

# Marine Science Review - 162

## Marine and coastal birds



### In this review:

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

---

## A. Recent articles – no abstract available

Lewis, R.L., Nel, D.C., Taylor, F., Croxall, J.P., and Rivera, K.S. **Thinking big - taking a large-scale approach to seabird bycatch.** *Marine Ornithology* 33(1): 1-5, 2005.

Hipfner, J.M. **Population status of the Common Murre *Uria aalge* in British Columbia.** *Marine Ornithology* 33(1): 67-69, 2005.

---

## B. Recent articles with abstracts

Lockwood, A., Couturier, A., and Wren, L.S. **From the tundra to Tierra del Fuego : protecting key sites for birds in Canada and throughout the Western Hemisphere.** *Biodiversity* 6(3): 40-48, 2005.

**Notes:** Canada provides habitat for more than 470 species of migrating and non-migrating birds. They provide a number of ecosystem services, biological control, pollination, seed dispersal, seed germination and nutrient recycling. However their habitats are under increasing pressure from threats such as urban expansion, industrial agriculture, logging, mining and pollution. In order to ensure that our migrants return each spring, we must also work to conserve their vital habitat beyond our borders.

-----

Yasué, M. **The effects of human presence, flock size and prey density on shorebird foraging rates.** *Journal of Ethology* 23(2): 199-204, 2005.

**Notes:** Animals may alter their foraging behaviour in the presence of humans because they perceive humans as potential predators. In this study I determined whether people caused shorebirds to reduce feeding rates at a stopover site in coastal British Columbia, Canada. I controlled for prey density and flock size because these variables may influence both the foraging rates as well as the effect of human disturbance on feeding efficiency. Semipalmated plovers decreased feeding rates when there were more people on the beach (multiple regression:  $F_{1,15}=5.86$ ,  $b=0.59$ ,  $P=0.029$ ,  $R^2=37.6\%$ ). For least sandpipers, the effect of human densities on feeding rates depended on flock size ( $F_{1,21}=5.97$ ,  $P=0.023$ ) and amphipod availability ( $F_{1,21}=4.98$ ,  $P=0.037$ ). This study demonstrated the importance of measuring subtle behavioural changes in foraging rates along with key ecological variables in order to assess the true impact of human disturbance on migratory shorebirds.

-----

Braune, B.M. and Malone, B.J. **Mercury and selenium in livers of waterfowl harvested in northern Canada.** *Archives of Environmental Contamination and Toxicology* 50(2): 284-289, 2006.

**Notes:** Total mercury and selenium were measured in livers of green-winged teal, northern pintails, buffleheads, king eiders, Barrow's and common goldeneyes, surf and white-winged scoters collected from 12 sites across northern Canada between

1988 and 1994. Hepatic mercury concentrations were  $< 1.0 \text{ mg.kg}^{-1}$  ww in 80% of the birds analyzed. Mercury levels did not vary much among species, with green-winged teal, northern pintails, and white-winged scoters, in particular, generally having quite low levels ( $< 0.5 \text{ mg.kg}^{-1}$  ww). Northern pintails had the lowest Se concentrations ( $< 2.5 \text{ mg.kg}^{-1}$  ww) overall whereas the higher Se concentrations ( $10\text{-}20 \text{ mg.kg}^{-1}$  ww) were found in the king eiders and scoters. Selenium showed a much greater variation in concentrations, particularly in the king eiders and scoters. Hepatic mercury concentrations found in the waterfowl analyzed in this study were an order of magnitude lower than toxicological threshold levels found in the literature. However, hepatic selenium concentrations in 33% of the females exceeded  $3.0 \text{ mg.kg}^{-1}$  ww and some king eiders as well as some surf and white-winged scoters contained hepatic selenium concentrations  $> 10 \text{ mg.kg}^{-1}$  ww suggesting levels of potential concern.

---

Yeung, C.K.L., Yao, C.T., Hsu, Y.C., Wang, J.P., and Li, S.H. **Assessment of the historical population size of an endangered bird, the black-faced spoonbill (*Platalea minor*) by analysis of mitochondrial DNA diversity.** *Animal Conservation* 9(1): 1-10, 2006.

**Notes:** We present a practical case of inferring historical demography in an endangered avian species, the black-faced spoonbill *Platalea minor*, which may be of reference for strategizing conservation planning for species lacking historical records. We applied a genetic approach, complemented by limited knowledge of demographic parameters and life history, to infer the historical population size in the black-faced spoonbill, based on 2369 bp of three protein-coding mitochondrial DNA fragments from 87 individuals. The best estimate of theta (a product of two times the female effective population and the mutation rate) was 0.00028, which led a historical population size of 10 320 (95% CI: 1976-37 254) individuals - roughly nine times larger than the current estimated global population size of 1206 individuals. For an avian species lacking historical demographic records, this study extrapolates the occurrence of a severe and probably recent historical population reduction in the endangered black-faced spoonbill. We suggest that the population decline of this bird might not be fully explained by factors such as the Korean War or loss of habitat; rather, a bottleneck resulting from pollution by pesticides seems more congruent with the demographic history in terms of the scale of the population reduction and the timing and pattern of recovery. Environmental monitoring is therefore suggested as a proactive step to prevent future pollution or disease outbreak.

---

Weimerskirch, H., Akesson, S., and Pinaud, D. **Postnatal dispersal of wandering albatrosses *Diomedea exulans*: implications for the conservation of the species.** *Journal of Avian Biology* 37(1): 23-28, 2006.

