TRATADO ANTARTICO
XIV REUNION CONSULTIVA

TRAITE SUR L'ANTARCTIQUE
XIV REUNION CONSULTATIVE

ANTARCTIC TREATY
XIV CONSULTATIVE MEETING

ДОГОВОР ОБ АНТАРКТИКЕ
XIV КОНСУЛЬТАТИВНОЕ СОВЕЩАНИЕ

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SCAR REPORT TO THE FOURTEENTH ANTARCTIC TREATY CONSULTATIVE MEETING

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH

Secretariat
Scott Polar Research Institute
Lensfield Road
Cambridge
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Executive Secretary
G.E. Hemmen

SCAR Report to the Fourteenth Antarctic Treaty Consultative Meeting

The President of SCAR will attend the Fourteenth Antarctic Treaty Consultative Meeting as an observer and will present some highlights of recent international Antarctic science and the work of SCAR.

Attached are separate statements from SCAR relating to items of the agenda for XIV ATCM (specifically agenda items 9.10 and 11) and two comments on the question of mineral exploration and exploitation which SCAR wishes to bring to the attention of the Representatives at XIV ATCM.

In response to an invitation from the Brazilian government, SCAR has nominated Mr J Bleasel as an expert to participate in discussions of Air-Safety in Antarctic (XIV ATCM Agenda item 14).

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XIV ATCM Agenda item 9. Man's Impact on the Antarctic Environment

1. Environmental Impact Assessment of planned scientific activities and related support activities

The SCAR Executive Committee was pleased that this item is on the agenda for XIV ATCM, wishes to draw attention to SCAR's response to ATCM Rec XII-3 which was in the form of a SCAR publication entitled Man's Impact on the Antarctic Environment and hopes that the suggestions contained therein will be helpful to the consultative parties in formulating appropriate procedures.

2. Waste Disposal

SCAR appointed an 'ad hoc' panel of experts, chairman J Bleasel, to prepare a response from SCAR to ATCM Recommendation XIII-4. The panel is gathering information from all national programmes on the types and quantities of waste products and the wide variety of disposal procedures at present in use. Only when that review is complete, and information is still lacking from some countries, will it be practical to formulate logistically feasible advice about future practice. SCAR is thus not yet in a position to provide a definitive response to Rec XIII-4 but expects to transmit such a response to Treaty consultative governments, through National Committees, after the SCAR meeting in September 1988. A progress report setting out the panel's approach to this problem, is attached (Appendix A).

3. Additional Protective Arrangements

SCAR's response to the first request contained in ATCM Recommendation XIII-5, formulated by a specially established 'ad hoc' group, chairman W N Bonner, and revised by the SCAR Executive Committee, was sent to National Committees in July 1987 for onward transmission to their governments.

A copy of that response is attached (Appendix B) from which it will be seen that SCAR is proposing the establishment of a new category of protected area which might be known as an 'Antarctic Protected Area'.

4. Environmental Data Management

In considering the second request for advice contained in ATCM Recommendation XIII-5, SCAR noted that the increasing tempo and scale of activities in Antarctica require increased effort to compile data in formats and in data centers so that items and data bases are in uniform or comparable notations and are readily accessible. The scale of activities in the Antarctic has increased to the point where adverse impact on the environment is likely, and measurement of biological and/or environmental change is the necessary response to environmental impact assessment. It was recalled that the

Antarctic has been dedicated by the Treaty Nations as "a continent for science" especially because of:

1. its role in certain global processes such as solar energy exchange,
2. the uniqueness of many plant and animal species and their communities in the harsh physical environments, and
3. the opportunities afforded for investigations and experimentation on a pristine continent.

It follows that comparability, storage and accessibility of scientific data on the physical environments and biota are essential parts of stewardship.

To prepare its response, SCAR has established an "ad hoc" group on Environmental Data Management, chairman W S Benninghoff, with the following terms of reference:

1. to survey the kinds of biological data bases available and the nature of their contents,

2. to examine the relevance of data management to existing and planned SCAR programmes,

3. to assess future needs for new and expanding SCAR programmes and for ensuring comparability of data formats,

4. to liaise with other relevant programmes (e.g. ICSU's CODATA) and to recommend further action.

Because of the complexities of the task and the need for detailed consideration by SCAR and its Working Group on Biology of proposals formulated by the group, the group has been requested to prepare its report in time for careful consideration at the Twentieth meeting of SCAR in 1988. Therefore, a definitive answer to the request contained in ii) of Recommendation XIII-5 will not be available for the Fourteenth ATCM. Attached for information (Appendix C) is a copy of the first working paper prepared by the chairman of the SCAR 'ad hoc' group.

5. Concentration of siting of stations

ATCM Recommendation XIII-6 did not call for any specific action by SCAR but SCAR expressed the view that the environmental impact procedures suggested in SCAR's response to Recommendation XII-3 (see 1 above) would help considerably to avoid problems that might arise from contiguous stations. The SCAR Executive Committee has recorded its concern that the continued increase in the number of stations on King George Island could result in unproductive duplication of programmes.

6. Safeguards for Scientific Drilling

The SCAR Executive Committee notes that "safeguards for scientific drilling" appears on the agenda for XIV ATCM and wishes to draw the attention of the consultative parties to a relevant recommendation adopted at XIX SCAR:

Rec GEOL SEG 1986-3
Scientific Ocean Drilling Program
Recognizing the likely gains to our knowledge of the palaeoenvironmental history and tectonic evolution of Antarctica from scientific ocean drilling, the Working Groups on Geology and Solid Earth Geophysics:

1) strongly support scientific drilling already planned by the Ocean Drilling Program in the Southern Ocean;

2) strongly endorse further scientific drilling in high southern latitudes, including drilling on the Antarctic Continental Shelf.

7. Introduction of living material into Antarctica

The SCAR Working Group on Biology had invited W S Benninghoff to convene an "ad hoc" group to study problems of introduction of living material into Antarctica. It was realised that some kinds of high risk introductions might arise because of inadequate regulation, some examples being:

- discarding of rotten fruit or vegetables with release of mould spores

- introduction of mushroom cultures in manure compost

- import of organisms in timber.

The "ad hoc" group has been asked to report to the SCAR Working Group on Biology in 1988 what measures, additional to those in the Agreed Measures for the Conservation of Antarctic Fauna and Flora, might be desirable to control accidental harmful introductions.

8. Statistics on seals and birds killed or captured

Tabulated statistics of seals and birds killed or captured in the Antarctic, 1975 to 1985, based on returns provided under Article XII of the Agreed Measures for the Conservation of Antarctic Fauna and Flora and the Convention for the Conservation of Antarctic Seals, were published in SCAR Bulletin 86, May 1987.

A.

MAN'S IMPACT ON THE ENVIRONMENT - WASTE DISPOSAL

SCAR Progress Report on ATCM Recommendation XIII-4

To respond to ATCM XIII Recommendation 4, SCAR formed a Panel of Experts on Waste Disposal. The Panel has summarised its approach to the problem as being to:

1. assess whether present waste disposal procedures, including mechanical plant emissions, at stations, field camps and on ships are, or are likely to be, harmful to the environment;

2. in the event of waste disposal procedures causing environmental impacts, identify procedures that contribute to impacts;

3. review and, if necessary, make recommendations to amend the existing Code of Conduct on waste disposal; and

4. advise on monitoring studies to assess environmental impacts associated with waste at stations and field camps.

The Panel is considering a broad range of waste products, to encompass all kinds of domestic and operational waste including atmospheric, terrestrial and marine emissions generated during Antarctic operations and liable to be disposed of continuously or periodically. The second of the tasks listed above will allow unsatisfactory procedures to be identified and amended in the course of the review. The fourth task refers to the need to develop practical scientific monitoring programs for all categories of wastes.

In conducting its inquiry,.the Panel has sought the active involvement of SCAR National Committees and national Antarctic operators as being the only practical means of obtaining accurate information on current Antarctic waste disposal procedures and their environmental effects.

The Panel circulated a series of questions and a workplan to all national operators and SCAR National Committees. The Panel invited SCAR National Committees to review the information collected, identify waste disposal procedures which may be environmentally harmful, and to recommend research and monitoring studies aimed at reducing the environmental impact caused by waste disposal procedures.

The quality of responses to the First Circular was highly variable and involved long time delays. A number of responses provided only minimum information and from some countries no response had yet been received.

From the limited information yet available, it has been possible to list waste disposal procedures for many year-round stations as well as a small number of field stations. Also, fuel usage figures have been obtained for many station, field, ship and air operations, thus making it possible to estimate gaseous and particulate emissions. These data have been used by the Panel to construct a first draft impact matrix which identifies the magnitude, persistence and likely extent of environmental disturbance caused by disposal practices for domestic, chemical, combustible and non-combustible wastes. In particular,the matrix has pointed to a range of disposal procedures which may have a potentially significant environmental impact. Accordingly, further effort will be concentrated on investigating whether these practices do have a significant impact and on identifying alternate disposal procedures.

Because of the lack of sufficient information at this stage SCAR is not in a position to make a Final Report to Antarctic Treaty Consultative Meeting XIV.

The Panel's future investigations involve four elements. Firstly, from national operators, greater factual detail on waste disposal procedures at all stations and field camps is needed. Secondly, from national operators, an estimation of the types and concentrations of their waste residues is required. Thirdly, the Panel will seek advice from SCAR National Committees on the environmental impacts of these waste residues and on recommended monitoring methods. Finally, additional specialist information is being collected on selected aspects of waste disposal e.g. current technology for compacting and baling non-combustible wastes, and the comparative effectiveness of low and high temperature incineration.

The draft final Report will then be referred to the SCAR Logistics Working Group to ensure the logistic feasibility of the procedures to be recommended and then to National Committees for comment.

B

THE PROTECTED AREA SYSTEM IN THE ANTARCTIC

Report of the SCAR ad hoc Group on

Additional Protective Measures

Response of SCAR to Antarctic Treaty

Consultative Meeting Recommendation XIII-5

Scientific Committee on Antarctic Research
International Council of Scientific Unions

Cambridge, UK June 1987

CONTENTS

THE PROTECTED AREA SYSTEM IN THE ANTARCTIC

Introduction

.1 The Antarctic has been regarded as a Special Conservation Area since the third Antarctic Treaty Consultative Meeting (ATCM) in Brussels in 1964. Since then, efforts to improve the conservation of the Antarctic environment, its fauna and flora have resulted in the matter being raised at several subsequent ATCMs, most recently at the Thirteenth, in 1985, when a Recommendation (XIII-5) was approved which called on the Scientific Committee on Antarctic Research (SCAR) to provide, _inter alia_, scientific advice:

> "on the system of protected areas in the Antarctic, including Sites of Special Scientific Interest (SSSIs) and Specially Protected Areas (SPAs) and the question of a possible additional category of area under a different form of protection"

.2 The full text of this recommendation is given in Appendix 1. An _ad hoc_ group on Additional Protective Measures was established at the 1986 meeting of SCAR to address the above request. The group consisted of W.S. Benninghoff, W.N. Bonner (Convenor), P.R. Condy and K.R. Kerry. The terms of reference are given in Appendix 2. The Group met in Cambridge in June, 1987, and this report is the result of its deliberations.

.3 The _ad hoc_ Group identified the objectives of protecting areas in the Antarctic (Appendix 3), the existing protective arrangements of the Antarctic Treaty System (ATS) (Appendix 4) and their deficiences (Appendix 5). It examined a variety of options for improving the system of protected areas (Appendix 6) and considered some practical aspects (Appendix 7).

Recommendations for the Improvement of the Protective Area System in the Antarctic

The existing system of protected areas in the Antarctic does not now fully serve the objectives of conservation of the Antarctic environment, its fauna and flora. These deficiencies are discussed in Appendix 5. The following five main recommendations are put forward as a practical means of improving conservation, while at the same time preserving the freedom for scientific research embodied in the Antarctic Treaty.

.1 **It is recommended that the existing and proposed provisions for Antarctic conservation should be subject to periodic assessment (including site visits) to determine whether the objectives of conservation are being achieved and the extent to which the existing regulations are being observed.** Such assessments should concentrate on protected areas (both existing categories and the one proposed in Recommendation 5), but will not necessarily be confined to these. Assessments may be programmed in advance or performed opportunistically.

2 **It is recommended that information arising from such assessments, or in the course of carrying out scientific research should be freely available to those concerned with conservation issues.** Retrieval of such information will be facilitated by its storage in a central

database. Information exchange between consultative parties would be facilitated by the existence of an office charged with this responsibility. The International Union for the Conservation of Nature and Natural Resources (IUCN) maintains a conservation database at its Protected Areas Data Unit (PADU).

2.3 It is recommended that a management plan for each existing and all future Specially Protected Areas should be prepared and agreed. In the past, SPAs have been created for very specific purposes, but they can potentially provide protection for all elements of the ecological systems present within them. To serve this purpose better, management plans should be prepared. Such plans could also identify and authorise activities that could be carried out in designated SPAs without jeopardising their specified purpose.

2.4 It is recommended that Consultative Parties take measures to encourage the submission of proposals for additional protected areas to provide for geographically distributed representative examples of all Antarctic terrestrial, inland water and marine ecosystems. This point has been addressed by ATCM Recommendation VII-2. The ecosystem classification matrices published in SCAR Bulletin No. 55, 1977, provide a useful list of such ecosystem types.

2.5 It is recommended that a new category of protected area be introduced to the system while retaining the present categories. The new category, in this document called an Antarctic Protected Area (APA), is a multi-purpose area into which can be incorporated SPAs, SSSIs, Historic sites, Monuments and Tombs as management units. An APA could incorporate both terrestrial and marine areas. The objective of an APA is to minimise disturbance to these areas insofar as such disturbance might detract from the special value or values manifest in these and for which the area was designated.

2.5.1 An area may be designated an APA if it contains one or more of the following:-

- representative examples of an ecological system;

- unique natural systems, features or complexes;

- historical sites, relics, monuments or other cultural features;

- SPAs, SSSIs or reserves established under the Convention for the Conservation of Antarctic Seals (CCAS) or the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR).

- areas on which the exploitable natural resources are ecologically dependent;

- areas or features of particular significance by virtue of their scenic beauty, inspirational quality, potential for recreational pursuits, or their status as wilderness.

2.5.2 Establishment of an APA would require the zoning of the whole area for different levels of protection or use. An APA could be a fairly extensive area, incorporating within it the current categories of protected areas where it is appropriate. It could include refuge huts, field stations, roads, runways and even permanent base installations but would require that the boundaries of such high-use zones be defined.

2.5.3 The presentation and assessment of proposals for APAs could be undertaken in a similar manner to that currently used for the establishment of SPAs and SSSIs. After consideration by SCAR, a proposal would be presented by a Consultative Party or Parties at an Antarctic Treaty Consultative Meeting. There might also be related recommendations by other sections of the Treaty System (e.g. CCAS, CCAMLR) if necessary.

2.5.4 Proposals would need to include the following information which will then form the basis of a management plan if the proposal is accepted:

- description of the area, together with a map showing SPAs, SSSIs and Historic Monuments and Tombs within it, perimeter boundaries, and boundaries of zones within the area;

- reasons for designation in terms of features, systems, and attributes to be protected and threats to them that are perceived or anticipated;

- details of human activities currently undertaken or planned within the area, and their likely effects on the features, systems and attributes to be protected;

- history of human impacts on the environment within the area;

- details of management measures proposed including:

  constraints on activities within the area, and within each zone;

  periodic assessment necessary to identify disturbance;

  any other relevant measures needed.

- review periods:

  for the determination of the extent to which the original objectives of the APA are being met;

  for the management plan.

3. Conclusions

The five recommendations listed above will:

3.1 contribute to a coherent system of protected areas for the Antarctic, as recommended by the Joint IUCN/SCAR Working Group on Long-Term Conservation in the Antarctic;

3.2 provide guidelines for their implementation and management, and

3.3 provide for frequent assessment of the protected areas regarding status and compliance, and wider exchange of information about these matters.

4. Acknowledgements

The Group has been assisted in its work by numerous people, and particularly by the members of the Joint IUCN/SCAR Working Group on Long-Term Conservation in the Antactic. The following people provided helpful advice or comments:

Sherburne B Abbott
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Jeremy Harrison
John Heap
George Hemmen
Peter Heyward
Takao Hoshiai
Peter Keage
Harry Keys
Lee Kimball
Jose Valencia

W. N. Bonner
Convenor
22 June 1987

Appendix 1

Full text of ATCM Recommendation XIII-5

XIII-5 Man's impact on the Antarctic environment: additional protective arrangements

The Representatives,

Recalling the measures adopted under the Antarctic Treaty of the protection of the environment, the protection of historic sites and monuments, the conservation of fauna and flora, and in particular the setting aside of Specially Protected Areas and Sites of Special Scientific Interest;

Desiring to ensure that activities in Antarctica should not harm the unique Antarctic environment, disrupt scientific investigation or other legitimate uses or be otherwise contrary to the principles and purposes of the Antarctic Treaty;

Bearing in mind that the Scientific Committee on Antarctic Research at the XVIIIth Meeting in Bremerhaven considered the question of the establishment of a new type of conservation area in the Antarctic;

Recommend to their Governments that through their National Committees they invite the Scientific Committee on Antarctic Research (SCAR) to offer Scientific advice:

(i) on the system of protected areas in the Antarctic, including Sites of Special Scientific Interest and Specially Protected Areas and the question of a possible additional category of area under a different form of protection; and

(ii) on steps that possibly could be taken to improve the comparability and accessibility of scientific data on Antarctica.

Appendix 2

Terms of Reference for the SCAR ad hoc Group on Additional Protective Measures:

I. To review:

i) the effectiveness of Article VIII of the Agreed Measures for the Conservation of Antarctic Fauna and Flora and subsequent practice in according special protection to certain areas as a conservation mechanism, and

ii) the effectiveness of ATCM Rec VII-3 and subsequent practice in designating SSSIs as a means of protecting scientific research from harmful interference,

II To consider how the concept of management of areas might be applied in the Antarctic Treaty area as a means of:

i) improving the effectiveness of the Agreed measures for the Conservation of Antarctic Fauna and Flora,

ii) regulating the environmental impact of coastal and inland stations and field camps and their associated activities,

iii) protecting areas of non-biological significance and/or outstanding scenic value, and

iv) achieving other ends of conservation and environmental protection consistent with the principles and purposes of the Antarctic Treaty system.

III To advise accordingly.

Composition of the Group

W S Benninghoff
W N Bonner (Convenor)
P R Condy
K R Kerry

Appendix 3

Objectives of conservation in the Antarctic
(identified by the ad hoc Group but not yet approved by SCAR or other subsidiary groups of SCAR)

1. Background

1.1 With the increase of the human population and the development of sophisticated technology (both products largely of the last two centuries), human ability to modify the environment has achieved such potential that there is now a risk that the environment will be damaged to the extent that it could no longer support human life and culture at those levels which are now seen as desirable.

1.2 With this in mind the International Union for the Conservation of Nature and Natural Resources (IUCN), in collaboration with the United Nations Environment Programme (UNEP), the World Wildlife Fund (WWF), the Food and Agriculture Organisation of the United Nations (FAO) and the United Nations Educational, Scientific and Cultural Organisation (Unesco), published in 1980 the World Conservation Strategy (WCS) (IUCN, 1980). The three main objectives of WCS are:

- to maintain essential ecological processes and life-support systems;
- to preserve genetic diversity;
- to ensure the sustainable utilisation of species and ecosystems.

1.3 WCS is concerned with resource conservation; it is a strategy to allow the material processes of life on this planet to continue. Other, aesthetic, factors are also important to humankind, however. With a human population increasingly concentrated in urban centres, a trend which seems likely to continue, 'wilderness' is seen to have intrinsic value. Scenic resources (which may overlap with wilderness) are also valued for their aesthetic appeal. Places or objects which have important historical or cultural associations are other features valued by society.

