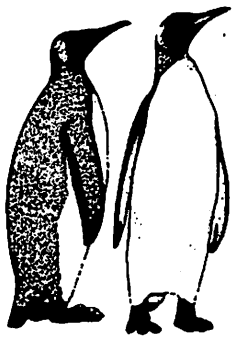

UNITED STATES
AMLR ANTARCTIC MARINE LIVING RESOURCES PROGRAM

AMLR 1998/99 FIELD SEASON REPORT

Objectives, Accomplishments and Tentative Conclusions

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10. **Seabird research undertaken as part of the NMFS/AMLR ecosystem monitoring program at Palmer Station, 1998/99; submitted by William R. Fraser, Donna L. Patterson, Peter Duley and Matt Irinaga.**

10.1 **Objectives:** Palmer Station is one of two sites on the Antarctic Peninsula where long-term monitoring of seabird populations is undertaken in support of U.S. participation in the CCAMLR Ecosystem Monitoring Program (CEMP). Our objectives during 1998/99, the twelfth season of field work at Palmer Station on Adélie penguins (*Pygoscelis adeliae*), were:

1) To determine Adélie penguin breeding population size,

2) To determine Adélie penguin breeding success,

3) To obtain information on Adélie penguin diet composition and meal size,

4) To determine Adélie penguin chick weights at fledging,

5) To determine adult Adélie penguin foraging trip durations,

6) To band 1000 Adélie penguin chicks for future demographic studies, and

7) To determine Adélie penguin breeding chronology.

10.2 **Accomplishments:** Field work at Palmer Station was initiated on 29 September 1998 and terminated on 6 April 1999. The early start date was aided by joint funding from the National Science Foundation's (NSF) Office of Polar Programs. In 1990, NSF selected Palmer Station as a Long Term Ecological Research (LTER) site, and has committed long-term funding and logistics support to an ecosystem study in which Adélie penguins represent one of two key upper trophic level predators selected for research. As a result of this cooperative effort between the National Marine Fisheries Service (NMFS) and NSF, field season duration at Palmer Station now covers the entire 5-month Adélie penguin breeding season.

Breeding Biology and Demography.

Adélie Penguin breeding population size was determined by censusing the number of breeding pairs at 54 sample colonies. Due to heavy spring sea ice conditions, however, censuses had to be delayed past the peak egg-laying period, or until 10 December 1998. These colonies contained 3762 breeding pairs, representing a 14.7% decrease in the population relative to the 4412 pairs censused in November 1997.

Breeding success was determined by following a 100-nest sample on Humble Island from clutch initiation to crèche. Adélie Penguin breeding success in 1998/99 decreased, with 1.49 chicks crêched per pair as opposed to 1.58 during 1997/98. As in past seasons, two other indices of breeding success were also evaluated. The proportion of 1 and 2 chick broodswas assessed at 54 sample colonies on 6 and 10 January 1999. Of the 2082 broods censused, 61.9% (n=1288) contained two chicks, no change from the 60.91% reported in 1998. Chick production was determined by censusing chicks on 23 and 24 January 1999 at 54 sample colonies when approximately 2/3 had entered the crèche stage. Production at these colonies totaled 5469 chicks, a 4.4% decrease relative to the 5722 chicks reported from these colonies in 1998.

Chick fledging weights were obtained between 1 and 16 February 1999 at beaches near the Humble Island rookery. Peak fledging occurred on 10 February, 3 days earlier than in February 1998. Chick fledgling weights in 1999 averaged 3.01 kg as opposed to 3.05 kg in 1998. Data specific to the chronology of other breeding events are still under analysis and will be submitted at a later date.

As part of continued demographic studies, 500 Adélie penguin chicks were banded on 1 February 1999 at selected AMLR colonies on Humble Island. The presence of birds banded during previous seasons was also monitored throughout the entire field season on Humble Island as part of these studies.

Foraging Ecology.

Diet studies were initiated on 6 January and terminated on 16 February 1999. During each of the sampling periods, 5 adult Adélie penguins were captured and lavaged (stomach pumping using a water off-loading method) as they approached their colonies to feed chicks on Torgersen Island. All birds (N=50) were released unharmed. The resulting diet samples were processed at Palmer Station. The samples taken contained a mix of prey items, but the euphausiid *Euphausia superba* was the dominant component of the diet. The abundance of samples containing fish in 1999 was unchanged relative to 1998 (6% vs. 6%) and 9% of the diet samples contained *Thysanoesa macrura*, similar to the 1997/98 season. Amphipods were evident in 5% of the diet samples versus 12% during the 1997/98 season. Diet samples this season were mainly comprised of krill in the size classes 40-45 mm, in general larger than the size frequencies observed in the 1997/98 diet samples.

Radio receivers and automatic data loggers were deployed at the Humble Island rookery between 5 January and 18 February 1999 to monitor presence-absence data on 35 breeding Adélie penguins carrying small radio transmitters. These transmitters were glued to adult penguins feeding 10-14 day old chicks. A preliminary analysis of the data obtained during the brood period suggests the mean foraging trip duration was 14.54 ± 4.46 h.

10.3 **Tentative Conclusions:** The 1998/99 season was characterized by heavy spring sea ice conditions but much lighter winter sea ice conditions than were present during the 1997/98 season. The nearly 15% decrease in the number of Adélie Penguin breeding pairs agrees with the effects that a light ice year is expected to have on the overwinter survival of this species (Fraser et al. 1992). That other measures of reproductive performance showed no significant departures between 1998 and 1999 may suggest that foraging conditions between seasons were comparable.

As in past seasons, the predominant component in the diets of Adélie penguins was *E. superba*. Other components of the diet were for all practical purposes inconsequential in the diets of this species during 1998/99. That krill size classes represented primarily include individuals in the 40-45 mm size class agrees with expectations (cf. Fraser and Trivelpiece 1995a, b) given that the last strong krill year class occurred in 1994.

10.4 **Disposition of the Data:** No diet samples were returned to the U.S. for analysis as all work was completed at Palmer Station. All other data relevant to this season's research is currently in our possession and will be made available to the Antarctic Ecosystems Research Group.

10.5 **Problems, Suggestions and Recommendations:** Both population trend data and breeding success continue to suggest that environmental variables such as snow deposition, among

others, may be key determinants of at least some aspects of the annual variability inherent in some of the monitored parameters (Fraser and Trivelpiece 1996, Fraser and Patterson 1997, Kaiser 1997). However, at the moment, there is no formal requirement in effect by which to standardize the collection and reporting of these data. Where these effects are becoming especially clear, is in the information conveyed by measures of reproductive success based on per-pair productivity. For example, the former can vary by up to 100% within the same colony based strictly on nest location, meaning this parameter is probably not "measuring" variability in the marine foraging environment as we assume. It is our opinion that the development of standards to measure snow deposition would greatly aid our interpretive potential within and between CEMP monitoring sites.

It is also important to note that during 1998/99 we only banded 500 Adélie Penguin chicks as opposed to 1000 in past seasons. It is now clear that some colonies on the Humble Island rookery can no longer sustain a banding effort comparable to past years. This has resulted primarily from a continued decrease in the number of breeding pairs at these colonies and the concomitant reduction in the number of chicks being produced. What is causing this rapid decrease in Adélie penguins on Humble Island is open to debate, but certainly it would appear prudent to begin evaluating some of the CEMP protocols themselves, and particularly the possible effects that flipper banding may be having on demography (Fraser and Trivelpiece 1994, Culik et al. 1993, Froget et al. In Press).

10.6

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