**Notes:** Many large marine vertebrates are today threatened by human activities and it is therefore crucial to obtain information on their distribution and behaviour at sea. In particular little is known about the time necessary for juveniles to acquire the foraging skills of adults. We tracked 13 juvenile wandering albatrosses *Diomedea exulans* by satellite telemetry during their first year at sea. They covered an average distance of 184000 km during the first year and restricted their dispersal to the unproductive waters of the subtropical Indian Ocean and Tasman Sea. This region of low wind velocities does not overlap with the foraging areas used by adults. After an innate phase of rapid dispersal with a fixed flight direction, young birds progressively increased their daily flight distances and attained adult flight efficiency within their first six months at sea. The complete overlap of the juveniles' foraging ranges with major long-line fisheries in the subtropical waters constitutes a major threat that could jeopardize the long term recovery ability of populations of the endangered wandering albatross in the Indian Ocean.

---

Schwarzbach, S.E., Albertson, J.D., and Thomas, C.M. **Effects of predation, flooding, and contamination on reproductive success of California Clapper Rails (*Rallus longirostris obsoletus*) in San Francisco Bay.** *Auk* 123(1): 45-60, 2006.

**Notes:** We assessed the reproductive success of the California Clapper Rail (*Rallus longirostris obsoletus*), an endangered subspecies restricted to San Francisco Bay, and the relative importance of predation, flooding, and contaminants as factors affecting that success. Our study was conducted in six tidal marshes in the northern and southern reaches of San Francisco Bay. This assessment, conducted in four breeding seasons (1991, 1992, 1998, 1999), determined that productivity of California Clapper Rails was much reduced over the natural potential. Only 69% of clapper rail eggs whose viability could be assessed were viable. Hatchability of eggs in North Bay and South Bay marshes was 65% and 70%, respectively. Only 45% of the nests

successfully hatched at least one egg. Despite mean clutch sizes of 6.7 and 6.9 in the North and South bays, respectively, clapper rails produced only 1.9 and 2.5 young per nesting attempt. Flooding was a minor factor, reducing the number of eggs available to hatch by only 2.3%. Predation on eggs was a major factor affecting nest success, reducing productivity by a third. Failed eggs were examined for abnormal development and contaminant concentrations. Contamination appeared to adversely influence California Clapper Rail reproductive success, as evidenced by deformities; embryo hemorrhaging; embryo malpositions; a depressed rate of hatchability; excess concentrations of mercury, barium, and chromium over known avian embryotoxic thresholds; and a correlation of deformities with elevated concentrations of some trace elements in eggs that failed to hatch. Mercury was the only significant contaminant common to all marshes.

-----

Murvoll, K.M., Skaare, J.U., Anderssen, E., and Jenssen, B.M. **Exposure and effects of persistent organic pollutants in European shag (*Phalacrocorax aristotelis*) hatchlings from the coast of Norway.** *Environmental Toxicology and Chemistry* 25(1): 190-198, 2006.

**Notes:** Although the coast of Norway is relatively clean regarding contaminants compared to areas of Europe with higher density of both people and industry, levels of persistent organic pollutants (POPs) exist in the marine ecosystem that may cause chronic exposure effects in wildlife. In this study, polychlorinated biphenyls (PCBs), some organochlorinated pesticides (OCPs), polybrominated diphenyl ethers (PBDEs), and hexabromocyclododecane (HBCD) were analyzed in yolk sac of European shag (*Phalacrocorax aristotelis*) hatchlings from an island situated on the coast of Mid-Norway. In addition, levels of retinol (vitamin A), retinyl palmitate, and  $\alpha$ -tocopherol (vitamin E) were measured in plasma and liver. The shag hatchlings seemed to be relatively highly contaminated by PBDEs and HBCD on a European scale. A negative relationship between PBDE-28 and liver tocopherol levels was revealed, and plasma retinol levels correlated negatively to levels of several PCB congeners, the summed PCB concentrations (SPCBs), and some OCPs. More studies should be done to reveal the effects of POPs, and especially PBDEs, on vitamin status in wild birds.

-----

Lewis, S., Gremillet, D., Daunt, F., Ryan, P.G., Crawford, R.J.M., and Wanless, S. **Using behavioural and state variables to identify proximate causes of population change in a seabird.** *Oecologia* 147(4): 606-614, 2006.

**Notes:** Changes in animal population size are driven by the interactions between intrinsic processes and extrinsic forces, and identifying the proximate mechanisms behind population change remains a fundamental question in ecology. Here we report on how measuring behavioural and state proxies of food availability among populations experiencing different growth rates can be used to rapidly identify proximate drivers of population trends. In recent decades, the Cape gannet *Morus capensis* has shown a major distributional shift with historically large colonies in Namibia decreasing rapidly, whilst numbers at South African colonies have increased, suggesting contrasting environmental conditions in the two regions. We compared per capita growth rates of five of the six extant colonies with foraging range (using miniaturised Global Positioning System loggers), foraging work rate, food delivery rates and body condition of breeding adults. We found significant associations between the rate of population change, individual behaviour, energetic gain and body condition that indicate that recent population changes are associated with extrinsic effects. This study shows that behavioural and state data can be used to identify important drivers of population change, and their cost-effectiveness ensures that they are an appealing option for measuring the health of animal populations in numerous situations.

-----

Forcada, J., Trathan, P.N., Reid, K., Murphy, E.J., and Croxall, J.P. **Contrasting population changes in sympatric penguin species in association with climate warming.** *Global Change Biology* 12(3): 411-423, 2006.