1.4 The Antarctic shares with other parts of the world the general needs expressed in the WCS. It possesses unusual ecological processes and unique genotypes that have arisen as a result of rigorous natural selection processes resulting from the extreme environmental conditions. Sustainable utilisation in the Antarctic will be confined to marine resources. The Southern Ocean has the potential to provide a significant contribution to the World's marine harvest, and preserving this potential must be a high priority.

1.5 Antarctica comprises the last remaining extensive wilderness on Earth and, while not entirely pristine, is the area by far the least affected by human activity. As such, it provides unparalleled opportunities for scientific research on systems and processes, the understanding of which may be vital to our future wellbeing. It is a reference standard for monitoring studies which assess the way in which industrial societies are affecting the global environment.

1.6 The scenic values of the Antarctic are especially high and it has some, though because of its recent discovery, few, historical and cultural sites.

2. **Objectives**

The objectives of protecting areas in the Antarctic are to minimise disturbance to them by human activity so that:

2.1 the diversity of natural phenomena and systems, both in the context of the Antarctic and the Planet Earth can be maintained;

2.2 genetic diversity can be preserved by ensuring that adequate representative populations of animals and plants are maintained in situ;

2.3 unique features, localities or complexes of features and sites of historical importance are undisturbed;

2.4 scientific research, including the provision of baseline data against which to measure change can be supported;

2.5 cultural values, such as scenic beauty, inspirational quality and wilderness status can be maintained;

2.6 recreational activities such as tourism should be supported.

. **Nature of Antarctic Systems**

.1 The Antarctic consists of two types of system:

(i) Small, but numerous, terrestrial areas where human activity can have a considerable impact, even if it is itself on a relatively modest scale;

(ii) Large, broadly uniform marine and terrestrial [icecap] areas capable of absorbing substantial human activity with little or no impact.

(Heap & Holdgate, 1986)

The first category comprises the 2% of the Antarctic's 14 million km2 that are free of permanent snow or ice. This is made up of a number of coastal strips and islands, mountainous rock outcrops and remarkable inland areas where ablation outstrips snowfall and 'dry valleys' result. Terrestrial vegetation (apart from some snow algae) is necessarily confined to these places. The vegetation may in turn support lower forms of animal life of which the most highly developed are tiny mites and primitive insects. In the most favoured coastal areas quite extensive stands of bryophytes, together with sparse occurrences of two flowering plants, may be found. In a few places higher insects (wingless midges) may occur. Coastal (and some inland) areas may contain small freshwater bodies whose ice-cover thaws briefly in the summer. In some of these areas the majority of the biota is concentrated in the lakes. Exposed rock areas such as these are needed as breeding sites by seabirds (except emperor penguins) and some seals. The excreta of these animals, which feed at sea, modify and fertilise the primitive soils of the terrestrial environment.

2 The ecological interactions and physiological adaptations of such communities are of especial interest to scientists, since the extreme environmental conditions, coupled with the fact that relatively few species are involved, tend to simplify processes, making their understanding easier than in other parts of the world and providing simple analogues with which to interpret more complex systems. The presence of many large tame vertebrates offers incomparable opportunities for the study of their behaviour, physiology and ecology. These examples could be multiplied almost indefinitely. They have basic importance to the study of biology and the understanding of the environment.

3.3 Because of the discontinuous nature of these habitats, their low species diversity, the relative lack of species competition and the very low growth rates of the terrestrial biota, their communities are exceedingly vulnerable. Physical fragility is evidenced in the way that passage of vehicles, or even human feet, compacts soil structure, dislodges lichens or disrupts moss carpets. The communities of these areas are ecologically fragile in the sense that they have small capacity to absorb change without themselves being profoundly altered. Such systems are particularly vulnerable to introductions, since because of their low species diversity, there may be many unoccupied niches and the indigenous species, through lack of adaptation to competition, will have little ability to resist invaders.

3.4. The second category comprises two distinct sub-categories, the sea and the ice-cap, where conditions are very different.

3.4.1 The ice-cap, apart from some snow algae and occasional transient organisms, mostly dispersed by the wind, is devoid of life. Its remote areas are the most sterile part of the Earth's surface. However, it is resilient to human pressures. There are no living systems to disrupt, and introductions cannot establish themselves. The marks of man or vehicles are soon obliterated by snow or scoured away by the wind. Foreign bodies (waste, etc.) are frozen and entombed in ice, limiting the spread of pollution. Dispersion from catchments to sumps cannot occur in this frozen world. The ice-cap is, of course, liable to general pollution from the atmosphere. This provides an important scientific resource, since cores of the ice-cap can provide a dated record of fluctuations of substances in the atmosphere.

3.4.2 The sea is resilient in a very different manner. The Southern Ocean is a high-energy system that has great buffering capacity and general ability to disperse pollution. It is most unlikely to suffer any detectable general impact from localised human activities (Heap and Holdgate, 1986). Environmental conditions in the sea are less extreme, more uniform and more continuous than on land, all factors that make for stability (Bonner, 1984). The marine ecosystem, in comparison with the terrestrial one, has a rich and diverse biota with a capacity to absorb change. The continuous nature of the marine environment and the mobility of most of its organisms ensure that local depletions can be restored, while high levels of competition and niche occupancy lessen the possibility of the establishment of alien introductions.

3.4.3 A characteristic of the Southern Ocean ecosystem is the dominance of a single member of the zooplankton, the shrimp-like krill, <u>Euphausia superba. superba</u>. Krill represents a very important link in the Southern Ocean food web and the consequences of a major reduction of this species would be severe. It is conceivable that such a reduction could be brought about by commercial exploitation.

3.4.4 The shallow seas represent a special case. At depths deeper than the limit of iceberg scour they support a rich marine fauna. This is localised, discontinuous and sessile, all factors which render it relatively fragile. Not enough is known of the vulnerability of such benthic communities to perturbation, but it is certainly much greater than that of the pelagic system and is greater still when the waters are enclosed in a bay or fjord.

4. Threats to Antarctic Systems

4.1 The threats against which protection is required include physical damage, disturbance of wildlife, the introduction of alien species, including microorganisms, and pollution by natural or man-made substances. Environmental impacts which might occur in the Antarctic as a result of scientific research or the logistical support of such research are listed in Table 4 in Benninghoff & Bonner (1985). Such a list would need to be expanded should mineral resources development activities occur in the Antarctic.

4.2 Although disturbance to the environment is an inevitable consequence of any activity, it is the degree of disturbance which is of primary concern. Thus it is necessary for there to be a very clear idea of what the values to be protected are, and the effect on those values that any activity or combination of activities will be likely to have.

5. Application of conservation measures

5.1 A clear definition of what is to be protected is necessary in order to determine whether the existing protective measures can achieve the objectives and guard against the threats, and whether their enforcement is adequate. Having done this, the fundamental requirement is information about the value, how it is manifested in an area and what are the potential threats to it. Since the value itself and threats posed to it will not be constant over time, it may be necessary to review the requirements for the protection of the particular value and to monitor the effectiveness of protective measures which have been taken.

5.2 The shape and size of the appropriate area will depend on a number of factors, including the nature of the value to be protected, topography and water catchment, prevailing winds, proximity to threats (eg stations, traverse routes, airfields) and ecological relationships and other factors such as the foraging ranges of birds.

5.3 Different values will require differing levels and categories of protection. When more than one value is found in an area, arrangements should be made for the adequate protection of each of these values.

5.4 The freedom to conduct those activities that do not adversely affect those values to be protected should be maintained.

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Appendix 4

Existing Protective Arrangements in the Antarctic Treaty system

1. The Agreed Measures

At a meeting of SCAR in 1960, scientists developed a set of rules of conduct for the conservation of living resources in Antarctica.

At the first ATCM it was agreed to consider this further and the Agreed Measures for the Conservation of Antarctic Fauna & Flora were produced at the third ATCM (Recommendation III-8)

The Agreed Measures provide the basis for conservation within the Antarctic Treaty area. They make provision for:

(i) prohibition of the killing, wounding, capturing or molesting of any native mammal or native bird except in accordance with a permit;
(ii) such permits to be issued only for certain restricted purposes;
(iii) the designation of Specially Protected Species;
(iv) the designation of Specially Protected Areas;
(v) regulating the importation into Antarctica of non-indigenous species, parasites and diseases;
(vi) minimizing harmful interference with the normal living conditions of Antarctic mammals and birds
(vii) exchange of information between Consultative Parties as to actions they have permitted.

On the advice of SCAR two species of seal (the Ross Seal and fur seals) have been accorded special protection. Twenty areas have been designated as Specially Protected Area, of which three have had their designation changed to Sites of Special Scientific Interest. Limits have been placed on the importation of plants, animals, viruses, bacteria, yeasts and fungi and requirements established for the inoculation of dogs against certain diseases. (Heap, 1987).

2. Protective Categories for Land and Sea Areas

There are currently six forms of protective category for land or sea areas available under the Antarctic Treaty System: Specially Protected Areas (SPA), Sites of Special Scientific Interest (SSSI), Historic Monuments, Tomb, Seal Reserves and closed areas under CCAMLR.

2.1 Specially Protected Areas.

SPAs are defined in Article VIII of the Agreed Measures as areas "of outstanding scientific interest" which are to "be accorded special protection ... in order to preserve their unique natural ecological system."

The permit system set up by the Agreed Measures was extended in SPAs to cover the collection of native plants and to allow only those activities necessary to serve "a compelling scientific purpose which cannot be served elsewhere" and which "will not jeopardise the natural ecological system in that area". The driving of vehicles within an SPA is prohibited, and ATCM Rec VIII-5 later made entry to an SPA for a compelling scientific reason subject to permit, except in cases of extreme emergency involving possible loss of human life or involving the safety of ships or aircraft.

ATCM Rec VII-2 clarified the nature of the SPA by extending the type of area to be considered for protection to:

a) representative examples of the major Antarctic land and freshwater ecological systems;
b) areas with unique complexes of species;
c) areas which are the type locality or only known habitat of any plant or invertebrate species;
d) areas which contain specially interesting breeding colonies of birds or mammals; and
e) areas which should be kept inviolate so that in future they may be used for purposes of comparison with localities that have been disturbed by man.

This Recommendation also involved SCAR in the process of assessment of proposals for SPAs, and introduced two further restrictions; that the number of SPAs should be kept to the minimum that will meet the above criteria; and, "that the size of each SPA should be the minimum required to serve the purpose for which the Area has been designated."

2.2 <u>Sites of Special Scientific Interest</u>

The category of "Site of Special Scientific Interest" was established under ATCM Rec VII-3 to protect areas where scientific investigations were being undertaken but which were not suitable for or could not be designated as SPAs.

Sites could be proposed only if (i) Scientific investigations were being carried out, or were planned to begin before the following meeting of SCAR, and where there was a demonstrable risk of interference which would jeopardise those scientific investigations; or (ii) they were of exceptional scientific interest and therefore required long term protection from harmful interference.

SSSIs are designated for a definite period, which may be extended following a review by SCAR, usually in the first instance by the Sub-committee on Conservation of the Working Group on Biology.

Each SSSI must have a management plan giving, where appropriate, the following details:

(i) A description of the site, together with a map delineating its boundaries;

(ii) The reason for designation;

(iii) A summary of the scientific investigations to be carried out at the site;

(iv) The proposed date at which the designation would expire unless extended;

(v) Proposed point of access;

(vi) Proposed pedestrian or vehicular routes;

(vii) Other kinds of scientific investigation which would not cause harmful interference

(viii) A statement on and guidelines for permitted scientific sampling;

(ix) Any other necessary restraints.

Designation as an SSSI confers a significantly higher measure of protection than that afforded by the Agreed Measures alone.

2.3 Historic Monuments

After consideration of the protection of "tombs, buildings or objects of historic interest" at the first ATCM, Rec I-9, V-4 and VI-14 led to the drawing up, in Rec VII-9, of a list of Historic Monuments which should be preserved. These recommendations require that ATCPs adopt all adequate measures to preserve and protect from damage these monuments. The list of Monuments includes huts, cairns and graves, monuments, plaques, crosses, etc., erected to commemorate the opening of stations, deaths of expeditioners and other notable events. The Historic Monument category has limited and specific objectives which do not relate to biological conservation.

2.4 Tomb

A unique category of protected area, that of Tomb, was created by ATCM Recommendation XI-3 following the tragic crash of an airliner in 1979. It was recommended that the site on the northern slopes of Mount Erebus where the accident took place should be declared a tomb and should be left in peace.

2.5 Seal Reserves

The category of Seal Reserve derives from the Convention for the Conservation of Antarctic Seals (CCAS). In a Seal Reserve it is forbidden to kill or capture seals. Currently there are three Seal Reserves, mostly made up of sea areas, with a combined area of 190,000 km2. They are seal breeding areas, or the site of long-term scientific research.

2.6 Areas set up under the Convention for the Conservation of Antarctic Marine Living Resources

Part 2(g) of Article IX of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) provides for "the designation of the opening and closing of areas, regions and subregions for the purposes of scientific study or conservation, including special areas for protection and scientific study." So far, only one area has been designated under this provision. Fishing, other than for scientific research purposes, is prohibited in waters within 12 nautical miles of South Georgia by Conservation measure 1/III.

For the purposes of CCAMLR, the term "conservation" includes rational use, so conservation measures introduced under the Convention are likely to relate directly to the utilisation of marine living resources.

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Appendix 5

Deficiencies of Existing Arrangements

1. Despite the provisions of the Antarctic Treaty and the designation of the Antarctic under the Agreed Measures as an area where no native mammal or bird may be killed, captured, wounded or molested, which created the world's largest protected area, several deficiencies are apparent in the existing system of protected areas. These are elaborated below.

2. **Inadequate representation and size**

2.1 SPAs and SSSIs are incomplete in ecological scope, with marked gaps in the representation of marine and inshore coastal environments, high mountains, inland aquatic ecosystems, and non-biological areas, such as ice, rock, soil and landform sites (as addressed by Recommendation VII-2 and clarified in the ecosystem classification matrices of SCAR (SCAR, 1977; Bonner and Lewis Smith, 1985).

2.2 Geographical distribution of SPAs and SSSIs is inadequate.

2.3 There is no provision for protecting areas of recreational, cultural, aesthetic, scenic or wilderness value. Sites are chosen for almost entirely scientific reasons, as in the protection of research activities at SSSIs, and to preserve areas of unique natural ecological systems (SPAs).

2.4 There is no provision for protecting larger areas of general ecological importance. SPAs are required to be the minimum size to serve only the specific purpose for which they were designated.

3. **Lack of consistency and enforcement**

3.1 There is a lack of consistency of approach to conservation matters as domestic legislation is not uniform among countries.

3.2 No effective central system exists for detecting, reporting or dealing with violations; for limiting or restricting activities in adjacent areas to avoid or minimize the risk of not satisfactorily achieving the objectives of designation; for exchanging information and for assessing the degree to which SSIs and SPAs, etc, are meeting their designated objectives.

4. **Inadequate fulfillment of conservation objectives**

4.1 Measures for achieving varying levels of protection are inadequate. There is no provision for buffer zones, for clear demarcation of boundaries or comprehensive management plan for SPAs.

4.2 There are no detailed instructions in the Antarctic Treaty System for the preparation of the description of sites to be designated. Although SCAR encourages the provision of detailed information about the site and likely threats to it as part of the management plan of SSSIs, in practice only minimal information has generally been provided, especially for SPAs.

4.3 No provision is made for periodic assessment of conditions in areas to determine the effectiveness of protection or to identify the need for review of SPAs. Without basic information it is difficult to determine whether the protection afforded by the designation is sufficient, or necessary.

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Appendix 6

Options for improving protective arrangements

1. The ad hoc group identified and considered various options for the improvement of conservation in the Antarctic in the light of the deficiencies of the present system (Appendix 5) and protected area concepts (e.g. World Park, Biosphere Reserve).

2. There appear to be four basic options:

2.1 Establish Antarctica as a World Park or Biosphere Reserve

Both concepts have certain merits in conservation terms. However, it is difficult, in political terms, to see how the concept of a World Park could be accommodated within the Antarctic Treaty. Under the present regime the Treaty has provided a valid basis for the goals of use of the Antarctic for peaceful purposes only and guaranteeing freedom for scientific investigation. Subordinating the Antarctic to any UN regime might involve the risk of politicising the area and re-open claims to sovereignty, presently held in abeyance by the Treaty. It may be noted that the UN Study on the Question of Antarctica has not recommended an administrative role for the UN. Similarly, establishment of Biosphere Reserves would conflict with the provisions of Article IV of the Antarctic Treaty. For these reasons this option is not considered further.

2.2 Improve the present system

The present system represents a comprehensive array of protective arrangements. However, there are shortcomings in their conception and design, and in the enforcement of and compliance with them. The present suite of protected areas (i.e. SPAs and SSSIs) is also incomplete in ecological scope and geographical distribution. These deficiencies are treated in greater detail in Appendix 5.

2.3 Introduce a new category of protected area while retaining the present system

Bearing in mind the deficiencies noted in 2.2 above and in Appendix 5, this option would mean the introduction of a new form of protected area which would, to the greatest extent possible, provide for buffer zones, multiple use, management plans and values other than those of a purely scientific nature. The question of central mechanisms for enhancing compliance and information exchange is addressed in Appendix 7.

2.4 Abandon the present system and formulate an entirely new system

While a completely new system of protected areas might provide a better framework for Antarctic conservation, its development and introduction could involve lengthy negotiations and possibly the elaboration of a new Convention. It might also be the most difficult to bring about and could take a long time. Long delays would exacerbate the problems presently being experienced (Appendix 5) and run the risk of a hiatus occurring in conservation.

3. It is concluded, therefore, that the action most likely to provide the best

solution to remedy the problems with the current system of protected areas is:

- the introduction of a new category of protected area (option 2.3) which could include within it the current categories and some elements of the Biosphere Reserve concept. Such an area might be known as an Antarctic Protected Area (APA);

- upgrading of the existing system to overcome deficiencies and the establishment of a central registry for information collection and distribution (option 2.2).

Appendix 7

Practical aspects of conservation

1. The following paragraphs elaborate some of the points raised in the main body of this report.

2. **Consistency of standards and exchange of information**

Although it is a mutual responsibility of all Consultative Parties to ensure that arrangements made under the ATS are observed and implemented, in practice the oversight of any designated APA might well have to be undertaken by one Consultative Party or perhaps a small group of Parties. It will be necessary to promote consistency of standards as the system is operated.

Some mechanisms exist under the Treaty which could be used to work towards consistency. The Exchange of Information under the Treaty, suitably expanded to include a report on relevant domestic legislation, designation of areas, activities carried out within them, management measures applied, and observed impacts, could enable inconsistencies in approach to be identified and discussed at the ATCM level. The present Antarctic Treaty inspection system, used both unilaterally and multilaterally, could enable the effectiveness of designations of areas and of components of their management plans to be reviewed. However the responsibility for the initiation of inspections still rests with individual Consultative Parties and for them to be of direct use in the management of protected areas, some form of coordination would probably be necessary.

The provision and subsequent availability of information on protected areas is vital to the attainment of the objectives of protection. The provision of a database would clearly aid the task of managing such areas.

3. **Assessment and review.**

No protocol exists for assessment under the present system, so it will be necessary to develop this in association with APA management plans. The initial description of an APA would need to include a basic inventory of what it contained. Assessment at intervals would be needed to see what changes were occurring and whether any of them could be attributed to human activity and, if so, whether action should be taken to arrest or mitigate such changes.

