THE CONSERVATION STATUS OF HEARD ISLAND AND THE McDONALD ISLANDS

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ABSTRACT

For all its area, the subantarctic region has few land outcrops and those which do occur, with the exception of Heard Island and the McDonald Islands, have been extensively and irreversibly affected by human beings. As the last unspoilt unit representative of the sub-antarctic biome Heard Island and the McDonald Islands are of outstanding universal value. They contain unique natural features of exceptional beauty and host habitats of rare and endangered plant and animal species.

With the cessation of sealing on Heard Island in the early 1900's, extreme geographic isolation and severity of climate have deterred visitors. The Islands are now experiencing increasing popularity and legal nature protection and conservation measures which can be considered to apply to the Islands are insufficient to ensure continuation of their biological integrity.

This study draws attention to the conservation status of subantarctic Heard Island and the McDonald Islands which are governed by Australia. Legal controls for the protection of nature on the Islands are assessed and contrasted with international conservation treaties and scientific programs which apply to the subantarctic region. It is concluded that the conservation status of the Islands is delicately balanced and that steps need to be taken as a matter of extreme urgency, to upgrade legal controls to facilitate their future protection. Practicable options available to government to afford appropriate protection to the Islands are identified and examined. These are:

(a) introduction of new legislation;

(b) incorporation of the Islands under the control of the Australian National Parks and Wildlife Service; or

(c) incorporation of the Islands under the Antarctic Treaty (Environmental Protection) Act 1980.

Of the three approaches, Option (c) is considered to be most beneficial for the Islands and would provide continuity between Antarctic and subantarctic nature conservation measures.

The history, geography and biology of the Heard Island and the McDonald Islands are discussed in the first half of the study to provide background to the subantarctic region generally and to give an appreciation of the current value of the Islands. The second half is devoted to describing and assessing past and current legal controls to protect nature. The final section focuses on reform options to upgrade nature protection which may be pursued by government.

It is evident from this study that the Islands under study are worthy of international conservation status. Declaration as a Biosphere Reserve under the International Union for the Conservation of Nature (IUCN) or inclusion on the World Heritage List in accordance with the World Heritage Convention are particularly relevant. However, action in this direction is dependent on, and subsequent to, the reforms options identified.

ABBREVIATIONS

AAT	Australian Antarctic Territory
ACT	Australian Capital Territory
Agreed Measures	Agreed Measures for the Conservation of Antarctic Fauna and Flora
ANARE	Australian National Antarctic Research Expeditions
ANPWS	Australian National Parks and Wildlife Service
BANZARE	British, Australian and New Zealand Antarctic Research Expedition 1929-31
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resources
FAO	United Nations Food and Agriculture Organisation
HI&McDIs	Heard Island and the McDonald Islands
ICSU	International Council of Scientific Unions
ISAS	International Survey of Antarctic Seabirds
IUCN	International Union for the Conservation of Nature and Natural Resources
MAB	"Man and the Biosphere" program established by UNESCO
SCAR	Scientific Committee on Antarctic Research
SIOEHI	South Indian Ocean Expedition to Heard Island 1965
SPA	Specially Protected Area
SSSI	Site of Special Scientific Interest
UNESCO	United Nations Educational, Scientific and Cultural Organisation

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1. INTRODUCTION

Heard Island and the McDonald Islands (HI&McDIs), a subantarctic island group consisting of three islands and a number of rock outcrops, lie close together in the Southern Ocean near 53°05'S, 73°30'E (Figure 1). They are about 4100 kilometres south-west of Perth, Western Australia, and lie on the Kerguelen-Heard submarine plateau. Heard Island is the largest island in the group being 42 km from NW to SSE, ice-covered for its greater area, and with an elevation of 2745 m above sea level. All the Islands are of volcanic origin.

The climate and landscape of the Islands are in stark contrast to that of mainland Australia. The Islands have a cool maritime subantarctic climate and, not infrequently, experience winds in excess of 130 km/hour for periods longer than a day at least once a year. Heard Island is heavily glaciated for most of its area and ice cliffs form the greater part of its coastline. The three small islands which form the McDonald group, although not permanently snow-covered, also have a cliffed coastline making access from the sea difficult. Geographical remoteness, harsh climate and rugged terrain are the features which have prevented permanent settlement and development of the Islands by humans.