**Notes:** Climate warming and associated sea ice reductions in Antarctica have modified habitat conditions for some species. These include the congeneric Adelie, chinstrap and gentoo penguins, which now demonstrate remarkable population responses to regional warming. However, inconsistencies in the direction of population changes between species at different study sites complicate the understanding of causal processes. Here, we show that at the South Orkney Islands where the three species breed sympatrically, the less ice-adapted gentoo penguins increased significantly in numbers over the last 26 years, whereas chinstrap and Adelie penguins both declined. These trends occurred in parallel with regional long-term warming and significant reduction in sea ice extent. Periodical warm events, with teleconnections to the tropical Pacific, caused cycles in sea ice leading to reduced prey biomass, and simultaneous interannual population decreases in the three penguin species. With the

loss of sea ice, Adelle penguins were less buffered against the environment, their numbers fluctuated greatly and their population response was strong and linear. Chinstrap penguins, considered to be better adapted to ice-free conditions, were affected by discrete events of locally increased ice cover, but showed less variable, nonlinear responses to sea ice loss. Gentoo penguins were temporarily affected by negative anomalies in regional sea ice, but persistent sea ice reductions were likely to increase their available niche, which is likely to be substantially segregated from that of their more abundant congeners. Thus, the regional consequences of global climate perturbations on the sea ice phenology affect the marine ecosystem, with repercussions for penguin food supply and competition for resources. Ultimately, variability in penguin populations with warming reflects the local balance between penguin adaptation to ice conditions and trophic-mediated changes cascading from global climate forcing.

-----

Schwarzbach, S.E., Stephenson, M., Ruhlen, T., Abbott, S., Page, G.W., and Adams, D. **Elevated mercury concentrations in failed eggs of Snowy Plovers at Point Reyes National Seashore.** *Marine Pollution Bulletin* 50(11): 1444-1447, 2005.

**Notes:** Mercury contamination poses a potential threat to western snowy plovers on the outer coast of Point Reyes, California. Embryos of 11 unhatched eggs from 6 nests on beaches of Point Reyes National Seashore, including one abandoned nest, were analyzed for mercury. Findings indicated that mercury concentrations were from 5 to 10 times higher than those in plover eggs analyzed by a previous study at 5 southern California sites; and eggs of nest siblings in the current study had similar mercury concentrations. The authors hypothesized that the source of mercury contamination may have been from adult plovers eating maggots on decomposing marine mammal carcasses, including a harbor seal near the study site that may have foraged in the nearshore environment of Tomales Bay. An inoperative mercury mine nearby has discharged thousands of kilograms of mercury into Tomales Bay since mining ceased in 1972.

-----

Friesen, V.L., Gonzalez, J.A., and Cruz-Delgado, F. **Population genetic structure and conservation of the Galapagos petrel (*Pterodroma phaeopygia*).** *Conservation Genetics* 7(1): 105-115, 2006.

**Notes:** The Galapagos petrel (*Pterodroma phaeopygia*) is endemic to the Galapagos archipelago, where it is known to breed only on five islands. The species has been listed as critically endangered due to habitat deterioration and predation by introduced mammals. Significant morphological and behavioural differences among petrels nesting on different islands suggest that island populations may differ genetically. Furthermore, nesting phenology suggests that genetically differentiated seasonal populations may exist within at least one island. We analysed variation in six microsatellite loci and part of the mitochondrial ATPase 6/8 gene in 206 Galapagos petrels sampled from all five islands. No evidence of genetic structuring within islands was found, although statistical power was low. In contrast, significant differences occurred among island populations. For the microsatellite loci, private alleles occurred at all islands, sometimes at high frequency; global and pairwise estimates of genetic differentiation were all statistically significant; Bayesian analysis of genotypes frequencies provided strong support for three genetic populations; and most estimates of migration between populations did not differ significantly from zero. Only two ATPase haplotypes were found, but the geographic distribution of haplotypes indicated significant differentiation among populations. For conservation purposes, populations from Floreana, Santa Cruz, San Cristobal and Santiago should be regarded as separate genetic management units. Birds from Isabela appear to be derived recently from the Santiago population, and the population on San Cristobal appears to be a mixture of birds from other populations. However, considering ecological and behavioural differences among birds from different islands, we recommend that all five populations be protected.

-----

Priddel, D., Carlile, N., Fullagar, P., Hutton, I., and O'Neill, L. **Decline in the distribution and abundance of flesh-footed shearwaters (*Puffinus carneipes*) on Lord Howe Island, Australia.** *Biological Conservation* 128(3): 412-424, 2006.

**Notes:** The flesh-footed shearwater (*Puffinus carneipes*) is a migratory seabird that ranges widely across the Pacific and Indian Oceans. The principal breeding populations are in Australia and New Zealand. The only breeding site in eastern Australia is on Lord Howe Island. Despite it being afforded a high level of legislative protection, the population on Lord Howe island has declined substantially during the last few decades. The total extent of nesting habitat in 2002 was 24.3 ha, a reduction of 13.4 ha (35.6%) since 1978. Loss of nesting habitat was associated with increased urbanisation, the adverse impact of which extended beyond the footprint of buildings and gardens. In 2002, overall burrow density was 0.123 per m<sup>2</sup> and the total number of burrows was estimated to be 29,853 +/- 5867, a decline of about 19.0% since 1978. A substantial decline in burrow

density was evident in the colony where loss of habitat to urbanisation had been greatest. In 2002, 58% of burrows were occupied by breeding birds, and the total population size was estimated to be 17,462 breeding pairs. Breeding success (the proportion of eggs that produced fledglings) was 50%, but was lowest in the most urbanised colony. To avert further declines in the population of flesh-footed shearwaters on Lord Howe Island major changes in land use practices, enforced through appropriate legislation, are needed, together with reductions in the level of seabird bycatch in fisheries operations and in the amount of plastics that litter the world's oceans.

