

*Workshop on a Management Plan for Deception
Island*

*José Valencia and Roderick Downie
Editors*

Instituto Antártico Chileno

2002

Table of contents

Executive Summary

1. *Introduction*
2. *Workshop Agenda*
3. *Recommendations and future actions*

4. *Welcome Address, Oscar Pinochet de la Barra*

Keynote Presentations

5. *The evolution of the concept of Management within the Antarctic System of environmental protection, Jorge Berguño*
6. *Deception Island: concepts and elements for an Antarctic Specially Managed Area, Michael Richardson*
7. *Physical geography, geology and Tourism: Deception Island, Antarctica, John Splettstoesser*
8. *An overview of the Flora and Fauna at Deception Island, Roderick Downie*
9. *Historical introduction to four key areas: exploration, early science, human presence and cooperation, Jorge Berguño*
10. *Tourism at Deception Island, John Splettstoesser and Denise Landau*

Working Groups Reports

10. *Management of Environmental Risk. Chair: Patricio Eberhard, Rapporteur: Rodolfo Sanchez*
11. *Selection of elements for Management Package, way forward and Multiple Use Resource Management based on Natural Features and Permanent Structures» Chair: Joyce Jatko, Rapporteur: Roderick Downie*
12. *Working Group 1. Management of Historic Sites and Monuments. Chair: Gustav Rossnes, Rapporteur: John Splettstoesser*
14. *Working Group 2. Scientific Research and Station Management. Chair: Jerónimo López M., Rapporteur: Birgit Njaastad*
15. *Working Group 3. Deception Island Tourism. Chair: Denise Landau, Rapporteur: Patricia Vicuña.*
16. *Working Group 4 Emergency Response. Chair: Jorge Berguño, Rapporteur: John Shears.*

Other Papers

17. *Towards an agreed strategy for the future management of Deception Island, J. Acero y Rodolfo Sanchez.*
18. *Markers and signs for historic sites and monuments in Antarctica, John Splettstoesser*
19. *Whalers' cemetery; Deception Island, South Shetland Islands, Robert Headland*

Background Texts

20. *Draft Elements for a Management Plan of Deception Island as an ASMA*
21. *Appendix I : A Chronological History of Deception Island*
22. *Appendix II : Deception Island and Antarctic fiction*

List of Documents

- 23. Background
- 24. Delivered to the meeting

- 25. *List of Participants*

Executive summary.

The final Report of the workshop “Development of a Management Plan for Deception Island as an Antarctic Specially Managed Area” contains a description of the structure of the meeting, the nature and contents of discussions and its results. The workshop was attended by 24 invited participants from Argentina, Chile, Spain, Norway, U.K., USA, IAATO and ASOC.

The objective of the first section of the workshop was to provide all necessary background information through six keynote presentations. The first two dealt with the conceptual framework of Antarctic Specially Managed Areas (ASMAs) under Annex V of the Madrid Protocol. J. Berguño treated the general requirements of management for ASMAs and M. Richardson on specific management elements for Deception Island. M. Richardson also addressed the concept of zoning within the framework of an ASMA.

Four presentations followed which reviewed Deception Island Geography, Geology, Flora, Fauna, Development of Science, History of exploration and occupation and Tourism. These contributions completed the background knowledge required for sound discussions amongst the working groups. The second section of this report contains the conclusions from the working groups on the following topics: The way forward for the ASMA, Management of Environmental Risk, Historic Sites and Monuments, Scientific Research, Stations, Tourism and Emergency Response.

The Workshop key outcomes were:

A Deception Island management strategy, a draft framework for a Management Plan of Deception Island, a list of thirteen delegated tasks, the planning of an International Expedition to Deception on austral summer 2002 and the terms of reference for the establishment of a Contact Group to complete the Management Plan.

Delegated tasks were:

- Management Program for Whalers Bay Historic site (Chile-Norway).
- Site Specific Management to protect areas of scientific/ecological importance (Spain-Argentina),
- Review of SSSI N° 21 (U.K.),
- Review of SSSI N° 27 (Chile),
- Production of maps (Spain),
- GIS of Whalers Bay (Chile)
- Oil spill contingency plan (Chile, Argentina, Spain),
- Emergency evacuation plan (Spain-Argentina),
- Management by Information (U:S:-IAATO),
- Visitor Code of Conduct (U.S.),
- Coordinate International Expedition (Argentina)
- Baily Head biological monitoring (possibly Spain and Argentina and
- *Markers and signs for HS&M (IATTO).*

It was agreed that the Convenor for the Contact Group to prepare the draft management plan for Deception Island as an ASMA will be R. Downie.

On April 4, 2002 the Interim Report of the Workshop was distributed to all participants

Introduction.

One of the most interesting features of the Antarctic Treaty is that it has build in mechanisms for change. From its initial form, of 14 Articles signed in 1959, it has grown into a System (ATS) including the Madrid Protocol, the Conventions on Antarctic Seals, Marine Living Resources, Mineral Resources and all the Recommendations, Measures, Decisions and Resolutions adopted and ratified by the parties. This unique quality has enabled the Antarctic Treaty Parties (ATCP's) to respond to different kinds of demands arising from different sources of human endeavors in Antarctica and other continents. Some of them are use of natural resources, scientific research, environmental protection, conservation and tourism. One mechanism is the periodical meetings of the ATCP's and also articles that allow periodical revisions.

During the last ten years the ATS has experienced an accelerated process of evolution. Some recent significant events that justify this assertion are: the entry into force of the Madrid Protocol and four of its five Annexes (1998), four years of functioning of the Committee of Environmental Protection (CEP) and conclusion of the negotiations of Annex V on Protected Areas and its imminent entry into force. This is also evident in the predominance of environmental issues on the agendas of the Antarctic Treaty Consultative Meetings (ATCM's).

These Antarctic International Political events have been simultaneous with a strong and sustained development of the Antarctic Tourism Industry and the fishing interests of several nations on the southern ocean waters. All of these elements have set the scenario for potential induction of conflicts of interests. Also, it is necessary to consider the risks involved in more frequent and larger operations taking place on areas of attraction because of their landscape values.

The case of Deception Island is emblematic because of the multiplicity of uses it has been given since its discovery. The most important of all of them is that during the past century it was the first and largest human settlement in Antarctica at the heights of the whaling industry (1931), also its key role in early aerial exploration (1929). More recently Scientific Research and Tourism are the most frequent activities.

On the other hand the ATCP's have reaffirmed their commitment to environmental protection after the completion of Annex V (1991) by the organization of several workshops (Cambridge, Tromso and Lima) to consider advances in concepts of area protection, management and the best ways to implement effective protection under the new challenges.

This Workshop was convened to give new impulse to the development of the category of Antarctic Specially Managed Areas (ASMA's) a discussion item not addressed on previous workshops. Participants of ATCP's active in the peninsula area saw the need to assess alternatives of management for a complex site such as Deception Island, including zoning and management by Information. Today Deception Island contains Historic Sites and Monuments, Terrestrial and Marine Sites of Special Scientific Interest and is the most frequent destination of tourist visits on the peninsula area.

The Workshop provided opportunity to bring into consideration old and new antecedents of the activities on the island, progress of the scientific knowledge on volcanology, bird biology, geology and cartography. All of these required for preparation of an ASMA management plan.

We offer this Final Report of our deliberations as a contribution to the progress of implementation of Annex V and for the future negotiations of the management plan for Deception Island as an ASMA.

We take the opportunity to thank all participants for their attendance and work during and after the workshop, specially to the keynote speakers, to Mr. George Munro for his picture on the front page, to Ms. Yasna Ordoñez for her dedication to the preparation of the electronic version of the text and to the Director of the Antarctic Institute Ambassador Pinochet de la Barra for his kind support and encouragement.

José Valencia

Santiago, June 2002.

Workshop Agenda

"DEVELOPMENT OF A MANAGEMENT PLAN FOR DECEPTION ISLAND AS AN ANTARCTIC SPECIALLY MANAGED AREA, (ASMA)"

March 25, Sunday

18:30 Registration
19:00 Icebreaker (Wine and Cheese). Hotel Club Presidente, LuisThayer Ojeda 558

March 26, Monday

08:30 Registration
09:00 **Welcome and Introduction** (O. Pinochet)
09:15 The development of Management and requirements for new ASMAS under the Madrid Protocol, Jorge Berguño
09:45 Deception Island: concepts and elements for an Antarctic Specially Managed Area, Michael Richardson
10:30 Coffee

Description and Overview

10:45 Physical geography, geology and Tourism, John Spletstoesser
11:05 Flora, Fauna, Stations, Current Research, Roderick Downie
11:25 Overview: historical introduction to 5 key areas: exploration, early science, human presence, aviation, and cooperation, Jorge Berguño
11:45 Structure, organization and aims of the meeting
12:00 Questions and Discussion.
12:15 Lunch
14:00 Discussion. **Management of Environmental Risk.**
Chair: Patricio Eberhard, Rapporteur: Rodolfo Sánchez.
Location and assessment of impacts of permanent and semi-permanent structures, scientific field work, transportation, waste management, tourism. Potential mitigating measures.
14:30 Summary and conclusions, Rodolfo Sánchez
15:00 Coffee
15.15 Discussion - **How the workshop should proceed**
Chair: Joyce Jatko. Rapporteur: Roderick Downie
Zones, Skeletal Management Plan, Admiralty Bay ASMA Management Plan, role of drafting group, Management by Information

March 27, Tuesday

- 09:00 1st. Draft Skeletal Management Plan
- 10:00 **Working Groups.** Each Working Group is tasked with discussing elements of the Skeleton Management Plan, within their terms of reference.
- Group 1. **Management of Historic Sites and Areas.**
Chair: Gustav Rossnes. Rapporteur: John Spletstoesser
Propose Management Strategy for each site, monument or area. Identify historical and cultural values, hazards & restrictions, access, guidance, access procedures: signposts, interpretative material, maintenance.
- Group 2. **Scientific Research and Station Management.**
Chair: Jerónimo López M. Rapporteur: Birgit Njaastad.
Identify nature and contents of current scientific and trends of future research, correlate to existing stations and field work, stations no longer in use and other associated infrastructures. Analyze need for site boundaries, potential need for zone markers and other procedures intended to optimize scientific results.
- 10:30 Coffee
- 11:00 Drafting groups proceed with their draft texts.
- 12:30 Lunch
- 14:00 **Working Groups**
- Group 3. **Deception Island Tourism.**
Chair: Denise Landau. Rapporteur: Patricia Vicuña.
Tourism statistics, trends, visitor movement patterns, impacts, formation of trails, cruise ships, yachts, future scenarios, educational, aesthetic and cultural values.
- Group 4. **Emergency Response**
Chair: Jorge Berguño. Rapporteur: John Shears.
Volcanic eruptions, oil spills, groundings, contingency plans, station fires, tsunamis, aircraft/landing options: ash plain spillway, landing on ice by skiequipped aircraft or on water by hydroplanes.
- 15:15 Coffee
- 16:00 Drafting groups proceed with their draft texts
- 17:30 Adjourn

March 28, Wednesday

- 09:00 Working Groups 1-4 to finalize reports
- 11:00 2nd draft Skeletal Management Plan
- 12:00 Lunch
- 14:00 Discussion and approval of reports
Identify further tasks from within Working Group 1-4
- 17:00 Adjourn
- 20:30 *Farewell Dinner. Diplomatic Academy, Catedral 1183.*

March 29, Thursday

- 09:00 Discussion on:
- Summary of Proceedings.
 - Workshop deliverables
 - Recomendations of Working Groups
 - Report for CEP
 - Role of the Consultative Parties regarding ASMA
 - Contents of interim Workshop Report
- 12:30 Lunch
- 14:00 Approval of Interim report contents
- 16:00 **Closure.**

Welcome Address by Oscar Pinochet de la Barra
Director of the Instituto Antartico Chileno
March 26, 2001

Dear Friends,

In Antarctica it is difficult to find a place more attractive than Deception Island. Fire in the middle of the ice, a quiet place to anchor, and a staircase to go deep into the planet.

The meeting starting today is not necessarily a time for poetry, but a good occasion to define some measures to protect more efficiently this strange island and its scientific zones. To grant the tourists the possibility of taking advantage of the most visited place of the whole continent, and to implement important protection measures born with the Protocol.

Somebody could remind us that this is a potential dangerous corner of the planet. Well, my friends, this is true also for the rest of the planet, sleeping quietly over a gracious bed of magma.

This workshop could be the initiation of a more active use of the rules we studied and approved in Viña del Mar and Madrid in 1990 and 1991, and afterwards.

I believe we are starting this new century with a serious and imaginative purpose about Antarctica, in the spirit of the Antarctic System, built on the strong ground of peace and science, a recognized success for the last four decades in the international field.

KEYNOTE PRESENTATIONS

The evolution of the concept of management within the Antarctic System of Environmental Protection

Jorge Berguñol

Introduction

1. During the early years of Antarctic exploration, large quantities of foodstuffs and other materials were imported to Antarctica from the vastly more productive ecosystems to the north. This organic matter has a great longevity when abandoned on the land of Antarctica as demonstrated by findings of exotic organic compounds, including nitrogenous compounds, after many decades of their original import into the terrestrial Antarctic ecosystem. But damage to and alteration of the land biota and the other Antarctic environments remained of little consequence when compared with today. Witnessing the enduring presence of straw and other materials left by the Shackleton expedition at Cape Royds, or finding intact the stock of seal and other meat left by Scott's men at Hut point is probably "food for thought" but not a source of environmental concern. The limited size of human presence, the narrow scope of logistic operations at the time prevented large-scale damage to organisms and habitats.
2. Preservationist interest in the Antarctic land mass was born at the turn of the century. The great explorers of the age brought back accounts of the fauna of this distant and forbidding region and its surrounding waters and islands which excited the imagination of conservationists already flexing their muscles in issues nearer home. The Chilean Government enacted legislation to protect seals in the Pacific and Antarctic waters in 1892. The Royal Society for the Protection of Birds (RSPB) in Britain urged protection of Antarctic penguins in 1905; ordinances to protect those in the vicinity of the Falkland (Malvinas) Islands were issued in 1909 and 1914. However, for practical reasons, interest in Antarctica and its neighbouring seas on the part of the international conservationist movement remained marginal.
3. This pattern remained unaltered until the signing of the Antarctic Treaty in 1959. The Treaty contained no environmental provisions but prohibited three activities with a potential for damaging the Antarctic environment: measures of a military nature, nuclear explosions and the disposal of radioactive waste. However, among the "measures in furtherance of the principles and objectives of the Treaty", its article IX, paragraph 1, subparagraph f) included: "preservation and conservation of living resources in Antarctica". On that basis, a set of recommendations was drawn up by SCAR in 1960 on "General rules of conduct for the preservation and conservation of living resources in Antarctica". In 1961 suggestions were advanced that all land and fresh water, including fast ice and ice shelves, and all coastal waters south of latitude 60° S, should be recognized as a "nature reserve". Conservation requirements were again assessed at a major symposium on Antarctic biology organized in 1962 by SCAR in Paris. Finally, at the third meeting of the treaty powers (Brussels, 1964) the "Agreed Measures for the Conservation of Antarctic Fauna and Flora" were negotiated.
The existence of this framework, which had many early advocates, including Brian Roberts, Alfred Van der Essen and Oscar Pinochet de la Barra, was widely welcomed both for their comprehensiveness, in the designation of the Antarctic Treaty Area as a "Special Conservation Area", and for their pioneering coverage of the fauna of a very large region of the earth.

1 Subdirector Instituto Antártico Chileno, Luis Thayer Ojeda 814, Casilla 16521 Correo 9 Santiago, Chile. jberguno@inach.cl

4. Article VIII of the Agreed Measures provided for the designation of a Specially Protected Area (SPA) for “areas of outstanding scientific interest” in order to protect their “unique ecological system”. From the perspective of both environmental and scientific management, the goal of such protection remained ambiguous. Was it the uniqueness of a certain ecological system or the outstanding scientific interest of the area? If such interest could not be served elsewhere, protection of a certain type of research resulted in crippling limitations for the development of another type of research. On the other hand, protection of fauna and flora seemed to require a more stringent restriction of all scientific activity within a SPA. Separation of the two categories, SPAs and Sites of Special Scientific Interest (SSIs) and development of different management plans to suit the requirements for each category was probably the first step towards management of Antarctic Protected areas.
5. In parallel with its own development, the Antarctic Treaty System originated a diversified Area Protection System, incorporating Historical Sites and Monuments (HSMs), Specially Reserved Areas (SRAs) and Multiple-use Planning Areas (MPAs). The Convention for the Conservation of Antarctic Seals (CCAS) contributed Seal reserves and sealing zones, while the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) established an ecosystem monitoring programme (CEMP). Lack of clarity as to its purpose characterized this expansion and, in the end, instigated a review of the system. At the time every component of the Protocol to the Antarctic Treaty for Environmental Protection had been justified by a comprehensive framework recommendation adopted during the XV RCTA. The only exception to that pattern of gradual consensus-building, the Antarctic Protected Area System, found itself at a crossroads.
6. Specially Reserved Areas (SRAs), intended to provide protection for areas of outstanding geological, recreational, scenic or wilderness interest, seemed to gather sufficient support but management plans for such areas were only tentative drafts. On the other hand, Multi-use Planning Areas (MUPAs) endeavoured to accommodate various uses and activities, to prevent cumulative environmental impacts, and to improve environmental protection by promoting cooperative planning, but consensus with these objectives did not guarantee their actual creation. Issues in the background, concerning the siting of research stations, duplication of scientific investigations, status of marine sites, uncertainties as to the size, number and value of many protected areas demanded a fresh start which, in the end, was globally approached through Article 6 of the new Protocol on Environmental Protection, and crystallized in its Annex V. While the new Annex overcomes most major deficiencies of the past system, a philosophical gap remains between the systematic and comprehensive protective goal embodied in Articles 2 and 3 of the Protocol and the more pragmatic emphasis displayed by Annex V.

The New Regime of Antarctic Protected Areas

7. Annex V rationalised the existing protected area designations, and distinguished more clearly between protected sites and managed sites. It remains a framework, heavily dependent on ecosystem classifications, extensive biological and geological research, positioning systems (GPS), site descriptions and maps, zoning techniques, visits, surveillance and monitoring procedures. Several workshops (Cambridge, 1992; Tromsø, 1998; Lima, 1999) have endeavoured to address the crucial requirements to the successful establishment and management of the Antarctic Protected Area System. Antarctic area protection requires the best scientific and technical advice, a well structured and cohesive approach based on the widest possible range of human and natural values; and, last but not least, the fundamental criteria and requirements for a proper management planning process. In the background of this evolving concept of environmental management stands a basic cleavage between two rival approaches: codes of conduct intending to discipline human presence and avoid adverse impacts through restrictions imposed to specific activities;

and area protection, which draws geographic boundaries to those activities with its main or exclusive focus on the configuration and nature of the protected space.

8. Further to the designation by the 1991 Madrid Protocol of Antarctica as “a natural reserve devoted to peace and science” and its provisions enhancing the comprehensive protection of the Antarctic environment and dependent and associate ecosystems, its Annex V establishes two new categories: Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs). ASPAs will include all SPAs and SSSIs designated by past ATCMs, which will be re-numbered and receive a new, or revised, Management Plan. SRAs will be subsumed under ASPAs, and MUPAS under ASMAs, when their Management Plans are prepared. The Management Plan for an ASMA at Admiralty Bay, King George Island, had been voluntarily adopted at the ATCM XX, and is now in force. HSMs may be designated as either an ASPA, ASMA, included in either one, or simply listed. The only recognized tomb, at the Erebus mountain, will be considered an HSM.

The Role of Deception Island

9. Deception Island has played a role, not insignificant, but generally inadvertent, in the evolution of the concept of environmental management within the Antarctic Treaty System: there are presently two SSSIs in Deception Island. Within the first site, “Parts of Deception Island”, there is one with a most interesting history. In 1969 a volcanic eruption in Telefon Bay brought into existence a small island. Recommendation VI-11 recognized the special scientific interest of new islands formed by geological processes, in particular for the study of the colonization by flora and fauna of an uncontaminated area. The recommendation did not, however, establish a protected area but rather a procedure for consultations and recommended that governments use “their best endeavours to prevent tourists from landing on such new islands”. This is important because an informal approach becomes *de facto* a management tool. In time, the island created during the eruption in Telefon Bay, and including the low land, containing a lake, which joins the island to the main island, became area C of SSSI 21 (Parts of Deception Island, South Shetlands).
10. The other SSSI n° 27, “Port Foster”, comprises two small areas of benthic habitat designated on the grounds of exceptional ecological interest because of their active character and considering the need to reduce accidental interference of ongoing research. The significance of this SSSI is that, together with “Chile Bay” (Discovery Bay), Greenwich Island, and South Bay, Doumer Island, they were the first marine sites proposed for protection already in 1977, but adopted some ten years later, at the ATCM XIV (Rio de Janeiro, 1987).
11. An extract from the Report of the XIV ATCM notes various reactions to the SCAR Report entitled “The Protected Area System in the Antarctic”. In the end, it was noted that, in order to obtain a better idea of the scope and consequences of SCAR proposal “that a new category of protected area be introduced to the system while retaining the present categories” and, in order to obtain a better idea of the scope and consequences of such a proposal it was suggested that the Preparatory meeting for the XVth ATCM could have before it draft management plans for sites which might suit the new category. Together with sections of Anvers Island, Beardmore Glacier, the Victoria Land Dry Valleys, Ross Island, Signy Island and Vestfold Hills, Deception Island was also proposed (Report, paragraph 97) but no draft plan was ever submitted at the XV ATCM.
12. Nevertheless, Deception remained in the background as a paradigm of the need for multiple-planning, accommodation of potentially conflicting uses, a large number of HMs and SSSIs, possible cumulative impacts from tourism, recreational, scenic, outstanding geological and vulcanological and wilderness

values, in addition to those of outstanding biological interest. The challenge of the envisaged Deception Island ASMA may be illustrated by a few random examples :

- a) The need has been recognized to consider the historic value of each abandoned station, refuge or camp-site before sanctioning its clean-up. This consideration is particularly relevant to any decision concerning present HMS 71 at Whalers Bay, but also for Pedro Aguirre Cerda Base, destroyed by the eruptions which took place in 1969-70. Improved management practices will not only allow buffering of historic structures, but also adequately protect ruins, artefacts and even areas of historic significance;
- b) Reference to apparent differences between values referred to in article 3 of the Protocol and Annex V must not be exaggerated, and should be subject to appropriate legal analysis. The relevance for Deception Island of this purported issue is a reminder that research within the atmosphere-biosphere-geosphere environment is highly interrelated; that the island's volcanic origin and definition as a "natural laboratory" for morphological change require that these inter-relations be taken into account; and recognition that science is both a primary and legitimate use of the continent in its own right, and underpins management of the Antarctic environment and its dependent and associative ecosystems;
- c) A few Antarctic islands or parts of them have been protected, and one of those, Moe Island, one of the South Orkneys, proposed by the UK and adopted at the ATCM IV, here in Santiago, constitutes a useful reference and is therefore included in the background documents of the workshop. However, a decision to protect, either as an ASPA or as an ASMA, or a combination of both, an entire island requires a keen understanding of the scope, constraints and values encompassed by that protection. Considered as a protected object, an island possesses in theory less diversity and more stability than a terrestrial ecosystem, a questionable proposition when applied to Deception Island. If the island is itself considered as a subject, as a living thing, as an actor, the choice of an island-oriented approach implies a more radical, clear-cut, distinct, and separate treatment of the protected area.

13. Deception Island is not just another representative example of maritime ecosystems. It is also an icon of past Antarctic history and a pilot case for the regulation of human activity, scientific and tourist orientated activity. This excursion into past experiences in Antarctic environmental planning clearly indicate how vital such instrument is to the successful achievement of protected area goals. The challenge of Deception Island is to build a bridge between the rival approaches (Spatial delimitation and Codes of Conduct), to incorporate into the management planning process relevant elements of non-Antarctic protected categories, in particular, educational and aesthetic values, and a very fundamental criteria: that the best protection, the most complete, does not proceed by exclusion. The story of Antarctic protection is a patent demonstration of that dilemma: a strategy is drawn, an option is made which inevitably leads to a partial formulation of policies and objectives, a management plan is adopted which is not tailored to the sum of possibilities offered by the site, and ultimately the management goals are not met. We must pledge that Deception Island will ultimately defeat the curse of its name.

Deception Island - concepts and elements for an Antarctic Specially Managed Area

Michael G. Richardson¹

1. Introduction

The designation of Deception Island as an Antarctic Specially Managed Area (ASMA) is likely to be seen as a trailblazer for future ASMA designations within the framework of Annex V of the *Protocol to the Antarctic Treaty on Environmental Protection* (1998). It remains to be seen whether a management plan can be produced which will sit comfortably within the protected area system, or whether the system itself can be suitably and innovatively modified to deal with what is certainly the most complex area yet to be dealt with under Annex V, or indeed within the protected area system as it has evolved up to now. For within its small area, Deception Island has a diverse range of interests, including science, nature conservation, aesthetics, operational research stations, intense tourist activity along with a range of historic sites and artifacts.

2. The Antarctic Protected Area System

Ever since the Agreed Measures of 1964, the protected area system has been an important component of the Antarctic Treaty System, which has set aside inviolate areas (Specially Protected Areas - SPAs), areas for science (Sites of Special Scientific Interest - SSSIs), and areas for historical or cultural purposes (Historic Sites and Monuments - HSMs). Other categories were added though never fully implemented e.g. Areas of Special Tourist Interest (ASTIs), Multiple Use Planning Areas (MUPAs) and Specially Reserved Areas (SRAs).

Annex V, which was adopted 2 weeks after the adoption of the Protocol, and which has yet to come into force, was intended to rationalise the Antarctic protected area system by replacing previous designations with two new categories: Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs), whilst retaining HSMs. A clear division was thus introduced between protection (ASPAs) and management (ASMAs). Annex V also gave the opportunity for existing historic sites either to be redesignated as ASPAs or ASMAs (thus introducing the notion of boundaries), or to remain listed as HSMs.

3. A Baseline for the Management of Deception Island

The preparation of a strategy document for Deception Island as a precursor to the development of a Management Plan was in itself a novel and original approach, at least within the context of the Antarctic protected area system. The Management Strategy for Deception Island set out 7 possible options, ranging from Business as Usual to the Total Protection of the island as an ASPA. Through informal meetings amongst those Parties with major interests in Deception Island, agreement had been made on the preferred option, i.e. an island-wide matrix ASMA incorporating zones such as ASPAs/SSSIs, HSMs, zones for tourism, etc. This model is precisely what was envisaged by Article 4 (4) of Annex V.

Whilst there is agreement on the schematic of this option, no agreement has yet been arrived at as to what the option will actually look like on the ground.

¹ Polar Region Section, Overseas Territories Department, Foreign Commonwealth Office, King Charles Street, London CB2 1ER
saad.fco@tinet.gov.uk

4. Management and Protection in the Context of Annex V

Annex V was constructed around the two apparently distinct notions of management and protection. However, the inter-relationship between management and protection, and as such between ASMAs and ASPAs, is not totally clear cut. Under Annex V, are they indeed totally distinct issues, or is there a blurring of this distinction?

Under Annex V, ASPAs exist to protect outstanding values (Article 3) (1) and to keep areas inviolate from human interference. Article 4 states that entry into an ASPA is prohibited except with a permit. Therefore the ASPA designation clearly addresses the notion of protection, making no reference to management. ASMAs, on the other hand, exist for areas where activities are being conducted:

- to assist in the planning and co-ordination of activities;
- to avoid possible conflict;
- to improve co-operation;
- to minimize environmental impacts.

Furthermore, article 5 (3) (1) makes reference to a code of conduct i.e. a non-mandatory provision. The initial conclusion to be drawn from this is that on the whole there is a distinction, whereby Protected Areas are intended to address protection, and Managed Areas to address management.

Further examination of Annex V, however, reveals that this relationship is not so straight-forward, and that there are in fact grey areas.

Under Article 3 we see the introduction of a third term, in prohibited, *restricted* or managed. This is repeated in Article 5 (3) (f) and Article 5 (3) (j).

Also, under Article 5 (3) (c), the notion of protection through *management* is introduced - viz. management activities to protect the values for which special protection or management is required.

Furthermore, under Article 5 (3) (j), mandatory provisions, for example the taking of native flora and fauna (i.e. activities subject to permitting), are introduced in non-mandatory Codes of Conduct.

It can be concluded that whilst protected areas on the whole address protection, they may indeed also include the notion of management. Conversely, managed areas may include restrictions (on time and place) - i.e. prohibitions including permitted activities. This would suggest that a degree of flexibility is required when implementing Annex V, particularly in relation to a complicated issue such as Deception Island.

There has been an apparent reluctance of Antarctic Treaty Consultative Parties to address managed sites as opposed to protected sites. This is apparent when one looks at the number of new site designations and revised Management Plans adopted since 1991 when the Protocol was adopted. Only one managed site (Admiralty Bay) has been proposed, and even that Management Plan has yet to be adopted formally. Reluctance to address the management of sites in Antarctica may be due to the following reasons.

