

### In this review:

- A. Recent articles – no abstract available
- B. Recent publications available online
- C. Recent articles with abstracts

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## A. Recent articles – no abstract available

Van Waerebeek, K., Sequeira, M., Williamson, C., Sanino, G.P., Gallego, P., and Carmo, P. **Live-captures of common bottlenose dolphins *Tursiops truncatus* and unassessed bycatch in Cuban waters: evidence of sustainability found wanting.** *Latin American Journal of Aquatic Mammals* 5(1): 39-48, 2006.

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## B. Recent publications available online

Christensen, L.B. 2006. **Marine Mammal Populations: Reconstructing Historical Abundances at the Global Scale.** Fisheries Center Research Reports 14(9). Fisheries Center, University of British Columbia, Vancouver. 161pp.

**Available at:** [http://www.fisheries.ubc.ca/publications/reports/report14\\_9.php](http://www.fisheries.ubc.ca/publications/reports/report14_9.php)

**Notes:** This Report presents reconstruction of the populations (at least back to 1950) of nearly half of the 115 species of marine mammals, i.e., of all those which are, or have been commercially exploited. This reconstruction uses a robust method and provides a first approximation of their populations. In many case, this is the first such reconstruction. The data used for this are catches of different species of marine mammals, going back as far as possible into the past, in one case to 1530. These catches are of variable quality and hence the author emphasizes that the reconstructed populations should not be viewed as 'assessment', and compared for example, with assessment by the International Whaling Commission. Rather, this report should be viewed as the first exercise based on the first publicly available compilation of all catches of all marine mammals in the world, hence providing the basis for various generalizations, and a public dialog about marine mammals. One such generalization is that it is the large whales which have been first hunted historically, with the result that the mean size of marine mammals killed by humans has been declining over time. We are now mainly killing dolphins and pinnipeds, though there is a move afoot to reinstitute large scale hunting of large whales. Another generalization is that overall the population of marine mammals has declined since 1950 by approximately 56% in terms of weight and by 11% in terms of numbers. Although some single species of marine mammal have recovered spectacularly in the last decades, for example the North East Pacific gray whale, overall, marine mammals have still to recover from the great hunts of the past. This process is slowed down by the continuation of various fisheries which have marine mammals as 'by-catch' in various parts of the world.

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Runge, M.C., Sanders-Reed, C.A., Langtimm, C.A. and Fonnesebeck, C.J. 2007. **A quantitative threats analysis for the Florida manatee (*Trichechus manatus latirostris*).** U.S. Geological Survey Open-File Report 2007-1086. 34 pp.

**Available at:** <http://www.pwrc.usgs.gov/resshow/manatee/documents/OFR2007-1086.pdf>

**Notes:** The basis of this threats analysis is a comparative population viability analysis. This involves forecasting the Florida manatee population under different scenarios regarding the presence of threats, while accounting for process variation

(environmental, demographic, and catastrophic stochasticity) as well as parametric and structural uncertainty. The manatee core biological model (CBM) was used for this viability analysis, and the role of five threats was considered: watercraft-related mortality, loss of warm-water habitat in winter, mortality in water-control structures, entanglement, and red tide. This assessment of threats suggests that watercraft-related mortality is having the greatest impact on manatee population growth and resilience. Elimination of this single threat would greatly reduce the probability of quasi-extinction. Loss of warm-water is also a significant threat, particularly over the long-term. Red tide and entanglement, while noticeable threats, have had less of an impact on the manatee population. The effect of water control structures may have already been largely mitigated. We did not, however, consider an exhaustive list of threats. Other threats (e.g., reduction of food resources due to storms and development) may play a role now or in the future, but were not specifically investigated.

## C. Recent articles with abstracts

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Williams, R. and Lusseau, D. **A killer whale social network is vulnerable to targeted removals.** *Biology Letters* 2(4): 497-500, 2006.

**Notes:** Individuals play various roles in maintaining social integrity of mammalian populations. However, many models developed for managing wildlife resources assume that all individuals are equal. Killer whales are social animals that rely on relationships within and among family groups for survival. In the northeastern Pacific, fish-eating, 'resident' killer whale populations are composed of matrilineal groups from which offspring do not disperse. We analysed the influence of various individuals' age, sex and matrilineal affiliation on their position in a social network. Here, we show that some matrilineal groups appeared to play more central roles than others in the network. Furthermore, juvenile whales, especially females, appeared to play a central role in maintaining network cohesion. These two key findings were supported subsequently by simulating removal of different individuals. The network was robust to random removals; however, simulations that mimicked historic live-captures from the northeastern Pacific were likely to break the network graph into isolated groups. This finding raises concern regarding targeted takes, such as live-capture or drive fisheries, of matrilineal cetaceans.

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Bejder, L., Samuels, A., Whitehead, H., Gales, N., Mann, J., Connor, R., Heithaus, M., Watson-Capps, J., Flaherty, C., and Krutzen, M. **Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance.** *Conservation Biology* 20(6): 1791-1798, 2006.