-----

Lawton, K., Robertson, G., Kirkwood, R., Valencia, J., Schlatter, R., and Smith, D. **An estimate of population sizes of burrowing seabirds at the Diego Ramirez archipelago, Chile, using distance sampling and burrow-scoping.** *Polar Biology* 29(3): 229-238, 2006.

**Notes:** The Diego Ramirez Islands lie 60 nautical miles southwest of Cape Horn and are the breeding site for three species of burrowing seabirds: blue petrels (*Halobaena caerulea*), common diving petrels (*Pelecanoides urinatrix*) and sooty shearwater (*Puffinus griseus*). Burrowing seabirds are highly vulnerable to predation by introduced vertebrate pests, and Diego Ramirez is an important breeding site because it is one of a few remaining subantarctic island groups with no introduced predators. Diego Ramirez is the only known breeding site for blue petrels in the southeast Pacific region, holding about 80% of the global population of that species, and with a population ten times larger than any other population in the world. We estimated the population size in 2002, using a novel application of the distance sampling technique to determine burrow density, and a burrow-scope with excavations to determine occupying species. We found that density was correlated with slope angle and soil wetness. Burrow densities in flatter terrain with drier soils were 2.03 burrows/m<sup>2</sup> (95% confidence intervals: 1.82-2.27) and 1.11 burrows/m<sup>2</sup> (0.84- 1.48) in steeper terrain with wetter soils. The occupation rate of burrows were significantly different between habitat types ( $t=2.74$ , d.f. 11,  $P < 0.05$ ); in flatter drier habitats the proportion of burrows that led to a nest was 0.85 (0.74-0.96), in steeper wetter habitats this decreased to 0.64 (0.50-0.78). We used a digital elevation model to calculate true area rather than planar area for the two habitat types on the main island of Bartolome, and charts to calculate planar area for the remainder of the archipelago. There were 1.35 (1.15-1.54) million pairs of blue petrels and 99,000 (65,000-134,000) pairs of common diving petrels on the archipelago. These are similar figures to those from the only previous estimate, made in 1980. We found breeding sooty shearwaters for the first time, and estimated a population of several thousand pairs. We emphasise the facility of distance sampling as an unbiased technique with practical advantages over commonly used area search methods for monitoring populations of burrowing seabirds. These advantages include increased survey efficiency allowing a larger sample size for a given effort and a correspondingly tighter estimation of density.

-----

Zharikov, Y., Lank, D.B., Huettmann, F., Bradley, R.W., Parker, N., Yen, P.P.W., Mcfarlane-Tranquilla, L.A., and Cooke, F. **Habitat selection and breeding success in a forest-nesting alcid, the marbled murrelet, in two landscapes with different degrees of forest fragmentation.** *Landscape Ecology* 21(1): 107-120, 2006.

**Notes:** We studied habitat selection and breeding success in marked populations of a protected seabird (family Alcidae), the marbled murrelet (*Brachyramphus marmoratus*), in a relatively intact and a heavily logged old-growth forest landscape in south-western Canada. Murrelets used old-growth fragments either proportionately to their size frequency distribution (intact) or they tended to nest in disproportionately smaller fragments (logged). Multiple regression modelling showed that murrelet distribution could be explained by proximity of nests to landscape features producing biotic and abiotic edge effects. Streams, steeper slopes and lower elevations were selected in both landscapes, probably due to good nesting habitat conditions and easier access to nest sites. In the logged landscape, the murrelets nested closer to recent clearcuts than would be expected. Proximity to the ocean was favoured in the intact area. The models of habitat selection had satisfactory discriminatory ability in both landscapes. Breeding success (probability of nest survival to the middle of the chick rearing period), inferred from nest attendance patterns by radio-tagged parents, was modelled in the logged landscape. Survivorship was greater in areas with recent clearcuts and lower in areas with much regrowth, i.e. it was positively correlated with recent habitat fragmentation. We conclude that marbled murrelets can successfully breed in old-growth forests fragmented by logging.

-----

Casaux, R. and Barrera-Oro, E. **Shags in Antarctica: their feeding behaviour and ecological role in the marine food web.** *Antarctic Science* 18(1): 3-14, 2006.

**Notes:** Feeding behaviour, ecological role in the marine food web and population trends of the Antarctic shag *Phalacrocorax bransfieldensis* and the South Georgia shag *P. georgianus* in Antarctica are analysed. The diving depths and duration recorded for these shags are the deepest and longest among all flying birds in Antarctica and match deep dives performed by small Antarctic penguins. Individual shags of both sexes partition foraging depths and food resources, which might diminish intra-specific competition. Like other sub-Antarctic shags, *P. bransfieldensis* and *P. georgianus* are bottom feeders that prey predominantly on demersal fish. In the southern Scotia Arc and west Antarctic Peninsula, nototheniids, mainly *Notothenia coriiceps*, constitute their main prey. Shag partners alternate the time at sea and, as the energy requirements at the nest increase, they increase the number but reduce the duration of the feeding trips. A steady declining trend in the number of breeding pairs of both species has been observed in the last decade at several Antarctic localities; this phenomenon at the South Shetland Islands might be at least partially explained by the effect of the commercial fishery on their prey. In inshore shallow waters shags occupy the trophic niche of main predators of demersal fish and play an important ecological role as regulators of populations of particular fish prey that have marked site fidelity. The potential use of shags as biomonitors in Antarctica is discussed.