1. Management is an activity which may have connotations to territorial possession and sovereignty issues;
2. Management is a resource-based activity, with financial cost implications;
3. Pro-active management (other than erecting signposts) is an anathema to Antarctic thinking
4. Antarctic thinking may question the need for active management.

5. The Concept of Zones under Annex V, and its Relevance to Deception Island

The preferred option of the Management Strategy referred to an island-wide ASMA incorporating zones. By zonation, we mean identifying specific areas which, due to specific activities or attributes, need a more specific or tailored approach to management. Article 5 (2) states that Proposed Management Plans shall include, as appropriate, the identification of zones within the area in which activities are to be prohibited, restricted and managed. In the case of Deception Island, the key issues are:

- i. are zones appropriate, and will they help in the management of activities on the island ?
- ii. what are the values for which zoning may be used (e.g. scientific research, nature conservation, stations infrastructure, tourism) ?;
- iii. where would the boundaries of such zones be ?;
- iv. what management or protection prescriptions would be needed within zones ?;
- v. how would zones be addressed on the ground ?

Practical implementation of the zones is important. Designing a complex matrix for Deception Island would be counter-productive if it was not workable on the ground.

6. Review of Existing Sites on Deception Island

Annex V initiated the review process of existing Antarctic protected sites, and this was further taken forward in Resolution 1 (Tromsø - 1998).

Two SSSIs are located on Deception Island, both of which are divided into sub-sites. SSSI No. 21 comprises 5 terrestrial sites, and SSSI No. 27 comprises 2 marine sites. Responsibility for reviewing these sites under Resolution 1 lies with the UK and Chile respectively. However, this review may be carried out as part of the wider process of zoning on Deception Island, at which time it should be decided whether they should be retained, modified or subsumed within a wider framework, or even done away with completely. Similarly, there are at present three designated HSMs at Whalers Bay. Attention should be paid to whether they are still relevant as individual sites, or whether they might be rationalized as one single site within a boundary.

7. Workshop Objectives

Bearing in mind the above, the following may be seen as suitable objectives for the Workshop:

1. agree and adopt the Management Strategy;
2. agree the overall format of the Management Package;
3. agree the framework of the Management Plan;
4. identify zones within the matrix ASMA;
5. delegate responsibility for further progress;
6. establish a Deception Island Management Plan Contact Group (e-mail correspondence group), and its terms of reference;
7. agree a timetable for future action;
8. agree interim measures pending the adoption of the Management Plan (e.g. Management by

Information).

Physical Geography, Geology and Tourism: Deception Island, Antarctica

*J. Spletstoesser*¹

Physical Geography and Geologic Summary

A. Deception Island is a young (< 750,000 years), active basaltic shield, or strato-volcano located in the South Shetland Islands. It has a large, flooded caldera, and is located astride a young (<1.5 million years) marginal basin spreading center (rift) in Bransfield Strait. The rift broke apart and separated continental crust of the South Shetland Islands, which formerly was contiguous with the Antarctic Peninsula. The rift expanded at an estimated rate of 0.1-0.3 in. (0.25-0.75 cm) per year (González-Ferrán, 1991). Volcanoes developed along this rift include Deception, Penguin, and Bridgeman Islands, and several submarine volcanic seamounts. Deception rises 3,300 ft (1,000 m), above the seafloor, and has a maximum elevation above sea level of 1,800 ft (550 m) at Mount Pond. The maximum depth of Port Foster, inside the caldera, is about 620 ft (190 m). Entrance to Port Foster is through Neptunes Bellows, a narrow opening in the breached crater wall.

B. Recent Geological Events. The volcano was particularly active during the 19th century, with eruptions occurring most decades (Orheim, 1972), but 20th century eruptions have been confined to 1906-12 and 1967-70. In January 1930, an earthquake resulted in the lowering of the bottom of Port Foster about 15 ft (4.6 m) and the destruction of the end of the wharf at Hektor Whaling Station (U.S. Navy Hydrographic Dept., Sailing Directions for Antarctica, 1943, H.O. No. 138, p. 103). The series of three eruptions in 1967, 1969, and 1970 resulted in considerable damage and changes to the topography of the island (detailed by Baker *et al.*, 1975). Evacuation of personnel following eruptions was a truly international effort, involving Argentinean, British, and Chilean support. Studies of the eruptions, also involving the international community, can be found in the extensive literature on the geology and related disciplines of Deception Island, both in the List of References (below), and Baker *et al.* (1975; Baker, 1990.)

(i). 4 December 1967. A large ash cloud developed in the north of the island, beginning about 23.00 hours. Ash and large hailstones fell heavily, and the sky became completely black, with continuous heavy thunderstorm. Chilean station members made their way overland to British station at Whalers Bay. Water in Whalers Bay was rising and falling rapidly. Personnel from Argentine, British, and Chilean stations were evacuated 5 December. A new island developed in Telefon Bay (Cameron, 1970, p. 803), and an eruption occurred from a crater on the NNE side of Port Foster. The Chilean station was buried by ash (Baker *et al.*, 1975, plate Va).

(ii). 21 February 1969. Only the British base was occupied—five men reported a strong earthquake at 03.34 hours, followed by many others during the night. A large cloud rose from the vicinity of Pendulum Cove at about 09.50, and soon after debris fell, requiring the men to take shelter until it abated. They returned to the main base holding sheets of corrugated iron over their heads because of the ash and lapilli (volcanic fragments of ash size—2-64 mm). Arriving at Biscoe House, they found the building breached from back to front, and large ice blocks inside the hut. The ice-block ‘lahar’, or mudflow, that descended from the vicinity of Mount Pond had buried or carried away much of the whaling station (Birkenmajer, 1995, Fig. 3, for path of lahar). A fissure that developed from Pendulum Cove to Mount Pond created the lahar, which also destroyed the Chilean station. Men were evacuated about 16.30 hours.

¹ IAATO, P.O. Box 2178, Basalt, Colorado 81621 USA.

(iii). **12-13 August 1970.** An eruption occurred when no one was on the island, in the northern part of coastline near the site of the 1967 eruption. A new strip of land was produced, and the 1967 'island' was incorporated within it (Shultz, 1972).

(iv). **Seismic surveys** carried out by the Spanish National Program of Antarctic Research on Deception Island beginning in 1987 show that seismic activity in and around the island is about 1000 events per month (Vila *et al.*, 1992). An earthquake measured in early 1991 had a magnitude 7, generating a tsunami which submerged an area 30-40 meters inland on one beach.

C. **Summary** (summarized from Baker *et al.*, 1975).

(i). Recent eruptions have all occurred on the inside of the caldera, and their arcuate orientation around the caldera wall suggests that the ring fracture is still active.

(ii). Eruptions were entirely pyroclastic, which is normal on Deception Island for vents close to sea level such as those of 1967 and 1969. Explosive eruptions from the much higher 1969 fissure may have been induced by contact of the magma with glacial melt water.

(iii). Chemical compositions of the material produced from the eruptions indicate that the ring fractures are tapping zones of variously differentiated magma, and they do not have access to a large uniform magma reservoir.

(iv). It is probable that the recent series of eruptions has not come to an end.

(v). Main hazards to human life and property are the floods of melt water released during subglacial eruptions (similar to the Icelandic jökulhlaups [glacier outburst floods]). The most convenient sites for scientific stations, low on the shores of Port Foster, are thus the most vulnerable to the effects of such eruptions.

(vi). The ring fracture zone is the most likely site for future eruptions, including the entrance at Neptunes Bellows.

(vii). The policy of allowing parties to remain on the island whilst a means of rapid evacuation exists is recommended and should be continued.

II. **Tourism**

Tourism at Deception Island consists of visits to four locations, three of them along the shoreline of Port Foster, and the fourth on the outside of the island. The time period of visits is normally from early November through early March in the austral summer. Visits are conducted primarily by cruise vessels that are operated by members of the International Association of Antarctica Tour Operators (IAATO), several non-IAATO member vessels, and yachts. National program supply vessels also visit the island, with paying tourists aboard some of them. The four locations for tourism include Baily Head, Whalers Bay, Telefon Bay, and Pendulum Cove. Shore visits involve from 1 to 3 hours of time per visit.

A. Baily Head is located on the outside of the island, on the east side and subject to vagaries of the open seas of Bransfield Strait. Swell and surf conditions often prohibit safe landings by Zodiac-type boats. A large colony of Chinstrap Penguins (*Pygoscelis antarctica*) (about 100,000 breeding pairs – Woehler, 1993) is the primary wildlife found there, although several species of flying birds also nest there. The penguin colony is located a short distance inland from the beach landing site, in a large, spacious amphitheater-like setting.

B. Whalers Bay is located inside Port Foster, immediately to starboard after passing through the high, volcanic tuff cliffs of the narrow entrance at Neptunes Bellows. This location is a popular stop for tourists because of the ruins of the Hektor Whaling Company, which operated here from 1912 to 1931. The station, along with the buildings of the British Antarctic Survey station, was destroyed by the eruptions of 1967 and 1969. Guided visits are made along the beach to nearby Neptunes Window, and to view the ruins of the structures at the whaling station and the research station.

C. Telefon Bay is the site of volcanic craters that were formed in the eruption of 1970, and involves a short walk uphill to the crater edges, and back to the landing site.

D. Pendulum Cove is located on the northeast side of Port Foster, and is a popular stop for tourism because of the geothermal springs active at the shoreline which provide an opportunity for a shallow ‘swim’ in heated waters. Inland from the beach is the site of the Chilean station Pedro Aguirre Cerda that was destroyed in the eruptions of 1967 and 1969.

E. Summary

Tourism visits to Deception Island involve four sites, only one of which has substantial wildlife. Many years of experience in visiting them has resulted in well-managed stops, without threat to wildlife, terrain, or historic content. Statistics on tourism visits to the four sites can be found at the IAATO website (see below), which illustrates figures for all sites visited in the Antarctic Peninsula for the period 1989-90 to 1999-00. Summaries of statistics for the four sites on Deception Island are listed in Table 1, showing that nearly 95,000 visitors have landed at those sites in the 11-year period.

Table 1. Tourist visits by cruise ship to Deception Island, 1999-00, and comparison with summaries of previous seasons. (From IAATO website www.iaato.org)

	Baily Head		Telefon Bay		Pendulum Cove		Whalers Bay		TOTAL	
	Landings/	Visitors	Landings/	Visitors	Landings/	Visitors	Landings/	Visitors	Landings	Visitors
10-yr Total, 1989-90	148	12078	65	5274	300	26030	425	35325	942	78943
1999-00	31	2595	9	634	57	5300	86	7333	183	15862
11-yr Total	179	14673	74	5908	357	31330	511	42658	1135	94805

Note: Figures for yachts not included. Figures are for landings only, not zodiac cruising.

References cited

- BAKER, P.E. 1990. Deception Island. *In* Volcanoes of the Antarctic Plate and Southern Ocean. W.E. Le Masurier and J.W. Thomson, eds. Wash., D.C., American Geophysical Union, *Antarctic Research Series*, v. 48: 316-321.
- BAKER, P. E., I. MCREATH, M.R. HARVEY, M.J. ROOBOL, and T. G. DAVIES. 1975. The Geology of the South Shetland Islands: V. Volcanic Evolution of Deception Island. *British Antarctic Survey Scientific Reports No. 78*, 81 p. + XIII plates.
- BIRKENMAJER, K. 1995. Some young volcanic features at Whalers Bay, Deception Island volcano, South Shetland Islands (West Antarctica). *Studia Geologica Polonica*, v. 107: 131-143.
- CAMERON, R. E. and R. E. BENOIT. 1970. Microbial and ecological investigations of recent cinder cones, Deception Island – A preliminary report. *Ecology*, v. 51, no. 5: 802-809.
- GONZÁLEZ-FERRÁN, O. 1991. The Bransfield rift and its active volcanism. *In* Geological Evolution of Antarctica, M.R.A. Thomson, J.A. Crame and J.W. Thomson, eds. Cambridge University Press, p. 505-509.
- ORHEIM, O. 1972. A 200-year record of glacier mass balance at Deception Island, Southwest Atlantic Ocean, and its bearing on models of global climatic change. *Report of the Institute of Polar Studies, Ohio State University*, No. 42, 118 p.

- SHULTZ, C.H. 1972. Eruption at Deception Island, Antarctica, August 1970. *Geological Society of America Bulletin*, v. 83: 2837-2842.
- SMELLIE, J.L. 1988. Recent observations on the volcanic history of Deception Island, South Shetland Islands. *British Antarctic Survey Bulletin* No. 81: 83-85.
- VILA, J., R. ORTIZ, A.M. CORREIG, and A. GARCIA. 1992. Seismic activity on Deception Island. *In Recent Progress in Antarctic Earth Science*, Y. Yoshida, K. Kaminuma, and K. Shiraishi, *eds.* Tokyo, Terra Scientific Publishing Co., p. 449-456.

An Overview of the Flora and Fauna of Deception Island

Rod Downie¹

1. Introduction

Deception Island is an unique Antarctic island which has had a long and varied history of human activity, including exploration, sealing and whaling, aviation, scientific research and tourism. It is an active volcano. The three most recent eruptions took place between 1967 - 1970 (Baker *et al.*, 1975). This paper gives an overview of the significance of the island exceptional flora and fauna, and comments upon the varying degrees to which they are affected by volcanic activity.

2. Flora

The location of Deception Island, only 950 km south of Tierra del Fuego, and its relatively mild and humid climate, make it potentially one of the most favourable localities in the Antarctic for the immigration of plant propagules and the establishment of vegetation. However, the aridity and instability of the substrata render them unsuitable for extensive plant colonization and community development. Vegetation is therefore sparse and closed stands are mainly restricted to small areas of stable soil receiving a permanent supply of moisture (Smith, 1988).

Volcanic effects on vegetation are two-fold: primary effects include direct burial by ash from volcanic eruption, or wind blown or water borne ash, and secondary effects include changes in topography and melt stream patterns (Collins, 1969). Following the three eruptions between 1967-1970, various new surfaces became available for colonization by plants. Most of these remained dry, porous, unstable, and therefore unsuitable for establishment. Large tracts of ash plains and slopes remain totally barren (Smith, 1984a, 1984b).

2.1 Vascular Plants

The two native Antarctic flowering plants both previously grew at single sites; Antarctic hairgrass (*Deschampsia antarctica*) formerly existed very sparsely in the crater below Ronald Hill (Smith, 1988). Antarctic pearlwort (*Colobanthus quitensis*) still grows between South-East Point and Baily Head. This area represents the largest known community of Antarctic pearlwort. It was partially covered by ash after the 1969 eruption (Longton, 1967).

The non-native vascular plants, *Poa annua* and *Poa pratensis*, have been recorded in Whalers Bay. *Poa pratensis*, first recorded by I. M. Lamb in 1944, survived on Deception Island for at least 4 years, flowering during one or more seasons. *Poa annua* survived for at least three summers and two winters, and was also known to have flowered (Longton, 1966). The community of *Poa annua* was destroyed by being covered by ash and eroded by melt streams (Collins, 1969).

¹ Roderick Downie, British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET, rh@pcmail.nerc-bas.ac.uk

2.2 Cryptogams

Areas of warm (geothermal) ground with constant high humidity offer ideal conditions for bryophyte colonization and the establishment of unusual associations of taxa and some unique communities - e.g. *Philonotis*, *Dicranella*, *Bryum*, *Pohlia*, *Tortula*, *Didymodon* and *Schistidium*, which grow together in a narrow strip of ice-free ground on a subsidiary peak 1 km north-north west of the summit of Mount Pond (Smith, 1988). This is the only known location in the Antarctic where *Philonotis acicularis* grows. *Racomitrium heterostichoides* and *R. lanuginosum* also grow near Pendulum Cove, the only site in the Antarctic where they are found.

The known bryophyte flora consists of approximately 50 species of moss, 6 species of liverwort and approximately 70 species of lichens (pers. comm, Lewis Smith, 2002). Aptroot and van der Knaap (1993) recorded 70 species of lichens on Deception Island, existing not only on natural but also artificial substrates, including concrete, wood, iron, asphalt, paper and cloth.

The best developed and most complex communities occur on lava outcrops and coarse scoria fields, often on the crests of exposed ridges and summits. In favourable habitats, colonization and growth proceed quickly, although this process is frequently reversed by natural perturbations (Smith, 1988).

Important areas of cryptogamic vegetation include Cathedral Crags, Whalers Bay, Crater Lake, Perchu Cone, an ice free area to the north-north-west of the summit of Mount Pond, Pendulum Cove, Fumarole Bay, between South-East Point and Baily Head, and between Collins Point and Entrance Point.

2.3 Algae

Algae, notably *Prasiola crispa*, are frequent in association with seabird colonies. Other algae, fungi and white yeasts are generally most abundant around fumaroles emitting moisture and CO₂ (Cameron and Benoit, 1970).

3. Fauna

3.1 Terrestrial and Freshwater Invertebrate Communities

Invertebrate species have been little studied on Deception Island. The few studies that have been carried out have concentrated on taxonomic descriptions.

Downie *et al.* (2000) contains a complete list of all recorded terrestrial and freshwater invertebrates on Deception Island, which includes 18 species of Acarina (mite), 1 species of Diptera (fly), 3 species of Tardigrada (tardigrade), 9 species of Collembola (springtail), 3 freshwater Crustacea (crustacean), 14 Nematoda (nematode), 1 Gastrotricha (gastrotrich), and 5 Rotifera (rotifer).

The mite *Parasitus tarsispinosus* and the springtails *Onychiurus sp.*, *Folsomia candida*, and *Hypogastrura viatica* are all introduced species.

3.2 Birds

There are eight species of birds breeding on Deception Island, and two other species are known to have bred on the island in the past. Volcanic activity may have influenced the size and fate of bird colonies on Deception Island (Croxall and Kirkwood, 1979).

The most numerous bird on Deception Island is the chinstrap penguin (*Pygoscelis antarctica*). Leppard and Kenny (1954) reported 8 rookeries on Deception Island; at Baily Head, Macaroni Point, a bluff to the west of Macaroni Point, Punta de la Descubierta, South Point, between South Point and Vapour Col, and two further rookeries in the vicinity of Entrance Point. A census carried out by Shuford and Spear in 1987 estimated a population of 140,000 - 191,000 chinstrap penguins on Deception, suggesting an increase since 1979 from an estimated 132,000 to 183,000 (Croxall and Kirkwood, 1979). No further whole-island census has been carried out since 1987.

The largest rookery is at Baily Head, on the south-east coast. De Korte (1996) estimated a minimum breeding population of 90,000. The rookery at Punta de la Descubierta on the west coast of the island has a population of approximately 20,000 breeding pairs (Moreno *et al.*, 1994, 1995, 1996, 1998, 1999, Carrascal *et al.*, 1995, Viñuela *et al.*, 1995, 1996, Barbosa *et al.*, 1997).

At Punta de la Descubierta, Viñuela *et al.* (1996) have noted the earliest recorded hatching dates for chinstrap penguins. One of the main factors determining the start of breeding in pygoscelid penguins is possibly the timing of the appearance of ice free ground (Williams, 1990). Early hatching dates indicate early laying dates and this may be related to the occurrence of geothermally heated ground at Deception Island. Punta de la Descubierta is located near the main geological fracture system of the island (Viñuela *et al.*, 1996), and investigations have shown ground temperatures as high as 12°C at 10 cm depth.

Macaroni penguins (*Eudyptes chrysolophus*) have been recorded as breeding on Deception Island (Gain, 1910, 1912, Stroud, 1953, Leppard and Kenney, 1954). Gain (1910) recorded a rookery of 50 birds in 1909 at Entrance Point. Stroud (1953) counted 25 individuals nesting together in the chinstrap penguin rookery at Baily Head. Leppard and Kenney (1954) counted 31 pairs at Macaroni Point amongst a colony of approximately 1,600 chinstrap penguins. Occasional pairs of Macaroni penguins still breed on Deception Island.

Brown skuas (*Catharacta lonnbergi*) nest in small numbers on Deception Island. De Korte (1996) counted 10 pairs at Punta de la Descubierta, and 6 pairs at Baily Head. Brown skuas also nest at Crater Lake and inland from Fumarole Bay (Downie, pers. obs., 1999).

Small numbers of kelp gulls (*Larus dominicanus*) breed in the abandoned structures of Hektor Whaling Station, inland from Fumarole Bay, in the vicinity of Collins Point, and near Lake Irizar. Cape pigeons (*Daption capensis*) nest in the cliffs at Cathedral Crags, Macaroni Point, Baily Head and 0.5 km north of South-East Point. Wilson's storm-petrels (*Oceanites oceanicus*) also nest in the scree at Cathedral Crags. Stroud (1953) records many thousands of Wilson's storm-petrels breeding on the island. Antarctic terns (*Sterna vittata*) breed at Whalers Bay, behind the abandoned buildings and amongst wooden whalers barrels along the beach, and probably in the cliffs behind Fumarole Bay and between Entrance Point and Collins Point. Snowy sheathbills (*Chionis alba*) nest at Baily Head and Punta de la Descubierta.

Terns, gulls and petrels are regularly seen feeding on krill that has been scorched in the thermal water at Pendulum Cove.

3.3 Birds previously known to breed on Deception Island

Stroud (1953) records blue-eyed shags (*Phalacrocorax atriceps*) breeding on rocks near the harbour entrance (Entrance Point). Gain (1910) and Flett (1944) recorded a rookery of gentoo penguins (*Pygoscelis papua*) on the west side of Port Foster. Blue-eyed shags and gentoo penguins are frequently seen on the island, but no longer breed there.

3.4 Non Breeding Birds Reported at Deception Island

Table 1. Non - Breeding Birds Reported at Deception Island	
Species	Reference
Adélie Penguin (<i>Pygoscelis adelia</i>)	Flett (1944) Stroud (1953)
Bartram, upland Sandpiper (<i>Bartramia longicauda</i>)	Bennett (1938)
Black -Bellied Storm- Petrel (<i>Fregeatta tropica</i>)	Stroud (1953)
Black-Necked Swan (<i>Cygnus melancoryphus</i>)	Lazo and Yañez (1989) Curt Martínez (1990)
Cattle Egret (<i>Bubulcus ibis</i>)	pers.obs, Cheesemans Ecology Safaris & Downie, 2000
Emperor Penguin (<i>Aptenodytes forsteri</i>)	Stroud (1953)
Giant Petrel (<i>Macronectes giganteus</i>)	Flett (1944) Stroud (1953)
Silver Grey Petrel (<i>Priocella antarctica</i>) sic. (Antarctic Fulmar) (<i>Fulmarus glacialisoides</i>)	Stroud (1953)
Snow Petrel (<i>Pagodroma nivea</i>)	Flett (1944) Stroud (1953)

4. Mammals

Deception Island has no breeding populations of mammals. Antarctic fur seals (*Arctocephalus gazella*), Weddell seals (*Leptonychotes weddelli*), crabeater seals (*Lobodon carcinophagus*), southern elephant seals (*Mirounga leonina*) and leopard seals (*Hydrurga leponyx*) haul out on the beaches of the inner and outer coast. Morton (1986) counted approximately 500 Antarctic fur seals on the beach to the south of Collins Point.

Whales have occasionally been sighted in Port Foster (Mott, 1986).

The brown rat *Rattus norvegicus* K. (*Mus* [sic.] *norvegicus*) was reported by Olstad (1930) to have been transported to Deception Island every year by the whaling vessels and floating factory ships, and bred in the vicinity of Whalers Bay. Very few survived through the winters. Pigs, sheep, horses, cattle, dogs, cats and poultry have all been kept at the whaling station or bases prior to the adoption of the Antarctic Treaty. No introduced species of mammals now occur on Deception Island.

5. Marine and Littoral Communities

The marine ecology of Port Foster, where species diversity is generally low, has been significantly influenced by volcanic activity and sediment deposition.

5.1 Benthos

Biological surveys of Port Foster have revealed a highly disturbed and impoverished benthic fauna (Torres, 1989). The eruption of 1967 caused mass mortality. Since then the benthic infauna has varied considerably. The principal benthic groups found at Port Foster are *Annelida (Polychaeta)*, *Mollusca (Bivalvia)*, *Echiuroidea*, *Crustacea (Amphipoda, Cumacea)* and *Echinodermata, (Ophiuroidea)*. Echinoderms are the most dominant phylum. They were also the dominant species in the samples of the Expédition Antarctique Française, 1908 - 1910 (Koehler, 1912), which suggests that the benthic community has reached the highest level of organization that it can achieve given the recurrent perturbations (Gallardo *et al.*, 1977, Arnaud *et al.*, 1998). The primary cause of perturbation has been covering by ash immediately following eruptions. Secondary causes have been identified as the redistribution of ash by wind and meltwater.

Gallardo *et al.* (1999) list the known benthic marine vegetation of Deception Island.

5.2 Plankton

18 species of Dinoflagellates and 6 species of Tintinnids were present in Port Foster in December 1970. *Peridinium antarcticum* was the most widely distributed of the dinoflagellates, and *Cymatocylys drygalskii* and *Cymatocylys parva* were the most widely distributed tintinnid (Hermosilla, 1976). Comparison with samples taken from the same stations in December 1969 (Hermosilla, 1975) reveal that *Peridinium antarcticum*, the species most abundant (100 % of surface samples) in December 1970, was absent in 1969. Approximately 57 % of the species found in Foster Bay in December 1970 were new to the area. The high percentage of species found in 1970 suggest that a process of recuperation was occurring in Port Foster, and that the area was returning to its original condition.

5.3 Krill

Ice krill (*Euphausia crystallorophias*) and Antarctic krill (*Euphausia superba*) in Port Foster have been studied by Everson (1987), Brinton and Townsend (1991) and Brierley (1999). The population of krill within Port Foster is probably landlocked and self maintaining, since interchange of water between the caldera and the surrounding Bransfield Strait is minimal due largely to the very shallow sill at Neptune's Bellows.

5.4 Fish

The fish of Port Foster have been little studied. *Notothenia neglecta n. sp* were caught by Nybelin (1951). *Notothenia* and ice fish (*Channinchthyidae*) were regularly caught during recreational fishing by the Operation Tabarin base complement (Flett, 1944). *Notothenia gibberifrons*, *Notothenia neglecta*, *Trematomus bernacchii*, *Parachaenichthys charcoti* and *Chaenocephalus aceratus* have also been caught in Whalers Bay, and *Champsocephalus gunnari* has been found washed up on the coast of Port Foster (Everson, 1969).

A survey in 1995 confirmed that the Nototheniidae species were the most abundant species in Port Foster (Olaso *et al.*, 1997). *Channinchthyidae* and *Bathydraconidae* were also present.

6. The Significance of the Natural Resources of Deception Island

Deception Island is significant as one of the most unusual natural ecosystems in the Antarctic. As such, it represents an important area for studies in geoscience and marine, terrestrial and freshwater life sciences.

Volcanic events offer a rare opportunity to study the effects of environmental change on an ecosystem, and the dynamics of ecosystems as they recover from the disturbance. The natural resources of Deception Island are to varying degrees affected by volcanic activity. For example, vegetation on the island has been destroyed by being covered by ash following eruptions, whereas areas of humid, geothermally heated ground have attracted the establishment of unique communities and plants not found elsewhere in the Antarctic. The effects of volcanic eruptions have significantly impoverished the marine ecology of Port Foster, allowing pioneer species to dominate. Laying and hatching dates of chinstrap penguins at Punta de la Descubierta are the earliest recorded for the species, as the birds take advantage of snow free ground possibly melted by geothermal activity.

The significance of Deception Island's important and unique flora and fauna is reflected in the fact that two Sites of Special Scientific Interest (SSSI) have been designated on the island. SSSI 21 comprises 5 areas on the shore of Port Foster, covering a total approximate area of 1.7 km². The SSSI was designated on the grounds that the island offers unique opportunities to study cryptogam colonization processes in an Antarctic environment. The site was proposed by the UK, and adopted at Antarctic Treaty Consultative Meeting XIII (Brussels, 1985). SSSI 27 comprises two small areas of benthic habitat in Port Foster, covering an approximate area of 1.9 km². This SSSI was designated on the grounds of its exceptional ecological interest due to its active volcanic character. The site was proposed by Chile, and adopted at the ATCM XIV (Rio de Janeiro, 1987).

Deception Island's unique natural resources are also highly valued by the Antarctic tourism industry. It is the most visited island in the Antarctic.

