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AMLR ANTARCTIC MARINE LIVING RESOURCES PROGRAM

AMLR 1997/98 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, 1997/98; 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 1997/98, the eleventh season of field work at Palmer Station on Adelie penguins (*Pygoscelis adeliae*), were:

1. To determine Adelie penguin breeding population size,

2. To determine Adelie penguin breeding success,

3. To obtain information on Adelie penguin diet composition and meal size,

4. To determine Adelie penguin chick weights at fledging,

5. To determine adult Adelie penguin foraging trip durations,

6. To band 1000 Adelie penguin chicks for future demographic studies, and

7. To determine Adelie penguin breeding chronology.

10.2 Accomplishments: Field work at Palmer Station was initiated on 1 October 1997 and terminated on 4 April 1998. 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 Adelie 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 Adelie penguin breeding season.

Breeding Biology and Demography.

Adelie penguin breeding population size was determined by censusing the number of breeding pairs at 54 sample colonies during the peak egg-laying period (24 - 29 November 1997). These colonies contained 4412 pairs, which was essentially unchanged relative to the 4445 breeding pairs censused 14 - 15 November 1996.

Breeding success was determined by following a 100-nest sample on Humble Island from clutch initiation to creche. Adelie penguins exhibited a slightly increased breeding success in the 1997/98 season, creching 1.58 chicks per pair, or 0.11 chicks more than were creched per pair in the 1996/97 season. As in past seasons, two other indices of breeding success were also

evaluated. The proportion of one and two chick broods was assessed at 54 sample colonies on 5 and 14 January 1998. Of the 2359 broods censused, 60.9% (N=1438) contained two chicks, a slight decrease from the 68.1% reported in January 1997.

Chick production was determined by censusing chicks between 29 January and 4 February 1998 at 54 sample colonies when approximately 2/3 had entered the creche stage. Production at these colonies totaled 5722 chicks, a decrease of 7.3% from the 1996/97 season in which 6142 chicks were censused.

Chick fledging weights were obtained between 6 to 23 February 1998 at beaches near the Humble Island rookery. Peak fledging occurred on 13 February, one day later than in February 1997. Compared to February 1997, the average fledgling weight of the 358 Adelie penguin chicks sampled this season was essentially unchanged (3.05 vs. 3.04 kilograms). Data specific to the chronology of other breeding events are still under analysis and will be reported later.

As part of continued demographic studies, 1000 Adelie penguin chicks were banded on 6 February 1998 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 20 February 1998. During each of the 10 sampling periods, 5 adult Adelie 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 subsequently released unharmed. The resulting diet samples were processed at Palmer Station. The samples collected contained a mix of prey items, but the euphausiid *Euphausia superba* was the dominant component. The abundance of samples containing fish was slightly lower than during the 1996/97 season (6% vs. 9%), and approximately 10% of the diet samples contained *Thysanoesa macrura*, similar to the 1996/97 season. Amphipods were evident in 12% of the diet samples versus only 4% during the 1996/97 season. Diet samples this season were mainly comprised of krill in the size classes 36-40 millimeters (mm) and 41-45mm, in general larger than the size frequencies observed in the 1996/97 diet samples.

Radio receivers and automatic data loggers were deployed at the Humble Island rookery between 4 January and 24 February 1998 to monitor presence-absence data on 35 breeding Adelie penguins carrying small radio transmitters. These transmitters were glued to adult penguins feeding 10-14 day old chicks. Analysis of the data has not yet been accomplished due to the volume of data obtained.

10.3 Tentative Conclusions: The 1997/98 season was characterized by heavy sea ice conditions well into the start of egg laying and frequent, heavy snows during much of the early Adelie

penguin breeding season. The fact that the number of breeding pairs was relatively unchanged compared to last season agrees with the effects that a heavier ice year is expected to have on overwinter survival. The increase in breeding success of 0.11 chicks per pair may in part reflect enhanced foraging conditions, as krill were abundant during much of the season. For the second consecutive season, a heavy infestation of ticks was noted during the egg-laying period, but the infestation did not appear as widely distributed as the previous season. However, we have obtained preliminary evidence that tick infestations in smaller colonies may force the entire colony to abandon reproductive efforts.

The predominant component in the diets of Adelie penguins was once again krill (*E. superba*). Other components, significant in previous seasons' diet samples, were present in lesser amounts (e.g., *T. macrura*, amphipods, fish). That krill size classes represented primarily individuals in the 36-40mm size class agrees with expectations based on a strong recruitment year in 1994.

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