**Notes:** Studies evaluating effects of human activity on wildlife typically emphasize short-term behavioral responses from which it is difficult to infer biological significance or formulate plans to mitigate harmful impacts. Based on decades of detailed behavioral records, we evaluated long-term impacts of vessel activity on bottlenose dolphins (*Tursiops* sp.) in Shark Bay, Australia. We compared dolphin abundance within adjacent 36 km<sup>2</sup> tourism and control sites, over three consecutive 4.5-year periods wherein research activity was relatively constant but tourism levels increased from zero, to one, to two dolphin-watching operators. A nonlinear logistic model demonstrated that there was no difference in dolphin abundance between periods with no tourism and periods in which one operator offered tours. As the number of tour operators increased to two, there was a significant average decline in dolphin abundance (14.9%; 95% CI = -20.8 to -8.23), approximating a decline of one per seven individuals. Concurrently, within the control site, the average increase in dolphin abundance was not significant (8-556; 95% CI = -4.0 to +16.7). Given the substantially greater presence and proximity of tour vessels to dolphins relative to research vessels, tour-vessel activity contributed more to declining dolphin numbers within the tourism site than research vessels. Although this trend may not jeopardize the large, genetically diverse dolphin population of Shark Bay, the decline is unlikely to be sustainable for local dolphin tourism. A similar decline would be devastating for small, closed, resident, or endangered cetacean populations. The substantial effect of tour vessels on dolphin abundance in a region of low-level tourism calls into question the presumption that dolphin-watching tourism is benign.

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Hall, A. J., McConnell, B.J., Rowles, T.K., Aguilar, A., Borrell, A., Schwacke, L., Reijnders, P.J.H., and Wells, R.S. **Individual-based model framework to assess population consequences of polychlorinated biphenyl exposure in bottlenose dolphins.** *Environmental Health Perspectives* 114(Suppl. 1): 60-64, 2006.

**Notes:** Marine mammals are susceptible to the effects of anthropogenic contaminants. Here we examine the effect of different polychlorinated biphenyl (PCB) accumulation scenarios on potential population growth rates using, as an example, data obtained for the population of bottlenose dolphins from Sarasota Bay, Florida. To achieve this goal, we developed an individual-based model framework that simulates the accumulation of PCBs in the population and modifies first-year calf survival based on maternal blubber PCB levels. In our example the current estimated annual PCB accumulation rate for the Sarasota Bay dolphin population might be depressing the potential population growth rate. However, our predictions are limited both by model naivety and parameter uncertainty. We emphasize the need for more data collection on the relationship between maternal blubber PCB levels and calf survivorship, the annual accumulation of PCBs in the blubber of females, and the transfer of PCBs to the calf through the placenta and during lactation. Such data require continued efforts directed toward long-term studies of known individuals in wild and semiwild populations.

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Charlton, K., Taylor, A.C., and McKechnie, S.W. **A note on divergent mtDNA lineages of bottlenose dolphins from coastal waters of southern Australia.** *Journal of Cetacean Research and Management* 8(2): 173-179, 2006.

**Notes:** Bottlenose dolphins have a global distribution throughout tropical and temperate waters, both inshore and offshore. Many studies demonstrate the existence of at least two *Tursiops* species: *Tursiops truncatus*, consisting of inshore and offshore eco-types and *T. aduncus*, a coastal Indo-Pacific type known to extend south into temperate waters down the east coast of Australia. To clarify the taxonomic status of two populations (Port Phillip Bay and Gippsland Lakes) of coastal bottlenose dolphins along Australia's south coast (Victoria), a 346bp region of the mitochondrial-DNA (mtDNA) control region was sequenced from ten individuals and they were incorporated into phylogenetic analyses involving published sequences of other *Tursiops* spp., *Stenella* spp. and *Delphinus* spp., found worldwide. Both neighbour-joining and maximum parsimony trees place Victorian coastal haplotypes in a highly-supported group separate to those from the other dolphins, including those from the southern part of the Australian eastern coast. Victorian haplotypes are least divergent from *T. truncatus* (average 5.5%) and most divergent from *T. aduncus* (9.1%), with intermediate levels of divergence from *Stenella* and *Delphinus* spp. These data suggest that the Victorian coastal dolphins, similar to other world-wide coastal populations, are genetically unique, long isolated and therefore likely to be locally adapted. This has important implications for management and conservation.

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Hansen, B.J.L. and Harding, K.C. **On the potential impact of harbour seal predation on the cod population in the eastern North Sea.** *Journal of Sea Research* 56(4): 329-337, 2006.

**Notes:** Increasing Scandinavian harbour seal populations during the last decades coincide in time with the collapse of the cod fishery. Assumptions of a causal relationship have led to claims favouring re-introduction of seal hunting. Proposals for 'adaptive management' often assume that decimating seal populations will automatically favour the fishery. This argument presupposes seal predation to be sufficiently large to have a measurable impact on the fish population. The potential magnitude of the cod-seal interaction was analysed using data on harbour seal abundance, feeding habits and compiled information on cod life history and cod landing statistics. A size-structured life history matrix for the cod population was applied and the size-specific prey preferences of harbour seals were taken into account. Estimated seal predation was small compared to both the landings by the fishery, and to minimum estimates of the total cod population. Furthermore, since the size classes of cod targeted by seals have low reproductive values, the impact of seal predation on cod production will be further reduced. Our analyses suggest harbour seals have a negligible impact on the cod fishery.