References

- APTROOT, A. AND VAN DER KNAAP, W.O. (1993). The Lichen Flora of Deception Island, South Shetland Islands. *Nova Hedwigia*, **56**: 183-192.
- ARNAUD, P.M., LÓPEZ, C.M., OLASO, I., RAMIL, F., RAMOS-ESPLÁ, A.A., AND RAMOS, A. (1998). Semi-quantitative Study of Macrobenthic Fauna in the Region of the South Shetland Islands and the Antarctic Peninsula. *Polar Biology*, **19**: 160-166.
- BAKER, P.E., MCREATH, I., HARVEY, M.R., ROOBOL, M.J. AND DAVIES, T.G. (1975). The Geology of the South Shetland Islands. V. Volcanic evolution of Deception Island. *British Antarctic Survey Scientific Reports*, **78**. 81 pp.
- BARBOSA, A., MORENO, J., POTTI, J. AND MERINO, S. (1997). Breeding Group Size, Nest Position and Breeding Success in the Chinstrap Penguin. *Polar Biology*, **18**: 410-414.
- BENNETT, A.G. (1938). Bartram, S. Sandpiper on the Falkland Islands. *Ibis*, 14th series, **2**(4): 768.
- BRIERLY, A.S. (1999). A Comparison of Antarctic Euphausiids Sampled by Net and from Geothermally Heated Waters: Insights into Sampling Bias. *Polar Biology* **22**:109-114.
- BRINTON, E. AND TOWNSEND, A.W. (1991). Development Rates and Habitat Shifts in the Antarctic Neritic Euphausiid *Euphausia Crystallorophias*, 1986 -87. *Deep-Sea Research*, **38** (8-9): 1195-1211.

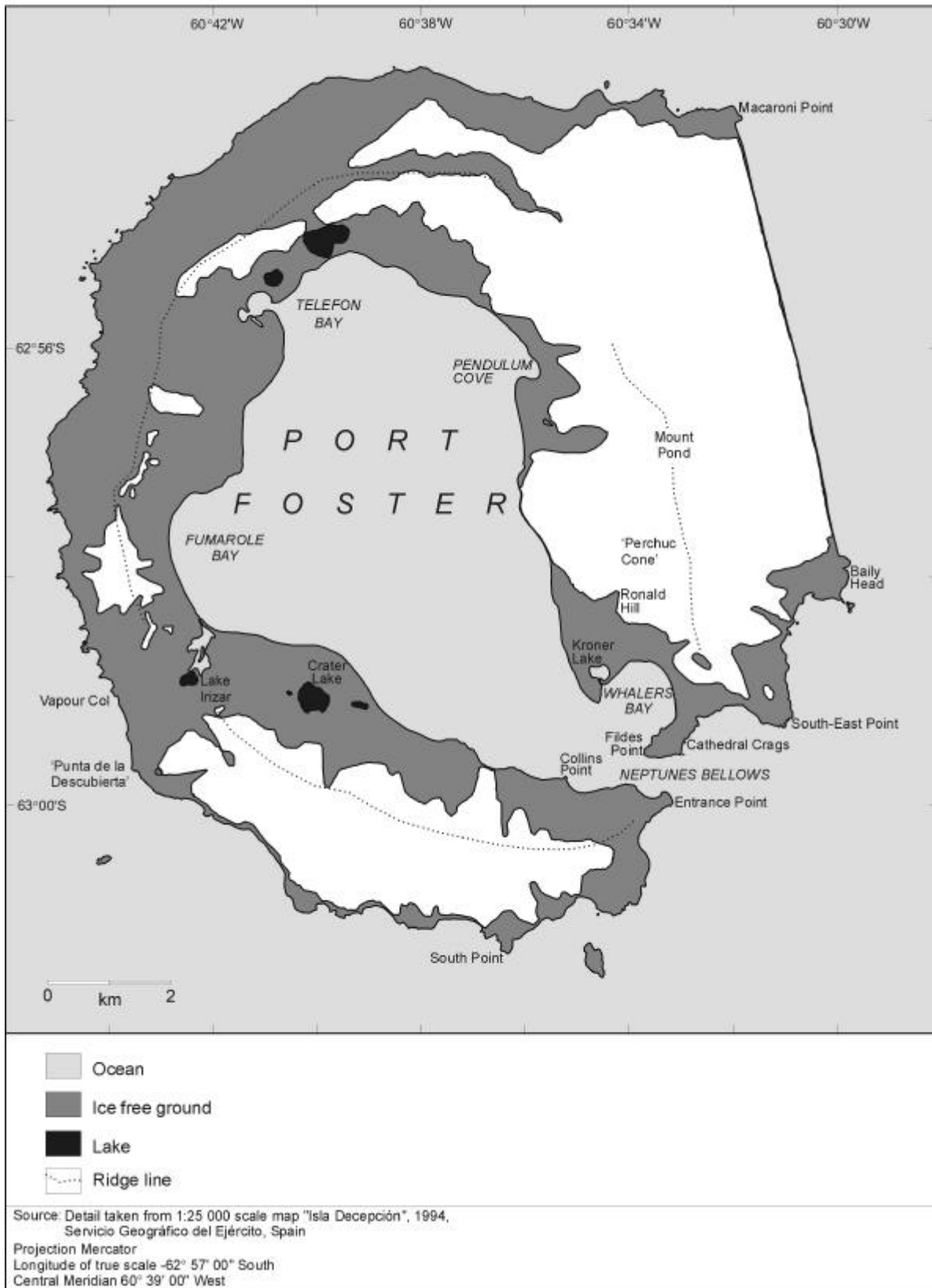
- CAMERON, R.E. AND BENOIT, R. E. (1970). Microbial and Ecological Investigations of Recent Cinder Cones, Deception Island, Antarctica - A Preliminary Report. *Ecology*, **51** (5): 802-809.
- CARRASCAL, L.M., MORENO, J., AND AMAT, J.A. (1995). Nest Maintenance and Stone Theft in the Chinstrap Penguin (*Pygoscelis Antarctica*). 2. Effects of breeding group size. *Polar Biology*, **15**: 541-545.
- COLLINS, N.J. (1969). The Effects of Volcanic Activity on the Vegetation of Deception Island. *British Antarctic Survey Bulletin*, **21**: 79-94.
- CROXALL J.P. AND KIRKWOOD, E.D. (1979). *The Distribution of Penguins on the Antarctic Peninsula and the Islands of the Scotia Sea*. British Antarctic Survey/ Natural Environment Research Council, Cambridge. 182 pp.
- CURT MARTÍNEZ, J. (1990). Observación de Cinco Cisnes de Cuello Negro (*Cygnus Melanocoryphus*) en la Zona del Tratado Antártico. In: Castellví, J. (Ed.). *Actas del Tercer Symposium Español de Estudios Antárticos, Gredos, Oct 3-5, 1989*. Comisión Interministerial de Ciencia y Tecnología, Madrid :112-114.
- DOWNIE, R.H., CONVEY, P., MCINNES, S.J. AND PUGH P.J.A (2000). The Non-Marine Invertebrate Fauna of Deception Island (Maritime Antarctic): A Baseline for a Comprehensive Biodiversity Database. *Polar Record*, **36** (199): 297-304.
- EVERSON, I. (1987). Some Aspects of the Small Scale Distribution of Euphausia Crystallorophias. *Polar Biology*, **8**: 9-15.
- EVERSON, I. (1969). Inshore Fishes from the South Orkney and South Shetland Islands, the Antarctic Peninsula and South Georgia. *British Antarctic Survey Bulletin*, **19**: 89-96.
- FLETT, W.R. (1944). *Base B. Deception Island. Report, 1944*. Unpublished Operation Tabarin report. BAS archive ref: AD6/1B/1944/A.
- GAIN, L. (1912). The Penguins of the Antarctic Regions. *Annual report of the Smithsonian Institution, 1912*: 475-482.
- GAIN, L. (1910). Rapport sur les Travaux de Zoologie et de Botanique in: *Rapports Préliminaires sur les Travaux Exécutés dans le Antarctique par la Mission Commandée par M. le Dr Charcot de 1908 a 1910*. Gauthier- Villars, Paris: 73-101.
- GALLARDO, T., PÉREZ-RUZAFÁ, I.M., FLORES-MOYA, A., AND CONDE, F. (1999). New Collections of Benthic Marine Algae from Livingston and Deception Island (South Shetland Islands) and Trinity Island (Bransfield Strait) Antarctica. *Botanica Marina*, **42**: 61-69.
- GALLARDO, V.A., CASTILLO, J.G., RETAMAL, M.A., YÁÑEZ, A., MOYANO, H.I. AND HERMOSILLA, J.G. (1977). Quantitative Studies on the Soft-Bottom Macrobenthic Communities of Shallow Antarctic Bays. In: *Adaptations within Antarctic ecosystems. Proceedings of the third SCAR Symposium on Antarctic Biology*, Smithsonian Institution, Washington D.C. : 361-387.
- HERMOSILLA, J.G. (1975). Contribución al Conocimiento de los Dinoflagelados y Tintínidos de Antártica. 1. Plancton colectado en diciembre, 1969. *Gayana (Zoología)*, **34**: 1-55.
- HERMOSILLA, J.G. (1976). A Contribution to the Knowledge of Tintinnids and Dinoflagellates after a Volcanic Eruption in Foster Bay, Deception Island, Antarctic. *Instituto Antártico Chileno, Serie de difusión*, **9**: 59-61.
- KOEHLER, R. (1912). Echinodermes (Astèries, Ophiures et Echinides). In: *Deuxième Expédition Antarctique Française (1908-1910) commandée par le Dr. Jean Charcot*, **8** (1). Masson et Cie, Paris. 270 pp.
- DE KORTE, J. (1996). Breeding Success of Skua's, *Stercorariidae*, in relation to Body Energy Reserves, Growth and Environmental Factors. *Circumpolar Journal*, **11** (1-2): 18-23.
- LAZO I.F AND YAÑEZ, J. (1989). First Record of Black-Necked Swan *Cygnus Melancoryphus* in South Shetlands and Antarctica. *Polar Record*, **25** (155): 354.
- LEPPARD, N.A.G AND KENNEY, R. (1954). *Report On Survey - Deception Island*. Unpublished Falkland Islands Dependencies Survey Report. BAS archive ref: L36/1953/B.

- LONGTON, R.E. (1967). Vegetation in the Maritime Antarctic. *Philosophical Transactions of the Royal Society of London, Series B*, **252**: 213-235.
- LONGTON, R.E. (1966). Alien Vascular Plants on Deception Island, South Shetland Islands. *British Antarctic Survey Bulletin*, **9**: 55-60.
- MORENO, E., MORENO, J., DE LEÓN, A. (1999). The Effect of Nest Size on Stone-Gathering Behaviour in the Chinstrap Penguin. *Polar Biology*, **22**: 90-92.
- MORENO, J., AMAT, J.A, SANZ, J.J. AND CARRASCAL, L.M. (1998). Determinants of Feeding Chases in the Chinstrap Penguin *Pygoscelis Antarctica*. *EMU*, **98**: 192-196.
- MORENO, J., CARRASCAL, L.M. AND SANZ, J.J. (1996). Parent-Offspring Interactions and Feeding Chases in the Chinstrap Penguin *Pygoscelis Antarctica*. *Bird Behaviour*, **11** (1): 31-34.
- MORENO, J., BUSTAMANTE, J., AND VIÑUELA, J. (1995). Nest Maintenance and Stone Theft in the Chinstrap Penguin (*Pygoscelis Antarctica*). 1. Sex roles and effects on fitness. *Polar Biology* **15** (8): 533-540.
- MORENO, J., CARRASCAL, L.M., SANZ, J.J., AMAT, J.A. AND CUERVO, J.J. (1994). Hatching Asynchrony, Sibling Hierarchies and Brood Reduction in the Chinstrap Penguin *Pygoscelis Antarctica*. *Polar Biology*, **14** (1): 21-30.
- MORTON, A.C. (1986). *Travel Report Sledge India and Oscar*. Unpublished British Antarctic Survey report. BAS archive ref: AD6/2R/1986/K6.
- MOTT, P.G. (1986). *Wings Over Ice. An Account of the Falkland Islands and Dependencies Aerial Survey Expedition, 1955 -57*. The author, Long Sutton, Somerset. 167 pp.
- NYBELIN, O. (1951). Sub-antarctic and Antarctic Fishes. *Scientific Results of the Bratæg Expedition, 1947 - 48*, **2**. 32 pp.
- OLASO, I, GARCÍA-CASTRILLO RIESGO, G. AND BALGUERÍAS GUERRA, E. (1997). Ichthyofauna of Livingston and Deception Islands. *Real Sociedad Española de Historia Natural Boletín (Sección Biológica)*, **93** (1-4): 79 - 86.
- OLSTAD, O. (1930). Rats and Reindeer in the Antarctic. *Scientific results of the Norwegian Antarctic Expeditions 1927- 1928 and 1928-1929*, No. 4. 20 pp.
- ORHEIM, O. (1975). Past and Present Mass Balance Variations and Climate at Deception Island, South Shetland Islands, Antarctica. In: *Commission of Snow and Ice. Snow and Ice symposium. Proceedings of the Moscow Symposium, August 1971*. IAHS publication **104**: 161-180.
- SHUFORD, W.D. AND SPEAR L.B. (1988). Surveys of Breeding Chinstrap Penguins in the South Shetland Islands, Antarctica. *British Antarctic Survey Bulletin*, **81**: 19-30.
- SMITH, R.I.L. (1988). Short Note. Botanical Survey of Deception Island. *British Antarctic Survey Bulletin*, **80**:129-136.
- SMITH, R.I.L. (1984 A). Colonization by Bryophytes following recent Volcanic Activity on an Antarctic Island. *Journal of the Hattori Botanical Laboratory*, **56**: 53-63.
- SMITH, R.I.L. (1984 B). Colonization and Recovery by Cryptogams following Recent Volcanic Activity on Deception Island, South Shetland Islands. *British Antarctic Survey Bulletin*, **62**: 25-51.
- STROUD, E.D. (1953). Some Notes on the Birds of Deception Island, South Shetlands. *Sea Swallow*, **6**: 13-15.
- TORRES, D. (1989). Chilean Antarctic Research: Main Biological Contributions for the Antarctic Conservation. In : Huh, H.T., Park, B.-K. and Lee, S.-H (Eds.). *Proceedings of the First International Symposium on Antarctic Science, November 4-5, 1988, Seoul, Korea*. Korea Ocean Research and Development Institute, Seoul: 229 - 252.
- VIÑUELA, J., MORENO, J., CARRASCAL, L.M., SANZ, J.J., AMAT, J.A., FERRER, M., BELLIURE, J. AND CUERVO, J.J. (1996). The effect of Hatching Date on Parental Care, Chick Growth, and Chick Mortality in the Chinstrap Penguin *Pygoscelis Antarctica*. *Journal of Zoology*, **240**: 51-58.

VIÑUELA, J., AMAT, J.A. AND FERRER, M. (1995). Nest Defence of Nesting Chinstrap Penguins (*Pygoscelis Antarctica*) against Intruders. *Ethology*, **99** (4): 323-331.

WILLIAMS, T.D. (1990). Annual Variation in Breeding Biology of Gentoo Penguins, *Pygoscelis Papua*, at Bird Island, South Georgia. *Journal of Zoology*, **222**: 247-258.

Figure 1. Deception Island



Historical introduction to 4 key areas: exploration, early science, human presence and cooperation

Jorge Berguño¹

I. Exploration

Charcot (1910) wrote: “I cannot find any document showing who really discovered this island...nor who christened it with the name Deception, most inappropriate in my mind”. In fact, “Deception” characterizes accurately the elusive appearance of the island and inevitably one wonders if its discoverer was not someone whose native tongue was English. Charcot himself suggested that the island may have been known to “the Spaniards, or, to be more exact, to the ancestors of the Argentinians”. This is unlikely although it is now accepted that Gabriel de Castilla went as far as 64° South in 1603, because he probably saw no land. In addition to the discoverer, the *Williams* from London, the *Espíritu Santo* from Buenos Aires, the *Hersilia* from Stonington, the Spanish naval vessel *San Telmo* wrecked near Livingston Island, and probably another brig from Buenos Aires, the *San Juan Nepomuceno*, were at the South Shetlands during the first sealing season in 1819. The pattern and chronology of the operation of these vessels, mostly in the vicinity of Rugged Island, make it improbable that any of them surveyed Deception, although there is a slight probability that the men from the *Hersilia* could have sighted the island from Boyds Strait on the return voyage to the United States. Nathaniel B. Palmer was second mate on board that ship.

The suggestion that Deception was almost certainly the land charted in “thick fog” by Edward Bransfield in January 1820 must be qualified. His chart shows Livingston Island trending as a solid line southward beyond the latitude of Deception Island. Bransfield suspected the existence of land, but it is not evident that he recognized it as an island. On the other hand, Captain Smith submitted to the British Admiralty a rough map with “Edwards Island” in the vicinity of Deception, without a hollow center. If Deception was sighted by Smith, and such knowledge is not reflected in Bransfield’s chart, Smith may have seen Deception during the 1820-21 sealing season.

Did Palmer, sent by Captain Pendleton to seek alternatives to President Harbour in Livingston Island to the south of that island, have any notion of the existence of Deception, its location and advantages? The cryptic note in the log of the *Hero*, for 15 November, 1820 (“stood for Deception”) and the track followed by the *Hero* do not provide a decisive clue, although the latter creates the impression that he probably had some notion of the island’s geographic position but ignored the advantages of the secluded harbour “secure from all winds” which he thoroughly surveyed after finding the entrance named by the American whalers Neptune’s Bellows (Fildes, 1821).

Nevertheless, Fildes also described the loophole at Whalers Bay (“Fildes Lookout” or “La Ventana del Chileno” from where the land to the southward could be seen) and recorded the statement by Captain McFarlane of the brig *Dragon* from Valparaiso who claimed that he had landed on it (the Antarctic Peninsula) on a date previous to December 16, 1820. McFarlane did not claim the discovery of Deception Island, which lies in the route from McFarlane’s Strait to the Peninsula. However, Captain John Davis wrote in the log of the *Huron* for the 1821-22 season: “I entered through the Mouth of the Dragon (instead of Neptune’s Bellows!) into the spacious harbor of Deception Island” (Davis, 1822). This *Dragon* was no

¹ Subdirector Instituto Antártico chileno

mythical creature, as the previous reference by Fildes to McFarlane's brig or the "Dragon Cove" located in British charts near the west entrance to McFarlane's Strait demonstrate.

We can only conclude that discovery of Deception Island is one of those Antarctic mysteries and recall the statement by a distinguished American scholar: "Until evidence to the contrary comes to light, it would seem that only McFarlane could have preceded Palmer, and this is uncertain". (Bertrand, 1971)

II. Early Science

Admiral Bellingshausen sighted Deception Island for some forty miles but did not survey it. On the other hand, the British naval expedition in the *Chanticleer* commanded by Captain Henry Foster, which took place between 1828 and 1831 and made surveys of Tierra del Fuego, Staten Island, the Antarctic Peninsula and the South Shetland Islands, will be mostly remembered on what is mostly recalled as the "Pendulum Voyage", organized to set out measurement stations around the world and measuring by pendulums, the infinitesimal forces of gravity. Deception Island was one of the chosen measurement points, where gravity and magnetic observations were made, maximum and minimum thermometers were deposited, and a map was drawn by Lieutenant Kendall.

Dr. James Eights, the naturalist on board of the American sealing vessel *Annawan*, the first trained scientist in Antarctic history, visited Deception Island in February 1830 and described the conditions he observed in one of several papers on the South Shetlands, probably the first scientific work on Antarctica published in the United States. Some ten years later, the American naval vessel *Sea Gull*, led by Lieutenant Robert E. Johnson, from the US Exploring Expedition, came next searching for the thermometers left by the *Chanticleer*. The party sailed out of Deception Island on March 17, 1840, after placing a record of their unsuccessful search in a bottle at the foot of the flagstaff which they erected.

It was this bottle which an American sealer, Captain Smiley found in 1842 and which led him to search and find one of the thermometers. As he left, Smiley witnessed that "...the whole side of Deception Island appeared as if on fire", counted some thirteen volcanoes in action, and observed that the island was undergoing many changes. Geologists now credit him with having observed probably one of the first volcanic eruptions of Deception Island in historic time. The beauty of Antarctic science lies, among other features, in its interdisciplinary character. In 1989, a group of INACH researchers found a positive correlation in biotic colonization of Deception's volcanic substrates related to eruptions presumed to have taken place in 1842, 1912 and 1917 (Covarrubias, Silva, Mahú y Mellado, 1990) while Professor Birkenmajer of the Polish Academy of Sciences, through lichenometric dating of a young fissure-erupted basaltic lava at the island's Mount Kirkwood also confirmed Smiley's reports (Birkenmajer, 1991).

Morphological changes mentioned by Smiley are a constant "Leitmotiv" of the early scientific research performed at the island. Charcot's comments (1910) on Lieutenant Kendall's map underline fairly large modifications in detail, affecting small lakes and the heights of the peaks as well as the shores of the inner basin. More dramatic changes occurred in Pendulum Cove, "the excellent harbor" described by Palmer, which had been filled by the fjord through landslide upheavals and reduced to a small crescent-shaped beach when the Argentinian naval vessel *Uruguay* arrived in Deception, searching for Charcot, leaving a cairn and a bottle with a message dated January 8, 1905. The scientific results of this expedition had an immediate echo in Chile, where Navy Commander Ismael Gajardo (1905) considered that these extraordinary changes in the landscape of Deception Island deserved the interest of the scientific community.

In the summer of 1990-91, a multidisciplinary Norwegian team studied the environmental impact of Hektor Station at Whalers Bay. It was found that the station and connected activities carried on until 1931 had a substantial impact on the surrounding vegetation and animals, not only during its operation but also

after its abandonment, a conclusion which should be duly taken into account when pondering on the merits for a Deception Island strategy and a subsequent Management Plan (Hacquebord, 1992).

Scientific accomplishments of the early expeditions were, and continue to be superseded in aspects concerning meteorology and climate change. Dr. Webster of the *Chanticleer*, Lieutenant Johnson and Admiral Dumont d'Urville visited the island at times of generally mild climate, while later expeditions endured more harsh conditions. Both Webster and Johnson maintained that the area of Deception Island amounted to some 50 square kilometers, while its diameter was considered to be about 19 kilometers from north to south, and from east to west. Technological progress allows for more thorough, precise and accurate measurements as it has been demonstrated by personnel of the Spanish Army, who have estimated at 98.5 km² the total land area of Deception Island, including all its outlying islets (Servicio Geográfico del Ejército Español, 1994) . This important achievement does not imply that the pattern of morphological change detected by early Antarctic science in Deception Island has waned. It only means that a solid foundation has been established which, subject to periodic review of a broad scientific data base, may accommodate more dynamic or evolutionary models (Baraldo, 2002).

III. Human Presence

The first settlement of Deception Island was probably located at Pendulum Cove and must have developed after Palmer's survey of the inner ring. Sailing instructions from Edmund Fanning and Benjamin Pendleton to captain Nathaniel Palmer (Palmer Documents, US Library of Congress) directed him to proceed to Staten Island and from there to Deception Island, chosen as base of operations for the 1821-22 sealing season (Bertrand, 1971). The wisdom of this decision was confirmed when the American sealers found Yankee Harbor, their previous shelter in Livingston Island, "about half frozen over". At least six American sealing vessels came to anchor in Deception harbour, christened by them as "Port Dunbar", during the month of November 1821 and left their base in Deception on January 30, 1822.

It is not known if the American or the British sealers continued afterwards to use Deception island as a base for their Antarctic operations . There is a strong hint that human presence initiated in the austral summer of 1821-22 not only continued but expanded. In a drawing by Lieutenant Kendall from the *Chanticleer* expedition (R. Bentley engraver, 1834) some constructions are visible in the shore, in addition to the tents erected by the expedition. Kendall's narrative provides a clue on past remains whose origin shall remain unsolved. The British expeditionaries located timbers, casks, hoops and other relics; found sealers graves, one with a body in good state of preservation, and noted buildings with blackened surfaces. Together with a shed built by Fildes with salvaged wood from the Cora in Desolation Island, constructions described by Kendall rank among the first Antarctic habitations.

The second settlement was born in the last months of 1906, when Captain Adolphus Amandus Andresen entered through Neptune's Bellows or the Mouth of the Dragon a harbour which was completely round, sheltered from all winds by tall mountains of volcanic rock, with deep calm waters gently stroking a beach where the sand was so warm that it left large patches entirely free of ice and snow . This was Andresen's second Antarctic whaling season. During the first one, Alexander Lange and Soren Andersen with factory ship *Admiralen* and 2 whale catchers had found a profitable base in Admiralty Bay, King George Island, on 28 January, 1906. Adolphus Andresen had been less successful in his own explorations, during the 1905-06 austral summer, of the Elephant Island group whose occupation had been granted to the Sociedad Ballenera de Magallanes by Chilean authorities. Elephant Island was considered inappropriate as well as other areas sighted by Andresen such as the northern shores of King George Island. This time, the rediscovery of Deception Island was a tremendously lucky strike.

For the next 8 years the Sociedad Ballenera de Magallanes used the bay, which became the main anchorage for the floating factories which also moored at Port Lockroy, Paradise Harbour, Admiralty Bay, Foyn Harbour and Mikkelsen Harbour. The Sociedad established a coal deposit, a monopoly since Andresen intervened and monitored the coal trade; built a shed for the coal and a pier, but the flensing and other operations were performed on the factory ship of the Sociedad Ballenera de Magallanes, the *Gobernador Bories*. Andresen lived there accompanied by his wife Marie Betsy Rasmussen, born in Hamburg of Danish and Norwegian ancestors, the first European woman to set foot in the South Shetland Islands (Charcot, 1910). Both had settled in Punta Arenas in 1894, but Andresen had been back in Norway twice, in order to assimilate the most advanced whaling technology, and to purchase vessels and equipment for his company.

A change came with the 1912 construction of the Hektor Whaling Station, under one of two British licences awarded to that effect outside South Georgia. The terms of the lease applied to “a lot of five acres situated in Factory Bay, Foster Harbour, in the Island of Deception..”, for a period of 21 years from 1 October 1912. Removal, appropriation or killing or use of any product, mineral or animal was prohibited. With a view to counteracting the monopoly of the Sociedad Ballenera de Magallanes, the lessees were requested to maintain a minimal coal stock for vessels in distress; and obligated to provide the official appointed by the British Colonial Government to supervise the whale fishery with a free passage once a year between Port Stanley and Deception Island (Bush, 1988).

Compared to stations in South Georgia, Hektor Whaling Station remained a more modest proposition. (Rosnes, 1996). But Whalers Bay was not only strategically valuable for the whaling fishery but represented the only spontaneous human settlement in Antarctica, the total sum of material and social creations by people who lived and worked there in the early years of the 20th century. At the end of its existence in 1931, a census was conducted on the island, revealing that some 650 men were employed on the mainland, with greater numbers on the factory ships and the whale-catchers, with a total population on and around Deception Island of 2000 or even 2500 men. In addition to the shore station, a dozen or more factory ships would have been lying in the shelter of the harbour, surrounded by a far larger number of whale-catchers, plying to and coming from the deep waters outside the island; while other vessels, tenders and colliers, brought mail, supplies, coal, and strengthened the community’s connection with the outside world. On the beach every factory ship owned its individual water well but a multitude of water boats, rowing boats, pump hoses, barrels were scattered around the place which ended with a partial breach in the island’s caldera, “Neptune’s Window”, romantically baptised by Chilean whalers as “La Ventana del Chileno”.

Hektor Whaling improved Andresen’s modest pier but it remained relatively small, some 150 feet long. Leading to it were rails upon which a small trolley operated, supplying the catchers with harpoons and other necessities. The huge oil storage tanks, the warehouses, the boiler house, the flensing platform, guano factory, cooking grills, plating shop, powder magazine were some of the auxiliary constructions surrounding the main factory buildings and a well equipped hospital. Outside the factory, up on a small hill, stood a red-painted house, the British magistrate’s cottage with a sheltered porch and a white pole where the Union Jack was hoisted during the summer whaling season. Another house had been built nearby, painted white and flying the Norwegian flag, for the representative of Nils Bugge & Co. from Tonsberg, occasionally accompanied by his wife, the second feminine presence, after Betsy Rasmussen, in Deception Island (Olsen, 1972).

Names in this very small town were not invented, or inspired by the rough Antarctic reality, but nostalgically adapted from familiar places at home. A recreational building alongside the utilitarian constructions, containing a small library, playhouse and piano, was named the Town Hall while Chilean whalers nick-named “Plaza de Armas” the small square outside. The road to the Magistrate’s cottage was called Whitehall Street, the path to the residence of the Norwegian manager became Storgaten, and at the turntable for the little trolley railway a notice read Kjose Junction with the usual stopping places whose

names were the same of a railway halt of Vestfold, the Norwegian district where most of the whalers came from.

Behind the factory and the towering mountains stood the most southerly graveyard in the world. The first burial in February 1908 of Nokard Davidsen, the Norwegian manager of a Canadian whaling company, gathered the whole whaling fleet of the South Shetlands at the time. The last one took place more discreetly in March 1931 when the shore station was abandoned. Many years after, in November 1953, a member of the FIDS also came to rest under the volcanic ashes of Deception's Cemetery (Headland, 2001).

The station became a diminishing return with the rise of distant seas whaling factories equipped with hauling-up slipways. Once abandoned, it remained a valuable shelter and source of support for many expeditions. The coal deposit of the Sociedad Ballenera de Magallanes remained intact (British Antarctic Pilot, 1930) until burnt by HMS *Queen of Bermuda*, sent in 1941 by the British Admiralty to destroy oil fuel installations and coal stocks to deny their use by German raiders. The scope of such destruction has been exaggerated, as the very precise statement by the captain of the vessel contained in the ship's log demonstrates. Therefore, the poor condition of the abandoned station and installations detected by later expeditions was probably caused by acts of vandalism presumably in the early months of 1936, denounced by the crew of the *Wyatt Earp*, the support ship of Ellsworth's expedition, which repeatedly used the island to assemble its flying machine, the Polar Star (Olsen, 1972).