In this connection the status of APAs, or parts of them, such as SPAs, SSSIs, etc., or the provisions of their management plans, would need to be periodically reviewed to determine whether the original purposes for which the areas had been designated still pertained, or whether changes in zoning or management plans were needed. Any Environmental Impact Assessment which might be required under the Antarctic Treaty System should be taken into consideration in reviewing the zoning of an APA or any management measures that apply within it.

4. **Requirement for an infrastructure.**

The proposed new form of protected area will involve a considerable amount of work in all phases of proposal and operation. Currently the Working Group on Biology of SCAR, and in particular, its Conservation Sub-Committee, do most of the work associated with the preparation and refinement of proposals for new SPAs and SSSIs. The additional work involved in APAs would be a substantial extra burden.

As activities in the Antarctic intensify and the provisions for environmental protection become more sophisticated thought needs to be given to the provision of support from the ATS to the scientific scrutiny provided by SCAR.

Should any central organisation be established for the Antarctic Treaty it would be useful if this could provide for the reception and distribution of information relating to environmental matters, and with the coordination of joint activities should these be called for.

Such an organisation could ensure that environmental matters were dealt with expeditiously in the intersessional periods between successive ATCMs and be responsible for maintaining contact with SCAR on matters referred to SCAR from an ATCM.

5. It is important to ensure that all personnel visiting or working in the Antarctic are aware of the Agreed Measures, the Code of Conduct for Antarctic Activities and Stations, and any other requirements for protecting and conserving the Antarctic environment.

6. It is clear, and proper, that the effective protection of the environment in the Antarctic requires more complex measures than in the past. Neither the Antarctic Treaty organisation nor SCAR should shrink from taking the steps necessary to achieve proper environmental protection while preserving the freedom of scientific research enshrined in the Treaty.

Appendix 8 Acronyms

APA	Antarctic Protected Area (provisional and unofficial term)
ATS	Antarctic Treaty System
ATCM	Antarctic Treaty Consultative Meeting
ATCP	Antarctic Treaty Consultative Party
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resources
CCAS	Convention for the Conservation of Antarctic Seals
FAO	Food and Agriculture Organization (of the UN)
IUCN	International Union for the Conservation of Nature and Natural Resources
PADU	Protected Areas Data Unit (of IUCN)
SCAR	Scientific Committee on Antarctic Research
SSSI	Site of Special Scientific Interest (of ATS Agreed Measures)
SPA	Special Protected Area (of ATS Agreed Measures)
UN	United Nations Organisation
UNEP	United Nations Environment Program
Unesco	United Nations Educational, Scientific and Cultural Organization
WCS	World Conservation Strategy
WWF	World Wildlife Fund

C

Notes for

SCAR ad hoc GROUP ON DATA MANAGEMENT

Membership

Prof. William S. Benninghoff (chairman) University of Michigan, Ann Arbor	Terrestrial biota
Dr. Richard Hennemuth Northeast Fisheries Service, NOAA	Marine fisheries
Dr. Robert J. Hofman U. S. Marine Mammal Commission	Marine mammals
Dr. Anna Palmisano NASA, Ames (& University of Tennessee?)	Marine plankton & microbiology
Prof. Roy Siegfried University of Capetown	Ornithology
Dr. David Walton British Antarctic Survey, Cambridge	Terrestrial biota

Terms of Reference:

1. to survey the kinds of biological data bases available and the nature of their contents,

2. to examine the relevance of data management to existing and planned SCAR programmes,

3. to assess future needs for new and expanding SCAR programmes and for ensuring comparability of data formats,

4. to liaise with other relevant programmes (e.g. ICSU's CODATA) and to recommend further action.

Possible Responses

1. Kinds of biological data bases available and the nature of their contents:
   a. Periodical publications
      — Annual Reports of Consultative Parties
         (1) Report of research effort completed in past year
         (2) Report of research planned for next year
         (3) Bibliography of published reports
      -- Antarctic Bibliography (published by National Science Foundation, Washington, D.C.
      -- New Zealand Antarctic Bibliography, Christchurch, N.Z.
      -- Antarctic Journal of the United States (five issues per year)
      — Professional journal, by discipline:
         Oceanus
         Polar Record
         New Zealand Journal of Antarctic Research

Possible Responses (cont.)

1. Kinds of biological data bases (cont.)

-- Compendiums e.g.:
Antarctic Atlas, by American Geographical Society

b. Unpublished data on biota:
-- BIOMASS Data Centre, BAS, Cambridge
-- BIOMASS Data Centre, Alfred Wegener Institut für Polar- und Meeresforschung, Bremerhaven
-- CCAMLR Data Centre, Hobart, Tasmania
-- NOAA Data Centre for Fisheries, Woods Hole, Mass. and Washington, D. C.
-- Percy Fitzpatrick Centre for African Ornothology, Records of Antarctic bird banding
-- BIOTAS (Biological Investigations of Terrestrial Antarctic Systems) circular letters, chronicaling current biological research

c. Unpublished data on physical environment:
-- Meteorological records at national centres in Australia, Chile, Argentina, France, Japan, etc.
-- Geologic data, at national agencies, institutes, and universities
-- Glaciological data, at national agencies, institutes, and universities

d. Collections:
-- Oceanographic Sorting Center, Smithsonian Institution, Washington, D. C.
-- Alfred Wegener Institut für Polar- und Meeresforschung, Bremerhaven

2. Relevance of data management to existing and planned SCAR programmes:

a. For monitoring man-induced changes in biotas and physical environments, in the service of biological conservation and protection of the natural environment.

b. To provide more and improved time-series observations of biotas and environments.

c. To improve archiving and accessibility of data on biotas and physical environments.

3. Assessment of future needs for new and expanding SCAR programmes and for ensuring comparability of data formats:

a. Extension of SCAR national committee responsibility for Antarctic conservation by directed national programmes and through cooperation with other SCAR national committees.

Possible Responses (cont.)

3. Assessment of future needs (cont.):

   b. Development of a unified system of data management embodying comparability of data terms, units, and formats, minimal duplication, and maximum accessibility.

   c. Incorporation of periodic reviews of trends in time-series data, neglected subject areas, opportunities for improved methods, and gaps in records.

   d. Development of a system for alerting cooperating parties to actual, imminent, or previously unrecognized man-induced changes in biotas or physical environments.

4. Establishment of liaison between SCAR and other relevant programmes with respect to data management, including some or all of the following:

   CODATA of ICSU with regard to standardized units of measurement
   UNISIST of UNO, the proposed world science information system
   ICSU Abstracting Board, a working group on bibliographic description
   MARC (Machine Readable Cataloging) of U. S. Library of Congress, British National Bibliography, and Canadian National Bibliography
   <u>Excerpta</u> <u>Medica</u>
   ASIDIC (Association of Scientific Information Dissemination Centers)
   ISO (Internatioanl Organization for Standardization)
   European Translation Centre in Delft
   IFIP (International Federation for Information Processing)
   FID (International Federation for Documentation)
   ESTEC (European Space Technology Centre in the Netherlands)
   COSPAR (ICSU's Scientific Committee on Space Research)
   SCOR (ICSU's Scientific Committee on Oceanic Research)

<u>Goals of Data Management</u>

1. Cost-efficient archiving, retireval, and dissemination of data relating to Antarctic biota and environments, especially time-series, with priority accorded to those of current or potential use for conservation or environmental protection.

2. Registry of data on biotas and physical environments in uniform or compatible terms and formats.

Goals of Data Management (cont.)

3. Assurance of free access to data on biotas and physical environments for cooperating parties.

4. Maintenance of a system for alerting cooperating parties to actual, imminent, or previously unrecognized man-induced changes in biotas or physical environments.

Proposed Recommendations (first approximation):

1. Establish liaison with data centres (see 1b above) and other relevant programmes (see 4 above) to ascertain the present and potential relation to this data management effort.

2. Consult with leading Antarctic data centres and depositories regarding terms, units, and formats and compatibility of computer software and hardware, and recommend best choice or choices.

3. Seek participation and cooperation of national committees by demonstrating benefits available at minimal cost.

4. Enlist participation of cooperating national committees in alert network for man-induced disturbances to biotas or physical environments, including participation in teams of specialists to review sites and cases and to recommend measures for mitigation of the problems.

W. S. Benninghoff
chairman

10 June 1987

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XIV ATCM Agenda item 10. Sites of Special Scientific Interest (SSSIs) and Specially Protected Areas (SPAs)

1) ATCM Recommendations XIII-7, XIII-8 and XIII-9. Sites of Special Scientific Interest

SCAR noted with approval the extensions to the designations of SSSIs 2 to 8, the amended management plan for SSSI 1, which incorporated a large extension, and the designation of new SSSIs 9 to 21.

2) SCAR was disappointed that SSSIs at Port Foster, Chile Bay and South Bay had not been approved at the Thirteenth Antarctic Treaty Consultative Meeting. It was believed that this was largely because all three proposals incorporate marine areas, the first two being exclusively marine, but it was noted that several established SSSIs contain marine areas and that at the Eighth ATCM a group of experts had concluded that the designation of marine areas was possible.

SCAR therefore invited its National Committees to inform their governments that SCAR wishes these three proposals to be resubmitted for consideration again at the Fourteenth ATCM. (Enclosure)

3) SCAR, noting that the period of designation of SSSI No 2, Arrival Heights, is due to expire on 31 December 1987 but that it is important that this site continue to be protected from man-made electromagnetic interference over a range of frequencies from 10^{-2} Hz to 10^{8} Hz because it is a most valuable site for the study of natural electromagnetic phenomena of relevance to ionospheric and magnetospheric physics, recommends that the designation of this site be extended by a further ten years, to 31 December 1997.

4) SCAR recommends the establishment of four new Sites of Special Scientific Interest:

Yukidori Valley, Langhovdem Lutzow-Holme Bay
Svarthamaren, Muhlig-Hofmanfella, Dronning Maud Land
Mount Melbourne, Victoria Land, Ross Sea
Marine Plain, Mule Peninsula, Vestford Hills, Princess Elizabeth Land

Proposals for these sites with proposed management plans were conveyed to National Committees in July 1987 for onward transmission to governments.(Enclosure)

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5) ATCM Recommendations XIII 10, 11, 12, 13 and 14.

SCAR welcomed the establishment of new Specially Protected Areas:

No 18 North Coronation Island, South Orkney Islands
No 19 Lagotellerie Island, Marguerite Bay
No 20 'New College Valley', Caughley Beach, Cape Bird, Ross Island

and the extension of the boundaries of SPA No 7, Cape Hallet, Victoria Land.

PORT FOSTER, DECEPTION ISLAND,
SOUTH SHETLAND ISLANDS

1. GEOGRAPHICAL LOCATION

Deception Island is an intermittently active volcano situated near the south-west end of the South Shetland Islands archipelago. Port Foster is a caldera lake almost entirely enclosed by land, with narrow access on the south side through Neptunes Bellows from the open ocean.

2. MANAGEMENT PLAN

The Site comprises two small areas of benthic habitat located in Port Foster as follows:

Area A: From between 50 and 150 m depth and between the following co-ordinates:

Lat. 62°55.5'S, Long. 60°38'00"W
Lat. 62°55.2'S, Long. 60°37'00"W

Area B: From between 100 and 150 m depth and between the following co-ordinates:

Lat. 62°57.2'S, Long. 60°37'20"W
Lat. 62°57.9'S, Long. 60°36'20"W.

Long-term research programmes are being undertaken in the two areas and it is important to reduce, as far as possible, the risk of accidental interference which could jeopardise these scientific investigations. The Site is of particular ecological interest because of its actively volcanic character.

3. MATRIX CODE

Terrestrial: Not applicable
Inland waters: Not applicable
Marine: Area A: S6, V6, W6
Area B: S6, V6

4. PHYSICAL FEATURES

(a) Topography. Deception Island is a caldera formed by subsidence of a group of Cenozoic volcanoes superimposed along radial faults. Port Foster is an almost-entirely enclosed body of water which receives large volumes of fresh water during periods of melt. Most of the shoreline is made up of fine ash beaches, except along about 5 km of the east coast where glacier ice from the slopes of Mt Pond enter the bay. In several places around the coast and within Port Foster (notably Pendulum Cove and Whalers Bay) there is geothermal activity.

(b) Geology. The island's geology and volcanic activity, with particular regard to the eruptions between 1967 and 1970, have been described by

Hawkes (1961), Baker et al. (1975) and González-Ferrán and Katsui (1970). The history of volcanism has been documented by Roobol (1973). The bottom of Area A consists of coarse- to medium-sized, poorly sorted volcanic sediment, and that of Area B consists of medium to fine, better sorted volcanic ash.

(c) Meteorology. Climatic records were obtained at the British station in Whalers Bay from 1944 (Pepper 1954) and the Chilean station Pedro Agiurra Cerda in Pendulum Cove from the 1950s. Both stations were destroyed in 1969 by a volcanic eruption. Records were also obtained at the Argentine station in Fumarole Bay. No records from any station exist after 1967. The climate of Deception Island is cold, humid and oceanic in nature. Total cloud cover is frequent, as are strong winds.

5. BIOLOGICAL FEATURES

(a) Terrestrial. Not applicable.

(b) Inland waters. Not applicable.

(c) Marine. The composition of benthic assemblages has varied greatly since it was first investigated immediately after the volcanic eruption of December 1967. Benthic animal communities have been most unstable since then. The most recent quantitative data (Retamal et al., 1982) indicate a high dominance of polychaetes, both in terms of numbers (71%) and biomass (54%). The most conspicuous macrofauna recovered from dredge samples include: the nemerteans Lineus sp. and Parborlasia corrugatus, the isopod Serolis kempi, the bivalve Yoldia eightsii, the echiuroids Abatus agassizi and Sterechinus neumayeri, the asteroids Lysasterias perrieri and Odonaster validus, the ophiuroid Ophionotus victoriae, and the holothurian Ypsilothuria sp. (Gallardo et al. 1977.

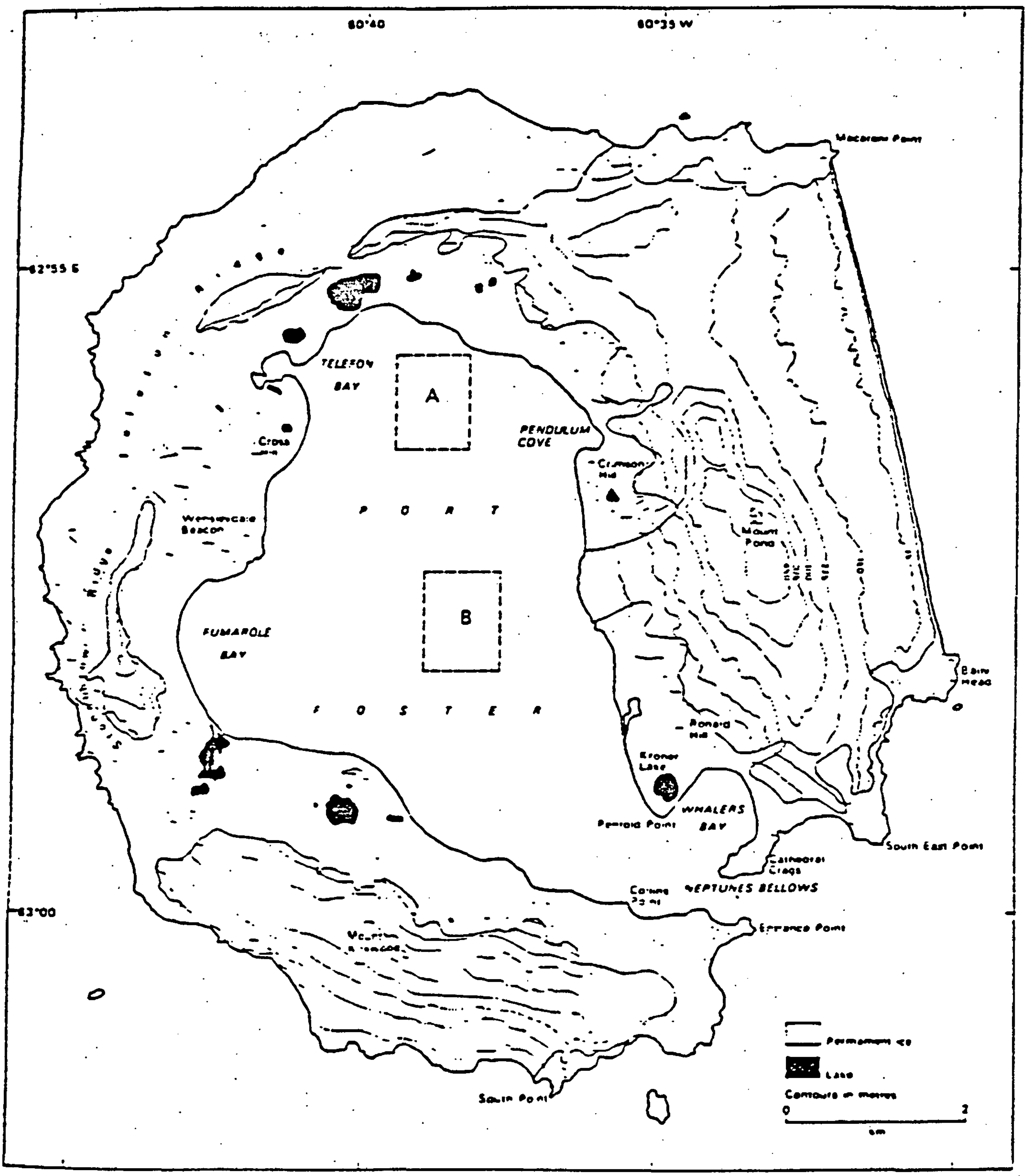
(d) Birds and seals. Not applicable.

6. SPECIAL FEATURES OF CONSERVATION SIGNIFICANCE

Port Foster has a long history of natural disturbances through volcanic eruption. The most recent of these occurred in 1967, 1969 and 1970, affecting the benthic sub-littoral fauna. A programme of benthic observations was started soon after the 1967 eruption (and pursued in subsequent years) in order to study the recovery of the affected benthic community. The area is particularly suitable for studying the stability or resilience of Antarctic benthic systems.

7. HISTORY OF IMPACTS AND PREVIOUS KNOWLEDGE

Port Foster was the site of three permanent scientific stations (in Whalers Bay, Pendulum Cove and Fumarole Bay) prior to 1967; earlier still a whaling station (in Whalers Bay) operated in the 1910s and 1920s. Impacts on the benthic habitat associated with these presumably occurred but, with the exception of Whalers Bay, these would probably have been negligible compared with the volcanic disturbances occurring from time to time. The possibility of chronic geothermal impact also exists.