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Womble, J.N. and Sigler, M.F. **Seasonal availability of abundant, energy-rich prey influences the abundance and diet of a marine predator, the Steller sea lion *Eumetopias jubatus*.** *Marine Ecology Progress Series* 325: 281-293, 2006.

**Notes:** Steller sea lions *Eumetopias jubatus* are central-place foragers that forage in the marine environment while using terrestrial sites to rest and care for young. Some terrestrial sites are used seasonally; however, the reasons for doing so are not fully understood. We addressed the hypothesis that seasonal availability of prey influences seasonal abundance and diet of sea lions. We quantified monthly prey availability and sea lion abundance and quarterly diet composition at Benjamin Island in SE Alaska (2001-2004). Large numbers of sea lions occupied Benjamin Island during the nonbreeding season from October to April when Pacific herring *Clupea pallasii* biomass was highest. Herring was the most common species in sea lion diet (frequency of occurrence [FO] = 90%) and comprised over 81% of the available pelagic prey biomass and 96% of the energy

encountered during pelagic surveys. Walleye pollock *Theragra chalcogramma* accounted for 19% of the available prey biomass but was only slightly less common in sea lion diet (FO = 88 %) than herring. Herring biomass was correlated with the number of sea lions; in contrast, there was no relationship between pollock biomass and number of sea lions. Several fish species were found in nearshore areas, but were uncommon in sea lion diet. Sea lions consumed the available pelagic prey but little of the available nearshore prey. The FO of herring and pollock in sea lion diet did not differ significantly between seasons; however, the FO of other seasonal prey species differed between seasons. Seasonal occupation of Benjamin Island by sea lions is influenced by seasonally available, densely aggregated, energy-rich prey.

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Trites, A.W., Miller, A.J., Maschner, H.D.G., Alexander, M.A., Bograd, S.J., Calder, J.A., Capotondi, A., Coyle, K.O., DiLorenzo, E., Finney, B.P., Gregr, E.J., Grosch, C.E., Hare, S.R., Hunt, G.L., Jahncke, J., Kachel, N.B., Kim, H.J., Ladd, C., Mantua, N.J., Marzban, C., Maslowski, W., Mendelssohn, R., Neilson, D.J., Okkonen, S.R., Overland, J.E., Reedy-Maschner, K.L., Royer, T.C., Schwing, F.B., Wang, J.X.L., and Winship, A.J. **Bottom-up forcing and the decline of Steller sea lions (*Eumetopias jubatus*) in Alaska: assessing the ocean climate hypothesis.** *Fisheries Oceanography* 16(1): 46-67, 2007.

**Notes:** Declines of Steller sea lion (*Eumetopias jubatus*) populations in the Aleutian Islands and Gulf of Alaska could be a consequence of physical oceanographic changes associated with the 1976-77 climate regime shift. Changes in ocean climate are hypothesized to have affected the quantity, quality, and accessibility of prey, which in turn may have affected the rates of birth and death of sea lions. Recent studies of the spatial and temporal variations in the ocean climate system of the North Pacific support this hypothesis. Ocean climate changes appear to have created adaptive opportunities for various species that are preyed upon by Steller sea lions at mid-trophic levels. The east-west asymmetry of the oceanic response to climate forcing after 1976-77 is consistent with both the temporal aspect (populations decreased after the late 1970s) and the spatial aspect of the decline (western, but not eastern, sea lion populations decreased). These broad-scale climate variations appear to be modulated by regionally sensitive biogeographic structures along the Aleutian Islands and Gulf of Alaska, which include a transition point from coastal to open-ocean conditions at Samalga Pass westward along the Aleutian Islands. These transition points delineate distinct clusterings of different combinations of prey species, which are in turn correlated with differential population sizes and trajectories of Steller sea lions. Archaeological records spanning 4000 yr further indicate that sea lion populations have experienced major shifts in abundance in the past. Shifts in ocean climate are the most parsimonious underlying explanation for the broad suite of ecosystem changes that have been observed in the North Pacific Ocean in recent decades.

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Tinker, M.T., Doak, D.F., Estes, J.A., Hatfield, B.B., Hatfield, B.B., Staedler, M.M., and Bodkin, J.L. **Incorporating diverse data and realistic complexity into demographic estimation procedures for sea otters.** *Ecological Applications* 16(6): 2293-2312, 2006.

**Notes:** Reliable information on historical and current population dynamics is central to understanding patterns of growth and decline in animal populations. We developed a maximum likelihood-based analysis to estimate spatial and temporal trends in age/sex-specific survival rates for the threatened southern sea otter (*Enhydra lutris nereis*), using annual population censuses and the age structure of salvaged carcass collections. We evaluated a wide range of possible spatial and temporal effects and used model averaging to incorporate model uncertainty into the resulting estimates of key vital rates and their variances. We compared these results to current demographic parameters estimated in a telemetry-based study conducted between 2001 and 2004. These results show that survival has decreased substantially from the early 1990s to the present and is generally lowest in the north-central portion of the population's range. The greatest temporal decrease in survival was for adult females, and variation in the survival of this age/sex class is primarily responsible for regulating population growth and driving population trends. Our results can be used to focus future research on southern sea otters by highlighting the life history stages and mortality factors most relevant to conservation. More broadly, we have illustrated how the powerful and relatively straightforward tools of information-theoretic-based model fitting can be used to sort through and parameterize quite complex demographic modeling frameworks.