IV. International Cooperation

Before scrutinizing the merits of cooperation, it would be fair to examine also some of the elements of conflict which arise in the intricacies of Deception's history. The Antarctic controversy arose in Deception Island, or more exactly, in its vicinity, when Captain Andresen was steaming back to Punta Arenas after his first whaling season on the island (1906-07) and crossed the track of the *Admiralen*, captain Lange. The two captains exchanged greetings and information on their respective catches, at which time a British inspector on board of the *Admiralen* informed Andresen that whaling operations in the South Shetlands required a British licence. Andresen disdainfully disregarded such advice but the Sociedad Ballenera de Magallanes received a bill for the precise amount he had mentioned to Lange, and quickly reported this incident to the Chilean Government, engaged since 1906 in an effort to agree with Argentina a common Antarctic boundary. The Chilean Foreign Minister reported the situation to his Argentinian colleague, and while the two statesmen agreed to the necessity for a united front, their countries were unable to finalise a Complementary Delimitation Treaty in Antarctica. The Sociedad Ballenera de Magallanes agreed to the payment exacted by the British Colonial authorities but reserved its position in the event that Chilean or Argentinian authorities would also demand a payment, stating in their reply that they had the authorisation of their Government to occupy Elephant Island and to fish and hunt in the South Shetlands and the Antarctic Peninsula (Bush, 1988).

Diplomatic historians have some difficulty in interpreting these and other aspects of Antarctic history. People who went to Antarctica, and lived an extraordinary life in a most extraordinary place probably understood better the singularity of the situation, and were less concerned with the ambiguities which have coalesced within the Antarctic system but have their deep roots in a chain of events linked to the Antarctic whaling season of 1906-07. The community which developed in Deception Island was unique in many respects, and its very special character requires a context, a historical perspective which would allow us to grasp the true meaning of contemporary events during the whaling age. Such perspective is provided by the prevailing climate of cooperation and the realization of the very special conditions existant in Deception Island.

In the period of whaling activity, the settlement at Deception Island became an icon for mutual assistance and human solidarity. The navigational aid placed by the Chilean Navy at the perilous entrance of the island, named after Adolphus Andresen, replaced a light for navigational purposes placed there during the whaling period. Any vessel in distress could benefit from supplies, coal, water, advice and timely help when required. The salvage of the collier *Telefon* (1908) by Andresen (Heyburn & Stenersen, 1988) is perhaps the best known of these episodes, but there were several other cases, including the *Solstreiff* salvaged by the vessel *Alejandro* from Punta Arenas in 1918 (Martinic, 1980); we should remember that both vessels were wrecked in the vicinity of King George Island and towed to Deception Island for repair. Antarctic historians seem to forget that, while the *Endurance* was drifting in the icy Weddell Sea, Shackleton's hopes were placed not on the final landing accomplished on Elephant Island, but on squeezing his way through Good Hope Sound into the Bellingshausen Sea and anchoring in Deception Island. His protracted rescue would probably have been replaced by a generous welcome from the whalers.

Deception's role as a valuable shelter and source of support to Antarctic expeditions was highlighted by the introduction of the airplane which brought about a truly revolutionary change in the pattern of Antarctic exploration. It was no capricious twist of destiny but the result of the vision of Sir Hubert Wilkins, and afterwards of Lincoln Ellsworth, both of them seeking to penetrate into the interior of the Antarctic continent in order to accomplish what Shackleton had failed to do overland, convinced that Deception provided the natural springboard for such attempt. Weather conditions made landing and take off by planes equipped with skis impossible and made it necessary to smooth off a runway on the sloping surface of volcanic ash at the entrance of Whalers Bay. But the fact is that, having abandoned the objective of a trans-Antarctic flight, Wilkins made in the morning of 20 December, 1929, the historic pioneering aerial reconnaissance which fortunately ended on the landing field of Deception. Wilkins stored his planes and supplies in Hektor's warehouse and obtained transportation on the whalers *Hektor*, *Fleurus*, *Melville* and *Ibsen*, while the *Scoresby* of the Colonial Office acted as a tender for the flying operations.

During Ellsworth's second attempt (the first one from the Bay of Whales had ended in failure), the Deception Island solidarity chain once more demonstrated its value, although the whaling station had been closed in the meantime. His plane, the *Polar Star*, was assembled in one of Hektor Whaling sheds, but once the engine was started, a connecting rod broke and the spare had to be produced by Siemens-Chile and shipped through Punta Arenas. While the support vessel *Wyatt Earp* traveled to Punta Arenas, Ellsworth and his pilots were isolated during several days in one of the whaling company's cottages by snow and blizzard. With improved climate conditions the repaired *Polar Star* flew from Snow Hill Island along the eastern side of the Antarctic Peninsula. On the third attempt, Montevideo and Punta Arenas provided fuel and supplies, but Deception Island remained the unique place where the plane could be dismantled, stored and reassembled. The dramatic end of the great trans-Antarctic flight from Dundee Island again enhanced the critical role of Deception Island, from where radio communications were established to support a relief operation, initiated in Punta Arenas with a Gamma monoplane taken on board the *Wyatt Earp* and unsuccessfully searching south of Charcot Island. The last chapter was written in the Ross Sea area where a ski rescue team headed by Sir Hubert Wilkins found Ellsworth and his copilot Kenyon safe and in good health in an unoccupied cottage of Little America.

Deception Island continued to play a significant part in the development of Antarctic aviation. Small planes have often been used in connection with exploring ships and play a strategic scouting role. This was the case of the Vought Sikorsky (308) of the Chilean Air Force carried on board the naval transport *Angamos* which flew over and landed in Deception, after taking aerial photographs and films in February 1947; and of the amphibious Supermarine Walrus MK-I launched shortly after by the Argentinian transport ship *Patagonia*. Direct connections between Antarctica and the other land masses of the Southern Hemisphere followed and on December of that year mail was dropped on Deception Island by a plane belonging to the Argentinian Navy coming from Piedrabuena in Patagonia. The first tourist flight by the Chilean Airline

(LAN) from Punta Arenas over Deception to the Antarctic Peninsula took place on 22 December 1956, while the American pilot Max Conrad made the first flight in a private airplane equipped with skis from Ushuaia to Deception Island on 15 December 1966. The United Kingdom based in Deception its aviation units and built a hangar to that effect which still stands. Canso flying boats from Hunting Aerosurveys Ltd, under contract from the British Colonial Office to develop a programme of vertical air photography of the Shetland Islands, flew from Toronto, Canada to Deception Island, and back, with only one stopover in the Falkland (Malvinas) Islands, after surveying 116.000 km² of unmapped terrain in Antarctica.

Reference has been made to the role of support vessels during the whaling age and subsequently during the so-called “Mechanical Age” when aviation developed in Antarctica. Such support was essential for the development of communications and mail services which are so indispensable to Antarctic expeditions. *The Discovery* from Captain Scott’s expedition went through the Strait of Magellan in one of its return trips to England only to drop its mail at Punta Arenas. The Chilean and Norwegian whaling companies provided those mail services to Punta Arenas and Sandefjord respectively, but it was Edward Binnie, Stipendiary Magistrate resident on Deception Island who inaugurated formally a Post Office in Whalers Bay, with a service to Port Stanley, with a first cancellation on 6 March, 1913. While the administrative post operated only during the whaling season, a mail service contracted by the Colonial Administration of the Falkland Islands with Tonsbergs Hvalfangeri provided mail, passengers and cargo services between Port Stanley, South Georgia and Deception Island from 1924 until 1971.

Certain jurisdictional acts took place on Deception Island, and rather than arguing on their merit, enhancing or challenging their validity, narrowing or expanding their scope, we should try to understand their true meaning, and assess their value as a lesson to be learned in Antarctic cooperation. The lesson to be learned is that the most effective acts are those which endured as practical benefits to the community. Admittedly, salvage operations are not intended to generate any jurisdictional effect, and the most famous of those, the rescue of the *Telefon* was sanctioned by a Standing Maritime Court of the South Shetlands, “the first and possibly the last to be held in that remote place” (Heyburn & Stenersen, 1988). The important aspect in any of these operations was the central role of Deception Island, which became the hub of a system of maritime assistance. The fact that Deception Island would also become the springboard for aerial exploration of the Antarctic hinterland (Wilkins, Ellsworth and the British project with Hunting Aerosurveys) is quite significant, not just in the more obvious geopolitical perspective of these ventures, which certainly may have a component of national competitiveness (such as naming landmarks, depositing cylinders, flags and messages) but because of their prevalingly international dimension.

The establishment of postal services also has played a role in the global Antarctic controversy with a substantial record of inconclusive exchanges between claimants and non-claimants. In the very specific context of Deception Island, we have recalled how the valuable element in Binnie’s Post Office was not necessarily the formal inauguration of a service which already existed, and continued to exist towards other destinations than Port Stanley, but the substance which was afterwards provided to the continuity of that service by agreement between the administrative authorities of Port Stanley and the Tonsberg company.

More important were some activities undertaken by the magistrates who reported births, marriages, and deaths to the Colonial Registrar General in Stanley. These records, many of them now held in the Scott Polar Research Institute (SPRI), in the case of Deception Island, have a rather ominous meaning because no entries are related to births or marriages, but all are marked “Magistrate” indicating that such a record concerns a “death” (Headland, 1981-86). Interestingly enough, the Norwegian company also held records of those deaths in a logbook whose original has been lost (Olsen, 1972) but copies may exist in the company’s archives in Norway. The determination by the Magistrate of the causes of death stops at the threshold of effective jurisdiction because none of the deaths recorded for Deception Island is typified as a “crime”. Much more enlightening is the knowledge we obtain, reading the reports of the *Norvegia*’s visit to Deception, of the

work performed by Dr. Nolan, a British physician resident in the island, in establishing the causes of these deaths, and the fact that the British Magistrate at the time of this visit , Gregor Brechin, had a Norwegian assistant, Johan Aarseth.

The threshold was crossed only once, long after the life-time of the Deception Island settlement, but significantly enough by the British Magistrate who tried and punished a man for savagely throwing a penguin to the dogs. Punishment is appropriately imposed by a judicial authority on one of his own subjects, a rule which is preponderantly applied in Antarctic jurisdiction. From the perspective of a rival claimant nation, one would instinctively tend to diminish the importance of this adjudication which, taken together with the Maritime Court of 1908 which heard the circumstances of the salvage of the *Telefon*, are the only records of this type of judicial findings. However, in both cases, a vital experience comes to the forefront, and issues concerning legal responsibility and liability emerge. Something that reinforces our belief that the lesson arising from Deception Island is one of constructive evolution, rooted in practical considerations, in order to prevent that the lack of any jurisdiction erodes compliance with the norms of the special legal and political regime applicable to Antarctica.

The least attractive part of our past history is precisely the confrontation centering in Deception Island, more than other areas of Antarctica, due to its symbolic meaning . To recall that a measure of conflict took place, including some actions which generated passionate reactions in the contending countries, is necessary. What remains essential is to recall that since 1948 a regime of restraint applied to the naval of the three overlapping claimants, that it was supported by the United States, and that such agreement implicitly clustered around Deception Island foreshadowed the final demilitarization of the Antarctic Continent. The aftermath of the more controversial events of the nineteen fifties was provided by their capability to cooperate during the International Geophysical Year (IGY), to agree upon the balance and function of their bases in that endeavour, and, in so doing, to establish a firm foundation to the negotiations for the Antarctic Treaty.

The impulse towards an expanded Antarctic System, encompassing many new actors, went beyond that type of spontaneous cooperation. We operate nowadays within a framework which demands increasingly more from each Antarctic actor. But such progress, any progress, is possible only because there was once, in the beginning, a solidarity which arose naturally and fraternally in the midst of an Antarctic community. This is the legacy that Deception Island bestows upon us, and surely Deception itself is entitled to a reward, no more but not less than the protection which the Protocol extends to the whole of Antarctica.

Background Documents

The following Background Documents, which have been included in this publication are relevant to the overview :

- I. A Chronological History of Deception Island (Adapted from Robert K. Headland. Chronological List of Antarctic Expeditions and Related Historical Events. Cambridge, 1989).
- II. R.K. Headland. Whalers' Cemetery: Deception Island, South Shetland Islands.

Tourism at Deception Island

John Spletstoesser¹ and Denise Landau²

Tourism at Deception Island has been very popular for many years, with one of the highlights being the 'swim' at Pendulum Cove, an event advertised prominently in many of the tour operator's brochures. This background document provides information on each of the four commonly visited sites on the island (Fig. 1), some history of each, reasons for the visit, and how shore operations are conducted.

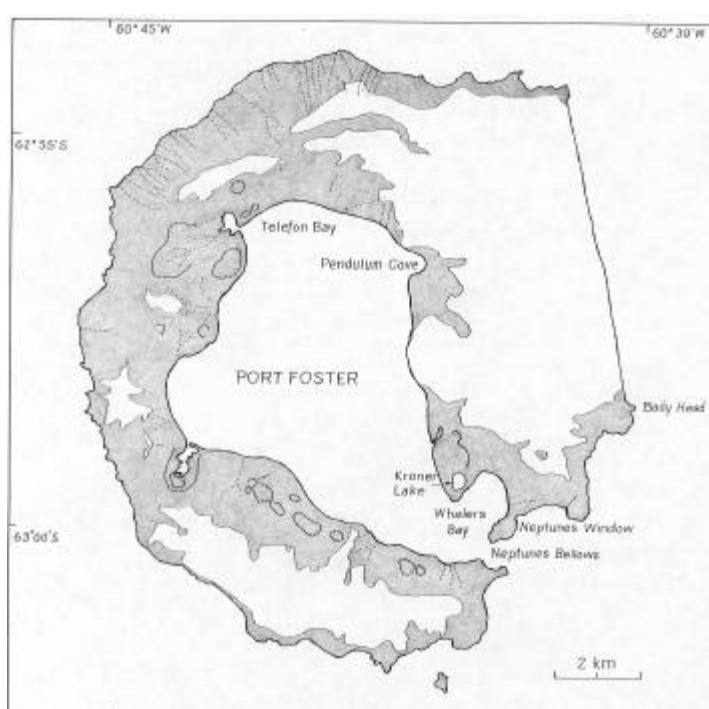


Figure 1. Map of Deception Island, showing main features.

Tourist visits are conducted primarily by cruise vessels that include IAATO member vessels and non IAATO member vessels, yachts, and national program supply vessels. IAATO member vessels currently range from 22-280 passengers per visit. The Marco Polo currently visits Pendulum Cove only and usually carries 500+ tourists per departure. During the 2000-01 season there were 117 vessel departures to the Antarctic Peninsula. Final numbers and statistics have not yet been compiled for 2000-01 season.

¹ P.O. Box 88, Spruce, Maine 04859, USA. Jspletts@midcoast.com

² IAATO. 0025 Dakota Meadows, Carbondale, CO 81623, USA. iaato@iaato.org

Tourist landing sites on Deception Island

1. Baily Head

Baily Head was named by FIDS in 1953-54 for Francis Baily, English astronomer who reported on Foster's pendulum observations made at Deception Island in 1829. It is also known as Punta Rancho (Camp Point), or Rancho Point, a name proposed by the commander of the Argentine ship *Granville* in 1947 through having observed that the feature resembles a hut with a double-pitched roof. That spectacular feature, plus the large colony of Chinstrap Penguins that breed there is a primary attraction for tourism visits. About 100,000 breeding pairs of penguins can be found there (1989 census--Woehler, 1993), although Naveen (1997) mentions a decrease since 1989. Naveen's (1997) map and description provide details of the normal landing site and distribution of penguins at Baily Head.

The beach there is exposed to open seas of Bransfield Strait, and often exhibits considerable swell and surf conditions that prevent landing by zodiac. When suitable for landing, zodiacs land on an ash beach between the high cliffs to the south and the extensive glacier cliff, which forms the eastern side of the island. This beach is also the terminus of meltwater streams, which drain snowfields, and glaciers of the interior of the valley where the penguins can be found. In the latter part of the summer, large numbers of Antarctic fur seals are often found on the beach. This is one of the two pathways that the penguins use to reach the sea and return to nests after feeding. Thus, there is often a constant stream of penguins coming from the valley to the sea, and others coming in from the water and heading into the valley. Large numbers of birds also are found on the beach itself. Leopard seals are often seen patrolling in the water near the beach, on the lookout for stray penguins. An occasional fur seal has been known to attack and kill a penguin as well, but this is not common.

After landing tourists on the ash beach, they are given a briefing of what is to be seen here, and a staff naturalist then leads a group of 15-20 tourists away from the beach toward the nesting sites of the penguins. Tourists are cautioned about staying at least 15 meters/50 feet from the fur seals, and not to get between seals and the water. Along the way, several highlights are pointed out, such as the near-vertical cliffs of volcanic tuff, which provide nesting sites for cape petrels and for growths of lichens (*Usnea* sp.). Snowy sheathbills nest among the avalanched boulders adjacent to the landing site, as do Wilson's Storm-petrels. Excellent examples of volcanic bombs can be seen within the ash beds of the tuff. Tourists are cautioned about staying a safe distance away from the cliffs, for evidence of occasional rockfalls is apparent.

A walk of about 100 meters/330 feet leads to an open panorama of an amphitheater crowded with chinstrap penguins, a truly spectacular sight. Tourists are led to a knoll where the view takes in most of the breeding birds, and once again briefed on what they are seeing--biology of the penguins, breeding behavior, whether to expect eggs or chicks, depending on the time of the season, and they are also cautioned about maintaining a safe distance (>5 meters/15 feet) from nesting birds. The noise of the busy penguins is very noticeable.

An occasional macaroni penguin can be seen among the chinstraps, perhaps breeding here. Some of the chinstraps often show flipper tags, signifying a research bird banded by scientists. Brown skuas are also breeders here, and occasionally show banding rings on legs.

Tourists are then left on their own, if they like, to enjoy the experience by themselves but advised to stay within view of a naturalist or take along a friend for safety, or follow the naturalists who continue with the group to various viewing points in the colony, explaining further what is seen. The very abundant alga, *Prasiola crispa*, is pointed out, covering the bare ground nearly everywhere, as are lichen stands on some of the hillsides. Plants are to be avoided when walking, whenever possible, although *Prasiola* is not necessarily

an example of a vulnerable species, and it is virtually impossible to avoid it on the bare ground away from nesting sites. One of the more popular walks goes to the cliff at the rear of the colony, with a spectacular view of the entire area of nesting birds.

About three hours are normally sufficient to experience the enormity of the spectacle, and its sounds and smells. Tourists then leave the landing site at the same beach. A high surf often makes this an interesting experience. Humpback whales are commonly seen in the waters around Baily Head, and the view of Livingston Island from here on a clear day is a memorable sight.

2. Whalers Bay

Whalers Bay is located just inside Port Foster, the flooded caldera of Deception Island, which was known to sealers from 1820 onwards. It is seen immediately to starboard after passing through the high, volcanic tuff cliffs of the narrow entrance to the caldera, Neptune's Bellows. On the port side can be seen the rusted hull of the whale-catcher *Southern Hunter*, wrecked here on 21 December 1956 while entering Neptunes Bellows.

Whalers Bay is the site of considerable history in this part of Antarctica, not only of whaling activities but also exploration and research. It was named by the French explorer Jean Charcot in 1908-10 because of the use by whalers. The Norwegian whaling captain Adolf Amandus Andresen, who lived in Punta Arenas, Chile, moored the first whaling floating-factory here in December 1906. A memorial plaque was erected in the mid-1990s in his honor (Historic Site No. 58).

The most obvious features at Whalers Bay are the remains of the shore-based Hektor whaling station, started here in 1912 and operated until 26 April 1931 when whaling ceased at Deception. The cookers were used to boil the oil out of the whale blubber, and the oil was then pumped to the adjacent tanks. Ruins of the whaling station are immediately adjacent to the zodiac landing site. These tanks were used for storage of whale oil and also for ship fuel at various times. The zodiac landing site is on a flat, volcanic ash beach between the storage tanks and the grounded drydock, which was used to raise ships for hull and propeller repair. Although weather can be a factor in sea conditions and wind in Port Foster, it is nearly always possible to land by zodiac at Whalers Bay.

Kelp gulls and Antarctic terns nest among the cookers, as evidenced by the piles of limpet shells and also by the terns' raucous calls when the parents are guarding nests. The only other wildlife in evidence inside Port Foster is the occasional Chinstrap or Gentoo Penguin on the beach, clubs of brown skuas, normally seen at a pond near the drydock, and numerous cape petrels nesting on the cliffs at Neptunes Bellows and also on the cliffs between there and Neptunes Window. In late summer, Antarctic fur seals haul out on the beaches around Whalers Bay, and a few Weddell Seals are seen on the spit at Kroner Lake.

After tourists are landed by zodiac at the whaling station, two groups are normally formed—one led by naturalists for a walk to Neptunes Window, and one to tour the station. Naturalists and historians are on hand to explain the significance of the station and its occupants at various times in the last century. The walk to Neptunes Window is on a flat beach up to a slight rise for the approach to the Window. On the way are well heads, numerous piles of wooden barrel staves and remains of water boats, used to transport spring water to the whaling boats. At least one fresh-water spring existed on this part of the beach. Care is taken to avoid the lichens (*Usnea* sp.) on the ground, and also to avoid the area below the cliffs on either side where cape petrels can be heard on their nests. The potential of avalanching boulders here make this precaution imperative. A worn walking path is evident on the route to the top of Neptunes Window, where a spectacular view can be had toward the Antarctic Peninsula. It is said that the United States sealer, Nathaniel Palmer, probably saw the Peninsula from Neptunes Window in November 1820, one of the earliest sightings of continental Antarctica.

On 16 November 1928 Sir Hubert Wilkins (with pilot Carl Eielson) made the first powered aircraft flight in Antarctica, starting at Whalers Bay. On 14 October 1934, the United States aviator Lincoln Ellsworth arrived at Whalers Bay on his ship *Wyatt Earp* to plan for an aircraft crossing of Antarctica. Port Foster was ice-free, which afforded no possibility of takeoff from sea ice. A change of plans to take off from the snowfield next to the whaling station was aborted by a mechanical failure. By the time a replacement part arrived from South America, all the snow was gone, so he left Deception Island for an attempt elsewhere. He finally made the flight the next year, in 1935-36, using Dundee Island as a takeoff point.

The whaling station itself also has other structures around it to illustrate the other parts of the history of Whalers Bay. The remains of the Falkland Islands Magistrate's house, near the station, are now also ruins. The Falkland Islands Dependencies Survey (now British Antarctic Survey) established a station here on 3 February 1944 (Base B), which was occupied until a series of volcanic eruptions began in 1967. In 1955-56 and 1956-57, Hunting Aerosurveys Ltd, under contract from the British Colonial Office, conducted a series of vertical air photography of the South Shetland Islands and the Antarctic Peninsula south to about 68 degrees latitude. A wooden building in back of the oil tanks remains from that era. The other buildings date to the British Antarctic Survey occupancy -Biscoe House- the largest remains intact except for the hole through the middle of the building. A metal airplane hangar was used for servicing single-engine Otter aircraft, for example, and was intended for expansion to receive twin-engine Otters when volcanic eruptions occurred and the station was abandoned. Steel girders for the hangar expansion lie outside the building. The fuselage of a stripped single-engine Otter can be found outside the hangar.

In December 1967, while the British station was occupied, as well as those of Argentina and Chile in other parts of Port Foster, a volcanic eruption at the north end of the island necessitated a total evacuation of the island. In February 1969, a further eruption on the westernmost side of Mount Pond occurred, melting glacier ice and producing mudslides with ice blocks (lahars) that flooded and destroyed the Chilean base and also the whaling station and buildings at Whalers Bay. Only the British base was occupied at that time, and all were evacuated. The British have not occupied the station since, except for occasional summer parties. The whalers cemetery was buried beneath the mud, and Biscoe House was wrecked when ice blocks went through it. A memorial cross, dedicated to Hans A. Gulliksen, a ship carpenter, is located between the whaling station and the hangar. (Dates on the cross are 7/4-71 -- 4/1-28, putting his death at the time of whaling station activity.) Gulliksen is interred in the whalers cemetery, but after it was buried in the 1969 eruption, relatives in Norway had the cross erected in his memory. The remains of the Norwegian whaling station were designated as Historic Site No. 71 under the Antarctic Treaty, 19 May 1995. Historic Site No. 31 commemorates the whalers cemetery where some 40 Norwegian whalers were buried in the first half of the twentieth century. The volcanic activity in 1967-70 is described in detail by Baker *et al.* (1975).

There is thus much to see and experience at this tourism stop, with more than a century of history in evidence. Tourists on board vessels should receive the following briefing information:

1. Do not enter buildings.
2. Do not get too close to oil storage tanks--foundations are washing out.
3. Avoid nesting terns and kelp gulls.
4. Avoid walking on vegetation--there is considerable moss at Whalers Bay, and *Usnea* lichens at Neptunes Window.
5. Do not walk beyond the hangar. SSSI No. 21E at Kroner Lake is nearby. Kroner Lake "is a small shallow crater lake with geothermal activity, the water and shore being warm to hot and the benthos colonized by various thermophilic algae." Continuing research on these areas is intended to examine succession of organisms associated with heated ground.
6. No graffiti allowed.
7. Do not take souvenirs, and do not disturb artifacts.

In August 1970 there was further activity along the northern edge of Port Foster, with eruptions occurring in about the same general area as in 1967, and a chain of new craters was developed at Telefon Bay.

3. Telefon Bay

Telefon Bay is named for a collier (*Telefon*) that was moored here in 1909, awaiting repairs. The whaling supply ship was blown on to Telefon Rocks, off King George Island, on 27 December 1908, and abandoned. Subsequently, Captain Adolf Amandus Andresen salvaged and moved the vessel to Telefon Bay. After winter, repairs were made and *Telefon* reached Punta Arenas.

A zodiac landing site is located on a wide, flat beach, from which a broad valley leads uphill for about 300 meters/985 feet to the steep face of a series of craters resulting from the 1970 volcanic eruption. The nearest accessible crater has a flat floor with an inflow of meltwater from a nearby glacier. The glacier is mostly ash-covered with ash layers visible within ice layers. The sides of the crater must be approached with caution because the concentric cracks around the edges imply that sloughing can easily occur. The valley from the beach landing site to the crater wall has numerous volcanic bombs littering the ground. There is no resident wildlife at this location. The visit is made mainly for the exercise of the walk and to view a significant product of the 1970 eruption.

4. Pendulum Cove

This cove is located on the northeast side of Port Foster, and is a popular tourism stop. It is also the site of the Chilean station Pedro Aguirre Cerda that was destroyed in the eruptions of 1967 and 1969. About 300 meters/1,000 feet south of the station is SSSI 21D, consisting of "two areas of heated ground--on the beach close to the shore and inland in a gully--where unique bryophyte communities have developed containing several species not known elsewhere in the Antarctic." This site is not well marked, and tour visits are managed so that tourists do not go inland beyond the uppermost storm berm on the beach landing site. Some tour vessel staffs place orange traffic cones in the area to illustrate a visible boundary that tourists are advised not to cross.

The name of Pendulum Cove derives from the pendulum and magnetic observations made there by the British expedition under Foster in 1829. The attraction here is the possibility of a 'swim' in geothermal waters, normally active at intertidal levels. Tourists are brought ashore in zodiacs adjacent to the area where the water is normally 'hot' and steaming. The steam often has a sulfurous odor, and boiled krill are often found in the water and on the beach. Antarctic terns are often at this location to pluck the krill from the water.

Tourists arrive with parkas and cold-weather gear over swim suits, disrobe and enter the water where staff have already determined the best places for the 'swim.' Tourists are advised in a briefing on the ship that they must have footwear of some sort to avoid scalding their feet. Sneakers or boots are commonly worn--socks only are unacceptable. The best conditions are achieved by crouching or lying prone in the water and mixing cold water with hot water. Towels are provided by the ship staff, and the swim is normally of short duration, especially when there is any wind. Zodiacs and drivers wait at the beach to transport the 'swimmers' back to the ship as soon as they have dressed to avoid chilling. This visit is normally less than an hour's time. The only wildlife here, aside from Antarctic terns, is an occasional Weddell seal on a nearby beach, a solitary Gentoo or Chinstrap penguin, often molting, and kelp gulls.

Briefings that apply at this location include the following:

1. Proper dress ashore must include footwear if entering the water, and stay within the authorized swimming area.

2. The only authorized area ashore is in the vicinity of the swimming beach--do not approach the ruined Chilean station, or the area of the SSSI.
3. Do not approach molting penguins, if present.

Environmental Risk

In addition to the above mentioned guidelines and briefings we have a ship wide policy distributed to IAATO and non IAATO vessels for boot and clothing decontamination to help prevent disease transmission.

