an undescribed subspecies of *Balaenoptera acutorostrata*. The only predictable aggregation of dwarf minke whales occurs each June/July in the northern Great Barrier Reef where it is targeted by a fully permitted swim-with whales industry. This study forms part of a broadly-based project investigating the biology and behaviour of dwarf minke whales involved in swim-with activities and the management of the human-whale interactions to inform sustainable management decisions. We used underwater photo-identification to gain insights into population demographics of whales involved in the activities. Photos and videos taken by crew and passengers onboard nine commercial vessels were supplemented by data collected by researchers. This resulted in a total of >25,000 images from 2006 and 2007. We identified 256 individuals (complete IDs with images from both sides of the animals); 151 in 2006 and 145 in 2007 (including 40 re-sights from 2006). More than one third of the animals were encountered repeatedly by the whalewatching fleet within each season (37.1% in 2006 and 38.6% in 2007). Individual whales were seen up to seven or eight times in 2006 and 2007, respectively. The average time between first and last sighting of individual whales was more than eight days in both years with maxima of 24 days in 2006 and 30 days in 2007. The high percentage of within-season re-sightings and the frequency of individual re-sightings indicate that the interacting population is relatively small. Conducting swim-with activities with a small population of whales some of which stay in the area for a long time raises concerns about cumulative impacts of the swim-with activity on individual whales.

### Examination of the level of anti-epizootic effectiveness of immune system of marine mammals as a method to estimate the influence of global changes of climate on the wild populations

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

that also can talk about high degree of their vulnerability during the epizootic process. In all cases visible effect of the environment on the state of health of animals was observed. Therefore these methods can be employed to estimate the influence of global climatic changes on marine mammal populations.

### Acoustic-based habitat models for Risso's and Pacific white-sided dolphins

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Habitat characterization allows prediction of heterogeneous dolphin distributions in response to highly variable oceanographic processes and can be used to understand and predict effects of anthropogenic disturbances. Many habitat models focus on contemporary dolphin occurrence data and environmental predictor variables, but time-lagged oceanographic data may increase models' predictive power due to ecological successional processes. Using hourly occurrence of Risso's dolphin (*Grampus griseus*) clicks and two types of Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) clicks in autonomous passive-acoustic recordings, as identified by their distinct spectral structures, we investigate hypotheses about the importance of time-lagged predictor variables with generalized additive models. Models related dolphin acoustic activity from recordings at six sites in the Southern California Bight between August 2005 and December 2007 to oceanographic variables including sea surface temperature (SST), SST coefficient of variation (CV), sea surface chlorophyll concentration (Chl), Chl CV, upwelling indices and solar and lunar temporal indices. Forward-backward selection and cross-validation methods were used to select models with the best predictive power. The most consistently selected variables for Risso's dolphins were SST (100% of models) and SST CV (80%), followed by Chl, Chl CV and solar indices (40% each). Predictor variables selected in Pacific white-sided click type A models were more variable with solar indices (100%) and SST and SST CV (60% each) being selected most frequently. Pacific white-sided click type B models were most consistent with SST CV (100%), solar indices (100%) and SST (80%) selected most often followed by upwelling (60%) and lunar indices (60%). Best predictive models for Risso's dolphins and Pacific white-sided dolphin type A clicks included time-lagged variables, suggesting the importance of ecological succession between abiotic variables and dolphin occurrence, while best models of Pacific white-sided dolphin type B clicks were for current conditions, suggesting association with prey aggregating features such as fronts and eddies.

### Fishing gears involved in entanglements of minke whales in the East Sea of Korea

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The entanglement of marine mammals in fishing gear is a global issue. It is considered to be a significant threat to minke whales (*Balaenoptera acutorostrata*) in the East Sea of Korea. This study investigated the types and parts of fishing gear involved in minke whale entanglements in this area between 2004 - 2007, as well as characteristics of the entangled whales (n=214). The majority of entanglements were caused by three types of fishing gear: set nets, pots and gill nets (n=207; 96.7%). Other entanglements were associated with bottom trawls, purse seines and trawls. Most entanglements occurred within 10 nautical miles of land (n=179; 86.5%), in water depths between 10 - 220 m. A total of 65 entanglements were attributed to the main and branch lines of fishing gear, and more entanglements were observed in the mouth than in any other body part (n=63; 30.4%). The mean length of entangled minke whales in set nets was significantly shorter than those entangled in pots and gill nets (p<0.001). Also, the mean body length of minke whales entangled in coastal and shallow waters was significantly shorter than those entangled in offshore and