Although unknown to most Australians, the Islands are Australia's only sovereign Territory in the Southern Indian Ocean sector of the globe and they host distinct landforms and unique biological features. However, the Islands are beginning to figure more prominently in world affairs. Concern for the conservation of the Antarctic marine ecosystem and for subantarctic island biotas has found expression in several international movements. This concern has grown as a result of the intent and activities by some

 FIGURE 1.

nations to exploit the living and non-living resources of the Southern Ocean and it seems that the time is right for an expansion of international interest in this part of the globe. For Australia's part, there are three important factors in any consideration of the future management of HI&McDIs which occur in the subantarctic.

Firstly, there is concern by nations participating in Antarctic research and resource assessment programs for the conservation and protection of wildlife in the Antarctic and subantarctic region. In particular, research has shown that, within the subantarctic, HI&McDIs are the last land masses to host an intact ecosystem representative of the region.[1] Also, it has been shown that the long-term monitoring of animal populations on the Islands is a unique and vital way to determine environmental disturbance to the Antarctic and subantarctic regions caused by humans.[2]

Secondly, geophysical and sea floor coring surveys initiated in the 1960s by the "Eltanin" cruises have revealed that the submarine plateau on which HI&McDIs is located may have a potential for hydrocarbon and mineral resources as indicated on other subantarctic submarine plateaux.[3]

Finally, as its only Territory in the Indian Ocean sector, Australia has a strategic interest in the Islands under study. Interest in this regard is heightened by the fact that Australia's claim to Heard Island is disputed by the United States of America,[4] and that there is a growing need for surveillance of foreign fishing vessels in the region generally.

Changes in international awareness, and the fact that there are no legal arrangements at the national level for the protection and conservation of nature on the Islands is the stimulus for this study. More appropriate legal

controls need to be introduced consistent with Australia's position in several international nature conservation agreements. In particular, Australia has taken an active role in negotiating nature conservation treaties in respect of the Antarctic[5] and the Southern Ocean[6], but an equivalent level of protection has yet to be afforded to HI&McDIs which have environmental similarities to, and an ecological interdependence with, the Antarctic and Southern Ocean. Moreover, the direction and scope reform may take remain an open question and are, to some extent, impeded by the general lack of information and understanding of the special needs of the Islands.

In international fora, there is increasing concern for the protection of remote oceanic islands because of their scientific value and biological peculiarities. Wace and Holdgate[7] and Elliot[8] provide an excellent resume' of the scientific importance of oceanic islands, and they compile an inventory and an assessment of the biological integrity of the world's remote oceanic islands by reference to the international programs integral to the UNESCO Man and the Biosphere (MAB) program, and the program 'Islands for Science' developed by the International Union for the Conservation of Nature and Natural Resources (IUCN). HI&McDIs have been cited as areas deserving special protection in both these programs[9] but, before international conservation arrangements can be pursued for the Islands, a clear national legal basis for their protection and conservation needs to be established.

The purpose of this document is to establish the significance of HI&McDIs as Australian Territory; it provides background information and attempts to steer a course towards ways and means of upgrading nature protection and conservation measures for the Islands.

To appreciate the importance of the Islands, both globally and as Australian Territory, the history of human activity, geography and biology of the Islands are given, followed by a review of current legal controls for the protection of nature. Practical approaches to upgrade current legal measures to ensure the future protection and conservation of nature are, subsequently, examined.

Information presented in this thesis has been drawn from a diversity of sources. Historical information for the period 1833-1880 is based on work by Roberts[10] and Bertrand[11], while scientific information has been extracted from reports by Australian National Antarctic Research Expeditions which occupied Heard Island from 1947-1954. Information on the contemporary history and administration of the Islands has been researched from government records and has not, hitherto, been published. Source material for the interpretation of the current conservation status of the islands and the identification of alternative legal options comes from my own involvement with government. In toto, the information presented is vital for an appreciation of the case for stronger legal protection and conservation controls, and for the drafting of a plan of management for the Islands. Hopefully, this document will trigger action in this direction.

The body of this thesis is given in the following four chapters. Chapter 2 reviews the history of human activity on the Islands. Chapter 3 is concerned with the environment of the subantarctic with particular reference to the regional importance of the islands under study. Their current conservation status, and the need to upgrade legal controls is covered in Chapters 4 and 5. Approaches to afford more appropriate legal controls to protect and conserve nature on the islands are given at the conclusion of Chapter 5. An appendix of photographs is also provided to give a visual appreciation of the Islands.