Boot and Clothing Decontamination IAATO's Recommended Guidelines

Introduction

While there is at present no conclusive evidence that tourists have introduced or transmitted diseases within Antarctica, there is indirect and circumstantial evidence that raises concern. There is the potential for visitors to be vectors of disease, both into and within the Antarctic ecosystem.

To minimize this potential IAATO recommends decontamination practices similar to those of the quarantine authorities of most countries who protect themselves from the introduction of external diseases.

Recommendations

1. In pre-voyage information:

1.1 Passengers are advised that Antarctica is an isolated continent and as far as we know is free of introduced diseases. We must ensure it remains so.

1.2 Passengers are advised that all boots and clothing must be clean before joining the ship. Those who go trekking, tramping, backpacking, farm visiting prior to the voyage must clean their boots and clothing thoroughly to remove all material from them. Tripod feet can also collect mud and seeds and should be checked regularly.

2. Pre-landing briefing:

2.1 Passengers are reminded that they must have clean boots and clothing to go ashore. Facilities will be available on deck for those who need them (the boot washing station).

3. Landings:

3.1 As far as possible, avoid walking in concentrations of organic material such as guano, seal placenta, seal faeces, in order to avoid moving this material around the landing site.

3.2 A simple brush scrubber at the landing site helps to clean boots before entering the zodiac. The device at the landing site is simply a three-quarter-inch-thick plywood sheet about 2-3 feet square with a couple of stiff-bristle scrub brushes attached, placed so that boots can be placed between them and vigorous brushing cleans the sides of the boot, while a brush on the bottom cleans the sole. The scrubbers are then thoroughly rinsed at the end of the landing period, and put into the zodiacs for return to the ship.

3.3 Before boarding the zodiac or helicopter, wash as much material off boots and clothing as possible. Ensure that whatever touched the ground ashore (backpacks in particular), boot cuffs, exposed velcro be inspected, brushed off, etc., before leaving the beach. Seeds and other vegetation in the Sub-Antarctic islands could easily be transported if not cleaned thoroughly.

3.4 On returning to the ship, boots and clothing must be cleaned thoroughly at the boot washing station.

4. *The boot washing station:*

4.1 This is a facility on deck at the head of the gangway (or in close proximity to the point of return of passengers where zodiacs or helicopters are used). It requires

- Running water and a hose.
- Drainage of water off the ship.
- Scrubbing brush and or coarse mat and shallow tray by which all debris can be scrubbed from boots and clothing
- A member of staff or crew to assist passengers to inspect their boots and clothing for complete decontamination.

5. *Between landings*

5.1 Every effort must be made to ensure that boots and clothing dry out completely between landings. (Desiccation is an important mode of controlling some micro-organisms).

6. *At the next pre-landing briefing*

6.1 Ask passengers to check that boots and clothing are clean before leaving the ship.

Trends

There has been an upward trend over the last 10 years with regard to both visitors and landings. IAATO expects this trend to continue rising over the next few years as more vessels operate Antarctic voyages. The following is a historical statistics and five year forecast of seaborne Antarctic tourism 2000-2005. This guestimate is based on current available information and could change in the future. It also includes seaborne tourism in both the Antarctic Peninsula and all other areas.

Year	#Operators	#Ships	#Voyages	# Passengers		
				Multiple Landings	No Landings	2 or less landings
1992-93	10	12	59	6704		
1993-94	9	11	65	7957		
1994-95	9	14	93	8098		
1995-96	10	15	113	9212		
1996-97	11	13	104	7322		
1997-98	12	13	92	9,473		
1998-99	15	15	116	9,857		
1999-00	17	21	154	11,880	936	1807
Forecast						
2000-01	20 (plus yachts)	19	142	12,993	0	0
2001-02	24	24 (plus yachts)	158	14,500	3000	?
2002-03	24	26 (plus yachts)	166	15,500	3000	?
2003-04	25	27 (plus yachts)	170	15,500	3500	?
2004-05	25	27(plus yachts)	170	16,000	3500	?

Summary

Tourism visits to Deception involve four sites, only one of which has substantial wildlife, a large Chinstrap Penguin colony. Many years of experience in visiting them has resulted in well-managed stops, without threat to wildlife, terrain, or historic content. Because Deception Island is on most of the itineraries of tour vessels in the Antarctic Peninsula, proposed schedules for operators are circulated in advance, and

confirmed by Expedition Leaders as dates of the visits approach so that more than one vessel does not appear at the same place. Because there are four sites visited, vessels in the area often alternate sites so that scheduled itineraries can be carried out. It is not uncommon for one ship to pass another at a shore visit to Whalers Bay while cruising on the way to Pendulum Cove, for example, and then alternating sites later.

Statistics on tourism visits to the above-mentioned four sites can be found at the IAATO website, which illustrates figures for all sites visited in the Antarctic Peninsula for the period 1989-90 to 1999-00. (Figures for the 2000-01 season are awaiting compilation pending return of tour operator's seasonal records.) Summaries of statistics for the four sites are listed in Table 1, showing that nearly 95,000 visitors have landed at the four sites discussed above in the 11-year period 1989-90-1999-00. Gradual increases occurred from 1998-99 to 1999-00, continuing a trend since 1996-97. Landings, and corresponding tourists, at Whalers Bay show the largest increase of all four sites (86 landings and 7,333 tourists in 1999-00 compared with 69 and 5,427 the previous year). Figures for Pendulum Cove also show comparable increases. Visits to Baily Head are often dictated by weather and beach conditions, and many tour vessels, although planning a visit there, are often turned away and opt instead for visits inside Port Foster, thus raising figures for Whalers Bay and Pendulum Cove, in particular, the two most popular locations for visits. Telefon Bay is visited least of the four because of the lack of wildlife, and is often scheduled as fourth in ranking for all potential visits to Deception Island. It is expected that the figures for 2000-01 will be about the same as the previous year, or slightly higher. Figures for visits by yachts are incomplete and are not included here.

It should be noted that because of the popularity of visits to Deception Island, and the presence of active summer stations there (Argentina, Spain), Port Foster can often be a busy place. Many instances have been noted of Treaty Party supply ships, helicopters, and zodiacs at mainly Whalers Bay and Pendulum Cove because of the presence of the whaling station and the ruined Chilean station. Some incidents that have been observed demonstrate the problems that can arise with members of government programs, and the impacts that they can have. Several of these incidents at Deception Island are elaborated by Riffenburgh (1998), as well as at other locations in Antarctica, as a result of government personnel presumably being unaware of the provisions of Treaty Recommendation XVIII-1. In one case, eight tourists on a government supply ship mentioned when asked by staff on a tour operator's vessel that they had received no briefing on conduct while ashore, and were unaware of the SSSI at Pendulum Cove, for example. The same supply ship also had a dog aboard. Tourists and ship personnel walked directly through the SSSI area on the way to examine the ruined Chilean station, and other infractions were also noted.

In other cases, a zodiac from a government supply ship went from the ship into Kroner Lake (SSSI No. 21E) to pick up ship crew from the area of the hangar (personal observations), and during the same visit the ship's helicopter 'buzzed' people ashore and disrupted the nesting terns and gulls at the whaling station ruins. Situations like this are especially awkward when observed by tour operators and their tourists, who query the need for Guidelines if not evenly practiced or enforced.

Although these are isolated incidents, it is apparent that not all government programs provide necessary briefings for personnel while in Antarctica, and while ashore, no supervision or management is conducted. It is probably not a simple matter to inform all personnel concerned, considering the numbers of Treaty Parties involved, and the vast number of ships and personnel, but it is recommended that some standardized means be implemented to circulate the guidelines of Recommendation XVIII-1 to everyone entering Antarctica, for whatever reason. All tour operators, for example, have copies aboard ships for distribution to all tourists; briefings of the content as well as reminders prior and during shore visits help to ensure that the guidelines are carried out. Recommendation XVIII-1 has been made available in not only the four Treaty languages but also in several others (German, Japanese) in order to ensure that all tourists, and ships' crew, are made aware of this important document.

Deception Island is a special place in Antarctica in view of its long history of exploration, sealing, whaling industry, research, and volcanic activity--the latter is probably not yet over. Everyone should, and can, enjoy and experience all these features in order to fulfill their visit to Antarctica.

Readers are invited to the website (www.iaato.org) of the International Association of Antarctica Tour Operators (IAATO) for information on the organization, statistics on tourism, a Membership Directory, and other aspects of its history.

References

- BAKER, P. E., I. MCREATH, M.R. HARVEY, M.J. ROOBOL, and D.T.G. DAVIES, 1975. The geology of the South Shetland Islands: V. Volcanic evolution of Deception Island. British Antarctic Survey Scientific Reports No. 78, 8. p. + 13 plates.
- NAVEEN, RON, 1997. The Oceanites Site Guide to the Antarctic Peninsula. Chevy Chase, Maryland, Oceanites Inc.
- RIFFENBURGH, B., 1998. Impacts on the Antarctic environment: Tourism vs government programmes. Polar Record, v. 34, no. 190, p. 193-196.
- WOEHLER, E.J., 1993. The Distribution and Abundance of Antarctic and Subantarctic Penguins. Cambridge, Scientific Committee on Antarctic Research.

WORKING GROUP REPORTS

Management of Environmental risk

Chair: Patricio Eberhard

Rapporteur: Rodolfo Sanchez

Patricio Eberhard as a Chairman of the Group, started discussions on the issue of E.R.M. presenting a double entry matrix model that identified activities undertaken at Deception Island and values likely to be affected by these. The aim of this matrix was to help identifying potential mitigation measures.

The elements (activities) for the matrix are

Structure

- Permanent Stations
- Field Camps activities
- New buildings construction
- Historic Stations and sites

Transportation

- Use of boats
- Use of all terrain vehicles
- Use of helicopters
- Marine oil spill
- Terrestrial oil spill

Tourism

- Introduction of non native species
- Souvenir collections by tourists
- Waste, debris, litter
- Footpaths
- Visit a SSSI

Scientific Activities

- Introduction of non native species
- Samples collection
- Waste, debris, litter
- Footpaths

Waste

- Remove / maintain non hazardous waste
- Remove / maintain hazardous waste
- Use of incinerator
- Use of water treatment plants

The values proposed were:

- Impact on vegetation
- Impact on wildlife
- Impact on topography
- Aesthetic impact

The variables for the matrix are: nil, low, high, very high.

Discussion:

Although initially conceived as a matrix to be filled up, as a indicator of impacts, the participants to the Group considered more appropriate to take the matrix as a model which orientates actions to be taken.

The UK proposed that the main users of the Island give their inputs to the list by describing their activities. Argentina, Chile, Spain, UK, USA and IAATO made a brief overview of them.

Some concerns were identified by the users, mainly those related to communications between stations present in the island, and ships as well as field parties, due to the likely case of a seismic-volcaic event.

After having discussed on these items, some of the participants have suggested incorporating historical, scientific and wilderness resources, as well as educational possibilities, to the list of Deception Island’s values, likely to be affected by the activities conducted there. Other proposals include modifying the list of activities, in order to better describe them.

Finally, the Group concluded that the list was useful to identify likely sources of conflicts, and that these considerations should be drawn on by the four groups to the established within the Workshop, immediately afterwards.

Matrix Environmental Risk

Nil, low, high, very high

	ACTIVITY	IMPACT ON VEGETATION	IMPACT ON WILDLIFE	IMPACT ON TOPOGRAPHY	AESTHETIC IMPACT
STRUCTURE	PERMANENT STATIONS				
	PERMANENT STATIONS				
	NEW BUILDINGS				
	HISTORIC STATIONS				
TRANSPORTATION	USE OF BOATS				
	USE OF VEHICLES				
	USE OF HELICOPTERS				
	MARINE OIL SPILL				
	TERRESTRIAL OIL SPILL				
TOURISM	INTRODUCTION OF NOM NATIVE SPECIES				
	SOUVENIR COLLECTIONS BY TOURISTS				
	WASTE, DEBRIS, LITTER				
	FOOTPATHS				
	VISIT A SSSI				
SCIENTIFIC ACTIVITIES	INTRODUCTION OF NOM NATIVE SPECIES				
	SAMPLES COLLECTION				
	WASTE, DEBRIS, LITTER				
	FOOTPATHS				
WASTE	REMOVE NON HAZARDOUS WASTE				
	REMOVE HAZARDOUS WASTE				
	USE OF INCINERATOR				
	USE OF WATER TREATMENT PLANTS				
NATURAL DISASTER	VOLCANIC ERUPTION				

The way forward for the Workshop and the Deception Island ASMA

Chair: Joyce Jatko

Rapporteur: Roderick Downie

Introduction

Note*

1. The group held differing views on how the Workshop should proceed:

either - discuss what Option 4 might look like i.e.. the concept of zones:

or - start drafting a framework Management Plan based upon the existing Admiralty Bay ASMA Management Plan.

Zones

2. The group discussed the concept of zones. USA described zonation as a useful management tool involving prohibitions, restrictions and guidelines to avoid conflict. Argentina questioned whether the ASMA should comprise ASPAs and HMSs only, and that the rest of island would be covered by a general Code of Conduct. There was agreement that Annex V allows for zones. The concept of including zones within the ASMA was accepted without agreeing the types of, or specific features about, such zones.
3. IAATO raised discussion on whether there was a need for zones for tourism, which would restrict landings elsewhere on the island.

Framework Management Plan

4. Participants were tasked with assessing how the Admiralty Bay ASMA Management Plan could be used as a framework for Deception Island.
5. Jerónimo López-Martínez, Rod Downie and John Shears were tasked with producing a “skeletal” ASMA Management Plan for the group.

Workshop Guidelines for Drafting Groups

6. The Guidelines for Drafting Groups (attached) were revisited by the group. There was general agreement for points 1-3, however it was agreed not to proceed with point 4 concerning the drafting of a report for the CEP.

* This session was scheduled as a discussion on Multiple Use Resource Management based upon Natural Features and Permanent Structures. However, an open discussion on how the workshop should proceed, and the Guidelines for the Drafting Groups, was held instead.

7. The group agreed that point 5, Management By Information, would be a useful interim and ongoing approach. Consideration needed to be given to:

Who? (target group) – all that visit Deception Island;

What information to be included? General introductory and historical information, as well as Visitor Guidelines specific to each site visited by tourists;

Who to prepare it? – Unresolved;

When? IAATO suggested in time for the IAATO meeting in July 2001.

8. Point 6 Further Work. Argentina tabled a proposal for a Joint International Expedition to Deception Island (see Acero, J. And Sánchez, R. Towards an agreed strategy for the future management of Deception Island).

Other Business

9. Chile indicated that GIS and METADATA could also useful future tools for the management of activities at Whalers Bay.

Report of Working Group 1

Management of Historic Sites and Areas

Chair: Gustav Rossnes

Rapporteur: John Splettstoesser

1. The group discussed three categories of value attributed to historic sites and areas: historical, scientific, and educational.
2. The primary historical values relate to structures of the whaling industry, base occupation, and associated artifacts in the Area. Further values relate to sealing, aviation, and exploration in the period of whaling activity, mutual assistance (solidarity) was evident in the presence of a light for navigational purposes.
3. Scientific values were discussed in relation to the volcanic lahar and its destruction of the structures at Whalers Bay, providing visual evidence of the power of this unique geologic event. Further scientific values relate to the potential for discovery and analysis of structures and artifacts, as they relate to the history of occupation, discussed above.
4. The educational value for visitors to view an outdoor museum consisting of the ruins of one of the earliest whaling stations in the Antarctic, as well as the British bases with their roles in exploration and research.
5. The value of artifacts was discussed in their relation to the distinction between waste and garbage. The point was made that the value of waste lies in its record of many of the activities present at Whalers Bay. It was agreed that before artifacts are considered for clean-up or removal, they should be inventoried and documented (including mapping) for their historical and cultural value. Also, waste whose risk to the environment or to human or wildlife safety outweighs its historical benefits (i.e. toxic waste) should be identified and disposed of properly.
6. The group agreed to the amalgamation* of the three existing HSMs at Whalers Bay (HSM No. 31, 58, 71) into a single HSM. This was agreed upon because of the benefits of having a single, rationalized management plan.
7. It was acknowledged that there is a need to identify boundaries for the new, rationalized Whalers Bay HSM, including specific guidelines for certain components such as the cemetery. Further, the educational value of the HSMs would be enhanced by making available informative material. Special note was made and illustrated of the recently surveyed GPS-controlled map produced by the Chileans of artifacts and structures at Whalers Bay.
8. The group discussed that it would be beneficial that the ruins of the Chilean station at Pendulum Cove be proposed as a new and separate HSM.
9. It was recommended that Guidance for Visitors, Recommendation XVIII-1 be reviewed and modified for application for visits to the historic sites and areas.

* *Editors Note: The precise meaning of this "amalgamation" includes the adoption of any of the two options contained in the background text "Draft Elements for a Management Plan of Deception Island as an ASMA", Section 7, paragraph HSMs, pp. 99.*

10. It was recommended that the existing information on historic sites and areas be assembled and collated in order to form a baseline for inventory and survey of the sites.
11. It was recommended that options be formulated with regard to disposal or preservation of structures and artifacts.
12. It was acknowledged that there is a need for interpretive material to be made available to visitors to the historic sites and areas.

Report of Working Group 2

Scientific Research and Station Management

Chair: Jerónimo López

Rapporteur: Birgit Njaastad

1. After a discussion of general aspects related to science at Deception Island, the group focused its discussion on the scientific values of the island, and how these best could be taken into account through the management plan.

Scientific values at Deception island

2. The group identified that the following scientific values are important at Deception Island:
 - Volcanology, both because of the active status of the volcano at Deception Island and because of evidence of recent eruptions.
 - Ecosystem recovery (flora and fauna, marine and terrestrial) from volcanic activity. The area could be used as a model area to study environmental changes.
 - Micro-climate
 - Glaciological record of the island
 - Oceanography (e.g. deployment of instruments, vents)
 - Bird biology
 - Environmental/human impacts studies
3. The group considered that zoning would be one appropriate action for managing the scientific values of the island.
4. Formal protection of areas of scientific value is one option for zoning. The existing SSSIs were considered as potential zones (and as future ASPAs), but it was recognized that these should be reviewed to ensure their appropriateness as protected areas. LIK indicated that it would initiate a review of SSSI No. 21. while will review SSSI No. 27. Other areas might in the future be identified as areas that would test be managed through special protection.
5. The group discussed the possibility of expanding SSSI No. 21 to include the eastern parts of Telefon Bay (immediately east of SSSI No. 21). Additional protection should be considered due to the unique geological aspects of the site, and in order to manage with respect to potential risks and impacts related to tourism activity in the area it was recognized that such considerations could be taken into account when reviewing the SSSI, but that it could be appropriate, as an interim measure, to designate the area as a zone of scientific interest (see below).
6. The group considered it useful to establish zones of scientific and/or ecological interest, as previously has been done in the Admiralty Bay ASMA. Each such zone would have to be accompanied by particular management code of conduct.

7. A number of potential zones of scientific and/or ecological interest were identified. It was recognized that this list might not be complete, and that a review by appropriate expertise would be necessary to evaluate the suggested zones, identify additional zones and suggest boundaries for these zones. The following zones were suggested by the group:
 - a. Fluvial terraces at Whalers Bay (geomorphology)
 - b. Punta de la Descubierta (penguin colony - current site of scientific investigation)
 - c. Kendall terrace areas (geology and undisturbed and representative area)
 - d. Cliff SE side of Crater Lake (botany - most diverse vegetation on the island)
 - e. Fumarolic ridge NNW of Mt. Pond (volcanology and botany - only known location for *Philonotis*, and unusual associations of taxa and unique communities)
 - f. "Perchuc Cone" (geology - pyroclastic cone and botany - colonization by lichens and moss)
 - g. Baily Head (penguins)
 - h. An area east of SSSI 21 in Telefon Bay (geology) The group noted that this area also could be considered as a potential expansion in the review of SSSI No. 21.
8. The group did not consider specific management measures for the sites identified above, and recognized that former work is needed with respect to this.
9. Further discussions will be necessary with respect to signposts and marking of protected areas and zones of scientific interest

Code of Conduct

10. In addition to the site specific guidance that will have to be developed for the sites identified above, the group considered/discussed elements that may be important to include in a general Code of Conduct for the Deception Island ASMA.
11. It was noted that visitors' interference with scientific instruments that are not located within protected areas is and may be a problem. A Code of Conduct should advise visitors not to interfere with scientific instruments and installations. It was also noted that scientists/operators should be required to label their instruments appropriately, and enable removal of the instruments as soon as they no longer are in use. IAATO noted that it could be useful in the interim to provide more specific information to tourists on what these instruments look like and where they are located. It was furthermore noted that it could be useful to maintain an up-to-date list of current instruments and installations.

Provisions for the Exchange of information in advance of proposed activities

12. The group considered exchange of information an important part of the management of the island. It was suggested that it would be very useful that the Parties working on the island exchange up-to-date information using their national Antarctic Programmes' websites under a separate Deception Island heading. It was noted that it would be important that IAATO had access to this information.

Report of Working Group 3 Deception Island Tourism

Chair: Denise Landau

Rapporteur: Patricia Vicuña

1. The group commenced the discussion with an overview of tourism at Deception Island. Deception Island is one of the most highly visited sites in the Antarctic. The current users were identified as IAATO members, non-IAATO members tour operators, yachts and national programs operators carrying tourists. The tourist season at Deception Island runs from November to March. Currently all visitors arrive by ship but other forms of tourism may develop in the future i.e. adventure, air and land-based tourism.
2. IAATO submitted an information paper that reviews tourism at Deception Island.
3. IAATO noted that in its opinion the environmental impacts of tourism is minimal considering the ten year recorded history of landings at Deception Island. The environmental impacts of tourism have not been studied in detail.
4. Future trends of Deception Island tourism show that potential numbers of tourists will continue to increase as they have in the past. There was a discussion of limiting tourist numbers in the future. IAATO can voluntarily do this, however it would be difficult regulate the activities of non-IAATO members, including other commercial tour operators, yachts and tourists with national programs.
5. The landing site at Baily Head, where there is a Chinstrap penguin rookery was discussed. One Party proposed that Baily Head should be closed to tourism on precautionary grounds. However, it was agreed that a monitoring program should be put in place to look at environmental impacts and possibly measure the carrying capacity of the site in order to have enough information to make management decisions. Measuring carrying capacity is a long term study and it may be very difficult. Concerns were raised about the short term needs that may exist, and about the logistic and financial aspects of conducting a monitoring program at Baily Head, which is relatively inaccessible. The Spanish delegates suggested that they would consult their scientists, who are actively conducting scientific research on Chinstrap penguins at Punta de la Descubierta.
6. Interim measures for management by information were suggested by IAATO, such as brochures, annual instructions to expedition leaders, IAATO Annual Meeting Briefing, etc.
7. The following conclusions were agreed upon:
 - a) Agree not to have specific tourist zones.
 - b) Identify landing sites where tourists are currently visiting or could be allowed to visit.
 - c) Merge Recommendation XVIII-I with additional guidelines specific to Deception Island.
 - d) Identify additional sensitive zones that could require management.
 - e) Recognizing the increasing trends in tourist activities and the sensitivity at Baily Head, there is a need to develop a long term monitoring program to measure environmental impacts.
 - f) Consider an industry wide impact assessment for Deception Island.

Report of Working Group 4

Emergency Response

Chair: J. Berguño
Rapporteur: J. Shears

Introduction

1.- The working group had a very useful discussion, which focussed on what emergency response procedures were needed at Deception Island, how such procedures could be developed and who should be responsible for further work.

2.- The IAATO representatives could not attend the working group. This was unfortunate as tourism is a major activity at Deception Island. The group considered that emergency response procedures need to cover both governmental (e.g. science and logistical support) as well as non-governmental (e.g. tourism, private expeditions) activities on Deception Island.

3.- The group agreed that there were two key issues concerning emergency response at Deception Island:

- Emergency evacuation of people in the event of volcanic eruptions
- Major oil spills in Port Forster

Emergency evacuation

4. There is a significant risk that Deception Island might erupt in the future. It has done so in the past. For example, eruptions in 1967 and in 1969 resulted in the emergency evacuation of the scientists and support staff on the island.

5. Spain has a very well developed evacuation plan for personnel working at Gabriel de Castilla Station. Argentina is working with Spain to produce a co-ordinated evacuation plan for both the Spanish and Argentinean stations.

6. The group agreed that IAATO needed to be involved in the preparation of the evacuation plan because of the large number of tourists now visiting Deception Island each summer.

7. An additional safety measure could be the development of an eruption "early warning system" based on the level of risk to be provided by the Spanish/Argentine scientists at Deception Island.

8. The group agreed that a simple island-wide emergency evacuation plan should be annexed to the ASMA Management Plan for Deception Island. This would be based on the work already underway by Spain and Argentina.

Emergency evacuation

Oil spill response

9. A further risk at Deception Island is a major oil spill. The group examined which activities might result in pollution (e.g. vessel grounding at Neptune's Bellows, transfer of fuel from ships to stations).

10. There is a range of oil spill contingency :plans at different geographical scales which cover Deception Island. For example, Spain has produced an oil spill contingency plan for Gabriel de Castilla Station. There is also a regional contingency plan for the Bransfield Strait. Chile and Argentina also organize a joint naval patrol to the Antarctic Peninsula. The ships in the patrol carry pollution response equipment and could respond rapidly to an incident at Deception Island.

11. The group agreed that it was important that the stations operating at Deception Island and visiting ships had the capability to respond rapidly to oil spills.

12. The group agreed that a simple island-wide oil spill contingency plan should be annexed to the ASMA Management Plan for Deception Island.

13. The group also considered that better hydrographic charting was required around the exterior of Deception Island.

OTHER PAPERS

Towards an agreed strategy for the future management of Deception Island

José M. Acero and Rodolfo Sanchez

Argentina wishes to express, through this brief non-paper, its technical position on this very important joint venture.

The Argentine Antarctic Program considers it necessary that this Workshop specifically addresses, among other issues, the following four matters:

1. Identification of conflicts

The document "*A management strategy for Deception island*" (Downie & Smellie, 2001), a basis to begin work on-a Draft Management Plan for the island, points out that conflicts exist between scientific activities and tourism, but it does not specify what sort of conflicts exist, where these occur and what is the magnitude of interference.

Therefore, the Workshop would benefit from the identification of the possible existing conflicts, not only between Science and Tourism, but also among other kinds of activities; or even conflicts between different scientific (or logistic, or tourist) activities themselves.

Such identification would be a very valuable starting point to propose realistic measures that allow appropriate coordination among the different activities undertaken in the island.

2. Management by Information

In "*A management strategy,..*" seven possible options to manage all activities undertaken in Deception Island are established. Even though consensus has been reached, that option 4 (*ASMA incorporating zones*) is the best alternative, the test suggests that, until a Management Plan is prepared and approved (which may take some time), the island may be adequately managed in the short term by implementing option 2 (*Management by information*).

Therefore, we consider it essential that this option, that will function as an interim measure guiding the management of the island in the near future, to be a matter of intense debate in this Workshop. Included as an appendix to this document is a list of issues that should be addressed, to implement this temporary strategy.

3. Tourism

The document "*A management strategy for Deception Island*" states also that conflicts of interest exist between Science and Tourism. Although this is not clearly defined, what is currently happening, it also remarks that environmental impacts due to tourism have been little studied. Thus, it would be fruitful to

address this issue during the Workshop. Debate should be oriented towards the design of a monitoring program, which will allow detection of possible impacts of tourism on the conservation values of the island.

But, assuming that conflicts do exist, it would be necessary, when debating, to establish a logical sequence. Bearing in mind that, although the undertaking of tourist activities is permitted in Antarctica, scientific research and conservation practices have a higher hierarchy within the Antarctic Treaty System. Therefore, the sequence should start identifying scientific, environmental and historical values as well as likely risk scenarios of the island. Once such values are identified, designation of further zones for tourism shall be discussed. However, before designating any new zone, the following issues should be a matter for intense debate:

Conflicts between fauna and tourism

Baily Head is a Chinstrap penguin and rookery that can be impacted by visitors, particularly if they scatter in four different directions, as described in "A management strategy for Deception Island". As tourists often visit other Antarctic locations with Chinstrap penguins, some of which are very close to Deception Island, such as Halfmoon Island, we suggest that Baily Head to be excluded from tourist schedules, until research on the behavior of birds and seals is undertaken there.

Conflicts between human health & safety and tourism

Deception Island is a site that poses serious risks to human health & safety, according to description included in Section 6 of "A management strategy... ". Taking this into account, the alternative of restricting access to certain unsafe places, or the undertaking of activities such as bathing and overland travel, should be thoroughly debated. Furthermore, creating zones for tourism in such locations, an option proposed in the document, may become an incentive to visit them. This option, under current circumstances, should not be encouraged.

4. Parties' role in the future management of the island

The role each Consultative Party will play in the future management of the ASMA also needs to be addressed within this Workshop. It should be reminded that there are only two summer stations, from Argentina and Spain, in the island for the time being. For that reason, it is convenient to introduce this issue within the Workshop, to explore alternatives aiming to promote effective participation of all Parties involved in this valuable joint venture.

