UNITED STATES

AMLR ANTARCTIC MARINE LIVING RESOURCES PROGRAM

AMLR 1990/91 FIELD SEASON REPORT

Objectives, Accomplishments and Tentative Conclusions

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1. Introduction

In support of its commitment to the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), the U.S. Antarctic Marine Living Resources (AMLR) program conducted field research in the Antarctic Peninsula area during the 1990-91 austral summer. As in past seasons, the field research consisted of two components: (1) land-based studies at Seal Island, a small island at the tip of the peninsula, and at Palmer Station, a U.S. scientific station further south on the peninsula; and (2) a research cruise aboard the NOAA Ship *Surveyor* in the waters surrounding Elephant Island, also at the tip of the peninsula (Figure 1.1).

The AMLR program's field research is based on the working hypotheses that physical features in the pelagic ocean (such as water mass fronts, sea ice, and upper layer mixing) constrain primary production and the spatial distribution of krill (*Euphausia superba*); and that the spatial distribution of krill affects the life history parameters of land-based krill predator populations during the reproductive season.

To investigate these hypotheses, reproductive and foraging studies were conducted on krill predators (pinnipeds and seabirds) at Seal Island (see sections 2.3, 2.4, 2.5, and 2.6); and studies of the ecology of Adelie penguins were accomplished at Palmer Station (see section 2.7). Work aboard the NOAA Ship *Surveyor* included physical oceanography studies (see section 3.3), phytoplankton and primary production studies (see section 3.4), a hydroacoustic survey to map the spatial distribution of krill (see section 3.5), and direct sampling for krill with nets (see sections 3.6 and 3.7).

In addition, some ancillary projects were conducted during the *Surveyor* cruise: (1) a study on the Antarctic Euphausiid *Thysanoessa macrura* (see section 3.8); (2) a survey of some Antarctic fish species collected during net sampling (see section 3.9); and (3) a study on oil pollution hazard in the Elephant Island area, and the thermal structure and geostrophy of the Drake Passage (see section 3.10).