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Zerbini, A.N., Waite, J.M., Laake, J.L., and Wade, P.R. **Abundance, trends and distribution of baleen whales off Western Alaska and the central Aleutian Islands.** *Deep Sea Research Part I, Oceanographic Research* 53(11): 1772-1790, 2006.

**Notes:** Large whales were extensively hunted in coastal waters off Alaska, but current distribution, population sizes and trends are poorly known. Line transect surveys were conducted in coastal waters of the Aleutian Islands and the Alaska Peninsula in the summer of 2001-2003. Abundances of three species were estimated by conventional and multiple covariate distance sampling (MCDS) methods. Time series of abundance estimates were used to derive rates of increase for fin whales (*Balaenoptera physalus*) and humpback whales (*Megaptera novaeangliae*). Fin whales occurred primarily from the Kenai Peninsula to the Shumagin Islands, but were abundant only near the Semidi Islands and Kodiak. Humpback whales were found from the Kenai Peninsula to Umnak Island and were more abundant near Kodiak, the Shumagin Islands and north of Unimak Pass. Minke whales (*B. acutorostrata*) occurred primarily in the Aleutian Islands, with a few sightings south of the Alaska Peninsula and near Kodiak Island. Humpback whales were observed in large numbers in their former whaling grounds. In contrast, high densities of fin whales were not observed around the eastern Aleutian Islands, where whaling occurred. Average abundance estimates (95% CI) for fin, humpback and minke whales were 1652 (1142-2389), 2644 (1899-3680), and 1233 (656-2315), respectively. Annual rates of increase were estimated at 4.8% (95% CI = 4.1-5.4%) for fin and 6.6% (5.2-8.6%) for humpback whales. This study provides the first estimate of the rate of increase of fin whales in the North Pacific Ocean. The estimated trends are consistent with those of other recovering baleen whales. There were no sightings of blue or North Pacific right whales, indicating the continued depleted status of these species.

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Berteaux, D., Humphries, M.M., Krebs, C.J., Lima, M., McAdam, A.G., Pettorelli, N., Reale, D., Saitoh, T., Tkadlec, E., Weladji, R.B., and Stenseth, N.C. **Constraints to projecting the effects of climate change on mammals.** *Climate Research* 32(2): 151-158, 2006.

**Notes:** Ecologists are under pressure to anticipate the ecological effects of climate change. Therefore many ecological publications (and most grant proposals) related to climate claim relevance to the projection of future climate change effects. Yet the steps leading from ecological description and understanding to reliable projection are rarely explicit. A good understanding of the factors which allow the ecological effects of climate change to be effectively anticipated is critical to both the quality of basic science and its application to public policy. We used research performed on mammals to explore scientific approaches to anticipation of climate change effects. We distinguished forecasting models based on correlations from predictive models based on cause-effect relationships. These categories represent extremes along a continuous gradient between pattern description and causal understanding. We suggest that the constraints to our capacity to anticipate fall into 6 broad categories rooted in the development and application of forecasting and predictive models. These categories help to identify the conditions that allow or prevent projection of the effects of climate change on ecosystems. This approach should also help to identify which research avenues will likely be most fruitful.

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Greig, D.J., Ylitalo, G.M., Hall, A.J., Fauquier, D.A., and Gulland, F.M.D. **Transplacental transfer of organochlorines in California sea lions (*Zalophus californianus*).** *Environmental Toxicology and Chemistry* 26(1): 37-44, 2007.

**Notes:** The transplacental transfer of organochlorines (OCs) in California sea lions (*Zalophus californianus*) was investigated by analyzing blubber samples from 20 female sea lions and their fetuses during the last trimester of pregnancy. A rapid, high-performance liquid chromatographic, photodiode-array method was used to measure blubber concentrations of polychlorinated biphenyls (PCBs), including dioxin-like congeners, as well as DDTs and hexachloro-benzene. Summed values of PCBs ( $\Sigma$ PCBs), of DDTs ( $\Sigma$ DDTs), and of PCB toxic equivalents ( $\Sigma$ PCB TEQs) were calculated from these data. The ratios of mean blubber concentrations of fetal  $\Sigma$ PCBs to maternal blubber concentrations of  $\Sigma$ PCBs were 0.45 by wet weight and 0.97 by lipid weight, but these ratios varied widely among, mother-fetus pairs. Mean ratios of fetal  $\Sigma$ DDTs to maternal  $\Sigma$ DDTs were 0.53 by wet weight and 1.12 by lipid weight. Fetuses were classified into two age groups, based on date of recovery, to examine differences in OC transfer because of gestational age. Fetal to maternal ratios for individual PCB congeners, DDT compounds, and  $\Sigma$ PCBs,  $\Sigma$ DDTs, and  $\Sigma$ PCB TEQs were lower among premature compared with late-term fetuses. These ratios increased for both groups as the logarithmic n-octanol/water partition coefficient ( $\log K_{ow}$ ) for each compound decreased. Linear predictions for  $\Sigma$ PCB and  $\Sigma$ DDT concentrations in fetal blubber could be obtained using the  $\Sigma$ PCB and  $\Sigma$ DDT concentrations in maternal blubber, maternal and fetal blubber lipid content, maternal mass, and maternal age. Fetal TEQ was explained by maternal TEQ and maternal age. The ability to predict contaminant concentrations in fetal blubber from maternal parameters is important for developing risk assessment models for marine mammals.

