New Zealand Subantarctic Islands Research Strategy

SOUTHLAND CONSERVANCY

Department of Conservation
Te Papa Atawhai

New Zealand Subantarctic Islands Research Strategy

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Cover photo: Recording and conservation treatment of Butterfield Point fingerpost, Enderby Island, Auckland Islands

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Foreword

New Zealand's Subantarctic islands are among the most pristine in the world. A considerable number now have very few introduced plants or animals and any direct impact on their ecosystems may be minimal. However, the effects of human activity are far-reaching and these islands can be barometers of change. Science has a role in calibrating the barometer.

The challenge for the Department of Conservation is to know as much about the condition of the Subantarctic islands as possible without putting them at risk. Every visit by people has risks attached to it. Legislatively, the islands are safeguarded as much as possible – they are National Nature Reserves, entry is by permit only. The high natural character of the islands has been recognised by their designation as a World Heritage Area. The department is committed to maintaining or improving the condition of these islands by continuing with the programme of eradication of all introduced mammal species.

I ask all researchers to think carefully about the value of their research to these unique and precious islands and to be conscious at all times of the risk their very presence brings to the biota upon them.

Kevin O'Connor

Conservator, Southland Conservancy.

1.0 Introduction

The New Zealand subantarctic islands are managed by Southland Conservancy of the Department of Conservation. Management has included pest eradications, weed control, threatened species recovery, archaeological survey and facilities maintenance. Frequency of visitation varies with management action undertaken by the department. However, the greatest pressure for access to the islands comes from researchers. Research projects can be long term and/or involve months of occupation of the islands or they can simply involve the collection of data and material which can be accomplished in a short time frame (a day or less per island). In addition, some research may be aligned to the Department's management goals whereas other research may be investigating global processes and have little obvious benefit to management of the islands. Thus, the purpose of this research strategy is, firstly, to provide a tool for managers to decide which research is most appropriate and, secondly, as a guide for researchers to indicate where the Department has specific research needs. The purpose is expanded upon in Section 2 of this strategy.

Priorities for research, evaluation of research proposals and obligations of researchers are given in Section 3. In Section 4 research themes are developed and contain key research topics which range from those targeted at management needs through to those which take advantage of the location or other characteristics of the islands to understand regional or global phenomena. Current research levels, including long-term research projects, are briefly described in Section 5 and in Section 6 logistics pertaining to work in the Subantarctic islands are explained.

A summary of information for researchers planning to work within the Subantarctic is in Appendix 1. Two other key documents for researchers to read and comply with are the operational guidelines and quarantine requirements, available from Southern Islands Area Office of Southland Conservancy.

All researchers are required to refer to this strategy when applying to Southland Conservancy for access to the islands and permission to conduct research. Applications should be justified in terms of the criteria listed in section 3.2.1 and the priorities for research in section 3.1. Application for approval, in principle, of research on the Subantarctic islands should be made before funding applications are submitted to funding agencies. Funding agencies, e.g., NSF, NERC, FRST, MoRST, Marsden Committee and University Grants Committees, are encouraged to use this strategy when considering applications for funding.

This strategy will be reviewed and updated in the light of new information five years from publication date. It will be aligned with review of major documents such as the Conservation Management Strategy for the Subantarctic islands.

1.1 SETTING

Lying in the Southern Ocean south to south-east of New Zealand are the five island groups that make up New Zealand's Subantarctic islands. Latitudinally, the islands range from the "roaring forties" to the "furious fifties" and all are located between

the subtropical convergence and the Antarctic convergence (Fig. 1). Along with Macquarie Island (an Australian territory), these islands constitute the Pacific Subantarctic sector. None of the New Zealand islands are permanently inhabited and all are totally protected as National Nature Reserves.

Subantarctic islands are highly valued because of their distinctiveness and because of their qualities as "natural laboratories" to help understand environmental systems beyond the islands (Chown et al. 1997, Young 1995, Hänel and Chown 1998a). The Subantarctic islands of New Zealand play an internationally important role because of their location and relatively natural condition. In the Pacific sector, the New Zealand islands lie between 47° and 53°S (Macquarie is at 54° 30'S). In comparison, the five South Indian Ocean sector island groups tend to be in the lower latitudes and are more spread out between 36°and 52°S. Many of the islands of the South Atlantic sector are more polar and are located between 51° and 63°S, although Gough Island lies at 40° 19'S. Thus, the New Zealand Subantarctic islands occupy the mid-latitudinal range among the Subantarctic island groups.

Fig. 1: The location of New Zealand's Subantarctic islands in relation to the subtropical and Antarctic convergences as well as the other Subantarctic island provinces.

Using their location in relation to defined biogeographic zones, the New Zealand island groups are all classified as cool-temperate – the warmest of the three southern, high-latitude zones (Clark and Dingwall 1985). They share this zone with the Falkland Islands, Tristan da Cunha and Gough Island (South Atlantic sector) and Île Amsterdam and Île Saint-Paul (South Indian Ocean sector). Macquarie Island, the only other island in the Pacific sector, is classified as Subantarctic (along with Îles Kerguelen, Îles Crozet, Heard and MacDonald Islands, Marion Island, Prince Edward Island and South Georgia). The other islands (including the Balleny Islands) lie within the maritime Antarctic zone (Clark and Dingwall 1985, p. 187).

The New Zealand Subantarctic islands comprise The Snares/Tini Heke, Bounty Islands, Antipodes Islands, Auckland Islands and Campbell Islands/Motu Ihupuku (Fig. 2). Summaries of the biology, geology and history of each island group can befound in the Nomination for World Heritage Listing (DOC 1997), the Subantarctic Islands Conservation Management Strategy (DOC 1998) and in the revision of the guide book to New Zealand's Subantarctic Islands (Peat 2003). Further details relating to facilities and logistics are given in Section 6 of this strategy.

Because of their origins and isolation from major land masses, their climate, topography and relationship to marine topography, the New Zealand Subantarctic islands have developed unique ecosystems with a high degree of endemism. Human influence on these islands is very recent although profound for some islands and species.

1.2 LEGAL STATUS

The New Zealand subantarctic islands are accorded the highest level of protection possible under New Zealand law. All are National Nature Reserves (under the Reserves Act 1977) and the reserve boundaries are at mean spring low water. In 1998 they became the New Zealand Subantarctic Islands World Heritage Area (Peat 2003). The justification for inscription as a World Heritage Area relates to the high level of biodiversity, population densities and endemism among the fauna and flora as well as the biogeography of the biota.

In addition, a marine reserve has been established around the Auckland Islands (DOC 2002). The Auckland Islands Marine Reserve encompasses c. 484,000 ha and includes all of the territorial sea and internal waters surrounding the Auckland Islands from mean high water spring out to 12 nautical miles. The marine reserve was established to protect a unique and outstanding marine environment and no extraction or disturbance of marine life (other than for approved scientific and management purposes) will be permitted in the reserve.

1.3 MANAGEMENT

Management of the New Zealand Subantarctic islands is the responsibility of Southland Conservancy of the Department of Conservation. Operations within the Subantarctic islands are the responsibility of Southern Islands Area of Southland Conservancy. The Area Manager is accountable for all activities undertaken within the department's area of jurisdiction in the Subantarctic islands.

Entry permits are required to land on any of these islands, since they are Nature Reserves. Research concessions are required for any research proposed for the islands and permits for collection of material are mandatory. Researchers must also adhere to the Department of Conservation's operational standards as outlined in the annually updated document "New Zealand Subantarctic Islands Operational Guidelines" (see Appendix 1). Summaries of legal status and the statutory basis for management of the islands can be found in DOC (1997, 1998).

