WG-CEMP-86/12

INTERNATIONAL CCAMLR APPLIED RESEARCH AND MONITORING PROGRAM, PRYDZ BAY PRIORITY AREA

Australia

Abstract

An outline is given of a proposed scientific research contribution by Australia towards the first five years of an International CCAMLR Applied Research and Monitoring Program in the Prydz Bay area. Emphasis is placed on the krill based part of the marine community in the Prydz Bay area. Some attention is also given to the fish and squid based part of the marine community on the Kerguelen Plateau.

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PROGRAMME INTERNATIONAL DE CONTROLE ET DE RECHERCHE APPLIQUEE DE LA CCAMLR, ZONE PRIORITAIRE DE LA BAIE DE PRIDZ

Australie

Résumé

Les grandes lignes d'un projet de recherche scientifique proposé par l'Australie en contribution aux cinq premières années d'un programme international de contrôle et de recherche appliquée de la CCAMLR dans la Baie Pridz sont exposées. Une attention particulière est apportée à la partie de la communauté marine basée sur le krill de la Baie de Prydz et également à la partie de la communaute marine du Plateau de Kerguelen basée sur les poissons et calmars.

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PROGRAMA INTERNACIONAL DE INVESTIGACION APLICADA Y CONTROL DE CCVRMA, AREA PRIORITARIA EN LA BAHIA PRYDZ

Australia

Resumen

Se da una reseña de una contribución de investigación científica propuesta por Australia dirigida a los primeros cinco años de un Programa Internacional de Investigación Aplicada y Control, de CCRVMA, en el área de la Bahia Prydz. El énfasis está puesto en la parte

basada en krill de la comunidad marina en el área de la Bahía Prydz. También se da algo de atención a la parte basada en peces y calamares de la comunidad marina de la meseta de Kerguelén.

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МЕЖДУНАРОДНАЯ ПРОГРАММА АНТКОМ'а ПО ПРАКТИЧЕСКИМ ИССЛЕДОВАНИЯМ И МОНИТОРИНГУ В РАЙОНЕ ПЕРВОСТЕПЕННОЙ ВАЖНОСТИ - ЗАЛИВЕ ПРЮДС

Австралия

Резюме

В общих чертах описывается предполагаемая научно-исследовательская работа как вклад Австралии за первые пять лет проведения Международной программы АНТКОМ'а по практическим исследованиям и мониторингу в районе залива Прюдс. Особое внимание уделено зависящей от криля части морского сообщества в районе залива Прюдс. Некоторое внимание также уделено зависящей от рыбы и кальмара части морского сообщества плато Кергелен.

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INTERNATIONAL CCAMLR APPLIED RESEARCH AND MONITORING PROGRAM, PRYDZ BAY PRIORITY AREA

1. INTRODUCTION

At the meeting of the ad hoc Working Group on Ecosystem Monitoring held in Seattle during May 1985, the Prydz Bay region was one of the areas that was agreed to be of first priorty for integrated studies directed toward the development of a program to monitor the effect of harvesting. This was subsequently confirmed by other member countries at the Fourth Meeting of the Scientific Committee of CCAMLR in September 1985.

Recognising the magnitude of such a task, the members of the Working Group agree that it will require a joint operation by several nations having a research capability in that area. It is also recognised that, as so little is known of the natural fluctuations within species, the factors determining these fluctuations and quantitative relationships between the key species of this community, long-term studies will be required to place monitoring on a sound basis. Furthermore, laboratory based studies, complementary to the shipboard programs, are necessary to investigate the factors controlling natural variability and interactions between the key species.

In a brief paper tabled at the last meeting of the Scientific Committee (SC-CAMLR-IV/10), Australia outlined the scope and a possible framework for such a multi-nation program within the Prydz Bay Priority Area. There is now a need for each nation interested in this area to set out just what it can carry out, so that a shared program can be developed.

As a basis for further discussion and planning, the following notes outline the direct contribution which Australia proposes to make to a first five year program in this region. This has been developed within a framework of the previous document (SC-CAMLR-IV/10) which sets out the features that might be given priority attention in this sector.