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Van de Vijver, K.I., Hosbeek, L., Das, K., Blust, R., Joiris, C., and De Coen, W. **Occurrence of perfluorooctane sulfonate and other perfluorinated alkylated substances in harbor porpoises from the Black Sea.** *Environmental Science and Technology* 41(1): 315-320, 2007.

**Notes:** Perfluorooctane sulfonate (PFOS) and other perfluorinated alkylated substances (PFAS) were determined in liver, kidney, muscle, brain, and blubber samples of 31 harbor porpoises (*Phocoena phocoena relicta*) of different age and sex stranded along the Ukrainian coast of the Black Sea. In all individuals and in all tissues, PFOS was the predominant PFAS, accounting for on average 90% of the measured PFAS load. PFOS concentrations were the highest in liver ( $327 \pm 351$  ng/g wet wt) and kidney ( $147 \pm 262$  ng/g wet wt) tissue, and lower in blubber ( $18 \pm 8$  ng/g wet wt), muscle ( $41 \pm 50$  ng/g wet wt), and brain ( $24 \pm 23$  ng/g wet wt). No significant differences could be determined between males and females, nor between juvenile and adult animals ( $p > 0.05$ ). Perfluorononanoic acid, perfluorodecanoic acid, perfluoroundecanoic acid, and perfluorododecanoic acid could be detected in liver tissue of approximately 25% of the individuals. Perfluorobutane sulfonate, perfluorobutanoic acid, and perfluorooctanoic acid were not detected in any of the porpoise livers. Although we investigated a potential intraspecies segregation according to the source of prey, using stable isotopes, no statistically significant correlation between PFOS concentrations and stable isotopes could be determined. It is, however, noteworthy that the contamination by PFOS in the Black Sea harbor porpoises is comparable to levels found in porpoises from the German Baltic Sea and from coastal areas near Denmark and, therefore, might pose a threat to this population.

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Bester, M.N., Wilson, J.W., Burle, M.H., and Hofmeyr, G.J.G. **Population trends of Subantarctic fur seals at Gough Island.** *South African Journal of Wildlife Research* 36(2): 191-194, 2006.

**Notes:** Counts on a few of the more recently colonized southeast coast breeding sites at Gough Island during the 2005/06 breeding season indicate a continued overall increase in pup production of Subantarctic fur seals *Arctocephalus tropicalis*. The mean annual rate of increase of 8.4% for the population inhabiting these beaches for the 17-year period 1988/89-2005/06 was less than half of that recorded over the previous 13 years from 1975/76 and suggests that numbers at these sites are approaching the asymptote of the long-term population growth curve.

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Thompson, P.M., Mackey, B., Barton, T.R., Duck, C., and Butler, J.R.A. **Assessing the potential impact of salmon fisheries management on the conservation status of harbour seals (*Phoca vitulina*) in north-east Scotland.** *Animal Conservation* 10(1): 48-56, 2007.

**Notes:** Conservation efforts are often constrained by uncertainty over the factors driving declines in marine mammal populations. In Scotland, there is concern over the potential impact of unrecorded shooting of seals, particularly where this occurs near Special Areas of Conservation. Here, we show that the abundance of harbour seals *Phoca vitulina* in the Moray Firth, north-east Scotland, declined by 2-5% per annum between 1993 and 2004. Records from local salmon fisheries and aquaculture sites indicated that 66-327 harbour seals were shot each year between 1994 and 2002. Matrix models and estimates of potential biological removal indicate that this level of shooting is sufficient to explain observed declines. Nevertheless, uncertainty over the number and identity of seals shot means that other factors such as changes in food availability may be contributing. Recent conservation measures markedly reduced the recorded levels of shooting in 2003 and 2004. In 2005, a coordinated management plan was developed to protect salmon fisheries interests while minimizing impacts on local seal populations. Comprehensive monitoring of future population trends and improved regulation of culls are now required to provide more robust assessments of the impact of human persecution on harbour seal populations in the Moray Firth and in other parts of the UK.

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Kasuya, T. **Japanese whaling and other cetacean fisheries.** *Environmental Science and Pollution Research* 14(1): 39-48, 2007.