Although all of the New Zealand Subantarctic islands are National Nature Reserves, for the purposes of management the islands have been further categorised into "minimum impact" and "refuge" islands based on their ecosystem condition and vulnerability to disturbance (DOC 1998, p. 39). Most of the islands have been classified as "minimum impact", i.e., the highest degree of naturalness and with entry strongly limited. The "refuge" islands are Auckland, Enderby and Masked Islands in the Auckland Island group plus Campbell and Folly in the Campbell Island group. The distinction between these two categories relates primarily to the presence, either current or in the recent past ("refuge" islands), or absence ("minimum impact" islands) of introduced mammals and the effects that these introduced species have had on the fauna and flora of each island. The overall level of modification is also taken into account. The management objectives for these two categories are given in Table 3 of the Conservation Management Strategy (DOC 1998). Research on "minimum impact" islands is for essential management purposes and can include monitoring of changes and identification of biological values. Such research can be conducted on "refuge" islands, with the addition of process studies not permitted elsewhere.

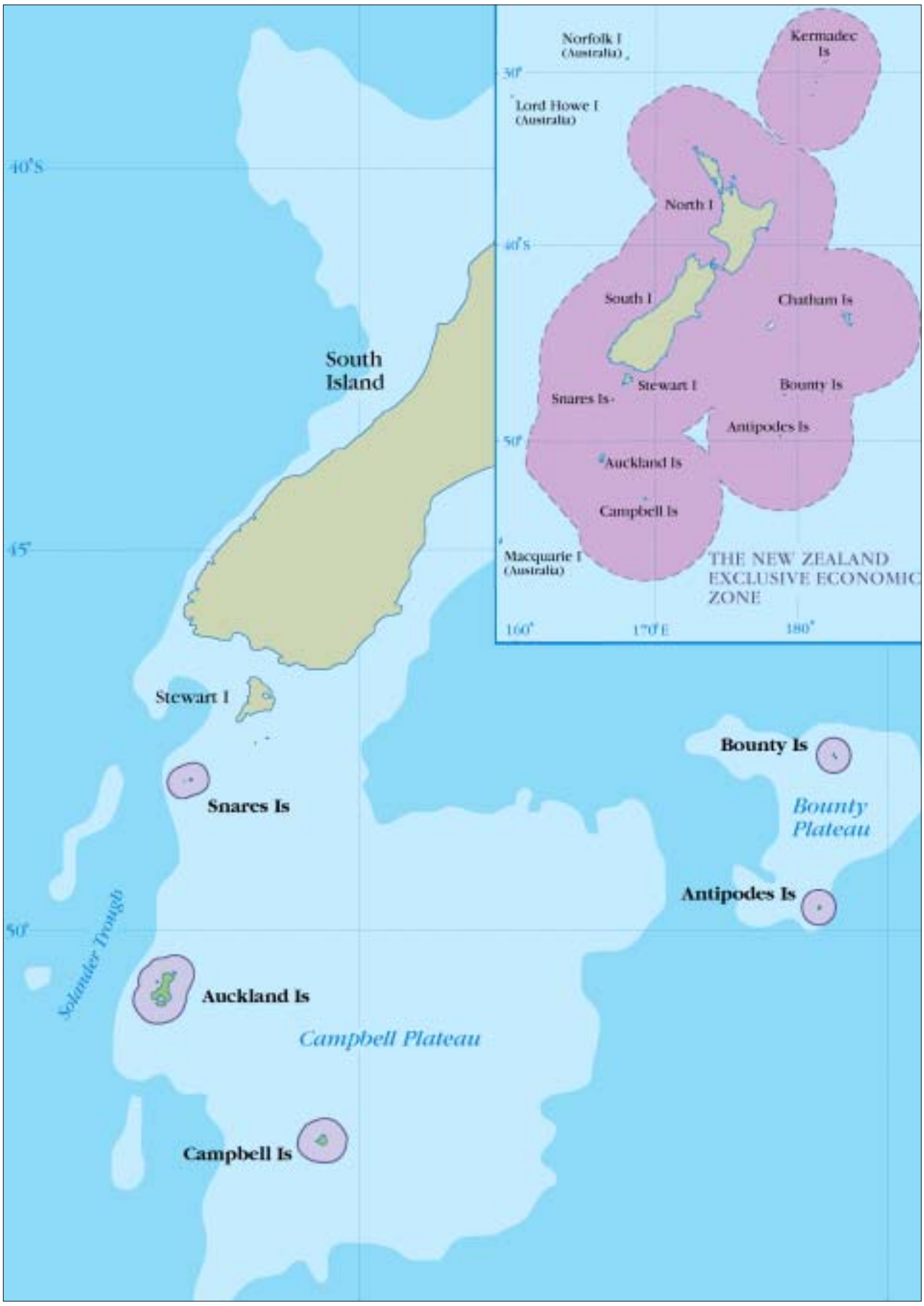

Fig. 2: The Subantarctic islands in relation to the submarine plateaux and the exclusive economic zone around all land masses of New Zealand.

The Conservation Management Strategy (hereafter, CMS) for the New Zealand Subantarctic islands provides for a reasonable degree of control over human activities and advocates a precautionary approach to granting visitor permits (DOC 1998 – see Part 5). Tourist numbers are limited to a maximum of 600 per annum at large sites and 150 per annum at small sites and access is limited to a few locations on just three islands (Campbell, Enderby and Auckland Islands).

Research and management are, or have been, conducted on most island groups within the last ten years. Those activities were strictly controlled, again using a precautionary approach (DOC 1998 – see Section 2.6, 2.7), and were permitted because the perceived benefits outweighed the perceived risks and impacts. Most of the research has been undertaken by New Zealand-based researchers but international teams of researchers have also worked on the New Zealand Subantarctic islands. However, since the declaration of these islands as a World Heritage Area, and given the increasing concern about the effect of exotic species in conjunction with climate change and increasing pressure from tourism, further restrictions on access may be warranted (Chown et al. 2001). Indeed, Chown et al. (2001) suggest ". . . if Southern Ocean islands are declared World Heritage sites, then exclusion of most human activity should accompany this declaration. Although such a decision would seem unpalatable, the available evidence suggests that it is the only way to ensure the persistence of many remarkable species and ecosystems."

2.0 Purpose of this Research Strategy

This strategy is intended to fulfil two purposes. The first is as a guide to researchers to indicate the types of research that the Department of Conservation currently considers will be useful for wise and effective management of this internationally significant group of islands – see Section 3.

The second is as a tool for managers, to assist them to discriminate more easily among the many applications for research that are received each year. The number of applications to conduct research in the New Zealand Subantarctic islands has risen considerably since 1995. Between 1987 (when the Department of Conservation was created) and 1995, the total number of research permits issued was c. 60. For the 1997/98 season 19 permits were issued (DOC 1998) and for the 2004/05 season there were seven research expeditions, seven management expeditions and 37 permits issued. Given that the islands have such a high degree of protection (and bearing in mind the purpose for which this protection was bestowed) as well as the limited facilities on the islands, there is a real need to limit and prioritise the research which is conducted on these islands.

Over the past five years there has been significant pressure via applications for research on a number of the Subantarctic islands, e.g., North East Island in the Snares and Enderby Island in the Auckland Islands. In order to manage these islands for their primary value as internationally significant wild places, it is possible that an annual quota for researchers may have to be introduced, along with the annual quota for visitors, to manage the cumulative impact on these islands.

The following quote sums up the responsibility of staff in Southland Conservancy who are the current managers of the New Zealand Subantarctic islands, and indicates why the Conservator has requested the development of this strategy:

". . . human visits collectively pose the single biggest risk [to the Subantarctic islands] – especially with their associated transport and likely travelling companions (e.g., rats, weeds or other pest organisms). Management of these island reserves is firstly about minimising the risks of adverse effects on the environment caused by people which may be equated – to an extent – with minimising visits. In setting access policies, there must be a balance struck between degree of risk and degree of benefit. All proposals – whether for tourism, science or management purposes – should be assessed consistently against stringent environmental standards. No special privilege should be given to any proposed visit other than that which is merited by the particular contribution of the proposal to the preservation of nature, which is the primary purpose of the reserve status and classification" (DOC 1998).