5. Future Actions

Taken into account all the above-mentioned issues, Argentina considers necessary to evaluate what kind of actions shall be taken for the adequate implementation of the new status Deception Island is going to be granted. For this reason, it would be convenient that interested Parties undertake a joint expedition in Deception Island during the next austral summer (2001-2002). The Argentine Antarctic Program offers the facilities of *Decepción* Station to accommodate researchers during their stay on the island. The Argentine Antarctic Program would provide logistic support and food supplies. Arrangements for transport can be discussed during the Workshop. Argentina does not commit Marambio Station facilities because of prevalent bad weather conditions, that would not allow rapid transport of personnel from South America to Antarctica. We would appreciate any assistance from other participants of this Workshop.

Therefore, we invite the Parties to support this proposal, which will represent a valuable example of international cooperation with the common goal of protecting the Antarctic environment.

Finally, we suggest to establish a Contact Group to begin discusses of specific aspects of a Management Plan for the ASMA. The terms of reference could then result from this Workshop, a draft is included as an appendix to this document, a preliminary agenda for such Group. A Progress Report of important international expedition could be submitted, as an Information Paper, to next CEP V (Warsaw), informing about progress achieved, and future actions to be taken.

Deception Island contact group

The following issues have been identified as topics for debate of a contact group , which could be established as a product of this Workshop:

1. Management by information

1.1. Identification of target groups, to which information shall be addressed:

- National Antarctic Programs
- IAATO members
- General public

1.2. Information to be prepared, according to identified target groups;

- Future ASMA
- General features of the island
- Location of areas with restricted access (ASPAs)
- Remarkable environmental values
- Historical values
- Risks to human health & safety
- Existing facilities
- Current scientific programs
- Languages to be used

1.3. Technical Resources

- Maps
- Posters
- Brochures
- Internet. National Programs, COMNAP, SCAR, IAATO, ASOC web sites
- ANAN Newsletter
- COMNAP Newsletter

1.4. Financial Resources.

1.5. Assignment of Responsibilities.

2. Joint Expedition Agenda

2.1. Scientific Activities

- Delimitation of likely new ASPAs in areas of scientific interest, not covered by current SSSIs.
- Accurate marking of boundaries of current SSSIs (future ASPAs).
- Identification of likely conflicts between science and other activities.

2.2. Human health and safety

- Testing possible escape routes in the field.
- Assessing likely sites for new refuge installation.
- Drafting communication procedures for accessing the island.

2.3 . Historic Sites and Monument

- Maintenance of HSMs:
 - Identification of damages and needs of maintenance
 - Assessment of visitors' behavior and possible consequences.
- Drafting of a Management Plan for HSMs and a protocol to adequately implement it.

2.4. Tourist Activities

- Monitoring tourist behavior: detection of likely conflicts with other activities.
- Based on the previous point, re-defining likely zones for tourism.
- Site identification for adequate marking, to avoid ambiguities.
- Drafting a Monitoring Plan to assess impacts due to tourist activities.
- Preparing an Emergency Plan for tourists.

Markers and Signs for Historic Sites and Monuments in Antarctica

John Splettstoesser¹

Introduction

This is a progress report on the status of markers and signs for Historic Sites and Monuments (HSMs) in Antarctica, with the objective of determining options available for sites on Deception Island. This is a task assigned to IAATO at the “Workshop on a Management Plan for Deception Island,” held in Santiago, Chile, March 26-29, 2001. The following draft is mainly a status report, intended to inform the Workshop organizers of progress to date. The report provides an overview, although not exhaustive, of the numerous types and designs of signs and markers distributed in Antarctica to identify HSMs and protected areas. Some of the historic examples of HSM signs are pre-Treaty, but are intended to show the variety that exists. The intent is to illustrate the variety and durability of materials. Signs on the historic huts in the Ross Sea area are illustrated as examples of durable materials of a generally common design and content. Whether a standardized design for all HSMs and protected areas might be achieved within the purview of the Antarctic Treaty Parties is unresolved at this point, and is perhaps impractical, as well as not a primary objective of this task.

I have approached the project with the following tasks in mind:

1. Survey the variety of types of signs and markers at mainly HSMs, but also at structures in order to determine possibilities for design, type of material, and longevity. Include illustrations of existing signs and markers;
2. Review options of materials for foundations (concrete), structural members to attach signs (aluminum, steel), and the signs (plastic, metal/alloy, wood);
3. Review possibilities of graffiti-proof paints or coatings;
4. Determine which language (s) the signs should include;
5. Propose standardized text for content of signs and markers;
6. Examine means to make signs and markers as secure as possible in order to avoid vandalism and theft by souvenir-hunters;
7. Attempt cost estimates;
8. Determine how the above factors apply to signs and markers planned for Deception Island HSMs., and whether a standardized form and material would be acceptable to Treaty Parties.
9. It is likely that further information on this task will become available as a result of outstanding queries, cost estimates, and the like. Supplements to the report will be issued when necessary.

History

Deception Island

There are presently three historic sites at Whalers Bay, Deception Island, as shown in inset Map 1 on the Frontispiece Map of Antarctica:

- **HSM 31** – Memorial Plaque marking the position of the cemetery at the abandoned Hektor whaling station;

¹ Office of the Secretariat, P.O. Box 2178, Basalt, Colorado 81621 USA.

- **HSM 58** – Cairn with plaque at the whaling station erected to honor Captain Adolfus Amandus Andresen, who was the first to establish a whaling operation on Deception Island, in 1906;
- **HSM 71** – Remains of the abandoned whaling station.

One of the possibilities raised at the Workshop with regard to the above sites would be to amalgamate all three into a single Historic Site and Monument (HSM) because of the benefits of having a single, rationalized management plan. It was also acknowledged that there is a need to identify boundaries for the new, rationalized HSM, and making available informative material, perhaps at the whaling station itself.

It was also considered practical to propose a new and separate HSM for the ruins of the Chilean station at Pendulum Cove, destroyed by volcanic eruptions in 1967, 1969, and 1970.

There are two Sites of Special Scientific Interest (SSSI) located on land on Deception Island, one at Whalers Bay (Kroner Lake, **SSSI No. 21E**), and the other at Pendulum Cove (**SSSI No. 21D**).

The above HSMs and SSSIs would require some kind of standardized markers and signs as authorized by the Antarctic Treaty, none of which exists at those sites, although in some cases markers or cairns were erected at various times. Examples of signs currently at Whalers Bay identify the location of Whalers Bay in general (Fig. 1), and are found on buildings (Biscoe House, BAS Station; and FIDASE building). An identical sign (the one shown in Fig. 1) was once attached to the outside wall of the aircraft hangar at Whalers Bay, but it has not been there for at least 2-3 seasons. Another sign at Whalers Bay (Fig. 2) was erected in honor to Captain Andresen (**HSM 58**), located on a wooden post near the hangar, and was photographed in the 1994-95 season. It disappeared some time the next season. It is assumed both signs, made of plastic, were ‘collectibles’, or souvenirs, and are lost forever.

The text on **HSM 58** was in three languages - Spanish (top), English (middle), and Norwegian (bottom), as follows:

“To honour Captain Adolfus Amandus Andresen, Antarctic pioneer, who was first to establish a whaling operation at Deception Island in 1906. The Committee on Foreign and Constitutional Affairs of the Norwegian Parliament, January 1993.”

Fig. 1. Sign at hangar (U.K.), Whalers Bay. Photo 1994-95.

Fig. 2. Sign commemorating Captain Adolfus Amandus Andresen at Whalers Bay. Photo 1994-95.

In the 1990s, a shore party from Greenpeace erected signs at Kroner Lake (**SSSI 21E**) and at Pendulum Cove (**SSSI 21D**) to mark boundaries and draw attention to those protected areas so that individuals would not enter them. Examples of signs at Kroner Lake are shown in Figures 3 and 4. [Note that Greenpeace reference numbers are different from Treaty-designated SSSI numbers.] Fig. 3 text reads as follows:

WARNING
Site of Special Scientific Interest
KEEP OUT
World Park Antarctica
Greenpeace Ref. Nº 26/S

Figure 4 text is in Spanish, as follows:

ATENCION
Sitio de Especial Interés Científico
POR FAVOR NO PASE
Parque Natural Antártida
Greenpeace Ref. Nº S12

Both of those signs, and those at Pendulum Cove, disappeared in the same season or the next. All signs at both locations were made of durable plastic, attached to plywood backing in a metal frame, and mounted on heavy-duty metal pipes sunk into the ash for stability. Not only have the signs been removed, but also the pipes, except for one pipe at Pendulum Cove.

Fig. 3. Sign (in English) erected by Greenpeace at Kroner Lake, Whalers Bay.

Fig. 4. Sign (in Spanish) erected by Greenpeace at Kroner Lake, Whalers Bay.

Within the last few years, a series of markers on metal poles were placed at Whalers Bay to illustrate a map of the identifiable relics of the whaling station, a brief history, and numbered markers placed at various sites at the station to point to the features on the map. Part of that assemblage also disappeared within a year or two.

Markers and Signs from other Locations in Antarctica

Antarctic Peninsula, Elephant Island, South Orkney Islands

Mikkelsen Harbor. There are many markers for various purposes in the Antarctic Peninsula, many erected prior to the Antarctic Treaty, and some since the designation of HSMs. Some of the earliest were those attached to buildings erected in the 1940s and 1950s, such as the refuge hut by Argentina at Mikkelsen Harbor, Trinity Island (Fig. 5, ‘Capitan Callet Bois’).

Fig. 5. Sign at ‘Capitan Callet Bois’ Hut (Argentina), Mikkelsen Harbor, Trinity Island. Photo 1986-87.

Text of sign in Figure 5 reads as follows:

ARMADA ARGENTINA
Servicio de Hidrografia Naval
REFUGIO NAVAL CAPITAN CALLET BOIS
Fecha Inauguracion: 10-XII-1954
f [lat.] = 63°54' 40"(S).
? [long.] = 60°47' 52"(W).

Many of those signs are still in good condition, and in some cases, have survived better than the building itself. Tourists on visits to some areas in the Antarctic Peninsula see examples of the Argentinean huts and their signs at Neko Harbor (‘Fliess’, built in 1948-49 season) and on Petermann Island (‘Groussac’, 1954-55 season). Signs of that era follow the same design and include information as that of ‘Capitan Callet Bois’.

Petermann Island. In an earlier time, the French explorer Dr. Jean-Baptiste Charcot, wintered on Petermann Island in 1909, and erected a plaque (made of lead) on the ridgeline of Megalestris Hill (Fig. 6), visible at the top of the snow slope from ‘Groussac’ hut (Fig. 7, 8) on Petermann Island. Charcot’s plaque includes the names of the expedition members, as shown in the Figure. It was removed several years ago, reputedly delivered to a museum in France, and a replica was to replace it, but as of the 2000-01 season it has not appeared.

Fig. 6. Lead Plaque on top of Megalestris Hill, Petermann Island, erected in Charcot's Wintering of 1909. (HSM 27.) (Megalestris Hill was named by Charcot - Megalestris is an obsolete name for the South Polar Skua.) Photo 1988-89.
Fig. 7. 'Groussac' Hut (Argentina), Petermann Island. Plaque (Fig. 8) is right of the door. Photo 1991-92.

Fig. 8. Sign at 'Groussac' Hut. Photo 1991-92.

Text of sign in Figure 8 reads as follows:

ARMADA ARGENTINA
Servicio de Hidrografia Naval
Refugio Naval **GROUSSAC**

Fecha Inauguracion: 6-11-1955

f [lat.] = 65° 11' (S).
? [long.] = 64° 10' (W).

More recently, a cross and plaque (Fig. 9) was erected on Petermann Island near 'Groussac' hut in memory of three men who were lost on sea ice off the island in August 1982. The brass plaque at the base of the cross provides details.

Fig. 9. Cross at Petermann Island in memory of three British men from Faraday Station who were lost on nearby sea ice in August 1982. Megalestris Hill is the rocky ridge on top of the hill to the left of the Cross. Photo 1993-94.

Rothera Point. Recent construction and placement of signs at Rothera Station (U.K.) in 2000 to mark **SSSI 9**, Rothera Point, involved two designs. The three main signs included a map and description of the site, and was constructed of 11 gauge aluminium and set in a concrete base. Perimeter boundary signs (20) were made of the same materials. [Information on these signs is provided courtesy of Rod Downie and John Shears (May 2001), and includes text of the signs, and also cost (about £1.5 K).]

Waterboat Point. Elsewhere in the Peninsula, the historical significance of the remains of a structure at Waterboat Point was pointed out by Stonehouse (1991), and an appropriate sign (**HSM 56**) (Fig. 10) shows the location where Thomas Bagshawe and M.C. Lester wintered in 1921-22. The sign has since weathered considerably, and is barely legible.

Fig. 10. Sign marking HSM 56, wintering location of Thomas Bagshawe and M.C. Lester, 1921-22, Waterboat Point, Paradise Bay. Photo 1993-94.

Fig. 11. Wooden sign at Penguin Point, Seymour Island, commemorating rescue of Nordenskjöld's men (Date on sign is 10-XI-1903). Photo 1991 - 92.

Seymour Island. Markers of a more permanent nature have been established at Seymour Island to commemorate the location at which the Argentine corvette *Uruguay* gave assistance to the Swedish Antarctic Expedition led by Otto Nordenskjöld on 10 November 1903. The original wooden sign erected in 1903 is still there, with much of the text visible (Fig. 11), and a concrete base with brass (or bronze) signs explaining the event in Spanish and English is adjacent to the wooden sign (Fig. 12) (**HSM 60**).

Fig. 12. Concrete base and brass (or bronze) plaques at HSM 60, Seymour Island, placed here by Argentina in January 1990. Photo 1991-92.

Elephant Island. Elephant Island is the location of one of the most celebrated expeditions in the history of Antarctic exploration, that of Sir Ernest Shackleton and the rescue of his 22 men from the *Endurance* at Point Wild in 1916. This rescue is commemorated by the presence of a monolith and plaque at Point Wild, with a bust of Captain Luis Pardo, of the Chilean naval vessel *Yelcho*. The monolith (Fig. 13) stands amongst a colony of chinstrap penguins in the approximate location of the overturned boats that Shackleton's men lived in from April to August 30, 1916. The inscription on the plaque (Fig. 14), made of metal(?), reads as follows:

La Armada de Chile
en homenaje al Piloto 2°
Luis Pardo Villalón

Comandante de la escampavía
"Yelcho", quien el 30 de Agosto de
1916, rescató de la Isla Elefante
a los náufragos del "Endurance"
???? de la Expedición Británica
de Sir Ernest Shackleton que fue
destrozada por los hielos,
hundida el 21 de Noviembre de 1915.

Isla Elefante, Enero 1988

Fig. 13. Monolith, bust and plaque at Point Wild, Elephant Island (HSM 53). Photo 1988-89.

Fig. 14. Close-up of Plaque in Fig. 13. Photo 1988-89.

Paulet Island. This is the site where the crew of the expedition ship *Antarctic* wintered in 1903 after the ship, under the command of Captain C.A. Larsen, became beset in ice and sank near the island. The 20 survivors constructed a stone hut and lived there from March until November 1903 when rescued by the Argentines in the ship *Uruguay* (refer to Seymour Island – **HSM 60**). A Historic Site marker was placed next to the hut by the Argentines, and also next to the cross marking the burial site of the only man who died during the expedition. Both the hut and the cross are **HSM 41** (Figs. 15, 16). The sign at the hut, consisting of a clear plastic cover over a plaque mounted on a short pole, is no longer readable, and the sign at the cross has disappeared. This would be a good place to replace each with a more durable sign (see Recommendations). The sign at the cross should be placed at the beach, just above the storm beach in order to avoid ice push by floes, and also to make it visible to visitors who walk along the beach. The area around the cross itself is impossible to approach during the breeding season because of the density of nesting Adelie penguins and (later) chicks.

Fig. 15. Stone hut at Paulet Island, shelter for the 20 men of the ship *Antarctic*, under the command of Captain Carl Anton Larsen, who wintered here in 1903. Photo 1993-94.

Fig. 16. Cross marking the burial site of Ole Christian Wengersgaard, who died on the island in 1903. Photo 1988-89.

Hope Bay. Another stone hut (Fig. 17) (**HSM 39**) was constructed at Hope Bay by three men who formed a companion party to that of Larsen's, and who were instructed to travel over the ice to inform Nordenskjöld that the ship *Antarctic* was unable to break through the ice to evacuate Nordenskjöld's party that summer. The three at Hope Bay spent the winter there in 1903, and were also rescued in November 1903, along with Larsen's men on Paulet Island and Nordenskjöld's men on Snow Hill Island. This complicated story with a happy ending is one of the incredible rescues that ranks along with the *Endurance* expedition of Shackleton.

Fig. 17. Stone Hut at Hope Bay, where three men from the ship *Antarctic* wintered in 1903. Photo 1987-88.

Fig. 18. Remains of Omond House, stone hut built in Bruce Expedition Of 1903 (HSM 42). Photo Dec. 1983 - Left to right, Keith Shackleton, Rene Preller, Alan Gurney.

Laurie Island, South Orkney Islands. An expedition led by William S. Bruce established a meteorological observatory (Omond House) in 1903, built as a stone hut (Fig. 18) on Laurie Island, one of the South Orkneys. Later structures were built by the Argentine government, which took over the site in 1904 and has operated it continuously as Orcadas Station ever since (Fig. 19). Omond House retains its stone walls, but nothing else, and its modest sign is of an impromptu nature, and has been replaced at least once since 1983-84. Omond House, structures built nearby in 1905, and a graveyard with seven graves (Fig. 20) constitute **HSM 42**.

Fig. 19. Sign at Orcadas Station (Argentina), operated since 1904 when Argentina took over station built by Bruce. Photo Dec. 1983. This sign has since been replaced by another.

Fig. 20. Cemetery at Orcadas Station (Argentina) (HSM 42). Photo Dec. 1983.

Ross Sea Area

The Ross Sea is known for early exploration of the continental interior, and for many of the historic huts located there for just over 100 years (Splettstoesser, 2000). As a result, Antarctic Treaty Parties designated many of the huts and related artifacts Historic Sites and Monuments, as discussed under the following sections on huts.

Cape Adare. The huts erected by C.E. Borchgrevink in the *Southern Cross* Expedition of 1899 still stand at Cape Adare, representing the first overwintering by humans on the Antarctic continent. The huts are designated as **HSM 22**, with signs in all four of the Treaty languages (English, French, Russian, Spanish) fastened to a metal frame and standing on a 4-legged metal structure adjacent to the huts (Fig. 21, 22). The hut on the right in Fig. 21 also had a roof, but it blew away since the time of the expedition.

Fig. 21. Borchgrevink's two huts (right) from the *Southern Cross* Expedition, 1898-1900, with HSM 22 signs at far left of scene on metal posts, with an angled upper surface. The wooden hut in the background is from Scott's northern party, 1910-11. Photo Jan. 1991.

Fig. 22. Close-up of signs in Fig. 21 of HSM 22. Photo Jan. 1991.

English text (lower left sign) is as follows (actual letters are all in upper case):

Borchgrevink's Hut Cape Adare
This Hut is an Historic Monument and
Preserved in accordance with the
Provisions of the Antarctic Treaty
To Commemorate the British
Antarctic Expedition of 1898-1900
Led by C.E. Borchgrevink
Who built the hut in February 1899

Hut Point Peninsula. This geographic feature is the southernmost part (77°51'S, 166°37'E) of Ross Island, in McMurdo Sound, and is the location of the *Discovery* Hut of Captain R.F. Scott, erected in the British National Antarctic Expedition, 1901-04. The hut is in good condition (Fig. 23), considering the time since construction and extreme weather conditions, and is designated as **HSM 18**. McMurdo Station (U.S.), the modern support/research facility, is adjacent to Scott's hut. The sign on the hut is made of brass or bronze (Fig. 24), and the text reads as follows:

The circular feature at the top of the plaque contains the words “National Trust Historic Places”.

The National Antarctic Expedition

1901-04 UNDER CAPTAIN SCOTT
ERECTED THIS HUT LATER USED BY
MEMBERS OF BRITISH EXPEDITIONS
1907-09 1910-13 1914-17

Fig. 23. Scott's *Discovery* Hut, 1901-04 (HSM 18). Photo Jan. 1975.

Fig. 24. Sign on Scott's *Discovery* Hut. Photo Jan. 1975.

A short distance from Scott's Hut is a cross placed in memory of George Vince, seaman lost in the 1901-04 expedition (Fig. 25) (HSM 19). On the top of Observation Hill above McMurdo Station is a cross (Fig. 26) placed by expedition members of the 1901-04 expedition in memory of Scott and his four companions who perished on the return journey from the South Pole in 1913 (HSM 20).

Fig. 25. Cross at Hut Point Peninsula erected in February 1904 in memory of George Vince, expedition member who died in the vicinity (body not recovered) (HSM 19). Photo Nov. 1960.

Fig. 26. Cross on Observation Hill, erected in January 1913 in memory of Scott's party which perished on the return journey from the South Pole (HSM 20). Photo Nov. 1961.

Cape Royds. When Sir Ernest Shackleton returned to the Antarctic, he erected an expedition hut (Fig. 27) at Cape Royds, facing McMurdo Sound on Ross Island. The signs (Figs. 28, 29) on the hut briefly explain the history, as well as a cautionary statement (Fig. 29) about its condition. Shackleton's Hut has been designated as **HSM 15**.

Fig. 27. Shackleton's Hut at Cape Royds, British Antarctic Expedition, 1907-09 (HSM 15). Photo Jan. 1991.

Fig. 28. Sign on Shackleton's Hut. Photo Jan. 1991. (Inscription below)

The format of the sign pictured in Figure 28 is similar to that on Scott's Discovery Hut (Fig. 24), with the logo at the top stating the same - "National Trust Historic Places". Below that is the following:

Cape Royds
The British Antarctic Expedition
1907-1909 under Lieut. Ernest
Shackleton built and occupied
this Hut

Fig. 29. Sign on Shackleton's Hut. Photo Jan. 1991. (Inscription Below)

Fig. 30. Signs next to Shackleton's Hut at Cape Royds. Photo Jan. 1991.

Cape Royds

This hut was built by members of the British Antarctic Expedition 1907-1909 under Lieut. E.H. Shackleton in March 1909

The hut was restored in 1960 as nearly as possible to the condition it was in when occupied.

Visitors are asked to remember that this building is a historic shrine. Its contents are irreplaceable.

Please do not interfere in any way with articles in this hut.

Nothing whatever must be removed.

Absolutely no smoking within or near this building.

By order

Antarctic Division D.S.I.R.

In addition to the signs placed on Shackleton's hut itself, a group of signs (Fig. 30) with text in the four Treaty languages is placed near the hut, similar to those at Borchgrevink's huts at Cape Adare (Figs. 21, 22).

Cape Evans. Scott returned to Antarctica and a quest for the South Pole in the British Antarctic Expedition (*Terra Nova*) of 1910-13. The *Terra Nova* hut is a few kilometers north of his earlier base at Hut Point, and only a few kilometers south of Shackleton's hut at Cape Royds. Scott's Hut (Fig. 31) was built in 1911, and is perhaps the most famous, and also the largest, of all the historic huts. The sign on the hut (Fig. 32) is of identical design and text as the one on Shackleton's hut at Cape Royds (Fig. 29), except for the name and historical information. Scott's Hut at Cape Evans has been designated as **HSM 16**. A cross at Cape Evans (Fig. 33) (**HSM 17**) was erected in memory of three members of Shackleton's expedition of 1914-16, who died in the vicinity in 1916. A monument placed nearby (Fig. 34) explains further the circumstances.

Fig. 31. Scott's Hut at Cape Evans (HSM 16). Photo Jan. 1991.

Fig. 32. Sign on Scott's Hut. Sign is located on right side of wall of the Hut in Fig. 31. Photo Jan. 1991.

Fig. 33. Cross at Cape Evans (HSM 17) erected in memory of three members of the Ross Sea party of Shackleton's Expedition of 1914-16, who died in the vicinity in 1916. Photo Jan. 1991.

Fig. 34. Monument at Cape Evans in memory of those lost in Shackleton's Expedition of 1914-16. Photo Jan. 1991.

Indian Ocean Sector

Buromskiy Island, Mirnyy Station. One of the most striking examples of marking an historic site is the cemetery on Buromskiy Island, Queen Mary Land, where Soviet, Czech and German citizens are buried, all members of Soviet Antarctic Expeditions who perished in a fire at Mirnyy Station (Russia) on 3 August 1960. The site has been designated as **HSM 9** (Fig. 35), with many additions to the cemetery since the original deaths, some of them consisting of ashes in urns that have been brought there from Russia. Nearly 30 graves/urns were interred in this remarkable place, where 29 caskets and 4 memorials (in January 1993) (Fig. 36.) are bolted to the rocky island (there is no soil), and a colony of Adelie penguins exists amongst the available spaces. In 1997 another one was added to the cemetery, that of Bruno Zehnder, Swiss photographer who became a U.S. citizen and was renowned for his love not only of penguins but of Antarctica as a whole. He was photographing penguins in the Antarctic winter, based at Mirnyy Station, and got lost in a blizzard in July 1997.

Fig. 35. Buromskiy Island and the Cemetery designated as HSM 9. Photo Jan. 1993.

Fig. 36. Graves on Buromskiy Island. Photo Jan. 1993.

Construction and design options

Concrete

Concrete has been used in Antarctica in many places and in many situations, despite the harsh, cold conditions. An example of a concrete base for **HSM 60** on Seymour Island is shown in Fig. 12. Various studies of concrete as a construction material in Antarctica are published, including those at Scott Base (N.Z.) when the new station was constructed (Varcoe 1978, 1979). Concrete use would be simpler for station construction, where station power and water are available, although it has obviously been used in remote areas as well. For example, 'Fliess' hut (Argentina) at Neko Harbor was constructed in the 1948-49 season, with the surface laid in a concrete cover extending the entire front entrance of the hut. An asphalt-type material was also used for part of the paving. Although showing signs of deterioration, the concrete is still functional. The same can be said of Almirante Brown Station (Argentina), where the original station, built in the 1950-51 season, consisted of considerable concrete used in its construction. Even after the station fire on 12 April 1984, the concrete remained in reasonably stable condition, and some original areas provided a base for station re-building in the 1990s. The same durability can be said of concrete construction at other Argentine stations and huts, as well as those of other Treaty Parties.

Metals

Many markers and signs placed at HSMs or protected areas have been mounted on metal poles or on 4-legged metal bases. For example, Borchgrevink's huts at Cape Adare has **HSM 22** markers displayed on a frame with 4 metal posts anchored in the ground (Fig. 21, 22). The signs are made of brass or bronze; corrosion (rusting) has occurred at each of the 4 steel(?) bolts that fasten each of the 4 signs to the metal frame.

Studies by the New Zealand Antarctic Programme have shown the utility of aluminum for construction purposes in Antarctica, using a protective coating by anodizing the metal (Fahy 1978). Control experiments were made to determine loss by natural corrosion through time by placing samples at Scott Base and at nearby Arrival Base to determine the weight loss as a result of atmospheric pollution (high at Scott Base, nil at Arrival Base). Considering the potential use for HSM and protected site markers, corrosion is not thought to be a serious factor through many decades of exposure to Antarctic conditions. Corrosion would be more extensive on aluminum than on bronze in the salty air environment.

Sign material

As shown in previous illustrations, many of the HSM signs are made of brass or bronze, which aside from turning green, are durable and less likely to experience any signs of corrosion as a result of environmental conditions. Perhaps one of the most important factors in selecting a material for the sign is whether it can withstand the possibility of graffiti, which is not uncommon at many of the sites visited by humans, and subsequent removal of the graffiti. (See Fig. 11, for example - in the lower right corner of the wooden sign can be seen 'H-91', an apparent reference to someone who autographed the sign in 1991.) Graffiti protection systems are available, as are materials for graffiti removal. A brief survey of the industry suppliers resulted in two companies and their products. Each is described briefly in Appendix 2.

Another type of material, fibreglas, should not be overlooked, which is in place on Beechey Island, Arctic Canada, where the original wooden grave markers dating from the mid-1850s of Sir John Franklin's expedition have been replaced by fibreglas. Three of Franklin's men died here on the expedition, which had the objective of locating a route through Arctic Canada, from the Atlantic Ocean to the Pacific Ocean (the Northwest Passage). The expedition spent the winter of 1845-46 here, with the three men dying in January

and April 1846. A fourth grave is that of a man from a search expedition - he died in May 1854. The grave markers are of a material that resembles fiberglass, with a brass plaque attached to provide information on the occupant. The original wooden markers are in a museum in Yellowknife, N.W.T. They were deteriorating badly in the climatic conditions, and would soon have had any inscriptions obliterated. The replacements show no sign of weathering, and have been there for about 10 years or more (photo available).

Cost estimates

Two companies operating in the area of the author were consulted, and approximate costs for manufacture of signs were obtained for more than one kind of sign material and design.

