Demography studies of seabirds at Admiralty Bay, King George Island

Karnovsky, N. J., Dilling, R., Slock, S., Trivelpiece, S. G., Trivelpiece, W. Z., Emslie, S. D.,
Antarctic Journal of the United States, 00035335, 1995, Vol. 30, Issue 5

The objectives of the long-term study carried out in Admiralty Bay, King George Island, are to deepen our understanding of the individual breeding biology of the three Pygoscelis penguins that breed there and to determine how the annual fluctuations in their reproductive success reflect changes in the antarctic ecosystem (**Trivelpiece** et al. 1990b).

The research carried out at the Copacabana field station had four main components:

• to continue to monitor reproductive success of the Adélie (Pygoscelis adeliae), gentoo (P. papua), and chinstrap (P. antarctica) penguins, south polar and brown skuas (Catharacta maccormicki and C. Ionnbergi), southern giant petrels (Macronectes giganteus), kelp gulls (Larus dominicanus), and sheathbills (Chionis alba);
• to examine foraging and diving behavior of Adélies and gentoos;
• to examine band-loss rates in Ad(dies and gentoos; and
• to sample the diets of all three Pygoscelids throughout the chick-rearing period.

The Copacabana field station crew arrived at Admiralty Bay in early October 1993 and stayed until March 1994. Admiralty Bay was ice flee upon our arrival, and the Polish scientists at nearby Arctowski Station reported that the bay had been ice free nearly all winter (members of XVI Polish Expedition, personal communication).

We continued our long-term penguin demography study, which consisted of following the breeding success of a random sample of 100 nests where we banded the adults, marked and measured the eggs, and weighed the chicks. We also monitored a control sample of 100 nests where the birds and their nest contents were never disturbed. Daily observations of the nests revealed that peak egg laying and hatching occurred approximately 1 week earlier than the previous year for Adélies and chinstraps and 2 weeks earlier for gentoos. Although Adélie feeding trips during the chick-rearing period were longer than usual, reproductive success was high. They fledged over 1.2 chicks per pair,

which was much greater than last year's fledging rate. In addition, Adélie fledging weights and recruitment of first-time breeders were up slightly from last season. The gentoos fledged over 1.3 chicks per pair, a rate similar to last year. For chinstraps, however, colony censuses revealed that the population decreased by almost 8 percent, continuing its marked downward trend.

To examine the foraging behavior of Adélies, 14-gram transmitters were epoxyed to birds that were feeding young chicks. For the most part, procedures were the same as those used in previous seasons (**Trivelpiece** et al. 1990a;Wallace et al. 1991; McCormick et al. 1993l, although the transmitters were placed lower down on the back of the penguins and the antennae shortened to reduce drag (see Bannasch 1993). Times at sea and on land were automatically recorded by a data logger connected to a receiver. Transmitters were deployed on gentoos for 1 week before attaching a time depth recorder as well. Diet samples were taken from these birds when they returned from their second foraging trips, and the instruments were removed. The reproductive success of each bird was followed throughout the season, and no significant differences in failure rates were found between birds with instruments and those without.

Weekly diet samples were taken from each species of penguin, using the stomach lavage method, as in past seasons. Although antarctic krill (Euphausia superba} was the preferred prey, the three species each had a higher occurrence of fish in their diets than in previous years. The average krill length was about 1.3 times larger than last year's average. Diet samples also contained a higher than usual incidence of pelagic amphipods and the euphausid Thyssanoessa macrura. Also of note, one chinstrap had eaten a juvenile squid from the family Onychoteuthidae, the first time a cephalopod has been found in diet samples from this study site.