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4. Although there is no formal documentation to this effect, U.S. diplomatic exchanges with Australian authorities prior to their occupation of Heard Island in 1969 were limited to requests for permission to use huts erected on the Island between 1947-1954 by Australian National Antarctic Research Expeditions. This action may be taken as non-recognition of Australian sovereignty over Heard Island in support of the claim to discovery by American Captain J. Heard, in 1853, over the sighting of the Island by British explorer, Peter Kemp, in 1833.

5. In December 1980, Australia ratified the Agreed Measures for the Conservation of Antarctic Fauna and Flora (Article IX of the Antarctic Treaty).

6. Australia has taken a leading role in the formulation and implementation of the Convention for the Conservation of Antarctic Marine Living Resources. Australia ratified the Convention in April 1981, the first signatory nation to do so.

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2. HEARD ISLAND AND THE McDONALD ISLANDS - Past and Present

There are few works which deal specifically with the history of human activity on HI&McDIs, and much of our current understanding comes from authoritative works by Roberts[1] and Bertrand[2]. In the period from discovery in 1833 to 1880, close to 100 voyages to Heard Island are registered from American ports alone[3] and logs kept by whale and merchantier shipping, and the diaries of the sealers on "Desolation Island" (a name shared by Iles Kerguelen and Heard Island), are the primary sources of historical information.

In addition to the bibliographies in the works cited above, the Scott Polar Research Institute Bibliography[4] and the Antarctic Bibliography prepared by the U.S. Naval Photographic Interpretation Center[5] were examined but yielded no other significant references. Access to original documents is made difficult since most documents are housed overseas and are not readily available in Australia. Literature used in this study was obtained from the National Library of Victoria, the State Library of Tasmania (archives), and from the Antarctic Division of the Department of Science and Technology. Other written material on early Antarctic and subantarctic voyages is held by the Mawson Institute for Antarctic Research, Adelaide.

For the purposes of this study, the history of voyages to, and human activity on HI&McDIs is given in two parts. Presentation in this form is chosen to emphasise two differing views of the Islands over time and, hence, in the way the Islands have been regarded.

The first part covers the period from discovery of Heard Island to the early 1900s based on the works by Roberts[6] and Bertrand[7]. As mentioned previously, the works represent the only detailed coverage of the early history of

human activity on the Islands and, despite common source material, differ in respect of dates of discovery for Heard Island and on the relative frequency of visits to the island by New London sealers. Variations in historical interpretations are identified to explain the disputed rights over Heard Island.

The history of the Islands from the 1930s to the present, which has not been presented previously, is given in the second part. Information has been researched from archives, Australian National Antarctic Research Expedition (ANARE) Reports and publications, and from records held by the Antarctic Division.

2.1 The Sealing Era

The early history of HI&McDIs is not known in detail because of the secrecy of British and American sealers who made considerable wealth from concealing the locations of islands which hosted large seal and penguin populations. The Islands were among the last subantarctic islands to be discovered, but seal populations found on Heard Island were recognised at a time when indiscriminate slaughtering had dramatically reduced seal populations in both hemispheres. Hence, the abundance of seals and penguins on Heard Island, combined with its late discovery, made it a focus for international sealing operations which persisted for nearly a century.

The first sighting of Heard Island is attributed to Peter Kemp on 27 November 1833. The objective of Kemp's voyage into this region was both exploratory and commercial and, like Biscoe before him, the venture was financed by the London merchant Charles Enderby. Biscoe's achievements during his 1830-33 voyage had been considerable and involved mapping a large section of the Antarctic coastline which he

named Enderby Land. Kemp was interested in the exploration of the coastline adjoining that which had already been charted by Biscoe. Kemp did not attempt a landing on Heard Island and continued southwards and mapped that part of the Antarctic coast now named Kemp Land. Kemp's sighting of Heard Island was charted by the Hydrographic Department of the Admiralty at the time and serves as the basis for British sovereignty over Heard Island, as Kemp's journal has since been lost and the sighting remained unpublished.

According to Lanman[8], Heard Island was subsequently sighted in 1849 by Captain Thomas Long of the "Charles Carroll" on whaling operations south of Desolation Island (Iles Kerguelen). However, it was not until November 1853 when Captain John Heard discovered the Island on a passage from Boston to Melbourne that the Island's geography and location to a degree of precision was published.