2.1 LINKS TO OTHER STRATEGIES

The Subantarctic research strategy is intended to be the primary guide for researchers and managers. It is linked to many other strategic documents produced by the Department of Conservation and other agencies, of which the principal ones are: the "Conservation Management Strategy: Subantarctic Islands 1998–2008" (DOC 1998), "Action Plan for Seabird Conservation in New Zealand. Part A: Threatened Seabirds" (Taylor 2000), "Department of Conservation Strategic Plan for Managing Invasive Weeds" (Owen 1998), "Draft: Southland Invertebrate Conservation Strategy" (Edwards 2001) and "New Zealand Science in Antarctica and the Southern Ocean (2004-2009)" (Peterson 2004). In addition, "Science Counts", a document that is revised annually, provides the framework for strategic research directions within the Department of Conservation (available from Research, Development and Improvement Division, Wellington). Any links made by research applicants to any of these other strategies must be justified. Planning documents for other Subantarctic island groups were also consulted during the preparation of this research strategy. None of the other Subantarctic island groups appear to have research strategies as yet.

Historic heritage management in the Subantarctic is guided by the Conservancy Historic Heritage Management Strategy. That document outlines priorities for the active management of historic and archaeological sites and for historical and archaeological research, placing management in the Subantarctic within the context of the whole Conservancy. The Department's national Historic Heritage Protection Standard Operating Procedure is also applicable in the consideration of applications to undertake any field research that may impact upon historic heritage values.

2.2 MONITORING

Monitoring requirements for populations of organisms or ecosystem changes and historic heritage buildings or archaeological sites are not outlined in this strategy. Research often provides baseline data for such monitoring and may also provide time-series data useful for monitoring change. Monitoring programmes are the responsibility of Southland Conservancy and these have yet to be addressed in separate survey and monitoring strategies for biological and historic heritage. The Conservancy has very limited resources to support monitoring of all but a few key species and communities.

In developing a monitoring framework, the Conservancy will consider several levels of information required:

- Assessment of the effectiveness of management actions;
- Detection of changes in biodiversity that exceed the range of natural variation, across a range of spatial and temporal scales;
- Early warning of potential irreversible changes, locally and globally;
- Meeting any national or international commitments for monitoring biodiversity.

Examples could include monitoring the physical environment for climate, erosion, magnetic field gravity, plate tectonic deformation.

Priority will be given to monitoring that relates to species in high threat categories (see Hitchmough 2002; Molloy et al. 2002) and where the benefits of investigating the status of those species substantially outweigh the risks. However, because the status of species

can change rapidly, in response to unforeseen events, monitoring will not be limited solely to documented species under threat. Several instances, in the past, have demonstrated the value of monitoring of common species. For example, interest based research on sooty shearwaters (Warham et al. 1982) and Buller's mollymawks (Richdale & Warham 1973) on the Snares has provided invaluable baseline data against which to measure current changes in population sizes and adult survival of these species.

The department encourages the gathering of incidental observations and data while researchers are focussing on their primary study. Much of this forms valuable monitoring data and a good example of this relates to the fantail population on the Snares where a population established between 1977 and 1981. By 1985-87 the population was estimated at 300 pairs (Miskelly et al. 2001) but by July 2001 the species was extinct on the islands (P. Sagar, pers. comm.).

2.3 BIBLIOGRAPHIC DATABASE

A Subantarctic bibliographic database containing biological, physical and historical references has been established in electronic form (MS Access). The database is managed by the Information Management Unit of Southland Conservancy and information for research or management is freely available on request by contacting the Programme Manager (Biodiversity), Southern Islands Area, Department of Conservation, P O Box 743, Invercargill, New Zealand, email subantarcticreferences@doc.govt.nz. Researchers are encouraged to contribute references relating to current publications to this database. It is a condition of all permits issued that a copy of each publication resulting from the research conducted be sent to the Southern Islands Area for incorporation into the reference collection and database, in order to inform management.

3.0 Research Evaluation and Conditions

There are three types of research recognised within this strategy:

1 Research undertaken to support management goals for refuge islands and minimum impact islands.

2 Research for knowledge goals that may assist management of ecosystems and historic heritage that relies on the special characteristics of the Subantarctic islands.

3 Research informing global and regional issues that relies upon the special characteristics and location of the islands.

Key research topics, organised within themes, are listed in Section 4 of this strategy. Each topic has been assigned to one of the three research types given above.

3.1 RESEARCH OF BENEFIT TO MANAGEMENT OF THE SUBANTARCTIC ISLANDS

The Conservation Management Strategy for the Subantarctic islands states:

"Preference has been and will be given to scientific research that will significantly enhance scientific knowledge and effective management of the islands" (DOC 1998). Research that is of direct benefit to Southland Conservancy, as managers of the New Zealand Subantarctic islands, is given below:

1 the design of simple monitoring methods for key species at risk, or of communities recovering from the effects of introduced biota;

2 information on the impact of fisheries on seabird and marine mammal species, as well as development of techniques to minimise these impacts;

3 the status and ecological requirements of threatened species, e.g., snipe;

4 complete documentation of the biodiversity and physical environment of the islands to ensure that protection and restoration activities are placed in context with knowledge of species composition and ecosystem functions;

5 the distribution and impact of introduced mammal species and effective control methods;

6 the effectiveness of quarantine measures, including risk evaluation and baseline "health" data for the islands;

7 the impact of human visitors upon the islands;

8 documentation of the biodiversity and physical environment of the Auckland Islands Marine Reserve as a baseline against which to measure future change.

Each of these topics is expanded into more specific questions in Section 4 (pp. 17 –26). Note that not all research to address these topics needs to be conducted on the Subantarctic islands.

Refer to section 2.6 of the Subantarctic islands CMS (DOC 1998, p. 67) for a summary of the more significant research completed recently or in progress, as well as the objectives for research and the implementation tasks the department will undertake.

3.2 FRAMEWORK FOR EVALUATION OF RESEARCH PROPOSALS

The Department of Conservation has an international obligation to manage the New Zealand Subantarctic islands to ensure the survival of the unique ecosystems they support. To this end, any threats to this overall goal will be minimised through management of risks. Researchers working on the islands pose significant risk and in order to manage this risk, the research will be evaluated using the criteria in section 3.2.1 and the risk assessment factors in section 3.2.2.

The following principle applies:

"Science activities involving high potential or actual risks should only be approved where a species or ecosystem is in definite threat of loss or damage" (DOC 1998), and the research will contribute to mitigation of that risk. Thus, the benefits of conducting research must always outweigh the risks and impacts of doing that work. Risk and impact will be dependent on the type and scale of research being proposed as well as the environment in which it will be conducted. Work on any island involves high potential risk, but more so on "minimum impact" islands. Departmental staff will always take into account the potential effect of the research on the species and communities selected for study as well as the fragility or status of the environment or island on which the research is proposed to be conducted. The more pristine the island or vulnerable the site, the greater the justification needs to be for allowing visits (DOC 1998, p. 87). *"Because a visit is proposed for scientific purposes [that] does not mean an entry permit will be granted (refer to 5.1 and 5.3 [of the CMS])."* (DOC 1998).

3.2.1 Research criteria

When processing applications for research permits the following criteria will apply, in the order listed:

1. The proposed research can only be done on the New Zealand Subantarctic islands and will be of significant benefit to conservation management of those islands.
2. The research could be done elsewhere but the benefits to conservation management are greater if done on the New Zealand Subantarctic islands.
3. The research can only be done on the New Zealand Subantarctic islands but the benefits to conservation management are limited.