**Notes:** *Background, Aim and Scope.* Discussions on management of whales and whaling are factually monopolized by the International Whaling Commission (IWC), resulting in a limitation of information flow to outside communities. With an aim to improve the situation, this article briefly reviews whaling and dolphin/porpoise fisheries in Japan, which is recognized to be the world largest cetacean exploitation. *Main Features.* The Japanese government grants an annual take of 22,647 cetaceans of 15 species for scientific whaling and various kinds of active dolphin/porpoise fisheries by the nationals. Further, over 100

baleen whales and numerous small cetaceans are taken in passive net fisheries. They are used mostly for human consumption and some for aquarium display. *Results.* Sustainability of the take is not evident and some populations have shown a historical decline. The Japanese program of scientific whaling has been reviewed by IWC and its Scientific Committee (SC), although they have arrived at no consensus. *Discussion.* The current scientific whaling program invites arguments from the view points of science as well as concerning the ethics of scientists, economy, and interpretation of the International Convention for Regulation of Whaling (ICRW) of 1946. The scientific whaling and other Japanese cetacean fisheries are benefited from nationalistic public attitude, and ambiguity and weakness of the ICRW. *Conclusions.* Japanese cetacean harvest will continue supported by domestic demand for whale products as long as the proceeds can sustain the operation, even with criticisms from outside communities. *Recommendations and Perspectives.* For safe management of small cetaceans exploited by Japan, studies are urgent on the population structure, abundance and validity of catch statistics. The results should be open to scientific communities.

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Richardson, E., Stirling, I., and Kochtubajda, B. **The effects of forest fires on polar bear maternity denning habitat in western Hudson Bay.** *Polar Biology* 30(3): 369-378, 2007.

**Notes:** The effects of forest fires on polar bear (*Ursus maritimus*) maternity denning habitat in western Hudson Bay were determined by comparing the physical characteristics of 48 burned and 101 unburned maternity den sites from September 2001 to October 2003. Fire significantly altered vegetation composition and increased the depth of the active layer, resulting in a decrease in the stability of den sites, the collapse of dens, and degradation of the surrounding habitat. Although bears investigated burned areas, analysis of mark and recapture data, satellite telemetry, radiotelemetry, and field observations all demonstrated that bears did not use burned areas for denning. While peat denning habitat is likely not limiting at this time, the re-use and occupancy of peat den sites during the summer may be an important means of energy conservation for pregnant female bears in western Hudson Bay. Increased energy expenditures in association with increased search times for suitable den sites and the excavation of new dens can potentially affect reproductive success. Predicted increases in forest fire activity as a result of climate change, along with the long-term recovery of denning habitat may reduce the amount of suitable denning habitat in the future. Resource managers need to be aware of the possibility of a shift in the distribution of denning bears and further loss of maternity denning habitat in western Hudson Bay.

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Langtimm, C.A., Krohn, M.D., Reid, J.P., Stith, B.M., and Beck, C.A. **Possible effects of the 2004 and 2005 hurricanes on manatee survival rates and movement.** *Estuaries and Coasts* 29(6): 1026-1032, 2006.

**Notes:** Prior research on manatee (*Trichechus manatus latirostris*) survival in northwest Florida, based on mark-resighting photo-identification data from 1982-1998, showed that annual adult apparent survival rate was significantly lower during years with extreme storms. Mechanisms that we proposed could have led to lower estimates included stranding, injury from debris, being fatally swept out to sea, or displacement into poorly monitored areas due to storm-generated longshore currents or storm-related loss of habitat. In 2004 and 2005, seven major hurricanes impacted areas of Florida encompassing three regional manatee subpopulations, enabling us to further examine some of these mechanisms. Data from a group of manatees tracked in southwest Florida with satellite transmitters during Hurricanes Charley, Katrina, and Wilma showed that these animals made no significant movement before and during storm passage. Mark-resighting data are being collected to determine if survival rates were lower with the 2004 and 2005 storms.

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Taylor, M.K., Laake, J., McLoughlin, P.D., Cluff, H.D., and Messier, F. **Demographic parameters and harvest-explicit population viability analysis for polar bears in M'Clintock Channel, Nunavut, Canada.** *Journal of Wildlife Management* 70(6): 1667-1673, 2006.

**Notes:** Polar bear (*Ursus maritimus*) numbers in M'Clintock Channel, Nunavut, Canada have decreased significantly since 1972. We used mark-recapture and recovery data collected from 348 marked polar bears from 1972 to 2000 to estimate demographic characteristics and harvest risks of the M'Clintock Channel polar bear population. Total (harvested) survival rates ( $\pm 1$  SE) from mark-recapture analysis were: 0.62 ( $\pm 0.15$ ) for cubs of the year, 0.90 ( $\pm 0.04$ ) for subadults (ages 1-4yr), 0.90 ( $\pm 0.04$ ) for adult (age  $\pm 5$ yr) females, and 0.88 ( $\pm 0.04$ ) for adult males. Mean litter size was  $1.68 \pm 0.15$  cubs with a mean reproductive interval of  $2.8 \pm 0.2$  years. By 6 years of age, on average  $0.29 \pm 0.47$  females were producing litters; mean litter production rate

for females aged > 6 years was  $0.93 \pm 0.33$ . We estimated total abundance to average  $284 \pm 59.3$  bears, of which  $166.9 \pm 35.4$  individuals were female and  $117.2 \pm 26.4$  were male. We incorporated our standing age and mark-recapture demographic parameters as input into a harvest risk analysis designed to account for demographic, environmental, and sampling uncertainty. Population growth rate was  $0.946 \pm 0.038$  for the period 1993-1999. A harvest quota not exceeding 3 bears/year is required if the population is to increase in the short term. Slightly higher quota options are available if increased risk and recovery times are accepted by stakeholders.

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Kannan, K., Agusa, T., Perrotta, E., Thomas, N.J., and Tanabe, S. **Comparison of trace element concentrations in livers of diseased, emaciated and non-diseased southern sea otters from the California coast.** *Chemosphere* 65(11): 2160-2167, 2006.