1. Dorr Woodcarving & Sign Co.
Route 1, 435 Commercial Street,
Rockport, Maine 04856 U.S.A.
tel/fax 207 – 236 – 2559

This company specializes in wooden hand-carved signs, but is able to send orders out to other vendors for other kinds of materials. Cost estimate of a single item (Fig. 24, brass plaque on Scott’s Discovery hut), with estimated dimensions of 24 x 16 inches (61 x 40.5 cm), would be \$650 U.S. for a brass plaque and about \$400 U.S. for aluminum. Aluminum was not recommended because of the corrosion potential as a result of airborne salts from marine environment (coastal station). A logo of the type shown on the upper portion of the plaque in Fig. 24, would involve extra cost.

2. Richard Furneaux Remsen
531 Park Street
P.O. Box 7
West Rockport, Maine 04865 U.S.A.
Tel: 207 – 236 – 3200
Fax: 207 – 236 – 0854
Email: furneaux@midcoast.com
Website: www.remsen.com

This vendor operates a foundry, and appears to be capable of manufacturing virtually anything in metal or glass, as evidenced by objects on display in the foyer of the building and on his website. His specialty is glass fishing lures in spectacular colors and shapes, but he also sculpts in bronze. Because only a few plaques might be required for posting at Deception Island (Whalers Bay and Pendulum Cove), I asked for cost estimates for a single plaque, but also for additional plaques, each one with different text, in the event that (hypothetically) many of the present Historic Sites and Monuments might receive a standardized plaque for posting at its location, given the possibility that eventually someone would visit/re-visit many of those sites and the opportunity would present itself to place a plaque there. HSMs with signs or markers that are acceptable in their present condition and format would likely not be replaced with a ‘standardized’ plaque. Figures quoted for two different sizes, both in bronze, are as follows:

n	12 x 16 inches (30.5 x 40.6 cm)	\$ 580 U.S.
n	9 x 14 inches (23 x 35.5 cm)	\$ 520 U.S.

Prices include lettering. A pattern would have to be provided, logo would be extra cost. Additional plaques would be at same cost because each one would contain different text. Bronze preferred over brass because of better appearance on weathering.

Recommendations

For durability and longevity, it would appear that a plaque constructed of metal, with raised lettering, and mounted on concrete or metal stands, would be of high quality material that would withstand the extreme weather and weathering conditions found in Antarctica. The brass (or bronze) plaques on the huts in the Ross Sea area are representative of perhaps an idealized situation for marking Historic Sites and Monuments. Steel bolts are not recommended because they rust and deface the plaque. One-way bolts would be useful in deterring their removal by ordinary tools - for example, bolt heads which can be turned inward, but resist removal. The heads could also be planed off to make the bolts impossible to remove.

Plastic, even of the most durable type, is not recommended because it is soon faded or bleached by sunlight, as well as becoming brittle. Also, with ordinary screw heads or nails that have been used to secure the plaques to buildings or wooden or metal posts, it is a relatively simple matter to pry the corners off with the tip of a screw-driver (Plaques in Figs. 1 and 2 show evidence of this means of removal.).

Perhaps the most durable and weather-resistant material presently in place to mark an HSM is the Richard E. Byrd Historic Monument (HSM 54), consisting of a bronze bust on black marble, situated in a conspicuous location at McMurdo Station (U.S.) (photo available).

Anti-graffiti paints and materials should be investigated for their potential in correcting the problem of defacing signs by vandals and visitors. Although it is not possible to eliminate graffiti, special materials are available to clean surfaces of virtually any kind of spray paint or other material, for example. (See Appendix 2.).

Because of the terrain at Whalers Bay and Pendulum Cove, consisting of loose volcanic ash and cinders, it is not a simple matter to place a suitable foundation for placement of plaques. A concrete base (Fig. 12, Seymour Island) or sturdy metal frames (Rothera Point; Fig. 22, Cape Adare), well sunk into the ash, would be adequate. In lieu of that, metal rods can be designed with splayed bases that resist removal once sunk and buried with ash. Plaques mounted on buildings would be easier to remove, and buildings are also vulnerable to substantial weathering, and in a worst case, destruction by fire.

It is not part of this exercise to designate responsibility for cost to any particular Treaty Party or Parties, although some means of assessing proportions, or cost-sharing, might be possible depending on the nationality (ies) involved at the historic sites. The expense of the product might be alleviated by a means of cost recovery by manufacturing replicas which could be sold on tour ships or other locations that passengers would frequent on the cruises (Maritime Museum at Grytviken, South Georgia; Port Lockroy; Treaty Party stations), and at gateway ports (IN.FUE.TUR at Ushuaia, Argentina; Stanley, Falkland Islands; Hobart, Tasmania; International Antarctic Visitor Centre, Christchurch, New Zealand; to mention a few). The replica could be made of a less expensive material in order to encourage sales, and this option could feasibly reduce the practice of 'souveniring' signs by trophy hunters. Whether Treaty Parties can enter this kind of commercial enterprise would have to be discussed. It may be possible for outside concerns to handle sales and return proceeds to the Party(ies) that originally paid for the placement of plaques.

It is noted that the cost estimates above are just that, estimates, and only from a single qualified vendor. Ultimately, depending on the manufacturer, and successful low-cost bidder, the actual costs might be lower. Treaty Parties who placed plaques at historic huts in the Ross Sea sector, and those elsewhere (Seymour Island) that are recommended here (brass or bronze, multi-lingual, concrete or metal frame base) can provide better cost estimates from their own experiences.

Publicizing the plaque replicas on tour ships and elsewhere (yachting magazines and other appropriate literature, e.g.) would also help to reduce 'souveniring'.

Summary

1. Whalers Bay presently includes three Historic Sites and Monuments:
 - HSM 31 – whaling station cemetery
 - HSM 58 – honor of Captain Andresen
 - HSM 71 – remains of whaling station

2. Format and configuration for proposed signs:
 - Combine into a single sign, which includes relevant information of the above, or several signs in the same area with relevant information on each. If an additional plaque is required for the abandoned Chilean station at Pendulum Cove, follow same recommendations herein, except for language (below). Text on sign should approximate language in official Treaty list of HSMs, with additional text for further details as deemed necessary.

3. Language options available:
 - Four Treaty languages (English, French, Russian, Spanish)
 - Norwegian, because of that country's involvement (Whalers Bay only)
 - All five languages because of exploration of early expeditions in this area (Whalers Bay only)

4. Sign Material:
 - Brass/bronze plaques (first choice), similar to those pictured in Fig. 12 (Penguin Point, Seymour Island), Fig. 22 (Cape Adare), Fig. 24 (Hut Point), and others. Next choices for materials should take into account available budget, but also consideration of durability. Emplacement should take into account the unconsolidated ash substrate, with options for securing the signs similar to those at Rothera Point, Cape Adare (Fig. 22), and Penguin Point (Fig. 12) – i.e., metal frames or concrete base.

5. Investigate options for anti-graffiti paints, making information available to Treaty Parties. If and when graffiti appears, Parties could procure materials to delete graffiti.

6. Review conditions of signs/markers at other HSMs in Antarctica with options to replace some of them with markers in standard format.

7. Consider possibilities of providing replicas of those placed at Whalers Bay for purposes of making them available for sale to tourists and others who frequent the sites, in order to recover costs of manufacture and placement of the official Treaty plaques.

Acknowledgements

Information concerning expeditions was condensed from historical literature and from Headland (1989). Map and List of Historic Sites and Monuments from "List of Protected Areas in Antarctica," 1997, London, Foreign & Commonwealth Office, and British Antarctic Survey.

References

FAHY, F.W. 1978. Aluminum Corrosion Assessment in Antarctica. *New Zealand Antarctic Record*, 1(2):20-25.

HEADLAND, R.K. 1989. *Antarctic Chronology*. Cambridge University Press.

SPLETTSTOESSER, JOHN. 2000. Centennial of Historic Huts in Antarctica: A tourism attraction. *Tourism Recreation Research*, 25(2):39-48.

STONEHOUSE, BERNARD. 1991. Historic Hut Site at Waterboat Point, Antarctica. *Polar Record*, 27(163):364.

VARCOE, G. E. 1978. Concreting in Antarctica. *New Zealand Antarctic Record*, 1(2): 26-30.

VARCOE, G. E. 1979. Concreting in Antarctica. *New Zealand Antarctic Record*, 2(2): 14-15.

Appendix 1. Antarctic Treaty references to Historic Sites and Monuments

Discussions and Recommendations dealing with Historic Sites and Monuments (HSMs) occurred numerous times in the history of Antarctic Treaty Consultative Meetings (ATCMs). The first appearance of a Recommendation appears in ATCM I, Canberra, 1961, as I-IX: Historic sites. The brief text mentions that Parties should consult whenever appropriate on restoration or preservation of sites, exchange reports on them, and adopt measures to protect them from damage and destruction. Subsequent ATCMs had similar Recommendations, for proposing new HSMs and for other reasons, but none includes language to designate particular construction or design of signs/markers for them. A complete list of HSMs, and reports on visits to them by Treaty Parties, is in 'Handbook of the Antarctic Treaty System', April 1994. Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, Article 8, provides current information on their designation.

Appendix 2. Remedies for Graffiti on Markers/Signs

From several options procured from the Internet, two examples are given of companies that provide materials for graffiti prevention and treatment. Further details are given in company literature, available on Internet.

1. Graffiti Solutions Limited

P.O. Box 12914
Penrose, Auckland, New Zealand
Ph. +64 +9 525 5722; Fax +64 +9 525 5718
Website: <http://www.graffiti.co.nz>

Graffiti/Guardian Coatings are available in 2000 colors or clear; matte, satin and gloss finishes; UV resistant, non yellowing, resistant to salt & environmental pollutants. Coatings suitable for a wide range of surfaces including natural stone, brick, concrete, timber, coloursteel, previously painted surfaces, signage, and park assets.

2. Insl-x Superior Coating Systems

50 Holt Drive, P.O. Box 694
Stony Point, New York 10980 USA
Ph. 845 786-5000; Fax 845 786-5831
Other offices in Clearwater, Florida; and Aurora, Illinois

Product name: Insl-Tron 2-Component Acrylic Aliphatic Polyurethane. Highly resistant to solvents, alkalis, and dilute acids. Suitable for use as an anti-graffiti coating using TH-0426 as a graffiti remover. Colors: black, white and gloss and semi-gloss bases to mix over 3000 colors.

Whether chemicals included in these products is permissible in Antarctica under the terms of the Antarctic Treaty is unknown, but would have to be evaluated.

Appendix 3. Directional Signs and Markers for Historic Sites and Monuments

Much of the present report pertains to signs and markers for HSMs, e.g., bronze plaques to identify the site, but in the case of Whalers Bay, Deception Island, additional signs might be useful to direct visitors to significant locations in the overall area. An example exists there, consisting of a metal pole framework with a short narrative and generalized map of the whaling station attached, with numbered sites highlighted. Those numbers are also on signposts with arrows directing visitors to the sites shown on the map. The narrative is in English and Spanish. Regrettably, the map was no longer there the following year of emplacement, indicating some of the known risks of placing what amount to 'souvenirs' at commonly visited areas that can easily be removed by visitors. In lieu of directional signage, tour vessels and Treaty Party vessels could be supplied with information sheets and maps that contain essentially the same information illustrated in the vandalized example mentioned. These sheets, or brochures, could be supplied to visitors as the occasions occur. Examples of this method of information and education exist for visitors to Port Lockroy, Wiencke Island.

If it is decided that signposts would be useful for Whalers Bay, in particular, attention should be given to the suggestions and recommendations specified in those sections of the report, namely, durable material such as metal for the sign itself, with bolts/screws consisting of non-removable heads. Plastic is vulnerable not only to deterioration by weather, but also is easily removed by breaking it away from its backing with standard tools. Examples are shown in Figures 1 and 2.

Participants in the Deception Island Expedition sponsored by Argentina in January-February 2002 should be made aware of proposals for placement of directional signage, and if appropriate, the locations and types of information displayed, as well as options for the types of material composing the signs.

Whalers' cemetery; Deception Island, South Shetland Islands.

R. K. Headland¹

There are graves on several islands of the South Shetland Islands but the largest number is on Deception Island, and the majority of these are of Norwegians involved in the whaling industry. Elsewhere in the South Shetland islands sealers' graves, from the 1800s, are recorded on Low Island and King George Island, as well as Deception Island. More recent graves are near several Antarctic stations in the archipelago.

The whalers' cemetery has 35 burials and a memorial to nine men whose bodies were not recovered. It was overwhelmed and buried by a lahar during a volcanic eruption in February 1969. The first grave and the *Graham* memorial were tall monoliths, these were undoubtedly knocked over, but most other grave-stones were low and many might still be in place beneath the surface. Subsequent erosion of the lahar has begun to reveal some traces of the cemetery. A coffin, without its bottom, is now on the surface. The establishment of the cemetery with first burial of a whaler, Nokard Davidsen, is described in Johnsen and Tønnessen (1959-69).

There have been several attempts to reconcile records and surveys to determine the names, and other data, of those interred there. A list of sources follows but a some disagreement is apparent between them. Apart from many of the inscriptions becoming undecipherable (prior to the eruption), there are various other problems in reconciling the data including: occasional men using more than one name, two whose deaths were recorded by the Magistrate on the island being buried elsewhere (Erling Ostern, + 4 IV 1925, in Norway and Carl Paul Hansen + 18 IV 1925, in the Falkland Islands), common graves (the four dead from *Bransfield* in one grave), and memorials where bodies have not been recovered (nine men from *Graham*, only one body of the ten aboard was recovered), records of deaths elsewhere (South Orkney Islands), and some inevitable transcription errors. Fortunately, where existing records conflict, these are mostly minor discrepancies in dates. Some mysteries remain and I regret that I have not been able to find a plan of the cemetery which would be useful in helping reconciling these data. As far as practical, supplementary information is included in the table where this is available. More information to determine, or corroborate, details in entries 5 (unknown), 6 (Muñoz), 15 (Arnhouse), and 32 (Thorvaldsen) is desirable.

The site of the cemetery was designated as the 31 st of the 'Historic Site and Monuments' under the provisions of the Antarctic Treaty during the seventh Consultative Meeting in 1972.

BERGUÑO, J. 1998 *Brief historical note on the cemetery at Whalers Bay*. Instituto Antártico Chileno. Santiago.[The most comprehensive account.]

CHAPLIN, J. H. 1951 (28 FEBRUARY) The Gravestones of Deception Island. South Shetland Islands.Falkland Islands Dependencies Survey Internal Memorandum, Cambridge. (This includes details of the arrangement and numeration of the graves. They are indicated by 'JHC number' in the list .)

HAMILTON, J. E. 1944 (24 APRIL) *Extract from the Registrar General's Records*. Government Archives, Stanley. [These records were kept by the Falkland Islands Dependencies Stipendiary Magistrates who were resident on Deception Island every summer during the whaling period. They are indicated by inquest number in the list ('Inq. number').]

JOHNSEN, A. O. AND TONNESSEN, J. N. 1959-69. *Den moderne hvalfangsts historie*. Sandefjord: Chr. Christensens Hvalfangstmuseum, publication 22.

¹ Scott Polar Research Institute Lensfield Road, Cambridge, U.K. CB2 1ER. Inglaterra.

KILLINGBECK, J. B. 1977. Deception Island in International Affairs. M. Phil Thesis, Scott Polar Research Institute, Cambridge.

ODDERA, A. J. 1942. Cementerio Isla Decepcion. Armada Argentina, Buenos Aires. [The earliest list of graves.]. Copies of the unpublished sources for this table are held by the Scott Polar Research Institute, Cambridge.

Copies of the unpublished sources for this table are held by the Scott Polar Research Institute, Cambridge.

DECEPTION ISLAND, SOUTH SHETLAND ISLANDS, WHALERS' CEMETERY

Compiled by R. K. Headland, Scott Polar Research Institute, 17 June 2001.

	Cognomen	Prenomen	Country	Death	Birth	Occupation	Age	Cause	Note	Reference
1	DAVIDSEN	Nokard	Norway	1908 I 22	1877	Captain	30	Drowning	Overboard from <i>Lynx</i>	
2	ODEGAARD	Georg	Norway	1910 XII 26	1894 IX 16		16		<i>Svend Foyn</i>	JHC 6
3	LAGERSTEDT	Henrik	Sweden	1911 III 8	1870 III 10		40		<i>Svend Foyn</i> , Port Lockroy	JHC 7
4	OLSEN	Hans	Norway	1911 XII 10	1869 I 17		42		<i>Svend Foyn</i> , Port Lockroy	JHC 14
5	[UNKNOWN]			1912 XII 18						
6'	MUÑOZ	Cayetano	Chile	1913 II 4			34			
7	CARLSEN	Sigurd	Norway	1913 XII 16	1896 II 20		17	Flensing accident		Inq. 13/6, JHC 3
8	NIELSEN	Olav	Norway	1914 I 7		Mate	46	Apoplexy	<i>Navorn</i>	Inq. 14/7
9	SORENSEN	Nils	Norway	1914 II 16		Flenser	24	Acute peritonitis		Inq. 14/8
10	HANSEN	Smren	Norway	1914 III 1	1872 I 5	Mate	42	Drowning	Nor	Inq. 14/9, JHC 17
11	ANTONISEN	Anton	Norway	1914 XII 18	1867 I 20	Whaler	17	Broken neck	Belgica Strait	Inq. 14/5
12	JOHANSEN	Karl Moe	Norway	1915 I 7	1880 VII 28	Baker	34	Blood poisoning		Inq. 15/6, JHC 28
13	SLAVONSKI	Max	Russia	1915 I 7		Foreman	29	Fell overboard	Belgica Strait	Inq. 15/1
14	JOHNSON	Axel L.	Sweden	1916 III 5		Sailor	30	Explosion	<i>Svend Foyn</i>	Inq. 16/7
15 ²	ARNOUSE	Arnov	Norway	1917 II 2	1867/120	Sailor	52	Cancer		Inq. 17/1
16	HOBERG	Herbert	Sweden	1917 XII 31	1882 I 31		29		Solstreif	JHC 2
17	HANSEN	Nils	Norway	1918 XII 22	1901 VII 2	Mariner	17	Opening boiler door by mistake		Inq. 18/14, JHC 9
18	SJOVOLD	Harald	Norway	1919 III 19	1878 XII 26	Captain	40	Drowning		Inq. 19/15, JHC 26
19	NYBRAATEN	Emil Hansen	Norway	1922 IV 3		Labourer	29	Heart failure		Inq. 22/6
20	HANSEN	Thorleif Biame	Norway	1924 III 16	1904 VII 29	Sailor	20	Nephritis		Inq. 24/27, JHC 18
21 ³	ANDRESSEN	Mathias	Norway	1924 III 11	1905 VII 7	Seaman	19	Drowning	<i>Bransfield</i>	Inq. 24/28, JHC 10
22 ³	CHRISTENSEN	Georg R.	Norway	1924 III 11	1897 II 1	Engineer	27	Drowning	<i>Bransfield</i>	Inq. 24/29, JHC 10
23 ³	SAMUELSEN	Niels Ernst	Norway	1924 III 11	1866 VII 31	Gunner	58	Drowning	<i>Bransfield</i>	Inq. 24/30, JHC 10
24 ³	GJERDOE	Carl Olaf	Norway	1924 III 11	1888 V 29	Master mariner	36	Drowning	<i>Bransfield</i>	Inq. 24/31, JHC 10
25 ⁴	JOHANNSEN	Albert	Norway	1924 XI 6-8		Sailor		Drowning	<i>Graham</i>	Inq. 24/19, JHC 29
26	MATHISEN	Einar	Norway	1925 IV 4	1887 IX 7	Mate	37	Septicaemia	<i>Svend Foyn</i>	Inq. 25/26, JHC 20
27	HANSEN	Carl	Norway	1927 XI 16	1882/1125	Captain	45	Uraemia	Solstreif	Inq. 27/17, JHC 13
28	GULLIKSEN	Hans Albert	Norway	1928 I 4	1871 IV 7	Ships carpenter	56	Heart disease	<i>Svend Foyn</i>	Inq. 28/18, JHC 24
29	ANDERSEN	Andreas	Norway	1928 IV 7				Beri-beri		Inq. 28/19
30	LANGHOLT	Albert	Norway	1928 I 7	1888		40			JHC 23
31	TORRESEN	Ivar Likness	Norway	1929 IV 1	1893 IX 18		35			JHC 12
32 ⁵	THORVALDSEN	Leif	Norway	1929 III 14	1906 VII 7		22			JHC 21
33	ANDERSEN	Oscar	Norway	1929 XII 31	1888 IV 25	Rivetter	41	Fracture of spine		Inq. 29/7, JHC 1
34	KNAPSTAD	Peder	Norway	1931 III 14	1885 IX 18	Workman	45	Fracture of skull		Inq. 31 /6, JHC 11
35 ⁶	FARRANT	Arthur Henry	Britain	1953 XI 17	1913 IX 22	Diesel Mechanic	40	Suicide		Inq. 53/1

¹ identification from J. Berguño, 1998

⁴ one body recovered of 10 who died when *Graham* sank

² also recorded as Olav Kristensen and Anon Anonsen

⁵ also recorded as A. M. Begann

³ In a common grave

⁶ Employed by the Falkland Islands Dependencies Survey

BACKGROUND TEXTS

Draft Elements for a Management Plan of Deception Island as an ASMA

1. Introduction

- Special values of Deception Island – science (including two summer stations), nature conservation, historic, educational
- Major activities – science, tourism
- Risks – volcanic eruptions, narrow shipping channel (Neptunes Bellows)
- Annex V – Articles 2, 4, 5 and 6
- Proposing Parties – Argentina, Chile, Norway, Spain, UK, USA

2. Aims and objectives of management plan

Assist in the planning and co-ordination of activities on Deception Island;

- Conserve the unique natural values of Deception Island
- Minimize cumulative environmental impacts of human activities;
- Avoid conflicts of interest
- Protect sites on the island which are representative of this unique ecosystem, and maintain them as potential reference sites to measure change;
- Protect historic sites, monuments and artifacts on the island, whilst allowing for conservation work or other management activities;
- Safeguard the health and safety of those visiting the island;
- Promote awareness, through education, of the significance of Deception Island.

3. Values for which special management and protection is required

- **Science**
 - Key area for studies related to Geoscience and Volcanology , both because of the active status of the volcano at Deception Island and because of evidence of recent eruptions.
 - Important area for studies in and marine, terrestrial and freshwater life sciences.
 - Valuable site for studies on oceanography
 - Area for studies on micro-climate of an Antarctic volcanic island
 - Glaciology
 - Bird biology:
 - Important area for studies related to ecosystem recovery (flora and fauna, marine and terrestrial) from volcanic activity. Potential model to study environmental change.
 - Possible site for human impacts studies
 - Historic Buildings as Scientific/archaeological asset – e.g. Hektor Whaling Station - Record of destruction caused by geological event
 - Vegetation - three species of bryophyte found on the island which have not been reported elsewhere in the Antarctic.
- **Specific and Unique ecosystem attributes.**
 - Kroner Lake - only geothermal warm lagoon in the Antarctic.

- Note: Vulnerability to introduction of non-native species. (Transfer of species between different locations in Antarctica e.g between South Shetland Islands)
- Unique attributes of Port Foster Krill populations
 - **Historic buildings and artifacts**
 - Historical record of whaling industry (Andresen, Hektor)
 - [Note:Artifacts (distinguish from waste)].
 - Hektor Whaling Station (1912) and its cemetery, represent the most significant whaling remains in the Antarctic.
 - Base B (UK), the first base established under Operation Tabarin in 1943.
 - Presidente Pedro Aguirre Cerda Station (Chile), built in 1955, destroyed by volcanic eruption in 1967.
 - [Note:Record of mutual assistance - solidarity]
 - **Educational value**
 - Whaling Station
 - Experience of visiting active volcano
 - **Aesthetic value**
 - **Other values.**

4. Management activities

- Establishment of zones for specific activities within ASMA (Protected zones (ASPAs), Historic Sites and Monuments (HSMs) and further zones for scientific and/or ecological interests where activities should be prohibited, restricted or managed, and appropriate marking of these zones.
- Station Management guidelines and operating procedures;
- Erection of signs, as appropriate ;
- Conservation Strategy and Management Plan for Whalers Bay;
- Island wide emergency escape plan in case of volcanic eruption.
 - [Note: Existing Argentine/Spanish plans];
- Oil Spill Contingency Plan for Port Foster;
 - [Note also: Regional Oil Spill Contingency Measures];
- Management Guidelines for Port Foster e.g. anchorages
- Code of Conduct for visitors .
 - [Note Identify landing sites where tourists can visit
 - Merge Recommendation XVIII-1 with additional guidelines specific to Deception Island
 - Identify additional sensitive zones that could require management];
- Long term monitoring program to measure environmental impacts of tourist activities e.g. at Baily Head?
- Early warning system for vessels to be provided by Argentina / Spain in case of threat of volcanic eruption;
 - [Note: IAATO may carry out an EIA for tourist activities on Deception Island, including all operators]

5. Period of designation

Designated for an indefinite period.

6. Description of the area

- Lat. 62°57'S, Long. 60°38'W. (Further location detail)
 - Boundary of ASMA defined as exterior coastline of Deception Island at low tide line. Includes Port Foster to the north of a line drawn across Neptune Bellows between Entrance Point and Cathedral Crags. Excludes offshore islets and rocks.
 - Climate - polar maritime;
 - Large active basaltic volcano, including cones, fumaroles, etc.
 - Total land area 98.5 km² ;
 - Marine ecology of Port Foster significantly influenced by volcanic activity;
 - Vegetation sparse, restricted to areas of stable and moist soil;
 - Invertebrate species little studied on Deception Island;
 - Eight species of breeding birds;
- **Description and location of structures within the area**

Active stations

- Decepción Station (Argentina) Lat. 62°59'S, Long. 60°43'W;
- Gabriel de Castilla Station (Spain) Lat. 62°58' 40''S, Long. 60°40' 30''W ;

Abandoned stations

- Hektor Whaling Station, Base B and the 'FIDASE' hut, Whalers Bay (62°59'S, 60°34'W).
- Presidente Pedro Aguirre Cerda Station (Chile) Lat. 62°56'S, Long. 60°36'W;

7. Zones within the area

- **ASPAs - to be agreed. Possible examples include:**

Current SSSIs

- SSSI No 21 (Note: To be reviewed by UK)
- SSSI No. 27 (Note: To be reviewed by Chile)

Possible other future zones or ASPAs.

Zones of scientific and/or ecological interest

(Note: management guidelines/code of conduct will have to be developed for each individual zone. The boundaries of the zones will have to be determined by further work, e.g. ground truthing).

- a. Fluvial terraces at Whalers Bay (geomorphology)
- b. Punta de la Descubierta (penguin colony – current site of scientific investigation)
- c. Kendall terrace area (geology and undisturbed and representative area)
- d. Cliff SE side of Crater Lake (botany – most diverse vegetation on the island)
- e. Fumarolic ridge NNW of Mt. Pond (volcanology and botany –only known location for *Philonotis*, and unusual associations of taxa and unique communities)
- f. “Perchuc Cone” (geology – pyroclastic cone and botany – colonization by lichens and moss)
- g. Baily Head (penguins)
- h. E and SW of SSSI 21 in Telefon Bay (geology) [*Note: Examine further in connection with review of the SSSI N° 21*]

HSMs

- Either
amalgamate 3 existing HSMs 31, 58, 71 (NOTE: but MUST retain values for which each was originally designated) plus remains of Base B and the FIDASE Hut. Establish boundary and issue informative material. (Management Plan included as Annex).
- Or
Re-establish HSMs 31 and 58 and designate new HSM to include HSM 71, including all whaling remains along beach, plus remains of Base B and the FIDASE Hut. Establish boundary and issue informative material. (Management Plan included as Annex).
- Presidente Pedro Aguirre Cerda Station (designated 2002)

Other zones e.g. Port Foster Anchorages

8. Maps and illustrations

Reference most recent published maps of Deception Island

- Topographic Map (Spain , 1994)
- Thematic Maps – Geological and geomorphological (Spain/UK, 2000)

Reference most recent aerial photography of Deception Island

- UK (1988)

Maps to be included in the Management Plan:

- Location map
- Topography and place names
- Location of ASPAs and HSMs

Appropriate large scale maps of ASPAs and site plans of HSMs will be included in their relevant Management Plan

Other detailed maps related to Annexes (e.g. escape routes) will be included in the relevant documents.

9. General code of conduct for ASMA

[Note: Additional specific Codes of Conduct as required

Further work needed to develop appropriate general guidance both for visitors and scientific programmes attached as appendices to ASMA management plan.]

access to and movement within the area;

- footpath routes, landing sites for zodiacs
- All Terrain Vehicles, helicopters

activities which are, or may be conducted within, identified zones, including restrictions on time and place

installation, modification or removal of structures;

For visitors:

- Do not interfere with scientific instruments or installations

For operators/scientific programmes:

- Label scientific instruments appropriately (time frame, owner, type of project, etc.)
- Remove scientific instruments once no longer in use

location of field camps;
taking of, or harmful interference with, native flora and fauna;
–precautions at HSMs regarding nesting birds/vegetation
–Recommendation XVIII-I
introduction of non-native species
collection or removal of anything not brought into the area;
disposal of waste;
requirement for reports regarding visits

10. Provisions for the exchange of information in advance of proposed activities

In Addition to the normal exchange of information by means of the annual National reports to the Parties of the Antarctic Treaty (Article VII – 5), and to SCAR and COMNAP:

- on-going exchange of up-to-date information between Parties working on Deception Island, e.g. using websites of national Antarctic Programmes (designate own heading for Deception Island research) open to IAATO.
- Yearly circulation of IAATO vessel call data and ship schedules.