60°40
60°35 W
62°55 S
63°00
Macaroni Point
TELEFON BAY
A
PENDULUM COVE
Cross
Crimson Hill
PORT
Mount Pond
B
FUMAROLE BAY
FOSTER
Baily Head
Ronald Hill
Kroner Lake
WHALERS BAY
Penfold Point
South East Point
Cathedral Crags
NEPTUNES BELLOWS
Entrance Point
Permanent ice
Lake
Contours in metres
0
2
km
South Point

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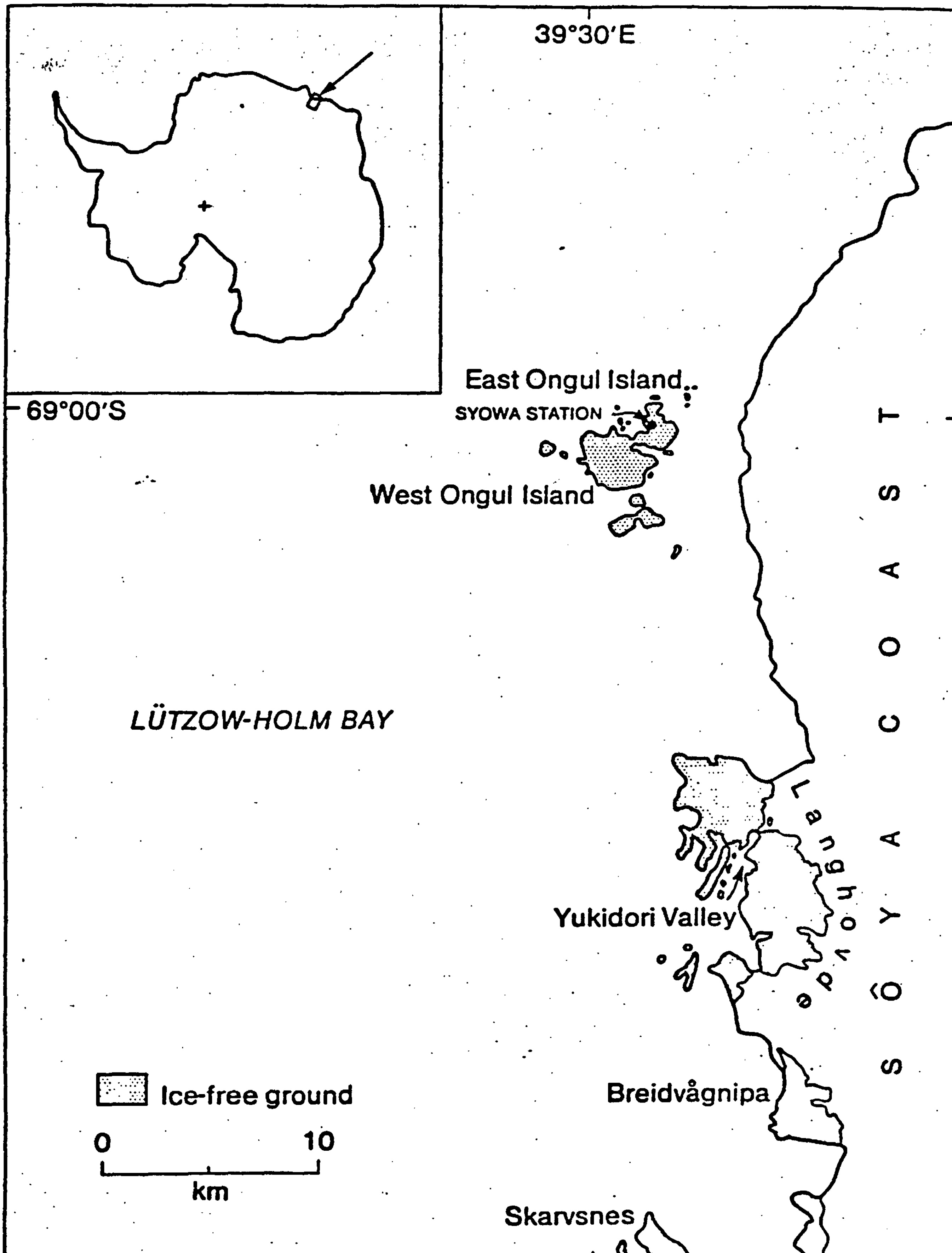

39°30′E
69°00′S
East Ongul Island
SYOWA STATION
West Ongul Island
LÜTZOW-HOLM BAY
Langhovde
Yukidori Valley
SÔYA COAST
Breidvågnipa
Skarvsnes
Ice-free ground
0
10
km

Sudzuki, M. 1964. On the microfauna of the Antarctic region. I. Moss-water community at Langhovde. JARE Sci. Rep., Ser. E (Biol.), 19, 1-41.

Sudzuki, M. 1979. On the microfauna of the Antarctic region. III. Microbiota of the terrestrial interstices. Mem. Natl Inst. Polar Res., Spec. Issue, 11 104-126 with 10 pls.

Ishikawa, T., Tatsumi, T. Kizaki, K., Yanai, K. Yoshida, M., Ando, H., Yoshida, Y. & Matsumoto, Y. 1976. Langhovde. Antarct. Geol. Map Ser., 5 (with explanatory text, 10 p). Tokyo, Natl Inst. Polar Res.

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the Site. Therefore, limited pedestrian and no vehicular access has been permitted since the construction of the hut. The valley has not been subjected to any environmental disturbance, with the exception of carefully controlled small-scale biological sampling of lake water, soil, lichens, mosses, invertebrate and sea birds.

7. HISTORY OF IMPACTS AND PREVIOUS KNOWLEDGE

Field surveys of geoscience and biological science have been carried out in the Langhovde area, including the Site, since the first Japanese Antarctic Research Expedition in 1957. Geological results for the region have been summarized by Ishikawa et al. (1976).

A preliminary biological survey was made during JARE 15 and 16 (1973-75). This study aimed to obtain information on the pristine state of the terrestrial ecosystem to compare with that influenced by Man around Syowa Station on East Ongul Island. The research studies were mainly undertaken in summer, and terminated after two seasons. The present programme is planned to gain a deeper understanding of the terrestrial ecosystems in this Site.

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Hirano, M. 1979. Freshwater algae from Yukidori Zawa, near Syowa Station, Antarctica. Mem. Natl Inst. Polar Res. Spec. Issue 1, 1-26 with 9 pls.

mites (*Nanorchestes antarcticus* and *Tydeus erebus*) were also reported by Ohyama (1977) and Ohyama and Matsuda (1977) from the Site.

(b) Inland waters. A study of the freshwater algae in the Site was carried out by Hirano (1979). Sixty-four species of microalgae, including cyanobacteria and green algae, were reported from Lake Yukidori and the adjacent area. Among them, one new species of *Cosmarium* (*C. yukidoriense*) and three new varieties of *C. clepsydra* have been described.

(c) Marine. Detailed studies have not been made and no data are available.

(d) Birds and seals. Several pairs of the south polar skua (*Catharacta maccormicki*) and numerous snow petrels (*Pagodroma nivea*) breed in the Site. The excrement of snow petrels is especially important as a major supply of nutrients for lichens and mosses. There is no information on seals.

6. SPECIAL FEATURES OF CONSERVATION SIGNIFICANCE

Yukidori Valley is representive of the typical continental Antarctic fellfield ecosystem. With more extensive expeditions in the ice-free areas, pedestrian traffic is increasing in the vicinity of the exceptional stands of vegetation. In order to achieve the project commenced by the 27th JARE 1985, a biological research hut was constructed near the beach at the mouth of the valley. This beach is approximately 250 m from the western boundary of the Site. However, it is intended to minimize Man's impact on the fauna, flora and terrain of the lower valley formed by relatively steep cliffs. Fluvioglacial terraces which consist of rather fine sand and gravel in the lower part of the valley. There is a dissected deltaic fan formed at the mouth of the stream. Detailed information on the geomorphology of the valley is given in the geomorphological map of Langhovde (Hirakawa et al. 1984).

(b) Geology and soils. The Yukidori Valley area is underlain by well-layered sequences of late Proterozoic metamorphic rocks. They are garnet-biotite gneiss, biotite gneiss, pyroxene gneiss and hornblende gneiss with metabasite. The foliation of the gneisses strikes N 10°E and dips monoclinally to the east at a moderate angle (Ishikawa et al. 1976, Matsumoto et al. 1979).

(c) Meteorology. A continuous climatic record has been maintained since 1957 at Syowa Station (published as "Antarctic Meteorological Data" by the Japan Meteorological Agency). Local climatic observations were occasionally carried out by field parties.

5. BIOLOGICAL FEATURES

(a) Terrestrial. Almost all of the plant species recorded from the Langhovde area occur within the Site. They include the mosses Bryum pseudotriquetrum (= B. algens), B. argenteum, Ceratodon purpureus, Pottia heimii, Grimmia lawiana, and the lichens Usnea sphacelata (= U. sulphurea), Umbilicaria antarctica, U. decussata, Alectoria (= Pseudephebe) minuscula, Xanthoria elegans. There are no liverworts or vascular plants (Kashiwadani 1970, Nakanishi 1977, Kanda 1981). The invertebrate fauna of the moss-water communities was studied by Sudzuki (1964, 1979), and two species of free living

(vii) Other kinds of scientific investigations which would not cause harmful interference

Research of other disciplines that might affect the biological studies should be avoided.

(viii) Scientific sampling

This should be restricted to the minimum required in connection with the programme. No rock samples may be obtained unless authorized in the entry permit.

(ix) Other restraints

None specified.

3. MATRIX CODE: Terrestrial: B1, C1, D1, E1, L1
Inland waters: L1, M1.1
Marine: not known

4. PHYSICAL FEATURES

(a) Topography. The valley is about 3 km in length from east to west and 0.5 to 1.5 km in width. The head of the valley, about 200 m above sea level, abuts the edge of the ice cap. A melt stream flows from the ice cap towards the sea through V-shaped and U-shaped sectors of the valley. Lake Higashi Yukidori lies north of the head of the valley. The main stream of the valley enters Lake Yukidori, in the middle of the valley, 125 m above sea level. It flows from the south-west corner of the lake and runs through

A preliminary biological survey was undertaken by the 15th and 16th JARE (1973-75). Taxonomical and ecological studies of moss and lichen vegetation along the stream and the lake margin were carried out, with particular reference to the relationship between this vegetation and water supply. The area has been chosen for an on-going biological research programme and for long-term monitoring studies. It is therefore necessary to afford protection to the Site so as to minimize human impacts.

(iii) Outline of research

A three year intensive study of the ecosystem commenced during the 1985-1986 season. This project consists of several ecological studies on fauna and flora in relation to the climatic and edaphic environmental conditions. Long-term monitoring of fauna and flora in some selected areas has also been conducted from the early stages of the investigation.

(iv) Date of expiry of designation

Initially 5 years from the date of designation, and thereafter subject to review.

(v) Access points

None specified.

(vi) Pedestrian and vehicular routes

Pedestrians should enter the Site only in connection with research activities. The operation of surface vehicles and the

SSSI 1/87

YUKIDORI VALLEY, LANGHOVDE, LUTZOW-HOLM BAY

1. GEOGRAPHICAL LOCATION

Yukidori Valley (lat. 69°14'30" S, long. 39°46'00" E), is situated in the middle part of Langhovde, on the east coast of Lutzow-Holm Bay, Greater Antarctica. The Japanese Station, Syowa, is situated on East Ongul Island about 30 km north of the site. (Note: "Yukidori" is the Japanese for snow petrel, Pagodroma nivea).

2. MANAGEMENT PLAN

(i) Description of site

The Site encompasses an area of 3 km by 0.5-1.5 km, the boundaries of which are shown on the accompanying map, located between a tongue of the ice cap and the east end of the valley. It includes a prominent stream and two lakes, and extends up to 50 m offshore near the mouth of the stream.

(ii) Reason for designation

The Site has a prominent fauna and flora which are representative of the terrestrial ecosystems of continental Antarctica. It has been chosen to satisfy the logistic needs of a continuing scientific study.

Zamorano, J.H. 1983 Zonación y biomasa de la microfauna bentónica en Bai
South, Archipelago de Palmer, Antártica. Publ. INACH, Serie Cientif:
30, 27-38.

Zamorano, J. [in press]. Zonación del macrobentos sublitoral en Bahía
South Antártica. Proc. Symp. on Recent Advances in
Antarctic Aquatic Biology with special reference to the Antarctic
Peninsula Region, Bariloche, 6-10 June 1983.

The spatial distribution of nine species of fish and their trophic relations have been described (Moreno et al. 1977). Species are segregated according to their habitat preferences, sponges and algae being refuges against predators.

(d) Birds and seals. No bird surveys have been carried out for this site.

Seals, in particular Weddell seals (Leptonychotes weddellii) visit the area to feed. Cetaceans, like killer whales (Orcinus orca) and humpback whales (Megaptera novaeangliae) enter the bay, sometimes to rest.

6. SPECIAL FEATURES OF CONSERVATION SIGNIFICANCE

[Not available at time of printing].

7. HISTORY OF IMPACTS AND PREVIOUS KNOWLEDGE

[Not available at time of printing].

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Moreno, C.A., Zamorano, J.H. & Duarte, W.E. 1977 Distribución y segregación espacial de las poblaciónes de peces en Bahía South (Isla Doumer), Antártica. Publ. INACH Ser. Cie., 5(1), 45-58.

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Vinje, T.E. 1981 Meteorological observations from Bouvetøya. Norsk Polarinst. Skrift. No. 175, pp. 85-103.

Watkins, B.P. 1981 Seabird observations at Bouvet Island. S. Afr. J. Antarct. Res., 10/11, 38-40.

(vii) Other kinds of scientific investigations which would not cause harmful interference

Any scientific research that requires collection of organisms should be avoided. Observations by scuba diving, which should not cause significant interference.

(viii) Scientific sampling

Collection of samples should be made only for compelling scientific purposes.

(ix) Other restraints

The dumping of waste from ships and bottom trawling should be avoided. Anchoring should be avoided except for compelling reasons.

3. MATRIX CODE

Terrestrial: Not applicable
Inland waters: Not applicable
Marine: S5, S6, S7, V5, V6

4. PHYSICAL FEATURES

(a) Topography. The entrance to South Bay is about 1 km wide, from where it is about 2.2 km to the north-east inner coastline. The maximum depth is 200 m near the centre of the bay, to the west of the Site.

(b) Geology. Doumer Island is composed chiefly of hybrid rocks of the Andean Intrusive Suite, predominantly tonalite, of late Cretaceous to early Tertiary age (Hooper 1962).

(c) Meteorology. No data are available for this site, but conditions can be expected to be similar to those recorded at the former British station at Port Lockroy, Goudier Islet, 6 km to the north (Pepper, 1954).

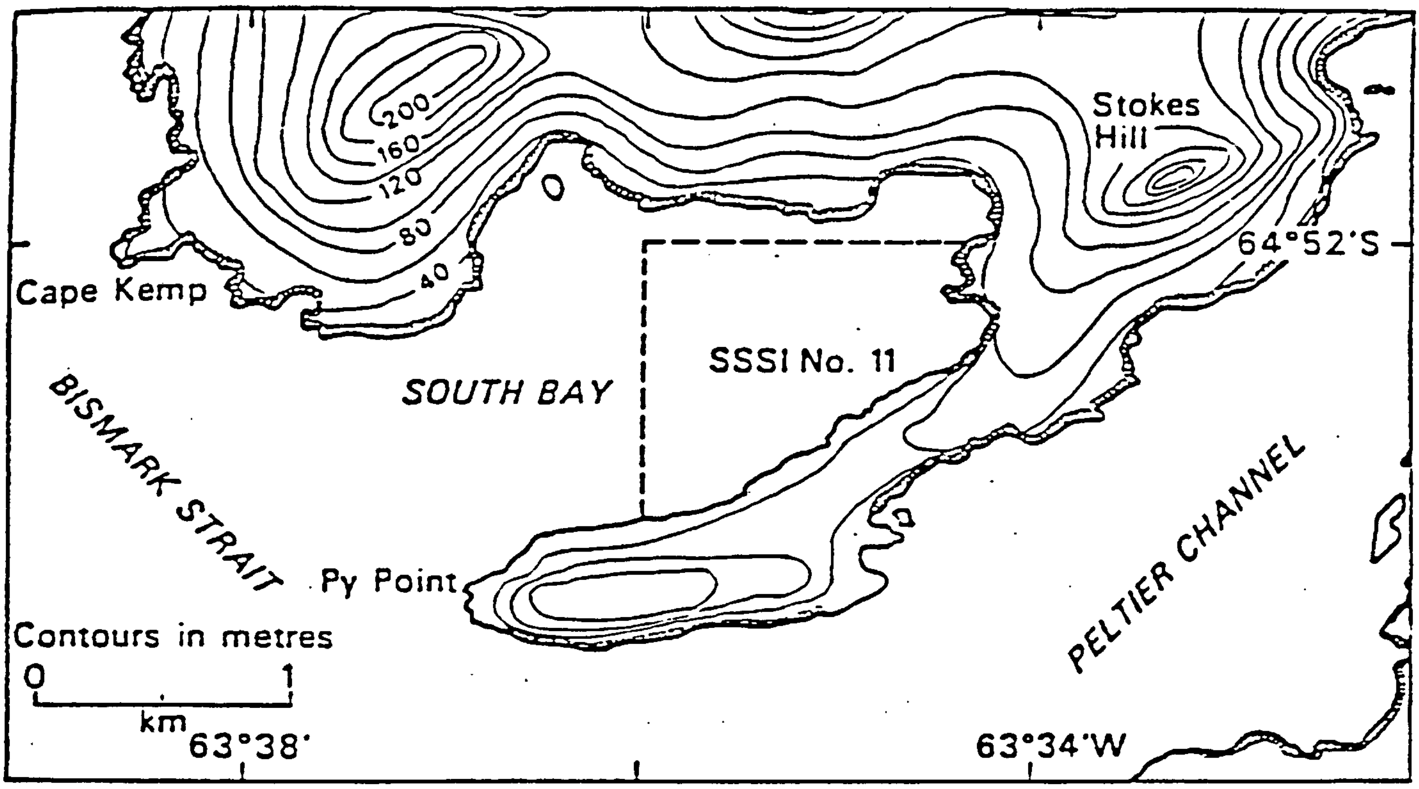
5. BIOLOGICAL FEATURES

(a) Terrestrial. The littoral is the only community present in this Site, but no data are available.

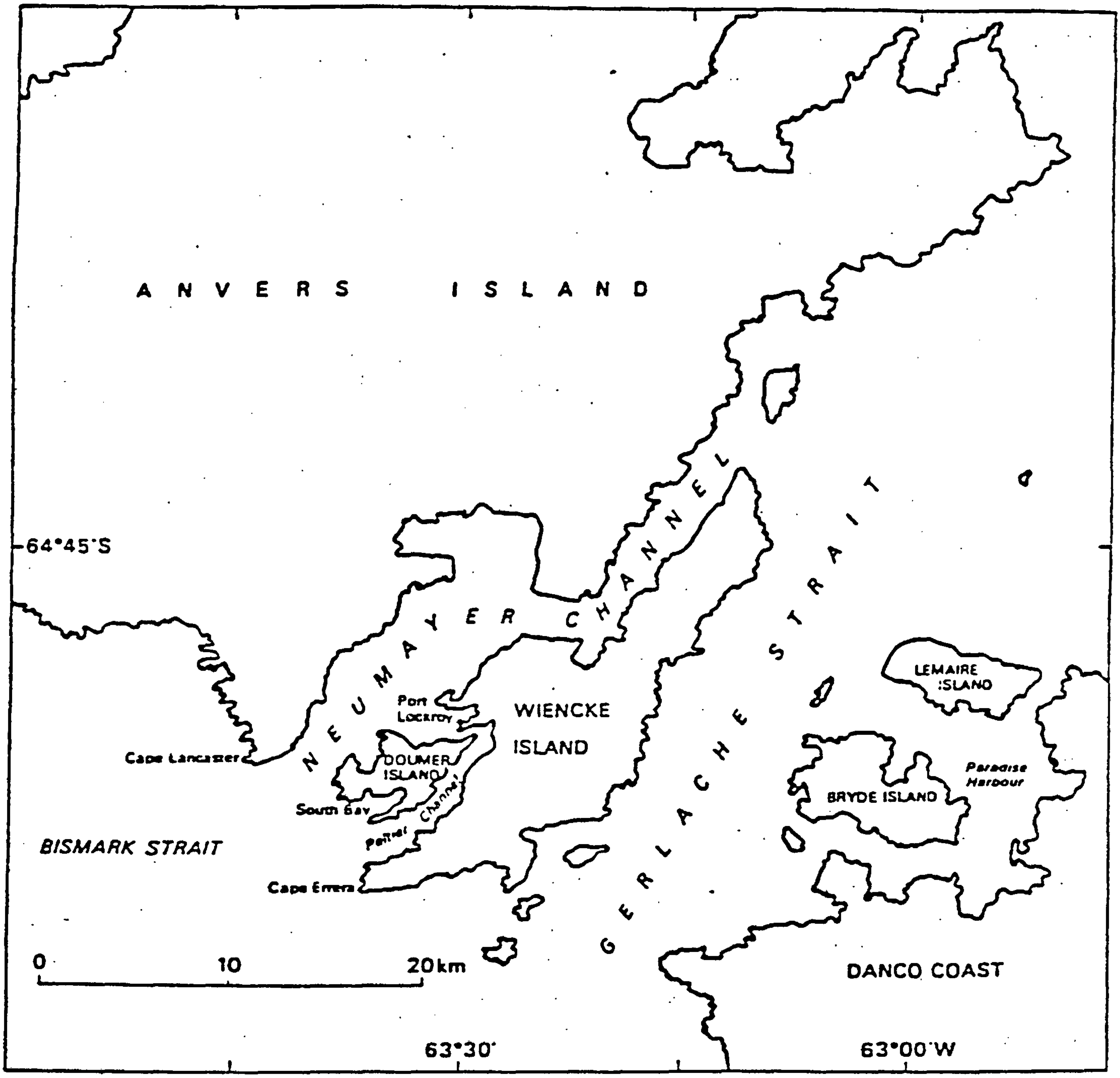
(b) Inland waters. Not applicable.