-----

de Leon, A., Minguéz, E., Harvey, P., Meek, E., Crane, J.E., and Furness, R.W. **Factors affecting breeding distribution of Storm-petrels *Hydrobates pelagicus* in Orkney and Shetland.** *Bird Study* 53: 64-72, 2006.

**Notes:** *Capsule* The main factors are past and present human activities, especially the introduction of rats to islands. *Aims* To assess factors that influence breeding distribution and abundance of Storm-petrel. *Methods* We used a database for 142 islands in Shetland and Orkney. Breeding status of Storm-petrel was related to data for each island on introduced and indigenous predators, other human-related features, and aspects of island geography. *Results* Although 92% of the total land area of the archipelagos comprised islands with rats present, Storm-petrel colonies were almost totally restricted to rat-free islands. They also occurred more frequently on islands with cliffs, far from neighbouring islands with humans, and on islands with a low rate of human visits. Colony size was smaller on the smallest occupied islands. Breeding numbers of Great Skuas *Stercorarius skua*, Great Black-backed Gulls *Larus marinus*, and Storm-petrels all correlated, as each increased with island size. *Conclusions* The presence or absence of rats is the single most important influence on Storm-petrel breeding distribution in Orkney and Shetland. However, geographical and human-related effects, such as the presence of cliffs or the occurrence of human visits, also appear to influence the distribution of Storm-petrels, whereas avian predators appear to have had little effect until now.

-----

Atkinson, P.W., Clark, N.A., Dodd, S.G., and Moss, D. **Changes in fisheries practices and Oystercatcher survival, recruitment and body mass in a marginal cockle fishery.** *Ardea* 93(2): 199-212, 2005.

**Notes:** Small hand-gathering shellfisheries have not been associated with the major negative ecological impacts observed as a result of large-scale and long-term mechanical dredging of Mussel *Mytilus edulis* and Cockles *Cerastoderma edule* in the Dutch part of the Wadden Sea and the Wash Estuary in the UK. A hand-gathering Cockle fishery has been in existence for many years at Traeth Lafan, a large sandy area in north Wales designated as a Special Protection Area on account of the wintering population of Oystercatchers *Haematopus ostralegus*. In addition to the hand fisher, suction-dredging for Cockles took place in four winters between 1989/1990 and 1996/1997 and the amount of farmed Mussels increased dramatically from 1995/1996 onwards. Since 1980/1981, the fishery can be characterised into three periods of similar management: 1980/1981 to 1988/1989, 1991/1992 and 1992/1993 (period A, eleven winters, hand gathering Cockles only, low Mussel stocks), 1989/1990 to 1990/1991 and 1993/1994 (period B, three winters, suction dredging and hand gathering of Cockles, low Mussel stocks) and 1994/1995 to 2002/2003 (period C, suction dredging in one out of nine winters and high Mussel stocks). Adult Oystercatcher survival, juvenile recruitment and both adult and juvenile mass were lower in period B, the winters in which dredging occurred and Mussel stocks were low. Increases in bird numbers after the dredging periods were due to greater juvenile recruitment, most likely caused by adults moving from the Cockle beds to feed on the new Mussel resource provided by a large increase in commercial farming. Commercial dredging for shellfish, even on a small scale, will increase the risk of higher Oystercatcher mortality especially if alternative food sources are not available. Mussel culture in the intertidal area adds new food supplies but internationally important numbers of birds should not have to rely on a food source of which the availability is likely to be determined by market forces.

-----

Raphael, M.G. **Conservation of the marbled murrelet under the northwest forest plan.** *Conservation Biology* 20(2): 297-305, 2006.

**Notes:** The Marbled Murrelet (*Brachyramphus marmoratus*) was listed as threatened in 1992, primarily because of loss of its old-forest nesting habitat. Monitoring conducted over the first 10 years following implementation of the Northwest Forest Plan shows at-sea murrelet populations appear to be stationary, but recruitment is very low and demographic models project a 4-6% annual rate of decline. Monitoring of nesting habitat indicated there were about 1.6 million ha of higher-suitability nesting habitat on all lands at the start of the plan, about half of which occurred on federal lands. Most (88%) of higher-suitability habitat on federal lands was protected within reserves. Over the past 10 years, losses of habitat due primarily to fire have totaled about 2% on federal lands. Losses have been much greater (12%) on nonfederal lands, due primarily to timber harvest. Habitat is expected to accrue within reserves as younger forest matures and attains sufficient diameter to support nesting sites. At-sea estimates of population size are strongly and positively correlated with amounts of adjacent nesting habitat at a broad scale, supporting the idea that amounts of nesting habitat are a primary driver in wide-scale murrelet population distribution. Conditions at sea, however, such as temperature regimes, prey availability, and pollutants, continue to affect murrelet populations. The system of large reserves seems to have achieved the short-term objective of conserving much of the remaining nesting habitat on federal lands. These reserves are also likely to contribute to the long-term objective of creating large, contiguous blocks of nesting habitat. The plan has a primary role in conserving and restoring nesting habitat on federal land but will succeed in this role only if land allocations calling for such protection are in place for many decades.

-----

Becker, B.H. and Beissinger, S.R. **Centennial decline in the trophic level of an endangered seabird after fisheries decline.** *Conservation Biology* 20(2): 470-479, 2006.