3.2.2 Risk Assessment

In relation to the risks that research expeditions may pose, managers will consider the following factors, *inter alia:*

1 status of the island(s) that the research is proposed for;

2 current research projects on the island(s) and the impact that these have in terms of species being studied, timing of visits and locations used;

3 the potential impact of new research on existing research;

4 current state of knowledge, including previous research, for the topic area in which research is proposed;

5 status of the species (one or more) that the research is proposed for;

6 the percentage of original archaeological desposit that remains and its uniqueness;

7 type of research that is proposed, e.g., observational or highly invasive/ manipulative;

8 amount and type of material requested for collection;

9 amount and type of equipment to be used/landed;timing and duration of stay;

10 number of personnel involved;

11 experience and credentials of research party members;

12 and ease of access and safety of parties.

3.2.3 Additional points to consider

The New Zealand threat classification system (Hitchmough 2002) will be used as an objective means of evaluating research proposals, where applicable.

Standardisation of methodology is encouraged, to enhance the value of research and enable direct comparison between different research sites (within the Southern Ocean) and/or times.

Permits will be considered for the minimum number of people required to do the work and there is a requirement for visit lengths to be as short as possible (DOC 1998, p.84). Where possible or practicable, all visits must be ship-based and landings restricted to day visits only (DOC 1998, p. 89).

Many research investigations do not require the researcher to visit the islands to collect material or gather data. Requests for material are held on file and opportunities are taken by researchers or DOC representatives visiting for other purposes to fulfil the requests. Researchers should note that Southern Islands Area staff would prefer that all needs for collection of material should be notified well in advance. Typically there is a flurry of requests for collection once a permit has been issued to an expedition. This creates a lot of work in a very short time frame and the pressure on staff, which includes consultation time, could be avoided by lodging requests as the need arises rather than as the opportunity arises. This facilitative role of Southern Islands Area staff benefits researchers (by minimising costs and maximising opportunities) and the islands (by minimising risks).

3.2.4 Process for proposal evaluation

The proposed research will be evaluated by the Subantarctic Islands Research Advisory Committee to determine its feasibility and relevance to the department's management goals, using this strategy and the Subantarctic Islands CMS as guiding documents. The committee comprises management staff from Southern Islands Area, the Conservancy Advisory Scientist and other technical staff within the Conservancy. Peer review of applications will be sought if necessary.

3.3 OBLIGATIONS OF RESEARCHERS

Researchers should follow the "Information Sheet for Researchers" (see Appendix 1) when submitting an application to work in the New Zealand Subantarctic islands. Humans are not a part of the natural ecosystems of the Subantarctic, and, with the exception of dispensation to stay overnight or visit otherwise restricted islands to conduct approved research, researchers will not be granted any rights over and above other visitors.

Implementation point 5, section 2.6 of the CMS requires science activities to be carried out in such a manner that:

- protection of the natural ecosystems is ensured, and
- they will cause no lasting changes in indigenous plant or animal populations or community relationships, and
- they have regard for tikanga Maori, and they do not conflict with essential management operations (DOC 1998, p. 70).

Once a research application has been approved, research expedition members are required to be familiar with and abide by the New Zealand Subantarctic Islands Operational Guidelines (see Appendix 1). All research team members should have read, be familiar and comply with the documents highlighted in Appendix 1 before embarking on their trip. A copy of each document should form part of team expedition gear.

Southern Islands Area staff conduct a briefing with the members of every expedition to the Subantarctic islands. The responsibility for the whole team is delegated to the Expedition Leader. The Expedition Leader is appointed by the team and approved by the department, and this person may be nominated as the departmental representative.

All visitors to the Subantarctic islands are required to report to Southland Conservancy any observations which indicate ecological changes (e.g., unusual numbers of dead plants or animals) or physical changes (e.g., mass erosion) (DOC 1998 p. 70).

4.0 Research Themes

The Department of Conservation, through the Conservation Act 1987, is primarily responsible for management of the natural and historic heritage of New Zealand. In order to manage the Subantarctic islands of New Zealand the greatest need for knowledge is on the biology of those islands. Three research themes dealing with aspects of biology have been identified. Inevitably these three themes are strongly linked because of the interactive nature of ecosystems. Thus, the location of a key topic in one theme does not preclude its applicability to another theme. The fourth theme covers non-biological research – geology, climatology and atmospheric research.

The topics listed below represent current gaps in our knowledge and many represent specific questions to aid management of the islands. The process used to derive these topics included:

- extraction of relevant research needs from associated strategies, e.g., the "Subantarctic Islands CMS" (DOC 1998), the two most recent Antarctic science strategies (Peterson 1999, 2004);
- suggestions from participants at two workshops (see Appendix 2);
- suggestions from reviewers of this strategy (see Appendix 3);
- consultation with Area and Conservancy staff;
- evaluation of known research conducted in the Subantarctic.

Key research topics printed in **bold** support management goals; those in regular font are research for knowledge goals that may assist management; and those in italics are research informing global and regional issues (see Section 3). **This list is not exhaustive.**

Any application to conduct research in the Subantarctic islands must take into account the overriding principle stated in Section 3.1 *"Science activities involving high potential or actual risks should only be approved where a species or ecosystem is in definite threat of loss or damage"* (DOC 1998). The fact that a topic is listed in this strategy is not sufficient justification for approval of the research. Benefits derived from research should be transferred to the wider community, where possible. Consider communication of your results beyond peer-reviewed journals via newspaper articles, talks to school and university groups, other interest groups (e.g., iwi, NGOs) and other institutions, (e.g., Museums).

4.1 THEME 1 – NATURAL ECOSYSTEMS

Subantarctic islands, like many islands around the world, provide the land base for mammals and birds which spend more than half of their lives at sea. The sea provides their food source and the land their breeding platform. Massive inputs of nutrients are brought from the sea to the land by these animals, from which land-based biota benefit. The ecosystems are comparatively simple to study because of their discrete nature, making them valuable scientifically for studies of ecosystem functioning and testing biogeographic principles (Walton 1986, DOC 1997). The islands also give a unique opportunity to study palaeoclimate change in southern

latitudes, through studies of peat and pollens, palaeo-snowlines, quaternary glaciation and palaeo-sealevels. The Subantarctic islands may also provide a useful barometer for assessing current climate change.

Seabirds and marine mammals are vulnerable to changes in their food supplies which may be brought about by natural changes of ocean currents and temperatures or by harvesting of fish, squid and krill by humans. Populations of these animals may also be reduced directly as bycatch of long-line fishing, in particular. Studies of the population dynamics of seabirds and marine mammals are essential to determine whether there are deleterious human impacts so that mitigation of those effects can be sought. Natural fluctuations in population abundance also need to be determined to provide context for human-induced disturbance.

The land birds, plants, fungi and invertebrates provide useful biogeographic information to better understand species dispersal and evolution. For some land birds and invertebrates speciation has occurred after the arrival of a flying ancestor. There are many endemic plants and invertebrates adapted to the Subantarctic environment. For example, the megaherbs with their large leaves and pink-purple coloured flowers is a Subantarctic phenomenon that has not been adequately explained.

Information is needed on the systematics of all Subantarctic organisms so that priorities for management can be determined. Marine mammals, birds and vascular plants are comparatively well studied and known but invertebrates, nonvascular plants, fungi and micro-organisms have received less attention.

The baseline disease status of Subantarctic organisms is very poorly known. In early 1998 there was massive mortality of NZ sealions, especially pups, recorded at Enderby Island but the cause could not be isolated. Large lesions and paralysis of the hindquarters were symptoms (Baker 1999). Between 1944 and 1987 the number of rockhopper penguins plummeted from 1,700,000 to 103,000 – a decline of 94% (DOC 1998) – but the cause (be it disease or starvation through changes in food availability) has not been determined. Baseline information on disease status of marine mammals and birds is needed, in particular, as these are the most mobile of the organisms in the Subantarctic. However, baseline information on disease status of other biota is also needed.