(c) Marine. Four different types of bottom surface have been described: rocky with algal growth, from 0 to 30 m depth; predominantly rock, covered by algae, silt and large quantities of sponges, from 30 to 110 m depth; mixed bottoms with predominantly deposits of mud and few rock outcrops with sponges, from 100 to 150 m depth; soft bottoms of silt and mud, from 150 to 200 m depth, corresponding to the deepest depression, occur near the centre of the bay just outside the site (Moreno et al. 1977).

The benthic macroinfaunal species richness increases with depth and is accentuated in bottoms with a steep slope. Biomass values fluctuate between 8 and 7690 g m^{-2} wet wt. Ice scour exerts a strong influence on the patterns of distribution and the abundance of benthic fauna (Zamorano 1983).



Stokes Hill
200
160
120
80
40
64°52'S
Cape Kemp
SSSI No. 11
SOUTH BAY
BISMARK STRAIT
Py Point
PELTIER CHANNEL
Contours in metres
0
1
km
63°38'
63°34'W


ANVERS ISLAND
NEUMAYER CHANNEL
GERLACHE STRAIT
WIENCKE ISLAND
Port Lockroy
DOUMER ISLAND
South Bay
Peltier Channel
Cape Lancaster
Cape Errera
BISMARK STRAIT
LEMAIRE ISLAND
BRYDE ISLAND
Paradise Harbour
DANCO COAST
64°45'S
63°30'
63°00'W
0
10
20km

SOUTH BAY, DOUMER ISLAND,
PALMER ARCHIPELAGO

1. GEOGRAPHICAL LOCATION

Doumer Island lies at the south-west entrance to Neumayer Channel between Anvers Island to the north-west and Wiencke Island to the east. It is separated from Wiencke Island by the Peltier Channel. South Bay lies on the south coast of Doumer Island.

2. MANAGEMENT PLAN

(i) Description of Site

The Site consists of a small area of coastal and subtidal benthic habitats down to 45 m depth subtended to the North by lat. 64°51'42"S, between long. 63°34'00"W and long. 63°35'20"W; and to the South by a diagonal line that starts at a point 100 metres from the Refuge [sub-base Yelcho] to long. 63°34'00"W. Boundaries are shown on the attached map.

(ii) Reason for designation

This Site is subject of a long-term ecological research programme; the purpose of the designation is to reduce, as far as possible, the risk of accidental interference which could jeopardize these scientific investigations.

(iii) Outline of research

The objective of the research is the study of the relationships among marine organisms in this area, which was started by scuba diving in 1972. Since 1981 advanced type experiments to understand community structure and functioning are under way, and will continue in the future. These require the avoidance, as much as possible, of artificial interference.

(iv) Date of expiry of designation

June 1988.

(v) Access points

Access points as such are not applicable. The area is not affected by the passage of boats.

(vi) Pedestrian and vehicular routes

Restricted.

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(c) Meteorology. Data for Arturo Prat Station are deposited with the National Meteorological Bureau, Santiago, Chile.

5. BIOLOGICAL FEATURES

(a) Terrestrial. Not applicable.

(b) Inland waters. Not applicable.

(c) Marine. The benthic assemblages have high species diversity and biomass. Bottom topography and sediment features influence the structure of the communities and distribution pattern of species. Two assemblages have been recognized: one, dominated by the polychaete *Maldane sarsi antarctica*, is located in the outer part of the bay, mainly below 100 m depth; other characteristic species in this assemblage are *Genaxinus bongrainii*, *Cyamomactra denticulatum*, *Typhlotanais greenwichensis* and *Pycnogonida* spp.. The inner assemblage, on the other hand, is not dominated by any single species but contains *Yoldia eightsii* and *Eudorella gracilior* as charcteristic fauna. The mean number of organisms determined in 1968 in the outer assemblage was 6030 individuals m^{-2}; the corresponding number in the inner assemblage was 3390. The mean wet weight biomass, however, was similar, i.e. 180 g m^{-2} and 164 g m^{-2}, respectively (Gallardo and Castillo 1969). The diet of *Notothenia rossii* and *N. neglecta* from Chile Bay has been described by Banamonde and Moreno (1970).

(d) Birds and seals. Not applicable.

6. SPECIAL FEATURES OF CONSERVATION SIGNIFICANCE

[Not available at time of printing].

7. HISTORY OF IMPACTS AND PREVIOUS KNOWLEDGE

[Not available at time of printing].

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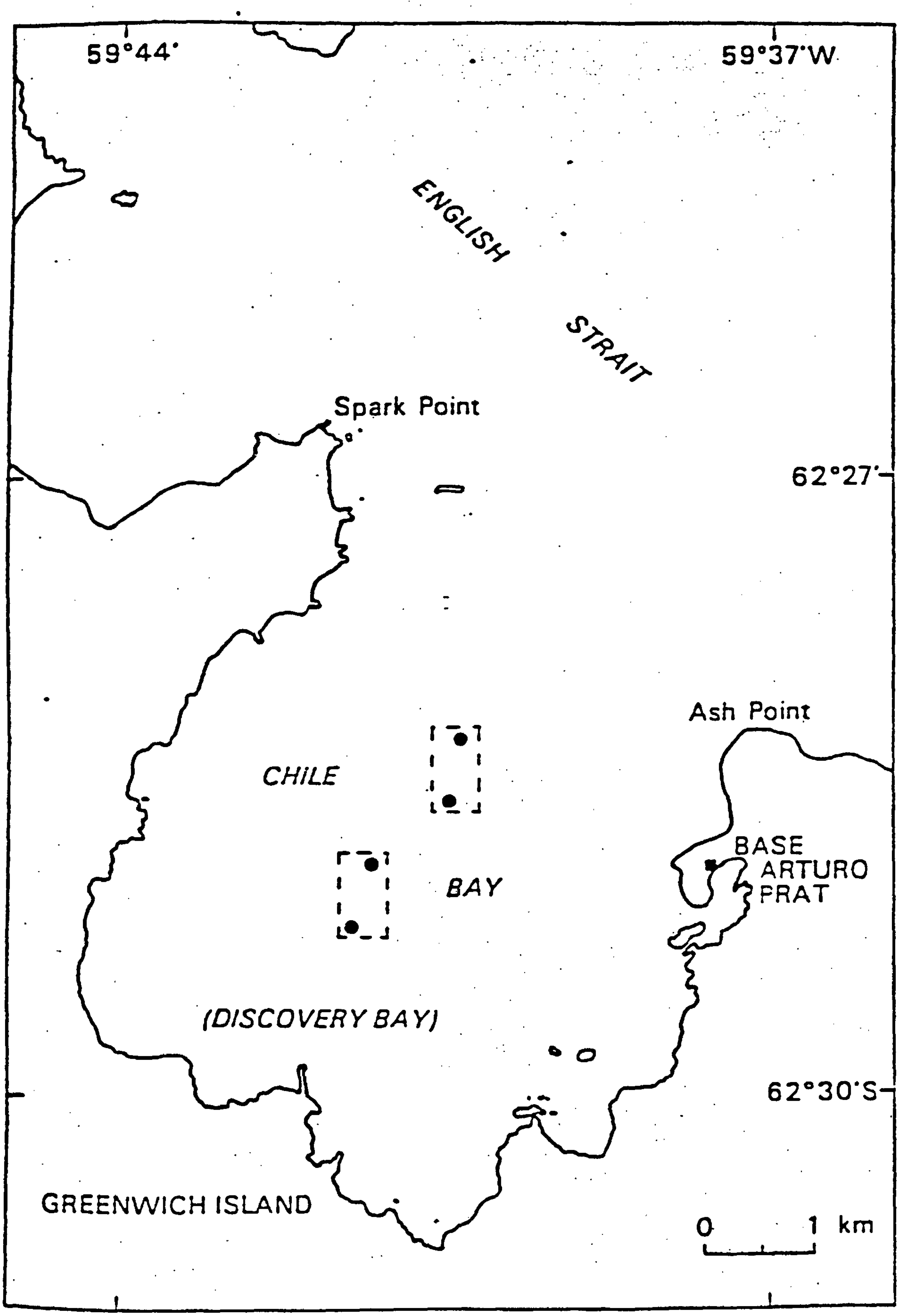

59°44'
59°37'W
ENGLISH
STRAIT
Spark Point
62°27'
Ash Point
CHILE
BAY
BASE
ARTURO
PRAT
(DISCOVERY BAY)
62°30'S
GREENWICH ISLAND
0
1 km

(vi) Pedestrian and vehicular routes

Not applicable.

(vii) Other kinds of scientific investigations which would not cause harmful interference

Scientific research other than the study of benthic habitats and communities.

(viii) Scientific sampling

Samples from the benthic habitats should only be taken for compelling scientific purposes. A programme should be initiated to monitor any pollution arising from ship activities.

(ix) Other restraints

Ships should avoid, so far as possible, the specific area of the SSSI. Anchoring should be performed for compelling reasons only. Ships should not discharge solid wastes within Chile Bay, and should minimise the discharge of liquid wastes. Bottom trawling or siting of bottom devices should be avoided.

3. MATRIX CODE

Terrestrial: Not applicable
Inland waters: Not applicable
Marine: Areas A and B: S8, S9, V6

4. PHYSICAL FEATURES

(a) Topography. The entrance to Chile Bay is about 3.5 km across from Spark Point (Punta Bascope) to Ash Point (Punta Troncoso). The inner coastline is irregular with several small bays, coves and islets.

Two glaciers reach the coastline, Great Traub Glacier on the west, and Air Force Glacier on the east to the south of Arturo Prat Station.

(b) Geology. Rock outcrops are not frequent around the bay. There is a vesicular andesitic cover of Jurassic to Cretaceous age, with intrusions of dioritic and andesitic stacks and dykes. There are a few isolated outcrops of horizontal basaltic andesites and lapilli-tuffs, of Tertiary age (Araya and Herve 1965).

The bottom of both sites consists of coarse to fine silt. The lithological and mineralogical composition of the sediments show their provenance from the outcrops and littoral deposits surrounding Chile Bay, i.e. porphyritic andesite, aphanitic andesite, diorite and andesitic volcanic breccia and tuffs (Valenzuela and Varela 1972). This material is transported to the coastline mainly by glaciers, solifluction and mud flows. These processes are intensified in the inner part of the bay where a glacier terminates. Chile Bay has a transverse submarine barrier, possibly a submerged moraine, trending south-east to north-west, separating areas A and B and dividing the bay into an inner part and an outer part. Sediments of the inner bay are protected from the action of waves and currents, thereby preserving the grain size distribution, sorting and shape of the material contained therein.

CHILE BAY, GREENWICH ISLAND, SOUTH SHETLAND ISLANDS

1. GEOGRAPHICAL LOCATION

Chile Bay (also known as Discovery Bay) lies on the north-east side of Greenwich Island, between Robert Island to the east and Livingston Island to the west.

2. MANAGEMENT PLAN

(i) Description of Site

The Site comprises two tracts of benthic habitat located as follows:

Habitat 1 [= Area A]: From between 50 and 100 m depth and between the following coordinates:

Lat. 62°28.9'S	Long. 59°41'12"W
Lat. 62°29.3'S	Long. 59°41'43"W

Habitat 2 [= Area B]: From between 100 and 200 m depth and between the following coordinates:

Lat. 62°28.3'S	Long. 59°40'15"W
Lat. 62°28.7'S	Long. 59°40'47"W

(ii) Reason for designation

In Chile Bay there has been continued quantitative and qualitative benthic research since 1967. Data being accumulated provide a baseline for long-term investigations. The site is of exceptional scientific interest and therefore requires long-term protection from possible harmful interference.

(iii) Outline of research

A long-term research programme was started in 1967 in connection with the study of benthic fauna re-establishment within Port Foster, Deception Island, following the volcanic eruptions of December 1967. Chile Bay has been designated a control study area. These studies are performed yearly during the summer. The community criterion to observe biota changes will be implemented with other acceptable criteria in order to comply with requirements of a long-term biological monitoring programme.

(iv) Date of expiry of designation

March 1983.

(v) Access points

Not applicable.

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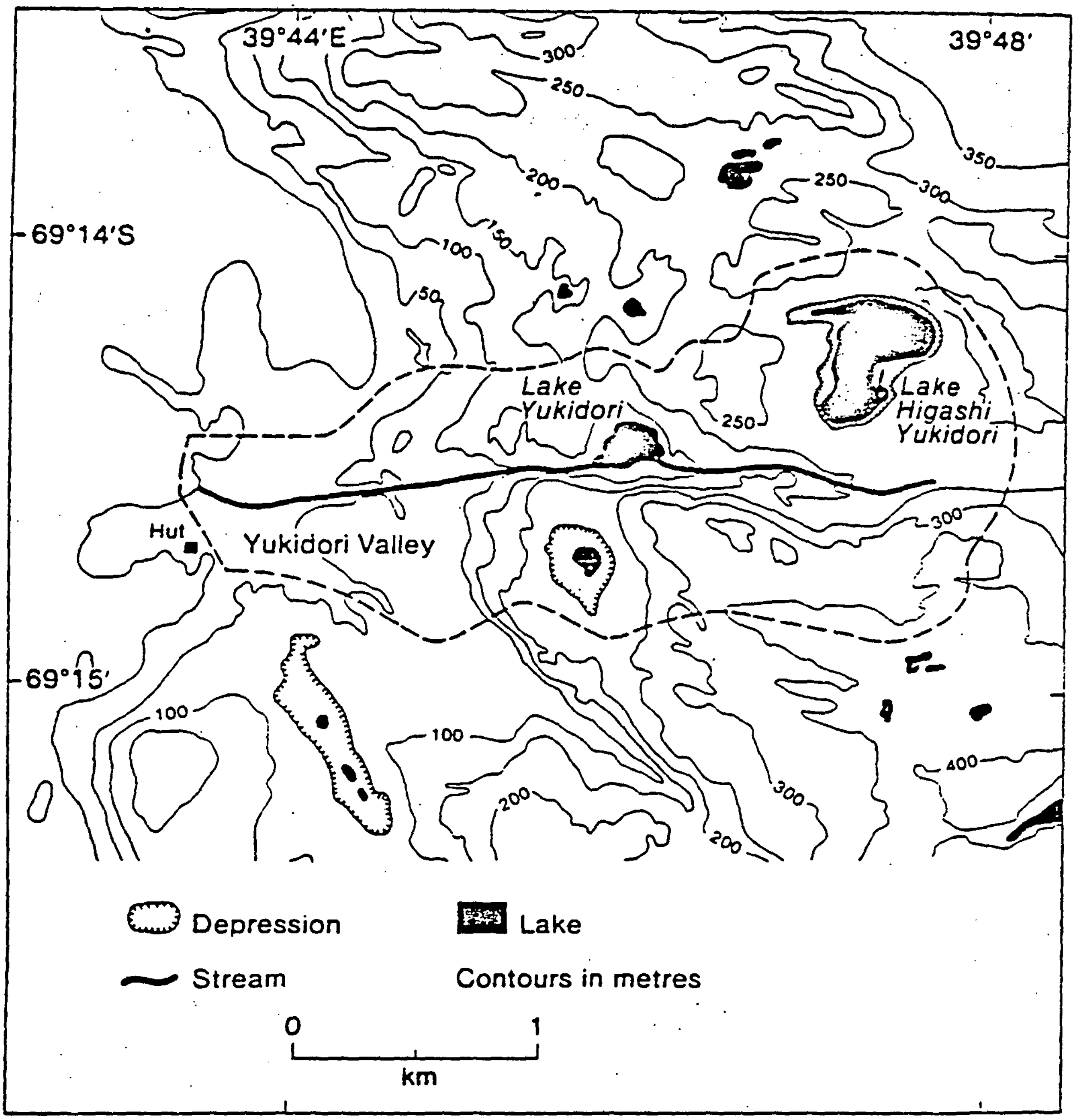
39°44'E
39°48'
69°14'S
69°15'
300
250
200
150
100
50
350
400
Lake Yukidori
Lake Higashi Yukidori
Hut
Yukidori Valley
Depression
Lake
Stream
Contours in metres
0
1
km

SSSI 3/87

SUMMIT OF MT. MELBOURNE, NORTH VICTORIA LAND

1. GEOGRAPHICAL LOCATION

Mt. Melbourne, North Victoria Land (lat. 74°21'S, long. 164°42'E) is situated between Wood Bay, on the west side of Ross Sea, and Campbell Glacier, about 20 km to the west.

2. MANAGEMENT PLAN

(i) Description of site

The Site comprises all terrain above the 2200 m contour on the main crater of Mt. Melbourne.

(ii) Reason for designation

The Site is of exceptional interest because of its extensive ice-free ground, at high altitude, which possesses several geothermal areas supporting a unique cryptogamic flora and microbiota. It also possesses unusual glaciomorphological and geomorphological features, and accumulations of organic matter.

(iii) Outline of research

There has been little previous research activity in the Site. The studies that have been undertaken have involved investigations of geothermal and volcanic activity and a survey of the plant and microbial communities. Future research is likely to include studies of soil microbiology and microfauna, vegetation, volcanology and the geophysics of the area.

(iv) Date of expiry of designation

Initially ten years from the date of designation, and thereafter subject to review.

(v) Access Points

Access to the Site is normally by helicopter and landings should be made only in the caldera, thereby avoiding any of the vegetated or other sensitive areas.

(vi) Pedestrian and vehicular routes

No vehicle should be used within the Site. Pedestrians should avoid, whenever possible, walking on any obvious areas of warm ground or disturbing any vegetation. Entry to the "Cryptogam Ridge" area of the Site should be made only from either end of the ridge. Entering the ridge directly up its slopes should be avoided.

(vii) Other kinds of scientific investigations which would not cause harmful interference

Low impact studies which have a minimal effect on the environment of the Site are permitted.

(viii) Scientific sampling

Samples should be acquired only for compelling scientific reasons and should not be taken to the detriment of the environment or of further scientific investigation. Sampling should be undertaken without causing the introduction of any foreign organisms.

(ix) Other restraints

Sterile protective overclothing should be worn and footwear should be sterilized before entering the Site to minimize contamination. Sterilized sampling equipment should also be used. All wastes should be removed from the Site.