**Notes:** Coastal marine ecosystems worldwide have undergone such profound transformations from overfishing that trophic interactions observed today might be artifacts of these changes. We determined whether the trophic level of an endangered seabird, the Marbled Murrelet (*Brachyramphus marmoratus*), has declined over the past 100 years after the collapse of Pacific sardine (*Sardinops sadax*) fisheries in the late 1940s and the recent declines of similar fisheries in central California. We compared stable-isotope signatures of dN-15 and dC-13 in feathers of museum specimens collected before fisheries decline with values in murrelet feathers collected recently. Values of dN-15 in prebreeding diets declined significantly, 1.4 parts per thousand or 38% of a trophic level, over the past century during cool ocean conditions and by 0.5 parts per thousand during warm conditions, whereas postbreeding values of dN-15 were nearly constant. The dC-13 values in prebreeding diets declined by 0.8 parts per thousand, suggesting an increased importance of krill in modern compared with historic prebreeding diets, but postbreeding diets did not change. Stable-isotope mixing models indicated that the proportion of energetically superior, high-trophic-level prey declined strongly whereas energetically poor, low-trophic-level and midtrophic-level prey increased in the prebreeding diet in cool years when murrelet reproduction was likely to be high. Decreased prey resources have caused murrelets to fish further down on the food web, appear partly responsible for poor murrelet reproduction, and may have contributed to its listing under the U.S. Endangered Species Act.

-----

Chambers, L.E., Hughes, L., and Weston, M.A. **Climate change and its impact on Australia's avifauna.** *Emu* 105(1): 1-20, 2005.

**Notes:** Relative to the northern hemisphere, little is known about the effect of climate change on southern hemisphere birds, although the impact could be significant. Here we review the effects of climate change on birds that have been documented or predicted, with particular reference to Australian species. Potential impacts include changes in geographic range, movement patterns, morphology, physiology, abundance, phenology and community composition. The evidence suggests that these changes are already happening, both overseas and in Australia, but more research is needed to determine the extent of these impacts and how to conserve birds in the face of climate change. Management options include promoting adaptation and resilience, intensive management of sensitive species, and improved planning for mitigation techniques and monitoring.

-----

Laich, A.G., Favero, M., Mariano-Jelicich, R., Blanco, G., Canete, G., Arias, A., Rodriguez, P.S., and Brachetta, H. **Environmental and operational variability affecting the mortality of Black-browed Albatrosses associated with long-**

**liners in Argentina.** *Emu* 106(1): 21-28, 2006.

**Notes:** The effects of different environmental and operational factors on the incidental capture of Black-browed Albatross (*Thalassarche melanophris*) in long-line fishing operations were analysed. This is the most commonly captured seabird by Argentine long-line fishing vessels, and significant decreases in its populations have been mainly attributed to long-line fishing practices. The estimated mean rate +/- s.d. of by-catch for the analysed period (1999-2003) was 0.03 +/- 0.39 birds per 1000 hooks. Black-browed Albatrosses were mainly caught during day settings. Higher capture rates were observed during autumn and winter. The effect of the length of long-lines on the incidental capture of Black-browed Albatrosses was also analysed, showing that higher capture rates occurred when short long-lines were deployed. Seasonal differences in the distribution of captures were observed, being widely distributed to the north of the shelf-break during autumn-winter (i.e. non-breeding season) and mostly concentrated in southernmost latitudes, closer to the presumed breeding area in the Malvinas (Falkland) Islands during spring-summer. Mortalities during winter were mainly associated with the Patagonian Toothfish (*Dissostichus eleginoides*) fishery, while those observed during summer were associated with long-liners targeting Kingklip (*Genypterus blacodes*) on the Patagonian Shelf.

-----

Cao, L., Pang, Y.L., and Liu, N.F. **Status of the Red-footed Booby on the Xisha Archipelago, South China Sea.** *Waterbirds* 28(4): 411-419, 2005.

**Notes:** Visits were made to the Xisha Archipelago, northern south China Sea, from 13 March to 9 April 2003 and 2 April to 7 September 2004, to determine the status of the Red-footed Booby (*Sula sula*). The Red-footed Booby was found to breed only on Dong Island (an area of 1.55 km<sup>2</sup>). Random sampling indicated that the island supported approximately 35,500 breeding pairs. The colony is the largest in the west Pacific and comprises more than 10% of the estimated world population. It is suggested that the island may hold more than 100,000 individuals, including fledged birds of the year, and immature and non-breeding birds. The Red-footed Booby nests only in *Pisonia grandis* trees on the island, and the most serious threat to the breeding colony is from a herd of introduced cows which are consuming the new *P. grandis* growth that otherwise would develop into potential nesting habitat. Recommendations are made for improved protection of birds on the Archipelago.

-----

Granadeiro, J.P., Dias, M.P., Rebelo, R., Santos, C.D., and Catry, P. **Numbers and population trends of Cory's Shearwater *Calonectris diomedea* at Selvagem Grande, Northeast Atlantic.** *Waterbirds* 29(1): 56-60, 2006.

**Notes:** The island of Selvagem Grande holds one of the most important colonies of Cory's Shearwater (*Calonectris diomedea*) in the Atlantic. Historical records suggest a stable population well in excess of 100,000 pairs. A succession of massacres in 1975 and 1976 dramatically reduced this population to less than 10% of the original numbers. Since 1977 strict protection was enforced and the population started a steady recovery. However, between 1995 and 1998 an alarming decline, of more than 13% of the birds, was reported and concurrently the monitoring work was interrupted. Data from other colonies in the Atlantic and the Mediterranean also indicated significant regional declines, some of which appear to be driven by unsustainable levels of accidental mortality in fishing gear. In order to investigate the persistence of the regressive trend at Selvagem Grande, we carried out a global census of the colony in June 2005. We counted 20,555 occupied nests and estimated the total breeding population at 29,540 pairs. The population still appears to be recovering from the massacres of 1975-1976, at an average rate of about 4.6% per year over the past 25 years. Our data reveal that Selvagem Grande now harbors the largest known Cory's Shearwater colony in the world. Results from this study suggest that this population is not, as yet, suffering from unsustainable fisheries-related mortality, which would be reflected in a decline in numbers. This situation contrasts with that of the Mediterranean, where significant mortality in fishing gear has been linked to shearwater population declines.