**Notes:** Infectious diseases have been implicated as a cause of high rates of adult mortality in southern sea otters. Exposure to environmental contaminants can compromise the immuno-competence of animals, predisposing them to infectious diseases. In addition to organic pollutants, certain trace elements can modulate the immune system in marine mammals. Nevertheless, reports of occurrence of trace elements, including toxic heavy metals, in sea otters are not available. In this study, concentrations of 20 trace elements (V, Cr, Mn, Co, Cu, Zn, Rb, Sr, Mo, Ag, Cd, In, Sri, Sb, Cs, Ba, Hg, Tl, Pb, and Bi) were measured in livers of southern sea otters found dead along the central California coast ( $n = 80$ ) from 1992 to 2002. Hepatic concentrations of trace elements were compared among sea otters that died from infectious diseases ( $n = 27$ ), those that died from non-infectious causes ( $n = 26$ ), and otters that died in emaciated condition with no evidence of another cause of death ( $n = 27$ ). Concentrations of essential elements in sea otters varied within an order of magnitude, whereas concentrations of non-essential elements varied by two to five orders of magnitude. Hepatic concentrations of Cu and Cd were 10- to 100-fold higher in the sea otters in this study than concentrations reported for any other marine mammal species. Concentrations of Mn, Co, Zn, and Cd were elevated in the diseased and emaciated sea otters relative to the non-diseased sea otters. Elevated concentrations of essential elements such as Mn, Zn, and Co in the diseased/emaciated sea otters suggest that induction of synthesis of metallothionein and superoxide dismutase (SOD) enzyme is occurring in these animals, as a means of protecting the cells from oxidative stress-related injuries. Trace element profiles in diseased and emaciated sea otters suggest that oxidative stress mediates the perturbation of essential-element concentrations. Elevated concentrations of toxic metals such as Cd, in addition to several other organic pollutants, may contribute to oxidative stress-mediated effects in sea otters.

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Borrell, A. and Aguilar, A. **Organochlorine concentrations declined during 1987-2002 in western Mediterranean bottlenose dolphins, a coastal top predator.** *Chemosphere* 66(2): 347-352, 2007.

**Notes:** We collected blubber samples from bottlenose dolphins stranded on Spain's Mediterranean coasts over a 25-year period (1978-2002). Samples were analyzed to determine time trends in levels of: HCB (hexachlorobenzene), PCB (polychlorinated biphenyls) and tDDT (dichlorodiphenyltrichloroethane and its metabolites). Overall, levels were high relative to other areas. This reflects both the ubiquity of organochlorine pollution in the western Mediterranean and the sampled species' coastal habit. There was a significant decline over the study period in the concentrations of all the compounds analyzed. However, the DDE/tDDT, which is indicative of DDT ageing, significantly increased. This suggests there has been no significant use of HCB, DDT or PCB in the region for a long time. It also indicates that the pollutant loads in the environment are gradually being reduced; either by degradation or by migration of the compounds to other regions. A comparison with dolphin species that have an oceanic distribution suggests that PCB decline at a comparable pace in coastal and offshore water bodies. However, the decline of tDDT is faster near the coast.

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Williams, R., Lusseau, D., and Hammond, P.S. **Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*).** *Biological Conservation* 133(3): 301-311, 2006.

**Notes:** This study examined the activities of "northern resident" killer whales (*Orcinus orca*) in Johnstone Strait, British Columbia, Canada, in July and August, from 1995 to 2002. Disturbance from boat traffic has been identified as a conservation concern for this population. The primary aims of the study were to test whether boat presence altered whales' activities, and if so, to estimate whether behavioural responses were likely to have carried energetic costs. A land-based observation site near a vessel-exclusion marine protected area allowed us to conduct a natural experiment to monitor whale activities in the presence

and absence of boats. Using Time-Discrete Markov Chain models, boat presence was linked to significant changes in the probability that focal whales would switch from one activity state to another, which led to significantly different activity budgets in the presence and absence of boats. We estimated that the energetic cost of meeting these budgets differed by only 3-4%. In the presence of boats, however, whales reduced their time spent feeding and the time spent rubbing their bodies on smooth pebble beaches. These lost feeding opportunities could have resulted in a substantial (18%) estimated decrease in energy intake. Our sensitivity analysis provides preliminary evidence that disturbance could carry higher costs to killer whales in terms of reducing energy acquisition than increasing energetic demand, and future research should address this directly. Meanwhile, our observations suggest that protected areas would confer greatest conservation benefit to endangered killer whale populations if they were designed to protect important foraging areas.

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Segura, I., Rocha-Olivares, A., Flores-Ramirez, S., and Rojas-Bracho, L. **Conservation implications of the genetic and ecological distinction of *Tursiops truncatus* ecotypes in the Gulf of California.** *Biological Conservation* 133(3): 336-346, 2006.