3. MATRIX CODE

Terrestrial: B8, F8, (?)G8

4. PHYSICAL FEATURES

(a) Topography. In profile, Mt. Melbourne is an almost perfect low-angle cone rising to 2732 m a.s.l., showing only slight dissection and little or no glacial erosion. Many basaltic cones and mounds occur near the base and on the flanks of the mountain. The summit caldera is about 1 km in diameter and forms a névé for a glacier flowing westward. The two main areas of ice-free ground (A - "Cryptogam Ridge" - and B on the accompanying map) are on the edge of the caldera, with a third area (C) 250 m lower on the northern slopes.

"Cryptogam Ridge", on the southern side of the main crater, is an area of geothermal activity. About 300-400 m of this ridge is ice-free with the remainder covered by numerous ice hummocks. These hummocks are hollow and are 1-6 m in diameter and up to 4 m high. The warmest areas of ground support the growth of patches of yellow-green moss, liverwort and brownish crusts of algae.

(b) Geology and soils. Mt. Melbourne is part of the McMurdo Volcanics which are a line of extinct volcanoes running along the coast of Victoria Land. The Mt. Melbourne area is more likely to be late Quaternary than late Tertiary in age, and the most recent eruption may have been only about 150 years ago.

The mountain is a large low-angle strato-volcano containing basalt, trachyandesite and trachyte flows and including pyroclastics. Small basalt scoria cones are scattered around the base, some of which appear to be very recent as they are undissected. Several older slightly dissected cones occur on the summit caldera.

Surface ground temperatures vary markedly over distances of centimetres on ice-free warm ground, up to a recorded maximum of 47°C. Random probing to depths of 1 m and detailed temperature transects to depths of 15 cm indicate substrate temperatures of up to 60°C. Within the ice pinnacles soil surface temperatures range from 10°C to over 40°C. Frost heave occurs at some warm areas.

Although the substratum is classified as azonal, there are two distinct soil zones within some areas of hot ground. These may have been formed by natural processes caused by heat, moisture and gases from below. A typical profile comprises an upper 0-5 cm layer of dark sandy soil with a lower 6-30 cm horizon consisting of large lighter coloured scoria gravels. The upper layer contains organic matter in which there is microbiological activity, including cyanophaecean nitrogen fixation. No clay minerals have been detected.

(c) Meteorology. No detailed data are available for the Site. Field party records, during one week in late November 1984, indicate summer air temperatures in the caldera area of -6°C to -20°C, with an absolute minimum of -32°C.

5. BIOLOGICAL FEATURES

(a) Terrestrial. The Site contains an unique bryophyte community comprising the moss Campylopus pyriformis and the liverwort Cephaloziella exiliflora. C. pyriformis is not known elsewhere in the Antarctic biome, and C. exiliflora is known from three other (low altitude) areas of continental Antarctica. Other than at a similar geothermal site at the summit of Mt. Erebus (protonemata only) this is the highest altitude at which bryophytes have been found in Antarctica. The unusual occurrence of shallow peat is evidence of bryophyte growth having taken place over at least several decades.

Algae grow over wide areas of the warm ground and on the surface of warm rocks in some fumaroles. The microflora comprises a range of unicellular and filmentous algae, including the green _Chroococcus sp._, _Tolypothrix sp._ and _Stigonema sp._ and the cyanobacteria _Mastigocladus laminosus_ and _Pseudococcomyxa simplex_. Thermotolerant and thermophilic micro-organisms have been isolated from the soils.

A single unidentified lichen has been observed as a component of black crusts over small areas of warm soil. The only invertebrate reported is a testate amoeba, _Corythion dubium_, amongst the vegetation.

(b) _Inland waters_. It is possible that a sub-surface reservoir of liquid water may be present below the hollow near the ice-fall outlet from the Mt. Melbourne summit caldera to the sub-surface melt of ice. However, there are no data confirming this.

The occurrence of plant life is made possible only by the water droplets formed by the condensation of steam. Very small 'pools' up to _c._ 50 cm^2 and about 1 cm deep have been observed on occasions where dripping condensate gathered in small depressions.

(c) _Marine_. Not applicable.

(d) _Birds and seals_. No observations of birds have been made near the summit of the volcano. In the adjacent, low-lying coastal regions there are breeding populations of south polar skuas, snow petrels and Adelie penguins.

6. SPECIAL FEATURES OF CONSERVATION SIGNIFICANCE

Certain areas within the Site support unique plant communities on steam-warmed ground; all lie above the 2200 m contour. The closest documented fumarolic ground is 400 km to the south at the summit of Mt. Erebus, but there the organisms differ significantly from those on Mt. Melbourne. However, recent evidence suggests that geothermal activity also occurs near Mt. Melbourne close to the coast. Elsewhere in Antarctica vegetation on steam-warmed ground is known only in low altitude maritime areas of the Antarctic Peninsula region where, again, the vegetation differs significantly from the Mt. Melbourne community. The Site is of extreme interest to botanists, microbiologists, volcanologists and geophysics. Uncontrolled human activity within this area could cause severe damage by trampling of plants, compacting soil and altering soil temperature gradients, changing rates of steam release and possibly causing the introduction of alien micro-organisms and cryptogamic plants. In 1984 geothermal area B (see map) experienced minor impact.

7. HISTORY OF IMPACTS AND PREVIOUS KNOWLEDGE

Mt. Melbourne was first sighted in 1841 by James Ross and first climbed in January 1967 by a New Zealand party. Since then the summit area has been visited by New Zealand parties in December 1972 and November 1984. The 1984 party surveyed the biota on "Cryptogam Ridge" (Area A on the map). Brief visits were also made in January 1983 by a United States party and more recently by West German (1984/85) and Italian (1985/86) parties.

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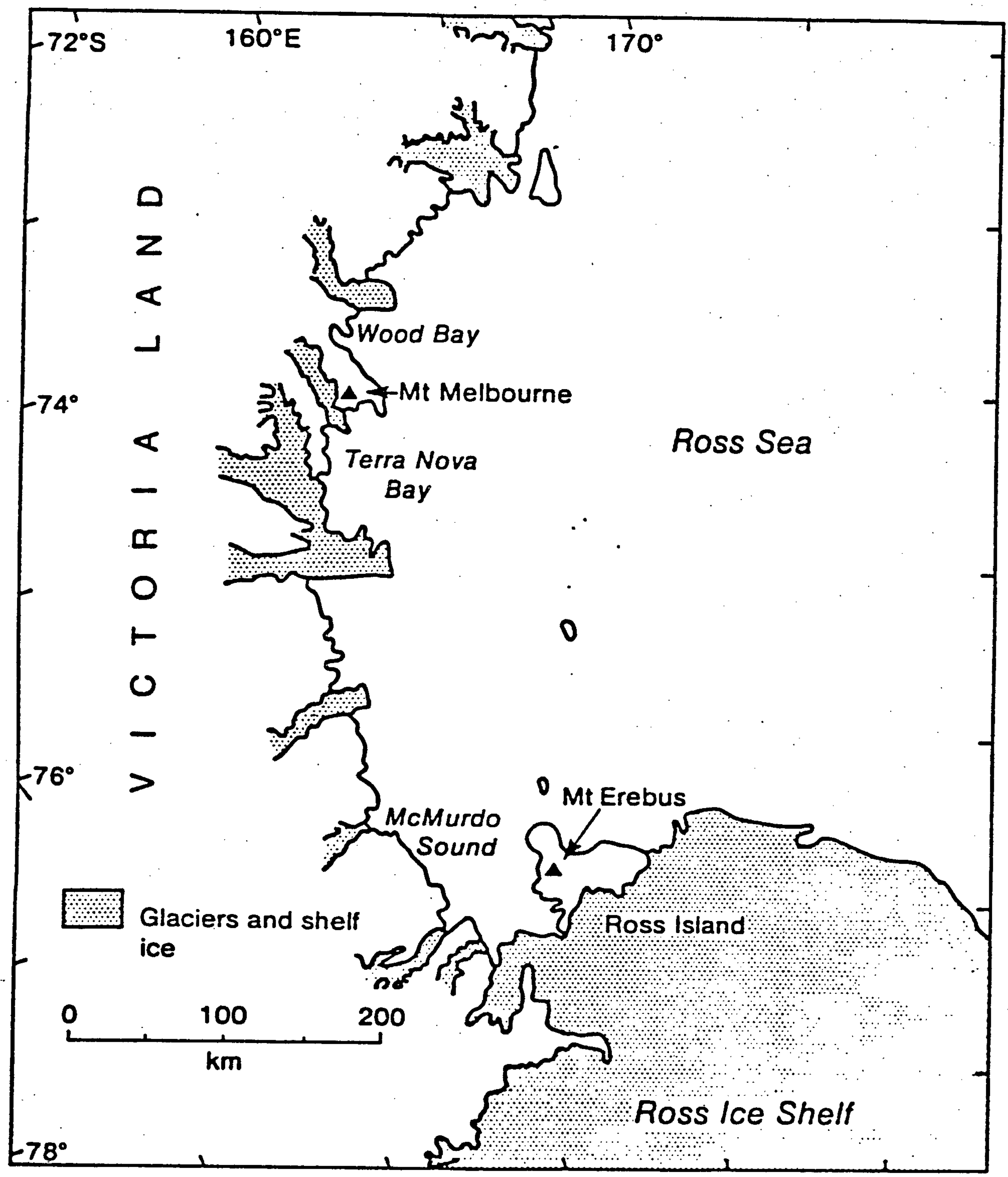
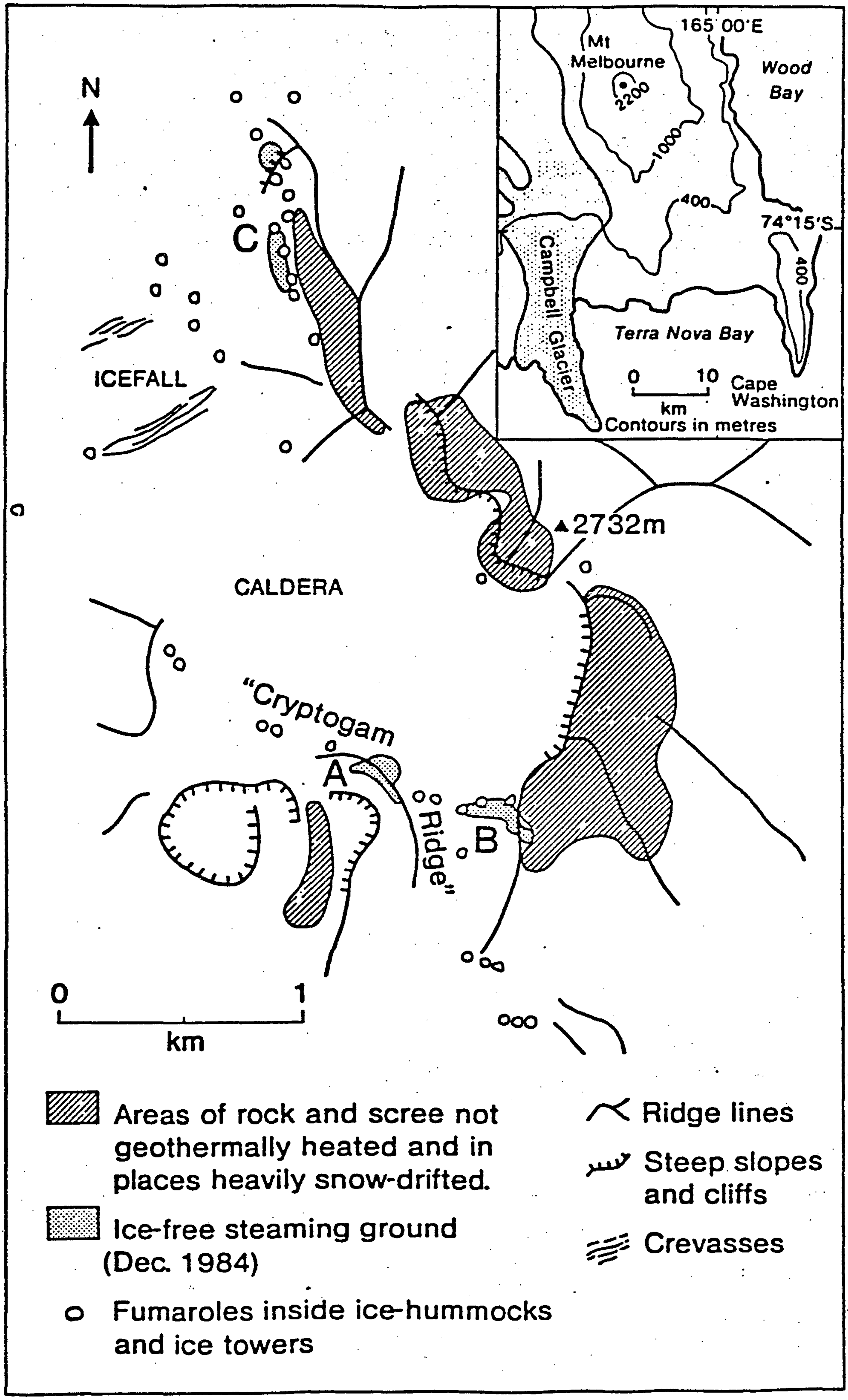


72°S
160°E
170°
74°
76°
78°
VICTORIA LAND
Wood Bay
Mt Melbourne
Terra Nova Bay
Ross Sea
McMurdo Sound
Mt Erebus
Ross Island
Glaciers and shelf ice
0
100
200
km
Ross Ice Shelf



N
C
ICEFALL
CALDERA
▲2732m
"Cryptogam
A
Ridge"
B
0
1
km
Mt
Melbourne
2200
1000
400
165 00'E
Wood
Bay
74°15'S
400
Campbell Glacier
Terra Nova Bay
0
10
km
Cape
Washington
Contours in metres
Areas of rock and scree not geothermally heated and in places heavily snow-drifted.
Ice-free steaming ground (Dec. 1984)
Fumaroles inside ice-hummocks and ice towers
Ridge lines
Steep slopes and cliffs
Crevasses

SSSI 2/87

SVARTHAMAREN, MÜHLIG-HOFMANNFJELLA, DRONNING MAUD LAND

1. GEOGRAPHICAL LOCATION

The mountain Svarthamaren (lat. 71°53'S, long. 5°10'E) is situated in Mühlig-Hofmannfjella, Dronning Maud Land. The distance from the ice shelf barrier is about 200 km.

2. MANAGEMENT PLAN

(i) Description of site

The Site consists of the mountain Svarthamaren with extensive screes at an elevation of about 1600 m a.s.l., about 3.9 km^2 in area.

(ii) Reason for designation

The Site provides exceptional opportunities for research on the Antarctic petrel (*Thalassoica antarctica*), snow petrel (*Pagodroma nivea*) and south polar skua (*Catharacta maccormicki*), and the study of different types of adaptation in seabirds breeding inland on the Antarctic continent.

(iii) Outline of research

A study of the breeding biology and ecophysiological adaptations in the Antarctic petrel was initiated in 1985. This is planned to continue during future Norwegian Antarctic Expeditions. The accessibility of the Site is limited by its location far inland, and this may hinder frequent research visits.

(iv) Date of expiry of designation

10 years from the date of designation.

(v) Access points

The Site may be entered from any direction but access should cause minimum disturbance to the bird colonies.

(vi) Pedestrian and vehicular routes

Vehicles should not enter the Site. Pedestrians should not move through the populated areas except in the course of scientific investigations. Helicopters and low-flying aircraft should avoid the bird colonies in accordance with the Agreed Measures for the Conservation of Antarctic Fauna and Flora.

(vii) Other kinds of scientific investigations which will not cause harmful interference

Any scientific investigation which will not cause significant disturbance to the biological programmes for which the Site has been designated.

(viii) Scientific sampling

Taking samples of the bird population by killing, capture, or taking of eggs should be done only for a compelling scientific purpose and in accordance with the Agreed Measures for the Conservation of Antarctic Fauna and Flora.

(ix) Other restraints

None specified

3. MATRIX CODE

Terrestrial: H8, G8

4. PHYSICAL FEATURES

(a) Topography. The Svarthamaren mountain is about 6 km long in a NW-SE direction, with the highest point being 2195 m a.s.l. The northern part of the NE side is dominated by screes, extending 240 m upwards from the base of the mountain. Above these screes, which are sloping 31-34°, are almost vertical cliffs. Beneath the slopes is a narrow area of flat ground bordered by glacier ice. The major feature of this side are two rock amphitheatres inhabitated by breeding petrels.

(b) Geology and soils. The main rock types are coarse and medium grained charnockitoids and small amounts of xenoliths. Banded gneisses, biotite amphibolites and granites of the amphibolite facies mineralogy are included in the charnockitoids. The slopes are covered by decomposed feltspathic sand.

(c) Meteorology. Meteorological data exist only for the period 13 January to 15 February 1985, during which the air temperature varied mostly between -5°C and -15°C. An automatic weather station was set up by NARE 1984/85 at Jutulsessen, 100 km west of Svarthamaren, to obtain long term weather statistics.

5. BIOLOGICAL FEATURES

(a) Terrestrial. The flora and vegetation at Svarthamaren are sparse, even compared with other areas in Mühlig Hofmannfjella and Gjelsvikfjella to the west of the Site (Engelskjøn 1985, 1986). This is apparently due to the considerable elevation of Svarthamaren, the prevailing shortage of meltwater, and the excessive nutrient deposition from the bird colonies. The only plant species occurring in abundance, but peripherally to the most manured areas, is the foliose green alga, Prasiola crispa. A fairly rich cyanophycean and lichen vegetation occurs elsewhere in the Mühlig-Hofmannfjella area. However, the surroundings of Camp Norway 5 support only a few lichen species on erratics 1-2 km away from the bird colonies: Candelariella hallettensis (= C. antarctica), Rhizoplaca (= Lecanora) melanophthalma, Umbilicaria spp., and Xanthoria spp. Bryophytes have not been recorded on Svarthamaren proper, but the moss Grimmia lawiana is frequent on the peripheral nunatak chains Hamarskaftet and Plogskaftet.

Areas covered with Prasiola are inhabited by Collembola (Cryptopygus sverdrupi) and a relatively rich fauna of mites (Eupodes angardi, Tydeus erebus), protozoans, nematodes and rotifers (Sømme 1985, 1986).

(b) Inland waters. A shallow pond measuring about 20 x 30 m, lying below the middle and largest bird subcolony, is heavily polluted by petrel carcasses, and supports a strong growth of a yellowish-green unicellular alga, Chlamydomonas sp. Smaller concentrations of algae occur on the fringes of a small frozen lake below the northern face of the mountain. No invertebrates were recorded.

(c) Marine. Not applicable.

(d) Birds and seals. There are very large breeding colonies of seabirds. The north-east slopes of Svarthamaren are occupied by a densely populated colony of Antarctic petrels, divided into three separate subcolonies. Less than ten breeding colonies of Antarctic petrels are described in the literature (Watson 1975), and the Svarthamaren colony is by far the largest known. The colony was subjected to the first close examination in January/February 1985 by Norwegian ornithologists participating in NARE 1984/85. The total number of breeding pairs in 1985 was estimated to be 208,000. In addition, 500 - 1000 pairs of snow petrels and 50 pairs of south polar skuas were breeding in the area in 1985 (Mehlum et al. 1985). The Antarctic petrels nest in the two rocky amphitheatres with a mean density of 0.75 nest per square metre. Most of the snow petrels nest in separate parts of the scree characterized by larger rocks. The south polar skuas nest on the narrow strip of flat, snow-free ground below the screes.

There are no sea mammals at Svarthamaren.

6. SPECIAL FEATURES OF CONSERVATION SIGNIFICANCE

The Svarthamaren Antarctic petrel colony is the largest known seabird colony situated inland on the Antarctic continent, and probably represents a significant proportion of the world population of this species.