The generality of claims to the discovery of Heard Island previous to that of Captain Heard is discussed by Bertrand[9] who argues forcefully for the integrity of Captain Heard's discovery and, therefore, American claimant rights to the Island. Following his sighting, Heard made repeated requests to the United States Home Office to register his discovery and he made claim to a reward offered to discoverers of "new lands". However, it is interesting to note that the Home Office took a most casual attitude in replying to Heard at a time when sealing grounds were in high demand. This anomaly is not answered by Bertrand[10] and may imply acknowledgement, official or otherwise, of Kemp's or Long's previous sighting.

In January 1854, Captain McDonald of the British sealer "Samarang" also laid claim to Heard Island. He then sailed westward and discovered the small group of islands

which are named after him. McDonald was quick to publish his discoveries which were contested by Heard who was in Melbourne at the time. The Islands were independently discovered an additional three times in 1854[11]. The sightings were recorded on voyages made by the "Earl of Eglington" (Captain J.S. Hutton), "Herald of the Morning" (Captain J. Attwaves) and "Lincluden Castle" (Captain Rees).

In a letter to the Nautical Magazine dated March 1855, Captain G. Hyde[12] of the Royal Mail Steam Ship "Argo" conveyed news of the apparent discoveries of Captains Rees and Attwaves and recommended that, as a matter of urgency, the Islands' locations be included in the appropriate charts. Captain Hyde's concern was well founded as the location of the Islands posed an obvious danger to both whaling and sealing vessels and merchant shipping which frequented great circle navigation routes from Europe and the Americas towards Australia.

By 1854, whaling and sealing in the southern oceans had been established for nearly seventy years. Inappropriate equipment for whaling in Antarctic conditions turned the early whalers to harvesting oil from seal blubber (British whaling fleets commenced the practice of flensing blubber from elephant seals in the 1770s). Captain James Cook, on his second circumnavigation of the world in 1772-1775, landed at South Georgia and Staten Island and reported large numbers of elephant and fur seals. In 1778, British and American sealing operations were established on both Islands and, by 1792, the sealers had extended their operations as far afield as Iles Kerguelen.

In 1785, commercial interests focused on the southern fur seal, following the opening of the China market to American and British traders who made considerable profits from the sale of seal skins. However, the indiscriminate

slaughter of fur seals, regardless of sex or age, rapidly reduced populations to an uneconomical level. The discoveries of Macquarie Island in 1810 by the sealer Hasselborough and the South Shetland Islands in 1819 by Smith represented the last boom in the sealing trade before the discovery of Heard Island.

By this time, Southern Ocean sealing operations were on a grand scale. For example, on the Isla Alejandro Selkirk of the Juan Fernandez group, Clark[13] has estimated that "between the years 1793 and 1807, upwards of 3 500 000 fur seal skins were obtained, and most of them taken to China". Cameron[14] gives the account of the voyage of the Boston sealer "States" which visited the Falkland Islands in 1784 and loaded a cargo of "13 000 sea otters".

A mode of operation had clearly been established by the early sealers; island discovery followed by immediate and intensive exploitation of seals and, consequently, it was not uncommon for owners of sealing vessels to experience heavy financial losses following seasons of high profit. In 1829, Webster[15], after completing a southern oceans voyage, reported "that not a single (fur) seal was seen, although it is only a few years since countless multitudes covered selfsame beaches." The innovation in the early 1800s of steam pressure cookers made it possible to harvest penguins for oil, increasing the devastation of animal populations on the subantarctic islands.

The first landing on Heard Island was made in 1855 by Captain E.D. Rogers of the American Whaler "Corinthian" who discovered the wealth of seals on the Island. In a letter to the nautical magazine, Captain Cameron[16] of the vessel "Anne" stated:

> Captain Rogers and two boats crews procured in one day from four to five hundred barrels of sea elephant oil; and said on looking from a small promontory, he saw at one elephants and sea leopards to fill 100 000 barrels with oil.