11. Management plan review procedures

- Deception Island Contact Group
- This Management Plan will be reviewed every five years by the proposing Nations and updated as required. Proposed revisions will be provided to the CEP, SCAR and other relevant components of the Antarctic Treaty System for comment, and shall be submitted to the ATCP's for adoption in accordance with established procedures.

12. Appendices

- **Management Plan for Whalers Bay**
- **Island-wide emergency evacuation plan**
- **Island-wide oil spill contingency plan**
- **Environmental monitoring**
- **Management Plans for ASPAs.**

Appendix I

A Chronological History of Deception Island

- 1820** **29 January.** The east coast of Deception Island was almost certainly the land charted “in thick fog” by Edward Bransfield.
- 15 November.** The name Deception Island was first recorded by Nathaniel Palmer, referring to the deceptive nature of this ring shaped island with its concealed natural harbour.
- Admiral Bellingshausen sailed past “...a high island, with steep cliffs and its heights covered by clouds..” and named it Teile
- 1821-22** Deception Island was used as the base of the large US sealing fleet from Stonington (USA) under the command of Captain Pendleton.
- 1829** Henry Foster of HMS *Chanticleer* was stationed at Deception Island. He made gravity and magnetic observations at Port Foster, where he also left maximum and minimum thermometers. Lieut. E.N. Kendall compiled a map of Deception Island, the first accurately surveyed map of an Antarctic landmass.
- 1830** US sealing vessel *Annawan* visited Deception Island during the first week of February 1830 and James Eights, considered the first trained Antarctic scientist, described the conditions he observed on the island.
- 1838** Dumont d’Urville sailed around Deception Island but, despite taking observations at Neptunes Bellows, he did not enter the caldera.
- 1839** The *Sea Gull* from Wilkes Exploring Expedition entered Port Foster on December 10. A small crater, hot springs, lakes and hills were explored, while animal and mineral specimens were collected.
- 1841 - 42** William H. Smiley of the US sealing vessel *Ohio* recovered the minimum thermometer left by Henry Foster (it recorded -20.3° C) and reported volcanic activity.
- 1844 - 47** Joseph Dalton Hooker published *Flora Antarctica*, which included a description of the flora of Deception Island.
- 1873-74** Eduard Dallmann in the steamship *Gronland* from Hamburg visited the South Shetland Islands, including Deception Island, and charted them.
- 1905** Argentinian naval vessel *Uruguay* surveyed and charted the harbour of Deception, leaving a cairn and a bottled message for French explorer Charcot.
- 1906-07** Adolfus A. Andresen, with factory ship *Gobernador Bories*, transport *Cornelia Jacoba* and the whale-catchers *Almirante Valenzuela* and *Almirante Uribe*, of the Sociedad Ballenera de Magallanes, Punta Arenas, used Whalers Bay for the first time as a site for a floating whaling factory. The company subsequently used the bay under a FIDG licence for the next 7 years. It was the principal anchorage for the floating factory ships operating in the region.
- 1908** **22 January.** Nokard Davidson, of the Newfoundland Whaling Company, fell overboard from *Lynx* and drowned. His grave is the first in the whalers’ cemetery at Whalers Bay.

- 26 December.** Whaling supply ship *Telefon* ran into unrecorded reef at the entrance to Admiralty Bay, King George Island. Salvaged by Adolfus A. Andresen, and moved to Telefon Bay, where it was repaired the following summer. A Standing Maritime Court of South Shetlands was convened at Whalers Bay.
- 1908-10** Jean-Baptiste E.A. Charcot aboard *Pourquoi Pas?* bunkered at Deception Island twice, obtained coal and advice on damage to the ship hull from Sociedad Ballenera de Magallanes. Mentions Madame Andresen, Marie Betsy Rasmussen, probably the first woman to live in Antarctica during the summer whaling seasons 1908-11.
- 1912** Aktieselskabet Hektor, of Tonsberg, Norway, established a shore based whaling station in Whalers Bay under a FIDG lease (granted 1 October 1911, for 21 years).
The first whale was processed on 24 December. The factory worked every summer until 1931
Port Foster was declared by the FIDG “Port of the Entry for Whaling Seasons”.
- 1913** Whaling companies managed their own mail services to Punta Arenas, Sandefjord and Port Stanley until a Post Office was opened by Edward B. Binnie, Stipendiary Magistrate, resident on Deception Island. The first cancellation was on March 6. This administrative post operated every whaling season until 26 April, 1931, when whaling ceased on Deception Island.
- 1917-19** Arthur George Bennet, FIDG administrator on Deception Island, made ornithological and other biological collections.
- 26 December, 1917.** Floating factory ship *Solstreiff* (Kapt. Thorstenden) was severely damaged off Cape Melville, King George Island. Towed to Deception Island, and repaired by crew from *Alejandro*, vessel owned by the Punta Arenas Salvage Company.
- 1920-21** The shore in the vicinity of the whaling station suddenly subsided, endangering the safety of the floating factory ship *Roald Amundsen*. Water in the harbour boiled, removing paint from the hulls of vessels moored there.
- 1924 -25 11 March, 1924.** Whale-catcher *Bransfield* capsized at South Bay, Doumer Island, killing four men buried in a common grave at the Whalers Bay Cemetery. The whale-catcher *Graham* foundered near Bridgeman Island about 6 November, 1924: all 10 men onboard died and a memorial was erected at the Cemetery. A violent volcanic subsidence occurred in the harbour on 4 January 1925.
- 1926** **Captain Hans P.** Hansen of Norwegian factory ship *Lancing*, carrying the first hauling-up slipway, visited Deception and filmed activities at the shore station.
- 1928** Sir Arnold Hodson, Governor of the Falkland Islands visited Hektor whaling station aboard SS *Fleurus*, a vessel providing regular communications between the Falkland Islands, the South Shetlands and Uruguay.
- 1928 - 29** Wilkins-Hearst Antarctic Expedition. Sir George H. Wilkins 1st expedition arrived at Deception November 1928 (pilot Carl Ben Eielson). In December 1928, Wilkins and Eielson flew two Lockheed Vega monoplanes 600 miles south along the east coast of the Antarctic Peninsula, as far as 71°20'S, 64°15'W.
- 1929** A severe earthquake occurred. The floor of Port Foster dropped by 4.6 m.
- 1929- 30** Sir George H. Wilkins 2nd expedition. An Austin 7 motor-car was used for transport on Deception Island and along sea ice; the party and their aircraft were transported to the island by the whaler *Melville* and returned in *Henrik Ibsen*, while RRS *William Scoresby* acted as tender for the flying operations.
- 1930-31** As a part of its Antarctic circumnavigation, vessel *Norwegia* visited Deception Island, surveyed and charted the harbour, provided a record of wrecks occurred in the vicinity (*Telefon*, *Graham*, *Bransfield*) and of activities at the shore station, including the presence of British Dr. Nolan, with a well equipped laboratory.

The last whaling season at Deception Island. At its conclusion, the administrative post was closed until 1943 (Operation Tabarin).

- 1934-35** Lincoln Ellsworth used Deception Island in an unsuccessful attempt to fly across Antarctica. Ellsworth assembled his aircraft the *Polar Star* at Deception Island. The aircraft was then moved to Dundee Island for the successful trans-Antarctic flight.
- 1941** In order to deny the use of installations by German raiders, HMS *Queen of Bermuda* arrived at Whalers Bay, March 5 1941, set fire to “a large heap of coal” (coal deposit of Sociedad Ballenera de Magallanes) blew up the supply and punctured the pipes of the oil tanks, but left the buildings of the shore station untouched
- 1942** The Argentine vessel *Primero de Mayo* visited Deception Island on 8 February. Argentina took formal possession of the sector between longitudes 25° W and 68°34'W, south of 60° S. A copper cylinder containing a note of the claim was left on site.
- 1943** In January, HMS *Carnarvon Castle* hoisted the British flag, leaving a record of the ship’s visit.
- 1943-44** Base B (UK) was established in the abandoned whaling station at Whalers Bay. It was the first British base to be established by Operation Tabarin, which later became the Falkland Island Dependencies (FIDS) and subsequently the British Antarctic Survey (BAS).
- 1946** ‘Bleak House’, the building used by FIDS at Whalers Bay, was destroyed by fire.
- 1947** Chilean naval transport *Angamos* surveyed and charted Deception Island, carrying on biological and geological work, and oceanographic research in the surrounding area.
- Amphibious Vought-Sikorsky plane on board of *Angamos* and flew from Greenwich Island to Deception Island, and subsequently to Livingston Island on 17 February 1947.
- Amphibious Supermarine Walrus MK-I plane on board of Argentinian naval transport *Patagonia* flew 14 times between 22 January and 29 March 1947 scouting the area between Deception Island and the Argentine Islands
- 25 December.** Decepción Station (Argentina) was established at the south of Fumarole Bay.
- Holger Holgerson and Nils Bratogg carried on oceanographic work for the Federation of Norwegian Companies and Surveyed Deception Island.
- 1948-49** Argentine refuge huts built at Telefon Bay (‘Thorne’) and Pendulum Cove (‘Pendulo’).
- 1950-51** Partial topographic and air survey of Deception Island was undertaken by Argentine expedition.
- 1952** 10 December. German whaling voyage visited Deception Island to inspect the abandoned whaling station at Whalers Bay for possible reopening.
- 1952-53** An Argentine refuge hut (‘Lasala’) and Chilean refuge hut were built on the landing ground near Whalers Bay, Deception Island. Both were dismantled by British personnel in February 1953.
- 1953** 14 April. First criminal law case in Antarctica heard before the Falkland Islands Dependencies magistrate on Deception Island, concerning the protection of wildlife. Able seaman Francis McNally was fined £2 for throwing a live penguin to huskie dogs.
- 17 November.** Arthur H. Farrant, Fids, was buried in the whalers cemetery.

- 1955** **18 February.** The Chilean station 'Presidente Pedro Aguirre Cerda' was established at Pendulum Cove, Deception Island,
- 1955- 56** The Chilean refuge 'Cabo Gutiérrez Varas' was built near Pendulum Cove.
- 1955-57** Hunting Aerosurveys Ltd. carried out vertical air photography of the South Shetland Islands and the northern Antarctic Peninsula with Canso flying boats based on Deception Island. 116, 000 km² of unmapped terrain were photographed. They were the first private company involved in Antarctic mapping.
- 1956** **21 December.** *Southern Hunter*, a Christian Salvesen and Company whale-catcher, was wrecked at Neptune Bellows. The complement were rescued by accompanying whaling vessels.
- 22 December.** The first tourist flight to Antarctica by LAN, the Chilean Airlines, with 80 passengers on board a DC-6B aircraft, overflew Deception Island and part of the Antarctic Peninsula.
- 1957** HRH Prince Philip visited Deception Island aboard HM Royal Yacht *Britannia*.
- 1957-58** A skidway for amphibious aircraft was built by Chile on Deception Island.
- 1961** **8 March.** The President of Argentina, Arturo A. Frondizi, visited Deception Island aboard *Bahía Aguirre*.
- 1964-65** Chile established a volcanological and seismological laboratory at Pedro Aguirre Cerda Base. The *Orehova*, part of a Soviet fleet prospecting krill and antarctic fish, visited Deception island.
- 1966** Max Conrad (USA) made de first flight of a private plane from Ushuaia to Deception Island.
- Lars Eric Lindblad, with the first Antarctic tourist vessel, *Lapataia*, visited Deception Island.
- 1967** HW Tilman, with the first private Antarctic yacht expedition, visited Deception Island aboard *Mischief*.
- 4 and 7 December.** Volcanic eruptions. The Argentine, British and Chilean stations were evacuated. A new island was formed in Telefon Bay.
- 1969** **21 February.** Volcanic eruption. The Argentine, British and Chilean stations were evacuated, by helicopters from the Chilean Navy.
- 1970** **13 August.** Volcanic eruption.
- 1983-84** The unoccupied BAS building, Priestley House, was removed without consent from Deception Island by parties unknown.
- 1988-89** Spanish summer station Gabriel de Castilla established on Deception Island.
- 1990-92** The private yacht *Freydis*, beset by sea ice, wintered in Decepción Station (Argentina).

Adapted from Headland (1998).
 Additional information from
 Bravo Flores (1995), Burke (1994),
 Hattersley Smith (1991), Killingbeck (1977),
 Martinic (1980) , Mott (1986)
 and Palazzi ()

Appendix II

Deception Island and Antarctic fiction

The first examples of Antarctic fiction can be traced to the Ancient World and the theoretical concept of a spherical world with symmetrical hemispheres and a great southern landmass that counterbalanced the known continents of Europe, Africa and Asia. Plato was first to develop the metaphoric possibilities of antipodean geography and history. Pursuant to his “Atlantis”, other utopias flourished in the mid-and-late fourth century B.C. while the Middle Ages continued this tradition with a basic Christian allegorical bias. Thomas More’s “Utopia” (1516) transposes the Platonic metaphor into a Pacific setting, where the natives of a peninsula of an unknown southern continent are persuaded to dig a vast canal, creating an island with the shape of a crescent folded around a central lagoon (the mythical form of Atlantis but also the anticipation of Deception Island). A more Baroque allegory, *Mundus Alter et Idem* (1605) by Bishop Joseph Hall of England inaugurates the series of imaginary voyages to the Great Southern Land, the *Terra Australis Incognita*. A substantial portion of this literature foresees the Austral Land as an island, a trend which expands during the seventeenth and eighteenth centuries due to the great number of castaways.

Coleridge wrote the most famous polar poem, *The Rime of the Ancient Mariner* (1798) in which an Antarctic ship is cursed when a sailor kills an albatross. But it is Poe’s novella *The Narrative of Arthur Gordon Pym* (1837) that stands as the most influential Antarctic literary masterpiece. Two islands mentioned in the narrative remind us of Deception, Bennet, small and rocky; and Tsalal, surrounded by islets, endowed with a temperate climate, and black inhabitants who probably murdered almost all the crew members of the schooner *Jane Guy* from Liverpool. Leaving these islands and sailing towards the South Pole, the expeditionaries find the Land of the Present, whose inhabitants have no memory of the past, nor any anticipation of the future.

James Fenimore Cooper also chose islands as scenarios for his Antarctic fiction. The simian-like inhabitants, *The Monnikins* (1835) of an Antarctic island probably placed in the Ross Sea, were only a pretext for a powerful political satire. However, his next Antarctic fiction, *The Sea Lions* (1849) is the great saga of nineteenth century sealing in the Antarctic seas and a profound meditation on the “icy barriers” as “the analogues of the mysteries which ultimately confront all rational inquiry and mark its farthest limits”. The *Sea Lions* are two islands whose unknown geographical position could be adjacent to the Falkland archipelago or that of the imaginary islands sighted at the beginning of the century by captains Macy and Swain.

Antarctic literature reflects some of the stages of Antarctic historical development, including the advent of the era of exploration and unlimited faith in the power of reason and science. The polar adventures described in Jules Verne’s literary creations interpret the modern mood, as the “Sphynx des Glaces” (1897) provides a rationalist answer to Gordon Pym’s metaphysical search. Among Verne’s heroes, Captain Nemo’s submarine “tour du monde” in “*Vingt mille lieues sous les mers*” (1869-70) has a mysterious base in a volcanic island, and although the Cape Verde or Canary islands have been suggested as a probable location of that harbor, Deception Island’s caldera is unquestionably the most likely candidate. Emilio Salgari chose the Shetland Islands and the Antarctic Peninsula as the stepping stone for an improbable attempt at the South Pole, made by members of the Baltimore Geographic Society riding bicycles over the ice shield. “*Al Polo Australe in velocipedo*” (1897) contains one of the best descriptions of Deception Island, Port Foster and its local fauna and flora.

During the early twentieth century, the search for mythical islands continued with Edgar Rice Burroughs' "The Land that Time Forgot" (1918), describing an island, Caspak, which also has a reminiscence of Deception, but entrance into its inland sea must be made through a subterranean river, by necessity in a submarine. Godefrey Sweven's "Limanora, the Island of Progress" (1903) is close enough to allow its volcanic activity to destroy part of Antarctica.

The vogue of science fiction swept over Antarctica with unspeakable horrors in H.P. Lovecraft's narrative "At the Mountains of Madness" (1931) set at the Trans-Antarctic mountains; Don L. Stuart's (John Wood Campbell) "Who goes there?" (1938) about an alien invader terrorizing an Antarctic station; René Barjavel's "La Nuit des Temps" (1968) where French scientists engaged in ice-core drilling find a thawed 900.000-year-old woman; Valery Brussov's "The Republic of the Southern Cross and Other Stories" (1977) dooming the Antarctic population by a lethal epidemic; and Olaf Stapledon's "Last and First Men" (1930) narrating the rise of eighteen different races of men, of which Homo Sapiens is only the first and the Patagonian, who colonize remote areas of Africa, Australia, as well as the now temperate coasts of Antarctica and its outlying islands, are one of the last. Doris Lessing, who considered Stapledon a genius, wrote in "Briefing for a Descent into Hell" (1971) about Monsieur Watkins' South Atlantic island, whose inhabitants live primitively in the jungle side-by-side to an extraordinary city of mysterious origin. Another modern version of the XVIIth century satires is Alexandre Jardin's "L'Ile des Gauchers" (1995), where 90 per cent of the population are left-handed.

John Calvin Batchelor's "The Birth of the Peoples Republic of Antarctica" (1983) that ends with the dismantling of an outpost on a forlorn island off the coast of Antarctica is not set out in Deception Island but in the more inaccessible Anvers Island. Ursula Le Guin, who wrote a short story about the winning of the South Pole by young women traveling in captain Pardo's *Yelcho*, also imagined in "The Farthest Shore" (1973) a Dragon's island, deceptive as Deception, obscure natural castle in the midst of the Southern Ocean, surrounded by its Kalessin cliffs.

Natural disasters, plane crashes, sailing into snowy blizzards, terrorism and mysteries, including Agatha Christie's "Ordeal by Innocence" (1958) are favourite subjects of Antarctic fiction. But the ethos of Antarctic exploration during the Heroic Age lives in A.E.W. Mason's "The Turnstile" (1912), W.B. Maxwell's "Spinster of the Parish" (1922), Hall Caine's "The Woman thou gavest me" (1913), Thomas Keneally's "The Survivor" (1969) and "Victim of the Aurora" (1977), Kare Holt's "The Race" (1974) and in dramatic plays such as Ted Tally's "Terra Nova" and Vladimir Nabokov's youthful drama "The Pole". Antarctica was used as a metaphor by George Bernard Shaw, Eugene O'Neill, Saul Bellow, Thomas Pynchon, Robert Musil, T.S. Eliot and J.F. Splettstoesser in his essay "Antarctica: the last outpost of the honor system. Insights in global ethics" (1993).

Deception Island definitively has a place in Antarctic fiction thanks to three fine literary contributions. Foremost is "Dan Yack. Le Plan de l'Aiguille" two novellas in one by Blaise Cendrars, published in 1927. An eccentric Englishman lands in 1906 at Port-Deception with his Chilean associate Gonzalo Hortalez, creates the "Compañía Chilota de Balleneros" with headquarters at San Carlos de Ancud and develops "Community-City" replacing the Norwegian whalers thanks to his preposterous great-grandfather's will. Community-City has 711 inhabitants, but zero females until doña Heloisa (Hortalez' wife) arrives and becomes the impossible love of Dan Yack. Ingredients of a real historical episode are woven into pure fiction: the date of Deception's rediscovery by captain Andresen; the whaling companies in Chiloé which were joint Chilean-Norwegian ventures; the establishment of the land factory are some of the fictionalized elements as is the mirror-image of doña Heloisa, Betsy Rasmussen, captain Andresen's genuine companion in Deception. But Heloisa's love is unattainable for Dan Yack because it happens in the imaginary Port-Deception, while the love between Adolffus Andresen and Betsy Rasmussen can only survive in the extraordinary conditions of Deception Island. Reality is greater than fiction.

Francisco Coloane, wrote a sort of Moby Dick, “El Camino de la Ballena” (1962), the adventurous and perilous life of Pedro Nauto, who sails to Antarctica under the command of an old sea-wolf, Julio Albarrán, on board of the *Leviathan*. Coloane, whose father was a whaler in the Chilean port of Corral, also mixes fiction with reality. Recalling that the establishment in Deception was initiated by a Punta Arenas whaling company, he maintains that it was destroyed by German raiders during the First World War, rebuilt by a certain Captain Hansen in 1920 and then abandoned. He vividly remembers the cemetery, identifies the tomb of Einar Mattissen and the column erected to the memory of the victims of the “Graham” sunk near Bridgeman Island, mentions their names and that they are not buried there since the sea took their remains. Another well-known Chilean writer, Salvador Reyes, contemplating the grave of Georg Odegaard, born in Cristiania (1894) and buried in Deception (1910) was reminded of a poem by Corbiere, on the difficult task entrusted to the man who would communicate to his mother the tragic news. However, the whalers oral tradition differed: the men decided to maintain the illusion of the distant mother by continuing to write to her, for the rest of her natural life, the letters Georg would have sent her if he had survived. Other writers have associated Deception’s graveyards with the romantic cemetery in the Lofoten Islands, which inspired Milosz ‘ poems “Les Sept Solitudes”.

Last but not least, we cannot evoke Deception Island without been reminded of Oscar Pinochet de la Barra. In “Antartica, sueños de ayer y del mañana” (1988), the search for Paradise travels mystically through the Antarctic light, into the distant past, back to our time, and intrepidly into the future. In the South-Antillian Arc, the temperate crescent of the south polar world, he finds a place to stay, a place to live a rich and meaningful life. Deception Island becomes a site for contemplation and meditation. Looking at the surrounding mountains, he endeavours to imagine a great dome covering and preserving the island through the centuries. One of his descendants writes to him, the last day of December 2.156, that his dream has been accomplished , and Deception is at last forever preserved for humanity. I do not know if the author’s design for the Deception Dome is a realistic proposition, but such a beautiful metaphor is perhaps the best reminder of the collective duty we have to protect this extraordinary island and safeguard its ecosystem for future generations.

Adapted from Cordes (1996) Fausett (1993) Guadalupe and Manguel (1980) and Pyne (1986).

List of documents

1. Background

1. HSM 31 Plaque at Whalers Bay, Cemetery. ATCM VII, Wellington, 1972 Ant/3
2. Historic Sites and Monuments. Rec. VII. 9. ATCM VII, Wellington, 1972.
3. Management Plan SSSI N° 21 Shores of Port Foster ATCM XII, Brussels, 1985.
4. Management Plan SSSI N° 27 Port Foster ATCM XIV Rio, 1987 WP/35 R 1
5. Madrid Protocol and Annex V Madrid 1990.
6. HSM 58 Cairn and Plaque, Andresen. ATCM XVI, Bonn, 1991 WP/40
7. Model Management Plan, Moe Island SPA N° 13 ACTM XVI, Bonn, and 1991. WP/19
8. MPA 1 Southwest Anvers Island. ATCM XVI, Bonn, 1991. WP/22
9. HSM 71 Whaling Station, Whalers Bay. ATCM XIX, Seoul, 1995. WP/21 R.2
10. ASMA 1 Admiralty bay, King George Isl. ATCM XX, Utrecht, 1996 WP/15 R2
11. Progress Rep. HSM N° 71 . ATCM XXII Lima 1999, IP/107
12. Deception Island - Future Management. SATCM XII The Hague, 2000 IP/8
13. A management Strategy for Deception Island, Roderick H. Downie and J.L. Smellie Cambridge, 2001.

14. Base Antártica Española - Gabriel de Castilla
15. Base Antártica Española - Gabriel de Castilla. Planes Contingencia y Emergencia
16. Guidelines for the reporting of oil spill incidents which occur in Antarctica (COMNAP, 1993)
17. Guidelines for Oil Spill Contingency Planning (COMNAP, 1993)

2. Delivered to the meeting

- Management Plan for Deception Island, South Shetland Islands, as an Antarctic Specially Managed Area (ASMA) Skeletal Draft, Rev 3.
- What does Option 4 mean?. The Way Forward
- Towards an agreed Strategy for the future Management of Deception Island. Argentina
- Deception Island Expedition - Austral Summer 2002. Draft, Argentina
- KGIS - The King George Island GIS Project
- ASOC's Statement for the Workshop on Deception Island - ASOC
- Towards an agreed strategy for the future management of Deception Island, J. Acero y Rodolfo Sánchez.
- Documentation of industrial monuments and sites - a pragmatic approach, Gustav Rossnes.

3. Appendices

- Whalers' cemetery; Deception Island, South Shetland Islands, Robert Headland
- A Chronological history of Deception Island
- Deception Island and Antarctic fiction

List of participants Workshop on Deception Island

Instituto Antártico Chileno, Santiago, Chile. 26 -29 March, 2001

ARGENTINA

Mr. Rodolfo Sánchez
Dirección Nacional del Antártico
Cerrito 1248
1010 Buenos Aires
rsanchez@dna.gov.ar

Mr. José M. Acero
Instituto Antártico Argentino
Cerrito 1248
1010 Buenos Aires
jmacero@abacnet.com.ar

CHILE

Amb. Oscar Pinochet de la Barra
Director Instituto Antártico Chileno
Luis Thayer Ojeda 814
Providencia,
Santiago
opinochet@inach.cl

Amb. Jorge Berguño B.
Subdirector Instituto Antártico Chileno
Luis Thayer Ojeda 814
Providencia,
Santiago
jberguno@inach.cl

Ms. María Luisa Carvallo
Instituto Antártico Chileno
Luis Thayer Ojeda 814
Providencia,
Santiago
Mlcarvallo@inach.cl

Eng. Patricio Eberhard B.
Instituto Antártico Chileno
Luis Thayer Ojeda 814
Providencia
Santiago
peberhard@inach.cl

Ms. Paulina Julio R.
Dep. Antártica.
Dirección del Medio Ambiente.
Ministerio de Relaciones Exteriores.
Catedral N° 1143, Santiago.
dima5@minrel.cl

Eng. Ricardo Jaña O.
Instituto Antártico Chileno
Luis Thayer Ojeda 814
Providencia,
Santiago
rjana@inach.cl

Geog. Patricia Vicuña V.
Instituto Antártico Chileno
Luis Thayer Ojeda 814
Providencia,
Santiago
pvicuna@inach.cl

IAATO

Mr. John Splettsstoesser
P.O. Box 88
Spruce,
Maine 04859, USA
Jspletts@midcoast.com

Ms. Denise Landau
0025 Dakota Meadows
Carbondale, CO 81623, USA
iaato@iaato.org

NORWAY

Ms. Birgit Njaastad
Norsk Polarinstitut
Polarmiljosenteret
N-9005 Tromsø
njaastad@npolar.no

Mr. Gustav Rossnes.
Directorate of Cultural Heritage.
P.O.Box 8196.
6034 Oslo
gustav.rossnes@ra.no

SPAIN

Dr. Jerónimo López M.
Comité Polar Español
Ministerio de Ciencia y Tecnología
José Abascal N° 4
28003 Madrid
Jeronimo@cicyt.es

Mr. Jesús Peñas Prekler
División de Operaciones
Ejército de Tierra
Prim N° 6
28004 Madrid
jpenasp@et.mde.es

UNITED KINGDOM

Dr. Michael Richardson
Polar Region Section
Overseas Territories Department
Foreign Commonwealth Office
King Charles Street
London CB2 1ER
saad.fco@gtnet.gov.uk

Dr. John Shears
British Antarctic Survey
High Cross, Madingley Road
Cambridge CB3 0ET
jrs.@bas.ac.uk

UNITES STATES OF AMERICA

Dr Joyce Jatko
National Science Foundation
Office of Polar Programs
Environmental Officer
4201 Wilson Boulevard, Room 755
Arlington Virginia 22230
jjatko@nsf.gov

Ms. Antonia Fairbanks
National Science Foundation
Office of Polar Programs
4201 Wilson Boulevard, Room 755
Arlington Virginia 22230
afairban@nsf.gov

SECRETARIAT

Dr. José Valencia D.
Instituto Antártico Chileno
Luis Thayer Ojeda 814
Providencia,
Santiago
jvalenci@inach.cl

Dr. Roderick Downie
British Antarctic Survey
High Cross, Madingley Road
Cambridge CB3 0ET
rhd@pcmail.nerc-bas.ac.uk

ASOC

Mr. Scott Altmann
Antarctica Project
ASOC Secretariat
1630 Connecticut Av. NW
Washington, DC 20009
Antarctica@igc.org

Mr. Ricardo Roura
ASOC European ADV.
Pieter Von Doesstraat N° 411
VH Amsterdam
1056 Netherlands
ricardo.roura@worldonline.nl

Mr. Cristián Pérez
ASOC L. America
6127 Corregidor Pedro Mariño.PAC
Santiago
asoc-la@terra.cl