4.1.1 Key research topics

4.1.1.1 Ecosystem dynamics

1 **How do the ecosystems respond to natural disturbances?**

2 **What are the main prey items of the different seabird species and where do the birds forage? Do males and females take different prey and use different parts of the ocean? (DOC 1998, Taylor 2000).**

3 What are the key environmental indicators, which can be used to monitor the different ecosystems within marine reserves within the Subantarctic? (see Theme 2B, key question 2, Peterson 2004).

4 How important are marine mammals and seabirds as recyclers of nutrients? (Bradford-Grieve 2000).

5 How do land-based organisms respond to nutrient enrichment from marine sources?

6 How important is annual variation in primary productivity in the oceans to marine mammals and seabirds? (Bradford-Grieve 2000).

7 What is the diet and foraging ecology of marine mammals in the Subantarctic? (DOC 1998).

8 What are the unique characteristics of the Subantarctic marine envronment that require protection and how is this best accomplished? (see Theme 2D, key question 5, Peterson 2004).

9 What is the role of nonvascular vegetation, fungi and invertebrates in ecosystem functioning, e.g., nutrient cycling? (DOC 1998).

10 What are the key relationships between native plants and animals of the Subantarctic, e.g., pollination, herbivory, and which species are involved? (DOC 1998).

11 What are the niches of the megaherb species? Do some have a role in succession?

12 What is the likely effect of changes in UV radiation on biota of the Subantarctic islands?

13 How sensitive are Subantarctic organisms and communities to inter-seasonal climate variability and therefore to longer-term climate change? (see Theme 3A, key question 2, Peterson 2004).

14 What are the food web dynamics, especially in relation to highly differentiated endemic invertebrates?

15 Can disturbed communities be restored; are seedbanks available as sources of propagules?

4.1.1.2 Population ecology

1 What is the breeding biology and population dynamics of threatened seabirds in the Subantarctic? (Taylor 2000).

2 What are the best methods for monitoring population status of seabirds and marine mammals?

3 What is the population size and status of marine mammals in the Subantarctic? (DOC 1998).

4 What is the breeding biology, population dynamics and habitat use of threatened landbirds in the Subantarctic, e.g., snipe, teal, parakeets?

5 What are the best methods for recovery of threatened species restricted to the Subantarctic islands?

6 What is the phenology of dominant plant species, e.g., tussock grasses, megaherbs?

4.1.1.3 Disease

1 What is the disease status (presence of disease antibodies) of all plants, birds and marine mammals in New Zealand's Subantarctic islands?

2 What diseases could the plants, birds and marine mammals be susceptible to?

3 What are the natural methods of disease transmission within and between Subantarctic wildlife populations (see CEP 2000)?

4 Are humans vectors for diseases that could affect Subantarctic biota?

5 Could wildlife of the Subantarctic act as vectors for disease transmission between New Zealand and Antarctica?

6 *What are the characteristics of wildlife diseases and their contribution to population dynamics (CEP 2000)?*

4.1.1.4 Systematics

1 The relationships and taxonomy of a number of seabird taxa need further work, particularly for the shags, crested penguins, prions, terns and smaller albatrosses such as Buller's, Salvin's and white-capped (Taylor 2000).

2 Some research on invertebrate systematics has been undertaken but more is required as many invertebrate groups have not been investigated at all (DOC 1998).

3 The scale of systematic research required for nonvascular plants and fungi is not known as the documentation of these groups is rudimentary.

4 What is the diversity of soil inhabiting organisms in the Subantarctic islands?

4.1.1.5 Biogeography

1 Which members of the Subantarctic biota have become extinct in recent times?

2 What are the relationships of Subantarctic biota to biota of other land masses and what are the relationships within Subantarctic biota?

3 What is the significance of seasonal movements of biota?

4 Why, and how, has the megaherb form evolved?

5 What is the geological history of each island group, particularly in relation to connections to the main New Zealand land mass, and in relation to a larger land area during lowered sea level periods?

6 What is the quaternary history of the islands; were they entirely ice-covered; what refugia may have existed between glaciers?

4.1.1.6 Physiology

1 Many megaherb species, especially *Pleurophyllum* spp., when transplanted to the mainland or grown from seed there do not survive through the summer months. What is the physiology of these species and how does that relate to their natural environment – is it unique to the Subantarctic islands?

2 Does the physiology of endemic invertebrates differ from that of their mainland relatives?

3 How does the physiology of Subantarctic animals compare with their relatives in other major biogeographic zones?

4.1.1.7 Pedology

1 What are the major soil forming processes operating in the Subantarctic islands?

2 To what extent do substrate conditions influence the distribution and behaviour of endemic biota?

3 What are the sources of soil salts and why do they accumlate? (see Theme 1B, Key question 3, Peterson 2004).

4.2 THEME 2 – EFFECTS OF INTRODUCED BIOTA

The Subantarctic islands lack native herbivorous and carnivorous land mammals and the ecosystems that have evolved on these islands are vulnerable to their effects (Walton 1986). Grazing mammals such as sheep, goats, cattle and rabbits as well as omnivorous pigs have been introduced to all of the NZ Subantarctic island groups with the exception of the Bounties (see DOC 1998, p. 45). Some of these grazers died out naturally whereas cattle and sheep have been eradicated from Campbell Island, cattle and rabbits from Enderby Island and goats from the main Auckland Island. Pigs survive on Auckland Island, and the predators cats and mice are found on various islands in the Auckland and Antipodes groups. Rats have been eradicated from Campbell Island and mice from Enderby Island. Research on the impacts of these introduced species is valuable as is investigation of the recovery of native biota once these aliens are removed. The known dates of introduction and eradication for introduced mammals in the NZ Subantarctic islands are given in the CMS for the Subantarctic islands (DOC 1998). The rats were eradicated from Campbell Island in 2001 (Peat 2003).

Introduced invertebrate species may also have considerable impact upon native Subantarctic organisms. Several studies of the effects of alien invertebrates have now been documented, e.g., Ernsting et al. (1995); Chevrier et al. (1997); Hänel and Chown (1998b). In most cases the invertebrates were inadvertently taken to the island groups concerned in association with human activities such as farming, scientific research, meteorology.

Introduced plants may also have adverse effects on the native biota. The spread of the introduced grass *Agrostis stolonifera* along waterways on Marion Island (Hänel and Chown 1998a) and on South Georgia (Walton and Smith 1973) has been well documented. There are no known native, nitrogen-fixing vascular plants in the Subantarctic islands but some of the introduced plants are N-fixing legumes. The potential impact of these species is unknown. A small number of plants are of unknown status – they may have been introduced by humans or dispersed naturally during human occupation but benefited from the vegetation disturbances created at this time. Examples are *Fuchsia excorticata*, *Hebe salicifolia*, and *Olearia lyallii* on Auckland Island (Johnson and Campbell 1975, Meurk 1982).

The role of exotic plants and animals as vectors for transmission of disease to native biota of the Subantarctic has not been studied to any extent. However, there is considerable potential for exotic species (including humans) to transmit exotic diseases to native Subantarctic biota. There is also the potential for diseases to spread to Antarctica via native and exotic organisms living in or visiting the Subantarctic islands (see 4.1.1.3 and 4.2.1.3).

4.2.1 Key research topics

4.2.1.1 Effects of introduced animals

1 **What is the impact of introduced grazing mammals on fauna and flora of the Subantarctic islands and how quickly do native species recover once these mammals are eradicated?**

2 **What is the impact of pigs, cats, rats and mice on the fauna and flora of the Subantarctic islands and how quickly do native species recover once these mammals are eradicated?**

3 Do mouse populations respond to mast seeding species?

4 What is the extent and rate of dispersal of exotic invertebrates on the Subantarctic islands and are they in competition with endemic species?