7. HISTORY OF IMPACTS AND PREVIOUS KNOWLEDGE

The Antarctic petrel colony was discovered by Soviet geologists in January 1961 (Konovalov 1962, Konovalov & Shulyatin 1964) during the Fifth Soviet Antarctic Expedition. The expedition landed in the area with an AN-2 aircraft and quite unexpectedly encountered thousands of birds taking off. The Soviets probably stayed in the area for one day only. During the period 9 January to 16 February 1985 ten of the scientists of the Norwegian Antarctic Research Expedition (NARE) 1984/85 worked in Mühlig-Hofmannfjella and Gjelsvikfjella, and established a main base camp (Camp Norway 5) on the glacier approximately 500 m north-east of the northernmost slope of the Site. Three ornithologists visited the colony daily, and the area was also investigated by a botanist and an invertebrate zoologist. Researchers of other disciplines surveyed this and nearby areas using skidoos (Orheim 1985). Only one landing by helicopter (a Bell 206) occurred during the period. The camp consisted of several tents and one wooden laboratory hut; the latter was left to be used by potential future expeditions to the area.

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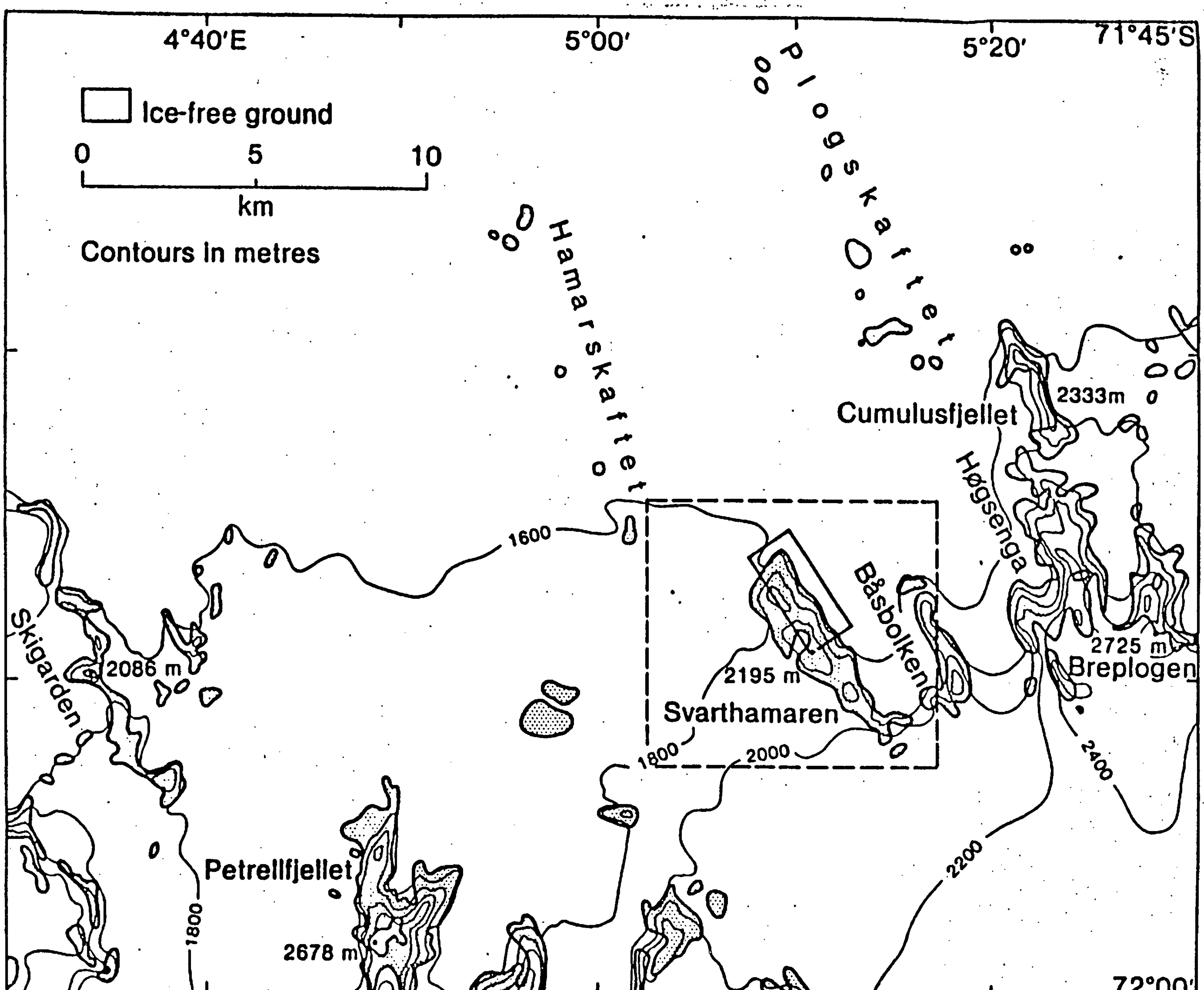
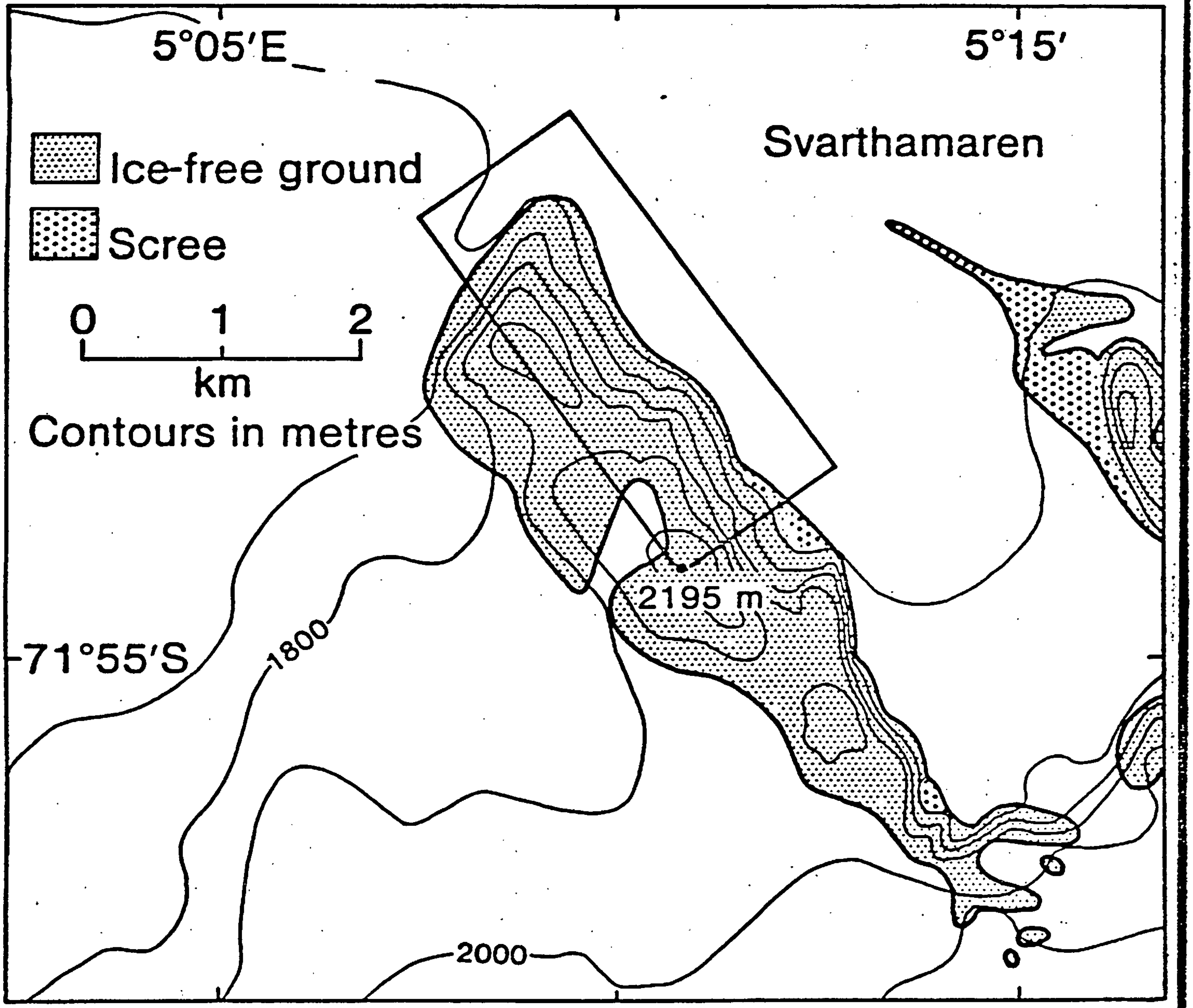

4°40'E
5°00'
5°20'
71°45'S
Ice-free ground
0
5
10
km
Contours in metres
Hamarskaftet
Plogskaftet
Cumulusfjellet
2333m
Høgsenga
1600
Båsbolken
2725 m
Breplogen
Skigarden
2086 m
2195 m
Svarthamaren
1800
2000
2400
2200
Petrellfjellet
1800
2678 m
72°00'


5°05'E
5°15'
Svarthamaren
Ice-free ground
Scree
0
1
2
km
Contours in metres
2195 m
71°55'S
1800
2000

MARINE PLAIN, MULE PENINSULA, VESTFOLD HILLS, PRINCESS ELIZABETH LAND

1. GEOGRAPHICAL LOCATION

Marine Plain (23.4 km^2) opens into an arm of Crooked Fjord on the southern side of Mule Peninsula, the southernmost of the three major peninsulas which comprise the Vestfold Hills. The Vestfold Hills comprise an essentially ice-free oasis (approx. 400 km^2) of bedrock, glacial debris and water at the eastern side of Prydz Bay on the eastern coast of Princess Elizabeth Land.

2. MANAGEMENT PLAN

(i) Description of site

The boundary of the Site is as follows:

commencing at lat. 68°36'30"S, long. 78°09'00"E it runs south-easterly to lat. 68°36'45"S, long. 78°10'30"E; thence south-easterly to lat. 68°37'30"S, long. 78°10'30"E, then south along the parallel of long. 78°12'30"E to its intersection by the low water mark on the northern shore of Crooked Fjord; from here it follows the low water mark of the northern shore of Crooked Fjord to its intersection with the meridian of long. 78°03'00"E; thence north along the meridian of long. 78°03'00"E to its intersection with the parallel of lat. 68°37'30"S, then north-easterly to lat. 68°37'00"S, long. 78°05'00"E, and finally north-eastwards to the point of commencement.

All co-ordinates are expressed in terms of the World Geodetic System, 1972.

(ii) Reason for designation

The site contains Pliocene marine sediments principally in the area below 20 m a.s.l. In addition to the dominant important fossils such as molluscs and diatoms, which define the age, the site has yielded well-preserved vertebrate remains of a new species, genus and probably family of fossil dolphin, plus at least one other vertebrate species.

Burton Lake, as a hypersaline lake which is still in seasonal connection with sea, presents the opportunity for important limnological research. It represents a unique stage in the biological and physico-chemical evolution of a terrestrial water body from the marine environment.

Davis (68°85'S, 77°58'E), a permanently occupied Australian scientific station, is located on Broad Peninsula, the central peninsula of the Vestfold Hills, 6 km to the north-west of the Site. It is the focus of continuing biological, including limnological, studies within the Vestfold Hills. As a result of its proximity, the scientific value of the Site could be diminished by accidental interference.

(iii) Outline of research

A palaeontological research programme has commenced following the initial discovery of vertebrate fossils at the site in 1985. The programme consists of the collection of well-preserved fossil molluscs and diatoms and, in particular, fossil vertebrates, with the aim of documenting the fauna of the epoch. Oxygen isotope studies on the well-preserved bivalve fauna will be employed to help quantify water temperature at that time.

Burton Lake is the subject of detailed year-round research as part of a programme aimed at understanding the evolution of the hydrological system in the Vestfold Hills, by looking at various stages of isolation from the marine environment.

(iv) Date of expiry of designation

10 years from the date of designation, and thereafter subject to review.

(v) Access points

Access should, where possible, be from the sea ice in Ellis Fjord or Crooked Fjord, or by helicopter at places where no disturbance can be caused by the aircraft to water bodies, vegetation or sediment deposits. If these means of access are not possible, access by land, either by vehicle or on foot, should be via Ellis Rapids at the eastern end of Ellis Fjord.

(vi) Pedestrian and vehicular routes

Vehicles should not be used within the site except for over-snow travel by motorized toboggan. Pedestrians or vehicles must not damage areas of vegetation, or disturb steep inclines marking sediment outcrops or the lake margins near these outcrops.

(vii) Other kinds of scientific investigations which would not cause harmful interference

Other research likely within the area is a study of the ecology of Wilson's storm petrels (Oceanites oceanicus), snow petrels (Pagodroma nivea), mosses and lichens, and other biota, and investigation of water bodies other than Burton Lake. Other scientific investigations which do not disturb the palaeontological, ecological and limnological programmes described are also permitted.

(viii) Scientific sampling

Scientific sampling should be restricted to that required for the programmes described in (iii) and (vii) above.

(xi) Other restraints

All waste materials taken into, or generated within the Site should be removed as soon as practicable. No fuel depots should be made within the Site, nor should refuelling operations be undertaken. No permanent buildings should be erected within the Site. Power boats should not be used on Burton Lake and use of other boats should be restricted to the minimum necessary to support programmes consistent with this plan.

3. MATRIX CODE

Terrestrial: None

Inland Waters: P6 (and seasonally Q6), and probably M1 and/or L1

Marine: None

4. PHYSICAL FEATURES

(a) Topography. The site includes Burton Lake (surface at sea level) as a major component of the western part of the region. An extensive low level (less than 20 m above sea level) area occupies the centre of the site with a north-south orientation. In the north-east is another area below 20 m. Areas above 20 m are mostly low hills of Precambrian rock acting as divides between the shallower parts. They are quite rugged and separated at their base by a marked change in their slope, probably representing an old (Holocene?) shoreline, from the much lower areas below 20 m. The surface of the lower areas below 20 m is marked by a series of concave-to-the-south recessional moraine ridges leading to the present "iceberg graveyard" in Crooked Fjord, at the southern end of the central low area. The geomorphology of this region has been reviewed by Pickard (1986).

(b) Geology. The Precambrian rock consists basically of 3000 Ma gneisses both from igneous and metamorphic protoliths (Collerson and Sheraton, 1986) intruded by numerous metabasalt dykes (intruded in at least three intervals between 1800 and 1375 Ma) with a roughly north-south orientation, a major feature of the Vestfold

Hills. Low lying areas consist of at least 8 m of early Pliocene (40-46 million years) diatomites and less common lenticular sandstone (Pickard et al. 1986, in press, Quilty in press) overlying the Precambrian rock and occupying the sites of what were embayments in the early Pliocene. In the western lobe (central area of the map, below 20 m a.s.l.), the Pliocene deposits are ovelain by a thin veneer of Holocene (6490 ± 130 y BP) glacial debris covering an area of 8-10 sq km, in places containing a few molluscs (Laternula elliptica King and Broderip) in situ.

Low scarps in the Pliocene adjacent to small lakes have yielded remains of a new genus, species and probably family - all extinct - of dolphin and there is evidence of another larger form. This vertebrate fossil fauna is the reason for the designation of the Site.

The geology of the Neogene is described in more detail by Quilty (in prep) and Pickard et al. (1986, in press) and the Precambrian has been reviewed by Collerson and Sheraton (1986).

(c) Meteorology. No data are available from the area, but conditions for Davis station, 6 km to the north-west, are similar (Burton and Campbell, 1980).

5. BIOLOGICAL FEATURES

(a) Terrestrial. No detailed studies have been made of plants within the Site, but Seppelt et al. (in press) have reported few species and no significant stands of vegetation.

(b) Inland Waters. There are many small lakes and ponds which have neither been studied nor named. The largest water body, Burton Lake, is more marine in character because of its summer daily tidal flow.

(c) Marine. Burton Lake opens to Crooked Fjord at its south-western corner. It has been the site of biological research for several years (e.g. Burke and Burton in press, Bayly 1986) (For the purposes of the Matrix Code, Burton Lake appears to better fit into the Inland Waters classification).

(d) Birds and Seals. No bird or seal surveys have been conducted in the area, but it is relatively devoid of birds and sea mammals, although Wilson's storm petrels and snow petrels occur sporadically and nest in the Precambrian hills.

6. SPECIAL FEATURES OF CONSERVATION SIGNIFICANCE

Apart from the area's prime significance as a site of fossils, Burton Lake and several of the small lakes are important as examples in a spectrum of lake types in the Vestfold Hills.

7. HISTORY OF IMPACTS AND PREVIOUS KNOWLEDGE

The area lies on the pedestrian route to the Mule Peninsula lakes (Clear, Laternula, Cemetery and McCallum) from Ellis Rapids, and many field parties have walked through the area in the 33 years of Australian occupation at Davis station. However, as the area is arid and barren (as is much of the Vestfold Hills), no biological work has been undertaken, apart from surveying the distribution of moss and lichen vegetation (found to be largely absent, Seppelt et al. in press) and research on Burton Lake, and there has been little or no impact on the area. Since the recent (1985) discovery of vertebrate fossils in the Pliocene marine sediments in the area, a research programme involving further visits to the area has commenced.