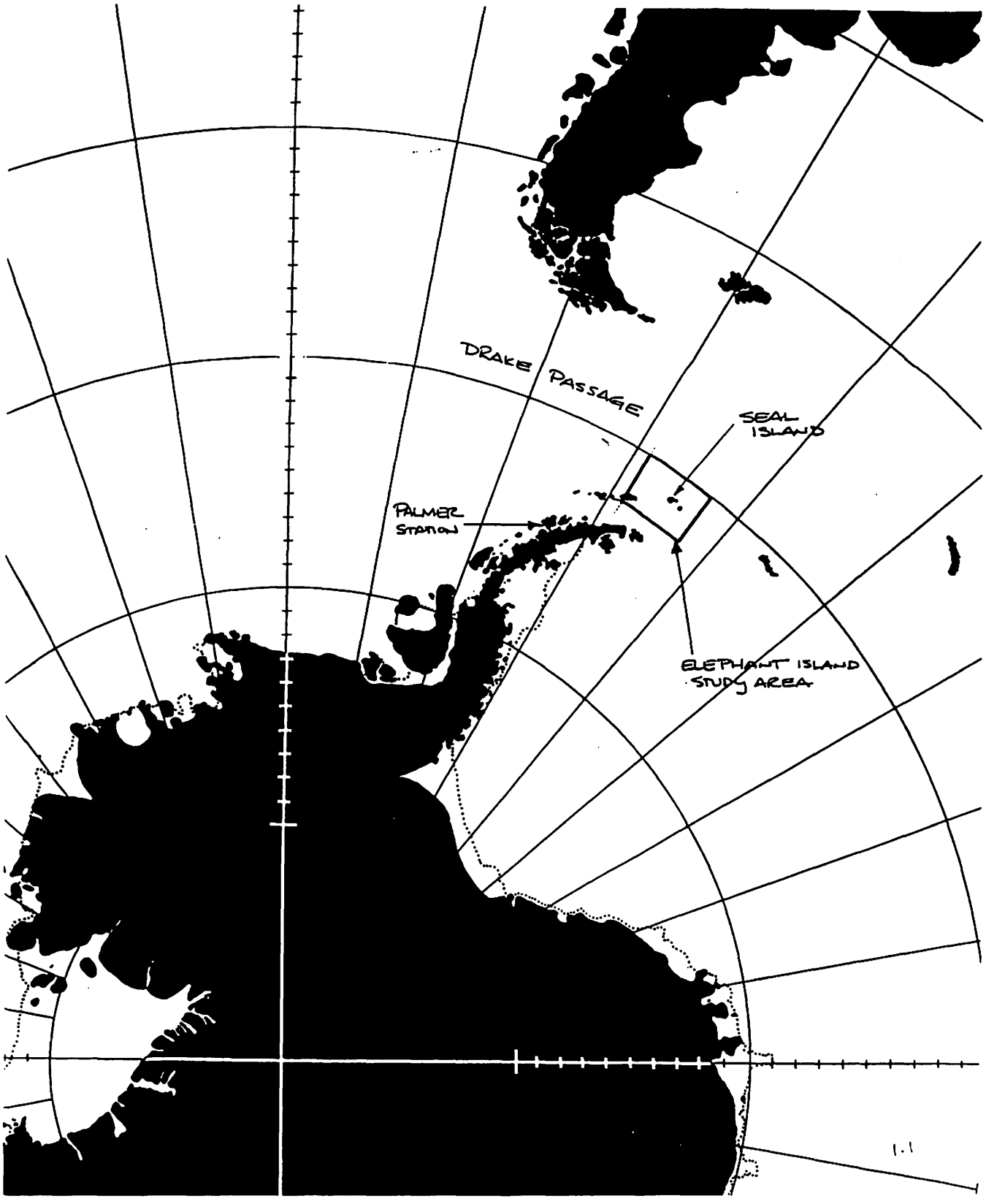

Figure 1.1 Antarctic Peninsula; locations of Elephant Island study area, Seal Island, and Palmer Station shown.

Fraser / Ainley

AMLR

2.7 Seabird research undertaken as part of the NMFS/AMLR ecosystem monitoring program at Palmer Station, 1990-1991; submitted by W. R. Fraser, Old Dominion University, and D. G. Ainley, Point Reyes Bird Observatory.

2.7.1 Objectives: Palmer Station is one of two sites on the Antarctic Peninsula where long term monitoring of seabird populations is being undertaken in support of U.S. participation in the Commission and Scientific Committee of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). Research at Palmer Station focuses on aspects of the ecology of Adelie Penguins that are complementary to the scope of research outlined by CCAMLR, and as such follows CCAMLR recommended field protocols designed to insure that data collection is comparable year to year both between and within research sites. Our objectives during 1990-1991, the fourth season of field work at Palmer Station, therefore, were to: 1) establish indices of Adelie breeding success, 2) gather information on Adelie diet composition and meal size, 3) determine Adelie chick weights at fledging, 4) determine the amount of time breeding adult Adelie Penguins need to procure food for their chicks, 5) band a representative sample (1000 chicks) of the Adelie chick population, and 6) determine adult breeding chronology.

2.7.2 Accomplishments and field schedules: Field work at Palmer Station was initiated on 7 December 1990 and terminated on 10 March 1991. Field work schedules and activities related to the above cited objectives were as follows:

Adelie breeding success: As in past seasons, two indices of breeding success were determined. On 5 January, the proportion of 1 and 2 chick broods was determined at 39 colonies in 5 different rookeries; on 22 January these same colonies were censused to assess chick production.

Diet composition: Diet studies were initiated on 9 January and terminated on 15 February. During each of the 8 sampling periods, 5 adult Adelies 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=40) were subsequently released unharmed. The resulting diet samples were processed at Palmer Station.