This Australian contribution places emphasis upon the krill (and other invertebrate) based part of the community in the Prydz Bay region, which covers the area of 55-85°E longitude and from the coast of Antarctica north to at least the winter maximum extent of the sea-ice. We recognise, and give some attention to, the fish and squid based part of the community, significant on the Kerguelen Plateau.

2. OBJECTIVES

The ultimate objective is to be able to manage the long-term well being of living resources within the Prydz Bay Priority Area.

Before this can be achieved we need :

a. improved knowledge of the biology of the components as well as the structure and dynamic functioning of this system,

b. to develop standard survey techniques,

c. test hypotheses concerning the direct and indirect effects of different harvest levels and strategies.

This requires the following research objectives :

- To quantify year to year fluctuation in the abundance and distribution of the selected consumers and their key food species within the Prydz Bay Priority Area.

- To develop techniques to measure, in the selected consumer species, those population parameters likely to respond quickly to changes in harvesting and/or environmental pressures within the system.

- To quantify environmental variables, both physical and biological that produce changes in the selected consumer species and their key food species.

- To quantify energy transfer through these selected species, and to determine variability (in both time and space) of these processes.

- To assess the foraging range and food preferences of selected consumers in Prydz Bay.

- To understand behavioural responses, not only in predator-prey relationships, but also between species competing for the same food.

- To apply such basic understanding of processes within this sub-system to modelling, moving from conceptual models to deterministic and stochastic models of the dynamics of this ecosystem.

However, before a monitoring program can be designed in detail it is essential to undertake detailed studies to establish exactly which are the most important food species in energetic terms. It is also necessary to quantify the importance of the various predators in order to select those consumer species which best indicate changes in pressures on the food species. Further, it is necessary to determine the principal sources of both physical and biological variability of the food species and their principal consumers.

Clearly, such objectives will take much time and research effort to achieve. They will require an innovative amalgamation of long-term data on natural fluctuations within Prydz Bay.

Laboratory studies to elucidate aspects of the physiological ecology and processes of growth in, and interactions between components of the ecosystem are essential complements to ship-board investigations.

The first phase of the Australian program will focus on further identifying the most important food species, selecting parameters of consumer species that respond rapidly to changes in pressures on the food

species, identifying environmental parameters affecting the variability of those species and the development of techniques for measuring those species and parameters.

As techniques are sharpened, an assessment will be made of the practicability of applying each in the field on both the scale and the degree of precision to warrant application for long-term monitoring. Some techniques or parameters may have to be discarded during this developmental phase.

3. SELECTED PREY SPECIES

3.1 Krill and Other Invertebrates

Australia will give most research emphasis to prey species, especially species of euphausiids.

Highest priority will be given to developing hydroacoustic methods to measure changes in relative abundance of euphausiids, rather than attempting to measure the standing crop in absolute terms.

The first step is to further analyse acoustic data already held from previous Australian cruises (e.g. FIBEX, SIBEX II, ADBEX I and II) in order to refine data handling and processing. This is being carried out during 1986.

During the next three summers (Section 7) intensive field work will be carried out in a confined area of the Prydz Bay Priority Area to resolve technical problems in the hydroacoustic technique. Net sampling and/or underwater video will be used to verify targets and to further investigate their density, size and orientation.

During the phase of technical development, some joint work conducted simultaneously with research vessels of other countries would be welcomed as inter-calibration and standardising of the technique is seen to be advantageous. In the expectation that the hydroacoustic technique can be refined adequately, the following three summers (from 1988/89) should see the development of wider monitoring surveys of krill in the Prydz Bay Priority Area, applying that technique.

Continuation of the laboratory based work on living euphausiids is planned to determine such basic aspects of their biology as longevity, growth and development, diet as well as gaining insights into their behaviour that may influence their apparent target strength.

3.2 Pleuragramma

Pleuragramma occurs over the shelf rather than near the shelf break and requires different sampling gear to euphausiids. In the 1986/87 and 1988/89 summers (Section 7) a short period (5+ days) will be devoted to sampling Pleuragramma on the shelf immediately south of the acoustic study area.

3.3 Demersal Fish

Some sampling of demersal fish on the shelf within Prydz Bay will be carried out (by 3m beam trawl) during the summers of 1986/87 and 1987/88. However, a full survey of demersal fish resources within Prydz Bay will depend on the capabilities of vessels used by Australia in the future, and other nations.