To understand longevity and winter survival rates of the penguins, one must know the rate of band loss. Last year, during the 1992-1993 season, Adélie males were injected subcutaneously with transponder implants. This year, the Adélies that had been (1) banded only, (2) implanted only, and (3) both banded and implanted were sought at their previous year's nest sites, where they were expected to return if they had survived the winter (**Trivelpiece** and **Trivelpiece** 1990); more than 50 percent were found to have returned. A smaller sample of gentoos was implanted as well. In addition to the difficulties of finding the gentoos, which are less faithful to their nest sites, it appeared that the transponders were more difficult to read through the skin of these birds. More transponders were implanted in both species so that with several years of data, we can determine band-loss rates and the possible effect bands may have

on the mortality of our study populations (see Culik, Wilson, and Bannasch 1993).

Through an increased effort to understand the relationship between the reproductive success of the south polar skuas and their main prey fish Electrona antarctica and Pleurogramma antarcticum, we collected guano samples from their nest sites throughout the breeding season. From the fish otoliths that were extracted from the guano, we found that, on average, the birds were foraging on 70-millimeter-long E. Antarctica and 128-minimeter-long R antarcticum. In addition, several samples contained Protomyctophum bolini.

The number of leopard seal sigbtings in Admiralty Bay declined dramatically this year. Whales were frequently seen in the bay and weekly seal censuses revealed an increase in fur seal use of haul-out sites.

We thank the crew of the R/V Polar Duke and the U.S. Antarctic Program for logistical support and members of the XVI and XVII Polish Antarctic Expeditions for their hospitality and assistance. This research was supported by National Science Fomulation grant OPP 91-21952.

References

Bannasch, R. 1993. Hydrodynamic aspects of design and attachment of a back-mounted device in penguins. In W.R. Fraser and W.Z. **Trivelpiece** (conveners), Workshop Report--Workshop on Researcher-Seabird Interactions. Washington, D.C. [Abstract]

Culik. B.M., RP. Wilson, and R. Bannasch. 1993. Flipper-bands on penguins: What is the cost of a life-long commitment? Marine Ecology Progress Series, 98, 209-214.

McCormick, D.F., **S**.D. Emslie, N.J. Karnovsky, L.W. Keith, **S**.**G**. **Trivelpiece**, and W.Z. **Trivelpiece**. 199:3. Continuing studies of the demography and foraging behavior of the Pygoscelis penguins. Antarctic Journal of the U.S., 28(5), 151-152.

Polish Expedition (XVI). 1993. Personal communication.

Trivelpiece, W.Z., C. Fritz, K.L. Montgomery, **S**.**G**. **Trivelpiece**, and D.F. Wallace. 1990a. Demography and foraging behavior of Pygoscelia penguins. Antarctic Journal of the U.S., 25(5), 220.

Trivelpiece, W.Z., and **S**.**G**. **Trivelpiece**. 1990. Courtship period of Adélie, gentoo, and chinstrap penguins. In L.S. Davis and I.T. Darby (Eds.), Penguin Biology. San Diego, California: Academic Press.

Trivelpiece, W.Z., **S**.**G**. **Trivelpiece**, **G**.R. Geupel, J. Kjelmyr, and N.J. Volkman. 1990b. Adélie and chinstrap penguins: Their potential as monitors of the southern ocean marine ecosystem. In K.R. Kerry and **G**. Hempel (Eds.), Antarctic Ecosystems. Ecological Change and Conservation. Berlin, Germany: Springer-Verlag.

Wallace, D.F., M. McClure, **S**.**G**. **Trivelpiece**, and W.Z. **Trivelpiece**. 1991. Continuing studies of the population biology and foraging behavior of Adélie, gentoo, and chinstrap penguins. Antarctic Journal of the U.S., 26(5), 179.

~~~~~~~~

By N. J. Karnovsky, Department of Biology, Montana State University, Bozeman, Montana 59717; R. Dilling, Department of Biology, Montana State University, Bozeman, Montana 59717; **S**. Slock, Department of Biology, Montana State University, Bozeman, Montana 59717; **S**. **G**. **Trivelpiece**, Department of Biology, Montana State University, Bozeman, Montana 59717; W. Z. **Trivelpiece**, Department of Biology, Montana State University, Bozeman, Montana 59717 and **S**. D. Emslie, Department of Science, Western State College, Gunnison, Colorado 81231
~~~~~~~~