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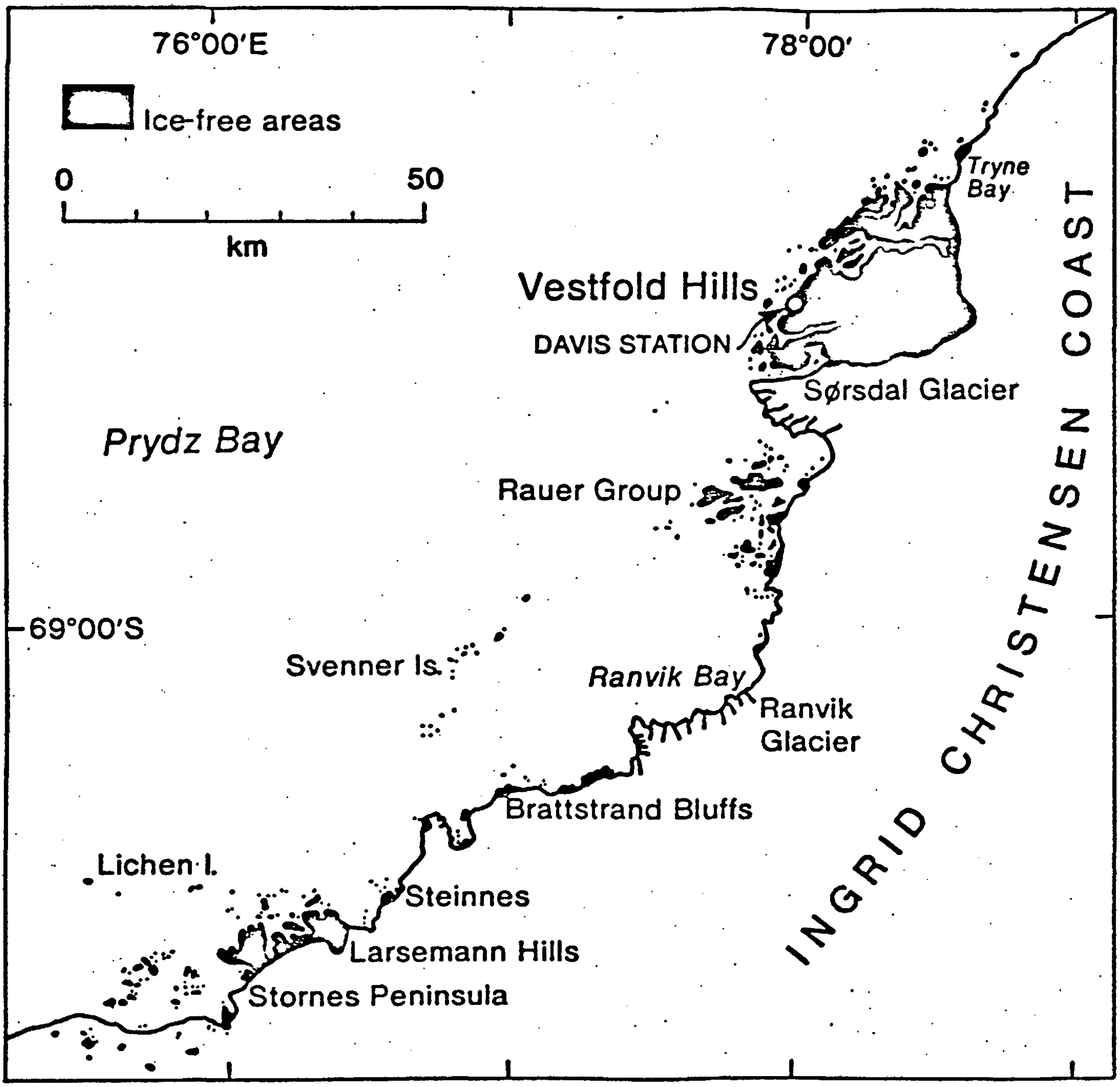
76°00'E
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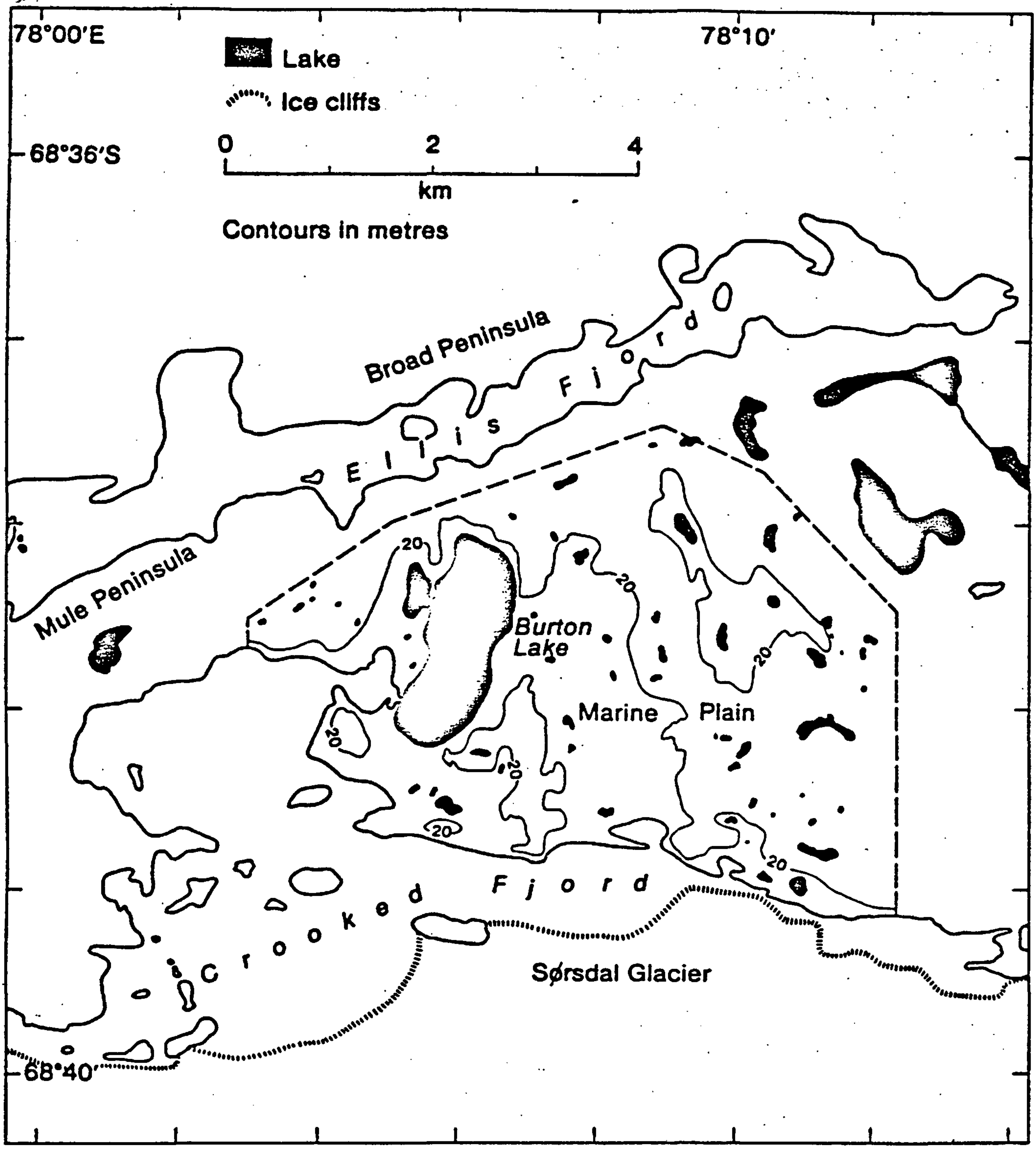
Ice-free areas
0
50
km
Vestfold Hills
DAVIS STATION
Tryne Bay
Sørsdal Glacier
Prydz Bay
Rauer Group
69°00'S
Svenner Is.
Ranvik Bay
Ranvik Glacier
Brattstrand Bluffs
Lichen I.
Steinnes
Larsemann Hills
Stornes Peninsula
INGRID CHRISTENSEN COAST



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Ice cliffs
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4
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Contours in metres
Broad Peninsula
Ellis Fjord
Mule Peninsula
20
Burton Lake
Marine Plain
Crooked Fjord
Sørsdal Glacier
68°40'

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XIV ATCM Agenda item 11. Effects of Tourism and Non-Governmental Expeditions in the Antarctic Treaty Area

In June 1987, the SCAR Working Group on Logistics discussed the question of non-governmental activities. Whilst acknowledging that the determination of policies and courses of action in relation to non-governmental activities is a matter for governments, the SCAR Executive Committee believes that the report of the discussions on this subject prepared by the chairman of the Working Group on Logistics, as amended by the SCAR Executive Committee, may be helpful to the Representatives at XIV ATCM. A copy is appended.

REPORT ON NON-GOVERNMENT ACTIVITY IN ANTARCTICA,

SCAR WORKING GROUP ON LOGISTICS.

1. Introduction

In 1986 at San Diego, the Logistics Working Group introduced the term 'Non-Government Activity' (NGA) to supersede the term 'non-government expedition' which has been used extensively in Antarctic Treaty discussions. The latter term no longer fully covers the range of activities occurring in Antarctica, particularly the increasing part played by commercial operators. The term NGA encompasses private expeditions, commercial tourism and activities of non-governmental conservationist groups.

At its meeting at Boulder, 8-10 June 1987, the SCAR Working Group on Logistics (WGL) resolved to prepare a paper defining the categories and scope of NGAs to identify the nature and extent of the impact on programs in Antarctica. The SCARWGL concluded that NGA is a matter for governments

This paper summarises information on NGA for the period 1983-84 to 1986-87, and examples of national program difficulties caused by NGA over a larger period.

2. Scope and Categories of Non-Government Activity

Unlike national operations whose programs are publicly accountable and directed by national policy, NGA is less restricted and generally seasonal in activity, with broad geographical interests. NGA frequently involves mixed groups of foreign nationals and is often under a corporate umbrella. A summary of NGA between 1983/4 and 1986/7 is being prepared.

NGA falls into four categories; overflights, cruises, private expeditions or voyages, and activities which require permanent facilities.

2.1 Overflights

Overflights were popular up until the tragic Mount Erebus air liner disaster in 1979. Overflights are less environmentally damaging than most other forms of tourism. They have no requirement for permanent facilities although they do rely on established observation and communications networks for weather and navigation information.

2.2 Cruises

There are presently three cruise ships operating. These cruises are the chief means of Antarctic tourism. Landing points are, typically, accessible scenic locations, areas where native fauna can be found and areas convenient to historic sites. Because tourists are accommodated on board ship, the likely impact on station facilities and local environments is not as high, per person, as for other forms of tourism, although experience is that interruptions are caused to station and some field scientific programs. Except in an emergency, organisers must plan to visit only those Antarctic stations for which permission has been sought and granted (ATCM IV-27). Cruise organisers must notify their itinerary for the purposes of information exchange under the Antarctic Treaty. At the end of each operational season, cruise operators should report on their activities including details of the stations which they visited (ATCM VIII-9).

The potential problems associated with this form of tourism include:

- Possible disturbance and damage to historic sites and monuments when concentrations of tourists are landed in one location;
- Possible environmental impact caused by mechanical breakdowns, strandings of passengers and groundings, fuel and oil spillages or the introduction of exotic biota;
- Possible medical emergencies; and
- Possible disruption to national programs. Over the last two years, some stations on the South Shetland Islands and the Antarctic Peninsula have experienced seasonal visitor numbers in the order 1000. At several stations, about 40 days of valuable summer program time were disrupted by the need to guide and supervise tourists.

2.3 Private Expeditions and Small Craft Voyages
These are typically adventure expeditions operating from cruising yachts, converted trawlers, whalers and ocean-going tugs. A number of expeditions have undertaken *limited scientific* activities, but the mainstay of financial sponsorship for private expeditions is their adventure appeal.

A number of private expeditions have received substantial assistance. Although the number of people who visit Antarctica in this way is relatively small, because of their need for extensive publicity they can be highly influential, often leading public opinion on Antarctic issues.

2.4 Permanent Facilities and Infrastructure
This category includes all NGA which have a long-term presence and permanent Antarctic facilities. Such activities place demands on the relatively small area of ice-free land and special measures are required to minimise potential impact on the environment.

Aircraft have taken large numbers of tourists to the maritime Antarctic, but the lack of suitable runways and accommodation facilities has limited the scale of operations. The permanent facilities required for the growth of this category of NGA are capital and labour intensive and include: airports and runways, wharves and bunkering, hostel or hotel accommodation, waste disposal and other infrastructure, and additional field shelters.

Of all the forms of NGA in the Antarctic, hotel-based tourism is potentially the form which has the most lasting and most concentrated environmental impact. In its favour it could be said that it localises impact in one place and allows for the ready adoption of technological innovation to problems of waste disposal in particular; and also control is relatively straightforward.

Greenpeace established a 'wintering-over' station at Ross Island in 1986/87 after an unsuccessful attempt in 1985/86.

3. Assistance Provided to NGA.
Assistance provided by national Antarctic operators to all categories of NGA continues to increase. There is a wide range of assistance which national operators already provide in all stages of NGA planning and operations.

Specialised assistance provided to separate categories of NGA is summarised below.

Overflights Air navigation, radio communications and in-flight information. Depending on the popularity of future overflights, flight planning will be necessary in air space in use by national research programs.

Government-sponsored tourist flights are being conducted at the Antarctic Peninsula and maritime Antarctic regions.

Private air operations are potentially the most disruptive to station activities, especially in the event of an emergency. The reinstatement of tourist overflights and the continuing increase in light aircraft operations will place great responsibility on ground staff to provide the best possible in-flight and weather prediction information.

Cruises At stations, research sites, and important sites for wildlife, there is a general need to guide and oversee the movements of comparatively large tourists groups (minimum size is about 120). Tourists are attracted to Antarctic stations because of their remoteness and because of a general interest in observing human activity in Antarctica. In the past two season's, about 2000 tourists visited King George Island. Successive cruises have produced major disruptions to station activities at their busiest time. In addition, several cruise ships have grounded and required assistance.

Because of the disruption to national programs caused by tourist cruises, some national operators have limited the number and timing of tourist visits which can be made to stations.

Private Expeditions and Small Craft. Small private expeditions using motor vessels or yachts have shown the greatest increase of all categories of NGA. Experience is that while all expeditions claim to be self-sufficient, the majority have made extensive use of the resources of national programs. This has included assistance which national operators have provided because of concern for the safety and well-being of expeditions. A number of expeditions have received assistance from up to four national programs.

Private air operations have allowed tourist groups to visit even the most inaccessible areas of Antarctica. Air operations often involve routing through a number of national stations, assistance in fuel handling and depoting, providing flight and weather information, search and rescue (SAR) standby, and ground crew commitment for landings, refuelling, and take-offs. In addition, there is added ski-way and site maintenance in the event of unannounced visits by private aircraft.

Permanent Facilities and Infrastructure The small number of expeditions which have sufficient resources to maintain small wintering parties have located their operations close to existing national stations. While these private expeditions have a comparatively broad range of facilities, they have little or no logistic backup or flexibility should an emergency arise. The New Zealand and United States of America Antarctic Research Programs have been involved in large-scale emergency assistance to these expeditions.

Year-round NGA has mostly involved national operators making available their radio communications facilities and weather prediction services. However, because these private expeditions emphasise their self -reliance, they tend to resist seeking or divulging information on their operations. In particular, WGL members have pointed to the difficulties experienced in seeking basic operational information from Greenpeace's first expedition.

4. Conclusion

Because increasing NGA in Antarctic is inevitable, so too is the likelihood of national operators having to provide both advisory and emergency assistance to them. The WGL's concern is the potential problems created by NGA which may jeopardise national research programs, put lives at risk in SAR operations, and increase financial costs for national operators.

The range of costs to national Antarctic programs of providing assistance to NGA may be summarised as:

- Time and labour commitment for predeparture briefings and specialist advice on the activities which are planned;

- Prior to and in Antarctica, the costs incurred to national operators in monitoring the NGA. This assistance is of two kinds. Firstly, ensuring that the NGA is well planned and the organisers have a comprehensive knowledge of relevant Antarctic Treaty measures. Secondly, a commitment by national operators to ensure that facilities (e.g. ski-ways, SAR facilities and radio communications) are fully operational in the event of their use by NGA;

- The costs incurred in providing supplies, shelter, transport and other emergency support. Because supplies taken to Antarctica are carefully rationed and costly to transport and store in Antarctica, the loss of small quantities has an over proportional cost to national programs.

- Lost research opportunity caused by disruption to programs and disturbance to monitoring sites. For example, the unannounced arrival of an NGA party to a research station has jeopardised human biological studies centred on the effects of isolation and restricted contact with the outside world;

- Disruption to entire national programs which may be caused by diverting ships, aircraft and personnel. Most national programs depend on shipping to resupply stations and for personnel transport. Because shipping operations take place within a narrow operational season, ship (and aircraft) diversions of a few days may significantly impact on the national programs. The emergency assistance of more than one national operator has been provided to a number of private expeditions. Despite advice to the contrary, expeditions have continued regardless, often to an unsuccessful conclusion and additional recovery costs to national operators.

The effect of diverting a national operator's ship can be quite serious. For example, a few years ago an Australian Antarctic vessel on its last voyage of the season had to be diverted to a rescue mission. After one day, Australia was able to locate another vessel to take over the rescue. If it had not been able to pass the rescue to another national operator, Australia would have had to leave 54 summer expeditioners to winter on the Antarctic continent and charter a ship to collect the Macquarie Island summer party; and

- Risks which may have to be faced by personnel from national programs in providing SAR and other emergency assistance. Emergency operations have involved personnel from national programs in flying operations in conditions which they would normally consider too dangerous for operations.

Ways must be found to provide NGA with as much assistance as is necessary to minimise the likelihood of disrupting national programs. In providing advice to NGA organisers, national operators need to stress the following points:

- The indicative costs involved in assistance by national operators;
- Concern to protect the national scientific programs;
- The liability of NGAs for costs of assistance rendered and the need for appropriate insurance;
- Antarctic Treaty obligations in respect of NGA;
- Guidance on the *Code of Conduct for Antarctic Expeditions and Station Activities*;
- The requirement to protect historic sites, monuments and artefacts;
- The requirement to protect the environment; and
- Liability for inadvertent environmental damage, if appropriate.

A Handbook in national languages, giving guidelines for NGA could be prepared. It is suggested that in the interests of all national operations a uniform Code of Conduct be prepared. This approach would provide an 'agreed' approach to NGA and also allow the opportunity for each national operator to make known the set of conditions upon which it is prepared to grant permission for groups to visit Antarctic Stations which it maintains (ATCM IV Rec.27). An 'agreed' approach would strengthen the position of Antarctic operators. There is also a need for consistency about how national programs, which in some cases have dispersed heads of responsibility, can be contacted. The Handbook should list key contact addresses for the national operators so that organisers of NGA have clear avenues of approach to operators during the planning stages of their expeditions.

TABLE 1. National Operators Affected by Non-Government Activity, 1983-87.

NATIONAL OPERATOR(S) AFFECTED	DATE	TITLE	TRANSPORT	ESTIMATED VISITOR NUMBERS	DESTINATION
AUSTRALIA	1984-85	Project Blizzard	Yacht *Dick Smith Explorer*	12	Commonwealth Bay Dumont D'Urville
AUSTRALIA AND FRANCE	1985-86	Project Blizzard	Motor Vessel *Southern Quest*	24	Commonwealth Bay Dumont d'Urville
ARGENTINA	1986-87	Lindblad Travel Inc.	Cruise Liner *M.S. Society Explorer* (Multiple visits)	576	Antarctic Peninsula
BRAZIL	1987	Amyr Klink	Private Yacht		Antarctic Peninsula
CHILE	1983-87	World Discovery	Cruise Liner *World Discoverer* (Multiple visits)	999	Antarctic Peninsula
	1984	Aero Petrel	Cessna 404 (Crashed Nelson Island, December 1984)	30	King George Island Antarctic Peninsula Fatal crash at Nelson Island
	1984-85		Cruise Liner *Linblad Explorer* (Multiple visits)	587	Antarctic Peninsula
	1986-87		Cruise Liner *Society Explorer* (Multiple visits)	576	Antarctic Peninsula
ITALY	1987	World Discovery	Cruise Liner *World Discoverer*		Ross Sea
NEW ZEALAND	1986	*Riquita* Expedition	Yacht *Riquita*	4	Cape Hallet Cape Adare Macquarie Island
NEW ZEALAND AND UNITED STATES OF AMERICA	1984-86	Footsteps of Scott Expedition	Motor Vessel *Southern Quest*		Ross Sea - Scott McMurdo & S. Pole
	1985-86	Austrian Mountaineering Expedition	Motor Vessel *Southern Quest*		Scott-McMurdo proposed Mt. Minto climb abandoned
	1985-86	Greenpeace International	Motor Vessel *Greenpeace*		Ross Sea
	1986-87	Greenpeace International	Motor Vessel *Greenpeace*	31	Ross Sea Scott & McMurdo Dumont d'Urville Macquarie Island
NEW ZEALAND, USA AND ITALY	1987	90 Degrees South	Motor Vessel *M.V. Aurora* Twin Otter & Bell 206		Ross Sea - Scott McMurdo and South Pole
UNITED STATES OF AMERICA	1983	Brooke Knapp	Gulfstream III		McMurdo Station
	1983	Seven Summits Odyssey	Tri-Turbo DC3		Antarctic Peninsula Siple Station
	1985	Antarctic Airways	Twin Otter		Palmer Station Ellsworth Mtns.
	1986-87	Antarctic Airways	Twin Otter	29	King George Island Ellesworth Mtns.
	1986-87		Private sailing vessels	80	Antarctic Peninsula
	1986-87	Society Expeditions	Cruise liner *M.S. Society Explorer* (6 visits)	600	Antarctic Peninsula
	1986-87	World Discovery	Cruise liner *World Discoverer* (3 visits)	300	Antarctic Peninsula
	1986-87	Private tour operator	Argentine Navy Vessel *Bahia Pariso* (2 visits)		Antarctic Peninsula