Early life stages of fish are collected as a by-catch of the euphausiid research sampling program.

4.3 Minke Whales

Casual sightings from ships are of no use for stock surveys. Only dedicated cruises can provide the data required. The Australian program does not attempt to include minke whales. If the International Whaling Commission proposed a minke whale sighting survey within the Prydz Bay Priority Area, Australia would give support as far as possible (e.g. supply experienced observers).

The Australian input to krill studies may yield limited information on feeding concentrations of whales. In this regard, Australia sees merit in the proposed Workshop on the Feeding Ecology and Distribution of Southern Hemisphere Baleen Whales, as a joint IWC/CCAMLR exercise (presently deferred).

4.4 Humpback Whales

Australia will continue to monitor the Group IV and V stocks of humpback whales as they migrate along the western and eastern coasts of Australia each winter. In the case of the Group IV stock (more relevant to the Prydz Bay Priority Area), monitoring by aerial surveys off Shark Bay (Western Australia) is now conducted every third year.

4.5 Elephant Seals

While the main thrust of the CCAMLR approach to ecosystem monitoring is toward the krill dependent portion of the system, Australia is also concerned with the fish/squid consumers. Directed research upon elephant seals is continuing with emphasis on population size and migration.

4. SELECTED PREDATOR SPECIES

4.1 Crabeater Seals

Australian field work within the pack ice during October-November 1985 highlighted the difficulties in developing a monitoring process using this species. Nevertheless, it is necessary that further studies be carried out on this important consumer.

Further data from this Area on the density, breeding and feeding of crabeater seals will necessitate dedicated ship time during both spring and summer, and even some winter observations. It is planned that there be observers for crabeater seals on early season resupply voyages whenever possible.

The Australian program includes a spring cruise in September-November 1987 and a summer study in January-February 1989 (Section 7). The data from these cruises, together with data collected by other nations within the same Area, will then be used in assessing the potential of crabeater seals for future monitoring.

4.2 Adelie Penguins and Antarctic Petrels

While there is a need for information on feeding throughout the year, the Australian contribution is centred upon shore based studies during the breeding season. Quantitative studies on food, feeding condition (including adult weight on arrival at nesting sites) and energy transfer will be carried out over 1986/87 and 1987/88 seasons and then assessed carefully to determine potential for long-term monitoring. Research on condition will be examined in relation to counts of breeding pairs. For Antarctic petrels, studies at the Rauer Islands and Scullin Monolith will provide information on differences (if any) in diet and breeding success between the two locations.

4.6 Fur Seals and Macaroni Penguins

These species breeding on Heard Island afford opportunities for studying the extent to which sub Antarctic breeding species may be supported by euphausiid (and other) stocks within this sector of the Antarctic marine ecosystem. At present, Australia has no immediate plans for further research on these species.

5. PHYSICAL ENVIRONMENT

While Australian scientists recognise that a number of oceanographic processes are of fundamental importance to productivity within the Prydz Bay Priority Area (e.g. the surface gyre; the vertical circulation, ice cover, etc), the extent to which these must be understood in order to interpret changes in key species within the ecosystem is debatable. As the interpretation of changes within species could be facilitated by information on changes in the physical environment, Australia recognises the opportunities for remote sensing of selected features (e.g. the gyre and ice cover), together with ground truthing as required. Ship time dedicated to oceanography is not included in Australia's direct contribution to a joint program in the Prydz Bay Priority Area at this stage.

6. TIME FRAME

The initial three years of the Australian contribution will concentrate on sharpening and assessing techniques, as well as gathering baseline information, moving towards monitoring (where feasible) in the fourth and fifth years. Clearly a longer time span will be required : the Working Group on Ecosystem Monitoring has a responsibility to keep this process under review.

7. SHIP TIME

Australia allocates in the order of 40 days per year of ship time (not including transit time between Australia and the study area) for Antarctic marine research. Proposed timing of cruises over the next five years is :

February - April 1987
September - November 1987
January 1988
April - May 1988
January - February 1989
October 1989
December - January 1990/91

8. COLLABORATION

Australia would welcome active participation by scientists and research vessels from other countries in the field program directed towards the needs of CCAMLR.