**Notes:** The demand for live bottlenose dolphins for commercial use is growing in Mexico, making the need for stock assessment and management ever more essential given their protected status. *Tursiops truncatus* is known to exhibit high levels of phenotypic polymorphisms. In the Gulf of California (GC), coastal and offshore ecotypes have been identified based on morphological, behavioral and ecological evidence, including different prey and habitat preferences. However, the extent to which this ecological and phenotypic variation is genetically correlated is unknown. Here we assess this correlation in GC bottlenose dolphins classified as coastal or offshore based on habitat, morphological and trophic evidence. Significant ( $p < 0.0001$ ) haplotype heterogeneity (exact test) and genetic differentiation ( $F_{ST} = 0.069$ ) were found in the mitochondrial control region, indicating some reproductive isolation between ecotypes. As elsewhere, coastal dolphins were less diverse than offshore. Phylogenetic analyses revealed paraphyletic coastal and offshore lineages and no evidence of lineage sorting, possibly due to recent isolation or gene flow. This is the first time that genetic, morphological and stable isotope evidence has been used to recognize ecotypes as different stocks for management purposes in bottlenose dolphins. Our results indicate that diversifying forces are shaping their phenotypic and genetic variation in the GC. Management and conservation efforts in this strategic region should aim to preserve these forces.

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Noren, S.R. and Edwards, E.F. **Physiological and behavioral development in delphinid calves: Implications for calf separation and mortality due to tuna purse-seine sets.** *Marine Mammal Science* 23(1): 15-29, 2007.

**Notes:** Tuna purse-seiners in the eastern tropical Pacific (ETP) capture yellowfin tuna by chasing and encircling herds of associated dolphins. This fishery has caused mortality in 14 dolphin species (20 stocks) and has led to significant depletions of at least three stocks. Although observed dolphin mortality is currently low, set frequency remains high and dolphin stocks are not recovering at expected rates. Mortality of nursing calves permanently separated from their mothers during fishery operations may be an important factor in the lack of population recovery, based on the recent discovery that calves do not accompany 75%-95% of lactating females killed in the purse-seine nets. We assessed age-specific potential for mother-calf separations and subsequent mortality of calves by reviewing and synthesizing published data on physiological and behavioral development in delphinids from birth through 3 yr postpartum. Results indicate that evasive behavior of mothers, coupled with the developmental state of calves, provides a plausible mechanism for set-related mother-calf separations and subsequent mortality of calves. Potential for set-related separation and subsequent mortality is highest for 0-12-mo-old dolphins and becomes progressively lower with age as immature dolphins approach adult stamina and attain independence.

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Rommel, S.A., Costidis, A.M., Pitchford, T.D., Lightsey, J.D., Snyder, R.H., and Haubold, E.M. **Forensic methods for characterizing watercraft from watercraft-induced wounds on the Florida manatee (*Trichechus manatus latirostris*).** *Marine Mammal Science* 23(1): 110-132, 2007.

**Notes:** Watercraft-related mortality represents 1,253 (24.9%) of 5,033 Florida manatee (*Trichechus manatus latirostris*) deaths recorded between 1 January 1979 and 31 December 2004. Wound patterns generated by collisions with watercraft are diagnostic. Sets of cuts and scrapes that are roughly equidistant and perpendicular to the direction of vessel travel are consistent with lacerations made by propeller blades. From these lesions, estimates of propeller diameter, pitch, rotation, and

direction of travel may be obtained. Considerable overlap of propeller sizes and pitches on different size vessels, common use of counter rotation propellers, and numerous other complicating factors may confound efforts to accurately predict vessel size and type from propeller wounds. Of the more than one million watercraft registered in Florida, 98% are  $\leq 12.2$  m (40 ft), yet watercraft 5.3-36.6 m (17.5-120 ft) are known to have killed manatees. Analysis of a 5-yr subset of mortality data suggests that a disproportionate number of propeller-caused watercraft-related mortalities could be attributed to propeller diameters  $\geq 43.2$  cm (17 in.), inferring that these were caused by watercraft  $\geq 12.2$  m (40 ft).

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Taylor, B.L., Martinez, M., Gerrodette, T., Barlow, J., and Hrovat, Y.N. **Lessons from monitoring trends in abundance of marine mammals.** *Marine Mammal Science* 23(1): 157-175, 2007.

**Notes:** We assessed scientists' ability to detect declines of marine mammal stocks based on recent levels of survey effort, when the actual decline is precipitous. We defined a precipitous decline as a 50% decrease in abundance in 15 yr, at which point a stock could be legally classified as "depleted" under the U.S. Marine Mammal Protection Act. We assessed stocks for three categories of cetaceans: large whales ( $n = 23$ , most of which are listed as endangered), beaked whales ( $n = 11$ , potentially vulnerable to anthropogenic noise), and small whales/dolphins/porpoises ( $n = 69$ , bycatch in fisheries and important abundant predators), for two categories of pinnipeds with substantially different survey precision: counted on land ( $n = 13$ ) and surveyed on ice ( $n = 5$ ), and for a category containing polar bear and sea otter stocks ( $n = 6$ ). The percentage of precipitous declines that would not be detected as declines was 72% for large whales, 90% for beaked whales, and 78% for dolphins/porpoises, 5% for pinnipeds on land, 100% for pinnipeds on ice, and 55% for polar bears/sea otters (based on a one-tailed t-test,  $\alpha = 0.05$ ), given the frequency and precision of recent monitoring effort. We recommend alternatives to improve performance.