-----

Wires, L.R. and Cuthbert, F.J. **Historic populations of the double-crested cormorant (*Phalacrocorax auritus*): Implications for conservation and management in the 21st century.** *Waterbirds* 29(1): 9-37, 2006.

**Notes:** In North America, the Double-crested Cormorant (*Phalacrocorax auritus*) is currently abundant, widely distributed across five broad geographic regions, and often perceived as overabundant. In many U.S. states and Canadian provinces, policy makers are pressured to significantly reduce cormorant numbers, primarily to minimize conflicts between cormorants and fish resources. Concurrently, large-scale conservation plans recently developed for birds in the Americas depart from the

traditional narrow focus on threatened and endangered species to encompass broader and more representative goals (e.g., Partners in Flight's objective to "keep common birds common"). In recent waterbird conservation initiatives, historic distribution and abundance provide the basis for conservation focus; these initiatives advocate conservation of birds in natural numbers and natural habitats. To provide a context in which current populations of Double-crested Cormorants can be understood, we reviewed historic and current breeding and wintering records to determine historic distribution (pre-1900), current distribution (1970-1999), and extent of range expansion across North America. Early records suggest Double-crested Cormorants were present in large numbers throughout much of their current range; colonies and flocks much larger than any known in the 1990s are well documented. However, numbers sharply declined through the late 1800s as cormorants were greatly reduced and/or extirpated in many areas. The population partially recovered through at least the mid-1900s, but experienced a second major decline during the 1950s-1970s. In the late 1970s, a second rebound began across much of the continent; the largest breeding populations (Canadian/U.S. interior, Atlantic Coast < 80% of total) increased from approximately 32,000 pairs in the early 1970s to > 226,000 pairs in the late 1990s. Comparison of historic and current records challenges the opinion that cormorants are currently overabundant, and suggests that perception of overabundance rests on socio-political rather than biological or ecological factors. For this species, and others that are seen as competitors with humans, limits of human tolerance (i.e. "social carrying capacity") are far narrower than those of biological carrying capacity. Because large numbers have been typical for cormorants historically population targets based on fishery or other objectives derived from human values will likely be readily surpassed, require intensive management, and significantly depart from the concept of conserving birds in natural numbers and natural habitats. Although managing fish-eating birds to benefit fishery yields may increase some fish populations, this approach does not resolve or address the underlying problems causing current fish population declines across the continent, and is in direct conflict with current broad scale conservation initiatives. To ensure inclusion of cormorants and other fish-eating birds in these conservation plans, the avian conservation community must continue to press for programs based on ecosystem health and process that recognize humans, fish and cormorants as three components of a complex system driven by man, species and dynamic interactions.

-----

Huntley, B., Collingham, Y.C., Green, R.E., Hilton, G.M., Rahbek, C., and Willis, S.G. **Potential impacts of climatic change upon geographical distributions of birds.** *Ibis* 148(S1): 8-28, 2006.

**Notes:** Potential climatic changes of the near future have important characteristics that differentiate them from the largest magnitude and most rapid of climatic changes of the Quaternary. These potential climatic changes are thus a cause for considerable concern in terms of their possible impacts upon biodiversity. Birds, in common with other terrestrial organisms, are expected to exhibit one of two general responses to climatic change: they may adapt to the changed conditions without shifting location, or they may show a spatial response, adjusting their geographical distribution in response to the changing climate. The Quaternary geological record provides examples of organisms that responded to the climatic fluctuations of that period in each of these ways, but also indicates that the two are not alternative responses but components of the same overall predominantly spatial response. Species unable to achieve a sufficient response by either or both of these mechanisms will be at risk of extinction; the Quaternary record documents examples of such extinctions. Relationships between the geographical distributions of birds and present climate have been modelled for species breeding in both Europe and Africa. The resulting models have very high goodness-of-fit and provide a basis for assessing the potential impacts of anthropogenic climatic changes upon avian species richness in the two continents. Simulations made for a range of general circulation model projections of late 21st century climate lead to the conclusion that the impacts upon birds are likely to be substantial. The boundaries of many species' potential geographical distributions are likely to be shifted = 1000 km. There is likely to be a general decline in avian species richness, with the mean extent of species' potential geographical distributions likely to decrease. Species with restricted distributions and specialized species of particular biomes are likely to suffer the greatest impacts. Migrant species are likely to suffer especially large impacts as climatic change alters both their breeding and wintering areas, as well as critical stopover sites, and also potentially increases the distances they must migrate seasonally. Without implementation of new conservation measures, these impacts will be severe and are likely to be exacerbated by land-use change and associated habitat fragmentation. Unless strenuous efforts are made to address the root causes of anthropogenic climatic change, much current effort to conserve biodiversity will be in vain.

-----

Drewitt, A.L. and Langston, R.H.W. **Assessing the impacts of wind farms on birds.** *Ibis* 148(S1): 29-42, 2006.