5 What effect do exotic invertebrates have on the phenology of endemic plant species (e.g., the aphid on Snares Islands' *Anisotome*)?

6 What is the effect of exotic bird species on the biota of the Subantarctic islands?

4.2.1.2 Effects of introduced plants

1 What is the distribution of introduced plants, lichens and fungi on each of the island groups (with the exception of the Bounty Islands)?

2 Are any of the introduced plants having a significant negative effect on any element of the native biota?

3 What is the rate of spread of the potentially exotic shrubs, e.g., *Fuchsia excorticata, Hebe salicifolia, Olearia lyallii* on Auckland Island? What is the effect of these species?

4.2.1.3 Exotic biota as agents of disease transmission

1 What is the disease status of exotic plants and animals in the New Zealand Subantarctic islands?

2 What is the potential for transmission of exotic diseases from exotic biota to native biota within the New Zealand Subantarctic islands?

3 What adaptations allow adventive micro-organisms to gain a foothold and what are their dispersal mechanisms (including the human vector)? (see Theme 1F, key questtion 3, Peterson 2004).

4.2.1.4 Eradication of introduced biota

1 Development of effective baits for pigs, rodents and cats suitable for use in the Subantarctic islands.

2 What are the best methods for presenting baits to pigs, rodents and cats?

3 What is the dispersal pattern of rodents on arrival upon these islands?

4 Are baits or traps more effective for eradication of founding rodents?

5 Development of effective, low impact techniques for eradication of targetted weed species.

4.3 THEME 3 – HUMAN IMPACTS AND SOCIAL INTERACTION

New Zealand's Subantarctic islands have a European history extending over 200 years including discovery, sealing, whaling, scientific exploration, colonisation and settlement, farming, shipwrecks of the sailing era, wartime coastwatching, research and meteorology. It is a rich history and all of these activities have left their mark. Research to piece together some of this history will be useful for effective management of historic sites and artefacts. One of the major impacts of humans, introduction and effects of alien biota, is dealt with in Research Theme 2.

Current human impacts come from research and management teams, fishing and tourism. Tourists are allowed ashore only on Campbell, Enderby and Auckland Islands

(the main "refuge" islands) and they are confined to specific parts of those islands. All islands may be viewed from the sea and inflatable motor boat cruising is regularly undertaken off the Snares. Tourism has been common during the summer months since 1979/80. Currently a maximum of 600 visitors is allowed each summer with some sites limited to a maximum of 150 visitors (DOC 1998). The limit of 600 has been set arbitrarily and research is needed to determine more objectively an upper limit for seasonal visits. Monitoring of visitor activities will be undertaken to determine the level of impact (DOC 1998).

All visitors have an effect on the islands whether through their interactions with wildlife or by compaction of soils and treading on plants and invertebrates. To date, in the NZ Subantarctic islands, very little research has been done on the effect of visitors on the behaviours of birds and marine mammals or human physical impacts on vegetation and soils. All visits bring the risk of introduction of alien biota, from micro-organisms through to rodents. Thus, research on the effectiveness of present quarantine measures is needed.

Potential future impacts in the Subantarctic relate to exploration for hydrocarbons in the Great South Basin. As a consequence, the islands may come under increased pressure as bases for shipping, perhaps even oil terminals, and the risk of pollution may be dramatically increased.

4.3.1 Key research topics

4.3.1.1 History and archaeology

1 **Survey-standard mapping of the pre-European Maori archaeology in Sandy Bay, Enderby Island, and further core sampling and test pitting of the Maori occupation area including adjacent wetlands, is required to establish the extent of archaeological remains.**

2 **Detailed archaeological investigation, and possibly excavation at one or more of the recorded sealing sites in the Auckland Islands would enhance knowledge about this aspect of the Island's history which is not well recorded in documentary sources due to the secrecy associated with the industry.**

3 **Archaeological survey of actively managed sites. Site information needs to be improved at Camp Cove (Campbell Island), North East Harbour whaling site (Campbell Island) and sites in Snares and Antipodes Islands.**

4 **General research and survey is necessary to improve knowledge of the nature and condition of archaeological sites on Campbell Island, Antipodes Islands, and Snares Island. Site information is currently very basic and, for a large number of sites, often from literature only. Similar survey on the Auckland Island group resulted in increasing the number of recorded sites from 53 to nearly 130.**

5 Further investigation of pre-European Maori occupation in the islands is required. For example, chert flakes and a scraper have been found in a pre-historic archaeological site on Enderby Island. It would be useful to ascertain if there is a local source for the chert on the islands, or if it comes from the Chatham Islands (with Ngati Mutunga) or from some other unknown source.

6 Understanding of archaeological evidence would be enhanced by completion of palynological work and carbon dating of pre-bomb marine species (deposits pre-

dating the first nuclear tests which released carbon 14 into the atmosphere) to improve calibration of archaeological carbon dates.

7 Better recording of remains of shipwrecks at the Auckland Islands is desirable.

8 Histories of human contact with the islands to be documented, especially from unpublished first-hand accounts. Of particular importance is completion of oral histories with early Meteorological Service staff, wildlife management staff, and any remaining un-interviewed coastwatchers.

9 Heritage landscapes – integrated studies of the relationships between people and the Subantarctic island environment over time building on the work already done at the Auckland Islands.

10 Any publication of historical research, and in particular the use of existing oral interview tapes, will be encouraged.

4.3.1.2 Human interactions with wildlife

1 Facilitate research to establish baseline behaviour and establish ongoing monitoring of any marine mammal viewing operations on or around the Subantarctic islands (DOC 1998).

2 What effect do visitor activities have on bird colonies (DOC 1998)?

3 Are the 5 m and 7 m rules effective in minimising stress to seabirds and marine mammals, respectively?

4 Does susceptibility of wildlife vary seasonally, e.g., in relation to breeding cycle?

5 Is there competition between seabirds and commercial fishers? What is the direct impact of fishing on seabirds and how can this be mitigated (DOC 1998, Taylor 2000)?

4.3.1.3 Physical impacts

1 Are some soil types more prone to erosion and can the effects of trampling be mitigated?

2 Does trampling result in a change to the vegetation along pathways and can or should this be mitigated?

3 Should visitors be channelled along pathways or is dispersal across the terrain less damaging?

4 What are the cumulative impacts of human activities in the Subantarctic and how should future activities be managed (see Theme 1F, key question 5, Peterson 2004)?

5 What is the fate of contaminants (e.g., fuel spills, sewage, microbes) in the Subantarctic (see Theme 3D, key question 2, Peterson 2004)?

4.3.1.4 Social effects

1 What are the attitudes and behaviours of managers, scientists, tourists, tour operators and concessionaires to the Subantarctic islands?

2 Are managers, scientists, and tourists (including tour operators) effective advocates for the protection of the Subantarctic islands?

3 What is the meaning of "Subantarctic heritage" to New Zealand society, and what place in the national consciousness does the Subantarctic hold (see Theme 3B, key question 5, Peterson 1999)?

4 What are the economic and sociological impacts of visitation to the Subantarctic (see Theme 3C, key question 4, Peterson 2004)?

4.3.1.5 Biosecurity

1 Are existing quarantine measures effectively preventing transport of alien organisms onto the Subantarctic islands?

2 What improvements are required to existing quarantine systems?

3 Development of a better rodent bait for use in quarantine and contingency operations.

4 What are the high risk alien species for the terrestrial environment?

5 What are the risks associated with movements between islands? What are the greatest biosecurity risks for littoral marine communities and how can these be mitigated?

6 What are the most effective/appropriate fumigation methods?

4.3.1.6 General

1 What is the relative impact of managers, researchers and tourists in relation to physical impacts, interactions with wildlife, and quarantine?