Chick fledging weights: Data on Adelie chick fledging weights were obtained between 4-24 February at beaches near the Humble Island rookery. During this interval, 337 chicks were weighed and released.

Length of foraging bouts: Radio receivers and automatic data loggers were deployed on a bluff overlooking the Humble Island rookery between 18 January and 17 February to monitor presence/absence data on 25 breeding Adelies carrying small radio transmitters. These transmitters were deployed on adult penguins feeding 10-14 day old chicks. An additional 15 transmitters available to us were not deployed due primarily to problems with the performance of both radio receivers (see Problems and Recommendations).

Chick banding: One-thousand Adelie chicks were banded as part of long-term demographic studies at AMLR colonies on Humble Island on 3 February. This effort was accomplished in 2.5 hours with the help of 13 Palmer Station and 2 National Science Foundation personnel. The presence of birds banded in previous seasons was also monitored during the entire field season on Humble Island as part of these demographic studies.

Adult breeding chronology: As last season, a 100-nest plot was established on Humble Island to assess the chronology of breeding events. Pertinent data were subsequently obtained every 1-3 days as weather permitted from 7 December to 25 February.

2.7.3 Preliminary results: This season's production of 2-chick broods (56% of the breeding pairs sampled) exhibited no significant change relative to last season (59% of sampled pairs). When compared to last season, however, chick counts at designated AMLR colonies decreased by approximately 750 chicks or 17%. Whether this decrease is due to post-hatching chick mortality or a change in the number of breeding pairs must await further analysis of our data. As last year, the predominant component in the diets of Adelie penguins was the krill *Euphausia superba*, with fish, in particular *Pleuragramma antarcticum*, exhibiting some dietary significance in late January. Krill size classes evident in the diet this season emphasized larger specimens (41-50mm) relative to last season (31-40mm), and were thus more similar to those encountered in the diets of Adelie Penguins during the 88-89 season. We currently cannot provide any information on the relative availability of krill between seasons based on telemetry data used to estimate the length of foraging intervals; analysis of these data is currently beyond the scope of this report due to the large size of the pertinent databases.

Mean Adelie chick fledging weights did not differ significantly from those evident last season (3.10 vs. 2.97 kg.). Indeed, as last year, the fledging period again encompassed a 3-week interval (4-24 February), with peak fledging occurring on 16 February (vs. 15 February during 89-90). The chronology of breeding events was likewise quite similar between these two seasons.

2.7.4 Disposition of the 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 Ecosystems Research Group coincident with the final report on this season's activities due 1 June.

2.7.5 Problems, suggestions and recommendations: Despite unusually severe weather during the field season and a relatively heavy schedule of visits by tour boats, virtually all AMLR related research was accomplished on a schedule complementary both to past seasons and CEMP/CCAMLR directives. The exception involved work associated with the telemetry phase of the study, specifically, the failure of both receivers to function off the external battery source. Each of these receivers had been refurbished by Advanced

Telemetry Systems in November 1990 and apparently incorrectly wired by their technicians. We know this to be the case because another receiver similarly refurbished for Dr. Wayne Trivelpiece for independent use on King George Island also exhibited the same problems as those in use at Palmer Station. With the help of Mr. Al Oxton, manager of Palmer's radio and communication systems, we eventually diagnosed and repaired the deficiency in the receivers. However, because this could only be accomplished by systematically rewiring and field testing each receiver on a trial and error basis, it was impossible to anticipate when and if the receivers would be repaired. By mid-January, therefore, coincident with a field test that suggested the receivers were working properly, the decision was made to deploy 25 transmitters rather than the full complement of 40. This was done to take advantage of an adequate sample of remaining adults feeding chicks of a suitable age within our study colony, yet at the same time minimize the loss and waste of transmitters that would result if the receivers continued to work improperly after deployment. By 20 January we were confident the receivers were operating properly, but elected not to deploy more transmitters as too many chicks at nest sites selected for this aspect of the research in our study colony had creched.