**Notes:** The potential effects of the proposed increase in wind energy developments on birds are explored using information from studies of existing wind farms. Evidence of the four main effects, collision, displacement due to disturbance, barrier

effects and habitat loss, is presented and discussed. The consequences of such effects may be direct mortality or more subtle changes to condition and breeding success. The requirements for assessing the impact of future developments are summarized, including relevant environmental legislation and appropriate methods for undertaking baseline surveys and post-construction monitoring, with particular emphasis on the rapidly developing area of offshore wind farm assessments. Mitigation measures which have the potential to minimize impacts are also summarized. Finally, recent developments in the monitoring and research of wind energy impacts on birds are outlined and some areas for future work are described.

-----

Huppopp, O., Dierschke, J., Exo, K.-M., Fredrich, E., and Hill, R. **Bird migration studies and potential collision risk with offshore wind turbines.** *Ibis* 148(S1): 90-109, 2006.

**Notes:** Worldwide, Germany is the leading country in the use of wind energy. Since sites for the erection of wind turbines became scarce on land, ambitious plans for the offshore regions have arisen. There have been applications for 33 sites within the German Exclusive Economic Zone in the North and Baltic Seas, some of which entail several hundred individual turbines. Eleven pilot projects are approved, and two others rejected. As several hundred million birds cross the North and Baltic Seas at least twice every year, the Offshore Installations Ordinance says that licensing will not be given if the obstacles jeopardize bird migration. Birds are potentially endangered by offshore wind farms through collisions, barrier effects and habitat loss. To judge these potential risks, the occurrence of birds in space and time as well as details on their behaviour in general (migration, influence of weather) and their behaviour when facing wind farms (flight distances, evasive movements, influence of light, collision risk) need to be determined. Furthermore, the influences of construction and maintenance works must be considered. Since 2003, we have investigated year-round bird migration over the North Sea with regard to offshore wind farms. The main objectives were to assess data on the aforementioned aspects of bird migration over sea. These data can contribute to, for example, estimations of collision risks at offshore wind farms, the possible impacts on bird populations and possible mitigation measures. Results from measurements with different techniques, including radar, thermal imaging, and visual and acoustic observations, were compiled. The findings confirm that large numbers of diurnal and nocturnal migrants cross the German Bight. Migration was observed all year round but with considerable variation of intensity, time, altitude and species, depending on season and weather conditions. Almost half of the birds fly at 'dangerous' altitudes with regard to future wind farms. In addition, the number of individuals in reverse migration is considerable, which increases the risk of collision. We demonstrated that, especially under poor visibility, terrestrial birds are attracted by illuminated offshore obstacles and that some species collide in large numbers. Passerines are most frequently involved in collisions. Even if the findings regarding collisions at a research platform cannot be directly applied to offshore wind farms, they do show that on a few nights per year a large number of avian interactions at offshore plants can be expected, especially in view of the number and planned area of projected wind farms. We suggest abandonment of wind farms in zones with dense migration, turning off turbines on nights predicted to have adverse weather and high migration intensity, and actions to make wind turbines more recognizable to birds, including modification of the illumination to intermittent rather than continuous light, as the most appropriate mitigation measures. We further conclude that a combination of methods is necessary to describe the complex patterns of migration over the sea. The recordings are to be continued with the aim of refining the results presented here, and of developing a model for 'forecasting' bird migration over the German Bight. We expect more information on avoidance behaviour and collisions after the construction of a pilot wind park.

-----

Fox, A.D., Desholm, M., Kahlert, J., Christensen, T.K., and Petersen, I.K. **Information needs to support environmental impact assessment of the effects of European marine offshore wind farms on birds.** *Ibis* 148(S1): 129-144, 2006.

**Notes:** European legislation requires Strategic Environmental Assessments (SEAs) of national offshore wind farm (OWF) programmes and Environmental Impact Assessments (EIAs) for individual projects likely to affect birds. SEAs require extensive mapping of waterbird densities to define breeding and feeding areas of importance and sensitivity. Use of extensive large scale weather, military, and air traffic control surveillance radar is recommended, to define areas, routes and behaviour of migrating birds, and to determine avian migration corridors in three dimensions. EIAs for individual OWFs should define the key avian species present; as well as assess the hazards presented to birds in terms of avoidance behaviour, habitat change and collision risk. Such measures, however, are less helpful in assessing cumulative impacts. Using aerial survey, physical habitat loss, modification, or gain and effective habitat loss through avoidance behaviour can be measured using bird densities as a proxy measure of habitat availability. The energetic consequences of avoidance responses and habitat change should be modelled to estimate fitness costs and predict impacts at the population level. Our present ability to model collision risk remains poor due to lack of data on species-specific avoidance responses. There is therefore an urgent need to gather data on

avoidance responses; energetic consequences of habitat modification and avoidance flights and demographic sensitivity of key species, most affected by OWFs. This analysis stresses the importance of common data collection protocols, sharing of information and experience, and accessibility of results at the international level to better improve our predictive abilities.

-----

Clark, N.A. **Tidal barrages and birds.** *Ibis* 148(S1): 152-157, 2006.

**Notes:** This paper reviews the main effects that building tidal power barrages would have on the bird populations using Britain's estuaries. The changes in the tidal prism that would occur after a tidal power barrage is built are discussed in the context of their effect on the ecology of the estuary. Three main issues are discussed; the effect of changes in size and nature of the intertidal areas of the estuary, effects on saltmarshes, and the displacement of birds at closure. Recently, tidal stream technologies have been developed which are individually likely to have small effects on birds. However the cumulative effects of large scale tidal stream arrays need to be investigated. Finally, the effects of tidal barrages are put in the context of Britain's energy policy and the need to reduce greenhouse gas emissions. Should tidal power barrages be considered in the future, there will be a need for strategic assessments to be used to select sites that maximize the energy produced while minimizing the impacts on bird populations.

-----