2 What are the likely effects of hydrocarbon exploration on Subantarctic biota? How can potential adverse effects be mitigated?

3 Does fire pose a risk to the vegetation, wildlife and soils of the Subantarctic islands?

4 What is the incidence of marine debris in the Subantarctic Islands? What is the effect of marine debris on wildlife?

4.4 THEME 4 – ABIOTIC SCIENCES

Although the Subantarctic islands are primarily recognised for their unique biota and human history, they are also important geologically. Basement rocks of the Campbell plateau outcrop in all of the island groups and the Snares and Bounty Islands are composed entirely of basement rocks. The Auckland, Antipodes and Campbell Island groups are largely volcanic and the Auckland and Campbell Island groups were glaciated during the Quaternary. The Subantarctic islands have, in the past, been a focus for meteorological investigations and currently there are automatic weather stations on Enderby and Campbell Islands. Other sciences for which the Subantarctic islands provide opportunities are atmospheric research, geology, geophysics, oceanography, and astronomy.

4.4.1 Key research topics

4.4.1.1 Geology

1 What is the geological and consequent ecological history of the Subantarctic islands and their biota? (Theme 2B, key question 1D, Peterson 1999.)

2 How do the physical characteristics of the coast influence biological processes? (see Theme 2A, key question 2, Peterson 2004).

3 Is the geology of the Subantarctic islands adequately described and mapped?

4 What is the glacial history of the islands, the extent of the ice caps and glaciers, and the likely effects on island area during palaeo-sea level changes?

5 What is the geological basement of the islands and surrounding ocean, and what does it mean in terms of plate-tectonic motion, continental break-up, and hydrocarbon potential?

6 What is the palynological and palaeontological history of the island groups and its relationship to species evolution at higher latitudes? What is the palaeo-latitudinal history of the island groups as deduced from fossils?

7 What are the plate motion vectors of the island groups, and what do they tell us in terms of modern plate-tectonic motion and strain, in relation to New Zealand and Antarctica? Is there a seismic hazard in the islands?

8 What are the present and future gravity and geomagnetic connections on the islands?

4.4.1.2 Climatology

1 What is the climate variation within and between the Subantarctic islands?

2 What is the palaeo-climatological history of the islands deduced from pollens, glacial geomorphology, isotope studies, and how does this relate to present day biota?

3 What is the temporal and spatial variability of the physical, chemical and biological processes in the Southern Ocean and how does this relate to climate variability and climate change? (Theme 2B, key question 1, Peterson 1999).

4.4.1.3 Atmospheric research

1 How has UV radiation changed in relation to ozone depletion?

2 What are the effects of atmospheric inputs via the jet stream on Subantarctic biota and processes, e.g., global cycling of contaminants?

3 Investigate development of automated instrumentation for use in remote areas that provides scope for linking into regional and or global research programmes.

5.0 Current Research

The amount of research conducted in the New Zealand Subantarctic islands is considerably less than for most other Subantarctic island groups (see Dingwall 1995). There are several reasons for this and the principal ones are:

- none of the New Zealand Subantarctic islands are permanently staffed and therefore there is no regular servicing of the islands;
- there is no specific government-funded budget tagged to research in the Subantarctic islands;
- some of the Subantarctic island groups have very difficult access with no safe harbours or anchorages;
- the costs of undertaking research are high;
- New Zealand has traditionally given management higher priority (proportion of funds) than other countries.

Thus, the logistics of working in the New Zealand Subantarctic are difficult. Researchers must totally fund their work (although Southland Conservancy may assist with logistical support and some gear – see section 6.3) including transport to the islands, and weather conditions may prevent landing.

Four long-term research projects have ongoing fieldwork at present or are about to conclude, all relating to impacts of humans on endemic animals. Two of these projects have been funded largely by Conservation Services Programme (CSP) which levies the New Zealand fishing industry to provide funds for research on species affected by bycatch: New Zealand sea lion population dynamics; and population status of Gibson's and Antipodean albatrosses. Details of the four research programmes are shown in Table 1.

Other research includes opportunistic GPS surveys by the Institute of Geological and Nuclear Sciences on Antipodes, Auckland and Campbell Islands, and magnetic and gravity readings on Auckland and Campbell Islands, where staff logistics and finance permit.

TABLE 1. THE CURRENT MAJOR RESEARCH PROJECTS IN THE NZ SUBANTARCTIC ISLANDS.

	NZ SEALION *(PHOCARCTOS HOOKERI)*	GIBSON'S AND ANTIPODEAN ALBATROSS *(DIOMEDEA EXULANS GIBSONI* AND *DIOMEDEA EXULANS ANTIPODENSIS)*	BULLER'S ALBATROSS *(DIOMEDEA BULLERI BULLERI)*	TITI – SOOTY SHEARWATER *(PUFFINUS GRISEUS)*
Research leaders	Louise Chilvers, DOC	Kath Walker, Graeme Elliot, DOC	Paul Sagar, NIWA	Henrik Moller, Otago University
Objectives	To determine the population status of this species To determine the dispersal patterns of this species To determine the vulnerability of this species to current fishing practices	To determine the population status of this species To determine the sectors of ocean used by these species To determine the vulnerability of this species to current fishing practices	To determine the population status of this species To determine the dispersal patterns of this species To determine the vulnerability of this species to current fishing practices	To determine the population status of this species To develop reliable census techniques To determine the vulnerability of this species to current harvesting practices
Methods	Tagging, branding, mark-recapture, reproductive success	Banding, satellite telemetry, mark-recapture, nesting success	Banding, satellite telemetry, mark-recapture, nesting success	Banding, satellite telemetry, mark-recapture, nesting success
Location	Auckland Islands – Enderby, Dundas, Figure of Eight	Auckland Islands – Adams Antipodes Island	Snares Islands	Snares Islands

6.0 Logistics

All researchers must refer to and abide by the "New Zealand Subantarctic Islands Operational Guidelines" (see Appendix 1). All operational requirements are covered in the guidelines. Failure to comply with these guidelines could result in further access to the New Zealand Subantarctic islands being denied, revocation of existing permits or prosecution.

6.1 FACILITIES

There are huts on all of the New Zealand Subantarctic island groups except the Bounties. The positions of the huts are marked on the maps in the CMS (DOC 1998). There are some tracks and boardwalks on some of the islands. In general, the level of facilities provided is minimal.

6.1.1 Snares

The 3-person hut and 2-person storeroom are located in Station Cove at Ho Ho Bay. Some boardwalks are provided in the vicinity of the hut but tracks are otherwise across soft peat and rocky areas.

6.1.2 Auckland Islands

On Enderby Island there is 8-bunk accommodation, with laboratory space in a separate building. Some boardwalk is provided. In Port Ross, there is a 6-person hut at Dea's Head but there are no tracks in the vicinity. A small 2-person bivvy is located on Dundas Island and this will be removed when the sea lion research finishes. A hut is currently located on Adams Island to support the Gibson's albatross research. This will be removed when the fieldwork for this research is completed.

6.1.3 Antipodes Island

An 8-person hut, comfortable for four people, is located at Hut Cove in the north-eastern corner of Antipodes Island. There are no marked tracks on the island.

6.1.4 Campbell Island

The main accommodation is at the western end of the old MetService hostel in Perseverance Harbour and can accommodate up to 10 people. Huts accommodating 2–3 people are located at Northwest Bay, Moubray Ridge, Southeast Harbour, Penguin Bay and the north-east end of the Faye ridge. There is a boardwalk to the Col-Lyall saddle and tracks to Northwest Bay and the old Met Station. Some earlier tracks are now used as routes.

6.2 TRANSPORT

All islands are accessed by boat although they are not always accessible due to rough seas. There is a small number of suitable vessels which can be chartered to provide transport and accommodation for research trips. Current prices range from NZ$12,000 - NZ$25,000 for a one-way trip to Campbell or Antipodes Islands, less for the closer Snares and Auckland Islands. Vessel-based research (where researchers stay on board ship overnight) may pose less risk to the Subantarctic islands. Current daily rates are c. NZ$3500 per day.

Alternatively, transport is sometimes available on tour ships but only if there is space available. Current prices are around US$250 per person per night aboard the boats. Researchers would normally disembark from one tour and embark on a later one returning to the mainland. The procedure for accessing tour ships is given in the "New Zealand Subantarctic Islands Operational Guidelines" (see Appendix 1).

There is no air transport to any of the islands but helicopters can be used for emergency evacuations from Snares, Auckland and Campbell Islands.

6.3 EQUIPMENT

All parties are expected to provide most of their own gear. However, with sufficient forewarning and planning, items such as HF radios, gas cookers and bottles, tents and plastic storage bins can be made available. Details regarding supplies and equipment are given in the "New Zealand Subantarctic Islands Operational Guidelines" (see Appendix 1).

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9.0 Appendices

9.1 APPENDIX 1: NEW ZEALAND'S SUBANTARCTIC ISLANDS – INFORMATION SHEET FOR RESEARCHERS

This two-page document is intended to provide a concise but comprehensive summary of Department of Conservation policies and processes for researchers contemplating pursuing their studies in the New Zealand Subantarctic. These procedures are consciously designed for the five subantarctic island groups (including the Auckland Island Marine Reserve) but apply to the island nature reserves surrounding Rakiura/ Stewart Island also.

The Management Philosophy

The primary management documents are the Stewart Island–Rakiura and Subantarctic Conservation Management Strategies (CMS). Management policies are derived either from these or statute. As the islands are all nature reserves entry is by permit only and management is charged with "protecting and preserving in perpetuity" the islands' natural characteristics. The CMS embrace an "island classification system", which distinguishes islands on ecological grounds, providing a tool for assessing acceptable human impact. Familiarisation with this distinction is advised.

The pre-eminent management focus is ensuring the prevention of the introduction of foreign organisms to these environments. The risk and potential damage of biological invasion exceeds all other currently identified threats. This threat is managed in two ways:

- 'landings' on the islands are minimised;
- appropriate quarantine procedures are ensured.

The secondary management focus is the effect of the proposed research on the subject matter and the wider environment. The potential benefits of the research are weighed against the potential detriments. Detriments include disturbance to specific wildlife or plant life, and the cumulative effect of researchers and their associated facilities at an ecosystem level. Benefits may be divided into academic and management outcomes, the latter of which will be more persuasive.

The Department of Conservation has prepared a research strategy describing 'management outcomes' and listing research priorities[1]. This is the complete guide to preparing a research proposal. The department does rely heavily on independent academic institutions for research and where their funding depends on 'academic' outcomes, negotiation may ensure sufficient management outcomes are incorporated to justify the study. To encapsulate the process: there is a sliding scale – the greater the management outcome the more risk or disturbance will be tolerated.

The Department would also like to emphasise several other points: if the research can occur elsewhere it will not be considered, cooperation between researchers is essential,

1 West, C. 2005 'New Zealand Subantarctic Islands Research Strategy" (see 'policies' - www.doc.govt.nz)

standard methodologies and proven techniques must be used if available; and the presence of assured funding and proven expertise will be taken into account.

The Permitting Process

Having read the research strategy and formulated their concept, researchers should then contact the Department of Conservation's Southern Islands Area Office, for further consultation and to obtain a High Impact Collection and Research application form. All research in this area is considered High Impact because of the status of the reserves and the need for managers to consult widely both internally and externally. The Southern Islands staff will advise on specific issues that may be problematic and refer the researchers to other departmental staff if necessary.

The application form should be filled in and returned electronically. The department will subsequently advise whether an application fee is required. The application will be processed in 4-6 weeks during which time the Department will consult with appropriate Iwi.

If problems are identified, the Department will continue to liaise with the applicant to attempt to rectify any conflicts. A report will then go to the Area Manager who makes the final decision. This person remains detached from the initial process.

The execution of a Collection/Research Permit may be carried out through opportunistic collection or through an expedition.

Opportunistic Collecting: The Southern Islands Area Office keeps a record of samples permitees require and identifies opportunities for their collection by expeditions. When opportunities are identified the department will initiate communication between the researcher and the expedition. It is the researcher's responsibility to ensure that the expedition receives the required equipment and information, while it is the expedition's responsibility to ensure the collection is included in their entry permit as an 'approved activity'. Often the use of opportunistic collecting will be a condition of a permit if the research itself does not justify an expedition.

Expedition: All expeditions require an entry permit which focuses on quarantine and logistics. Again an application form must be obtained from the Southern Islands Area Office. At this time the **New Zealand Subantarctic Islands Operational Guidelines, Expedition Quarantine Procedures and Minimum Impact Code** will also be provided. Expeditions should note that the party size and length of stay on the island will be minimised as much as possible. The department will also facilitate cooperation between researchers attempting to fund an expedition.

Quarantine

Quarantine is taken very seriously, as will become apparent when the Expedition Quarantine Procedures are provided. All expedition members must be familiar with these procedures. The pre-expedition quarantine check at the Eye Street Quarantine Store is an 'audit'. Problems identified must be rectified by the expedition member. Expeditions must plan for a day either side of arrival and departure to pack, clean and quarantine expedition gear. The quarantine check is complimentary except for those expeditions departing during weekends, which will pay full cost recovery.

Logistics

The department does have a supply of equipment available to expeditions. Need must be signalled in advance to assure availability. Priority will be given to management activities and costs will be recovered on a fair wear and tear basis.

Further enquiries to Southern Islands Area Office (03) 214-4589.

9.2 APPENDIX 2: PARTICIPANTS IN TWO WORKSHOPS TO IDENTIFY RESEARCH NEEDS FOR NEW ZEALAND'S SUBANTARCTIC ISLANDS

Workshop 1

Jacinda Amey	Andy Cox	Peter Dilks
Graeme Elliot	Paddy Gilroy	Pete McClelland
Janice Molloy	Peter Moore	Andy Roberts
Chris Robertson	Paul Sagar	Mike Slater
Lou Sanson	Kath Walker	Sue Waugh
Carol West		

Workshop 2

Eric Godley	Martin Foggo	David Given
Peter Johns	John Marris	Matt McGlone
Colin Meurk	Vivienne Nicholls	Brian Patrick
Brian Rance	Geoff Walls	Carol West

9.3 APPENDIX 3: REVIEWERS OF THIS STRATEGY

Geof Copson	Dept of Parks & Wildlife Heritage	Australia
John Cooper	University of Cape Town	South Africa
Christine Hänel	University of Stellenbosch	South Africa
John Croxall	British Antarctic Survey	United Kingdom
Ruth Dalley	Fiordland Ecology Holidays	New Zealand
Jenny Steven	FRST	New Zealand
Chris Jacomb	Historic Places Trust	New Zealand
Ian Turnbull	IGNS	New Zealand
Colin Meurk	Landcare Research	New Zealand
John Marris	Lincoln University	New Zealand
Paul Sagar	NIWA	New Zealand
Wendy Nelson	NIWA	New Zealand
Glenys Dickson	Southland Conservation Board	New Zealand
Robert Guyton	Southland Museum & Art Gallery	New Zealand

Peter Tait	Talisker Charters	New Zealand
Janice Molloy	BRU, DOC	New Zealand
Mariska Wouters	ERD, DOC	New Zealand
Elaine Wright	SRO, DOC	New Zealand
Paul Dingwall	SRU, DOC	New Zealand
Peter Moore	SRU, DOC	New Zealand
Euan Young	Blenheim	New Zealand
Rowley Taylor	Nelson	New Zealand