Rogers' report on the Island's resources was immediately acted upon and, in less than a year, the vessel "Laurens" with four tenders under the command of Captain F.E. Smith worked the Island with Rogers. According to Roberts[17], the enterprise, which extended over the summer, was entirely successful having killed 500 fur seals and loaded 3 000 barrels of elephant seal oil. The "Laurens" was loaded to capacity with the cargo valued at $130 000. (Bertrand[18] states that a total of 4 700 barrels of seal oil were taken from the Island during the venture).

The riches of the Island could not be kept secret any longer and, in 1857, Henry Rogers of the American brig "Zoe" landed with 25 men to winter on Heard Island. Rogers' habitation of the Island represented the first of a procession of sealing teams which were to occupy the Island for thirty years. During this period, sealers, mostly from New London, visited and occupied the Island on a year-round basis, but British sealing and whaling fleets remained active in the region operating from Desolation (Kerguelen) Island.

Clark[19] and Starbuck[20] provide summaries of vessels which cleared New London ports bound for Heard and Desolation Islands. Generally, New London sealing enterprises undertook annual voyages to Heard Island to load elephant seal oil and fur seal pelts and to change over and provision the wintering sealing gangs. Living on the Island with its severe conditions and with only primitive shelter was a hard life, but evidence shows that a good number of sealers returned a number of times to live on the Island.

The risks associated with sealing on the Island were considerable. In an endeavour to break into the American monopoly on the Island, a Tasmanian, W.L. Crowther, despatched two whaling vessels for Heard Island. Only one vessel, "Offley", reached the Island and worked it in

conjunction with an American sealer "Mary Powell" which had aided in the rescue on Crowther's disabled ship "Elizabeth Jane". However, the vessel ran aground under the ice cliffs which surround the Island and 8 000 pounds worth of blubber (and two ships) had been lost. Not all those that wintered on the Island did so by choice. Several vessels involved in sealing on the Island were lost along the Island's coastline. The account of the "Trinity" in 1880 is a well quoted example. Having established a food depot at the northern end of the Island, the "Trinity" proceeded to Spit Bay at the south end of the Island to unload men and supplies. A rising northerly gale caused the ship to drag her anchors and eventually the ship was beached and wrecked. It was not till 15 months later that the remaining crew were rescued by the USS "Marion" which had been despatched by the Navy Department to search for the "Trinity".

However, high risks did not deter the sealing trade. The total productivity of Heard Island in terms of barrels of elephant seal oil reaped, or the number of fur seals pelts taken, is difficult to ascertain. The records of the early sealers purposely gave misleading details of station and catch in order to keep secret their actual location while many sealers had differing names for Heard Island. It was the convention at the time among the many sealers to refer to both Kerguelen and Heard Islands as Desolation Island. Nevertheless, the frequency of sealing ship visits between 1858 and 1875 ranks the Island among the most intensively harvested in the subantarctic.

It is remarkable that extermination of at least the fur seal was not assured by the uncontrolled slaughter that was practised. Why extermination did not actually occur may, in part, be attributed to three factors. Firstly, the severity of sea state and climate of Heard Island made sealing a hazardous occupation at the best of times. Secondly, the heavily crevassed glaciers which flow to the sea prevented sealing gangs from working every beach in a

season. Finally, the contribution of Kerguelen and McDonald Islands breeding stocks for the recolonisation of Heard Island cannot be discounted. Up to this time, no landings on the McDonald Islands are recorded due, largely, to the severity of the coastline.

Roberts[21] delineates the start of modern commercial exploitation on Heard Island in 1907 when the Kerguelen Sealing and Whaling Company of Cape Town made application to the United Kingdom for a licence to conduct sealing. Sealing recommenced in 1926 and, again, large numbers of elephant seals were slaughtered for their oil. By this time, technological innovation in the whaling industry in the form of a semi-mechanical and steam processing technique (which increased the yield of oil from animal blubber) had been extended to sealing. Its immediate effect was to enable small seal populations which were previously uneconomical to harvest to be a viable proposition and also allowed seal blubber to be reduced on board ships simultaneously with whale blubber. The introduction in 1922 of stern slipways to whaling vessels and the invention, in 1932, of the Gjeldslad Claw enabling whale carcasses to be hoisted on deck for flensing suited Antarctic conditions and, subsequently, the Kerguelen-Heard area was intensively fished.

The Kerguelen Sealing and Whaling Company whaler "Kildalkey" under the command of Captain H.O. Hansen was a frequent visitor to Heard Island and, in 1929, erected a hut and a navigation beacon and raised the British flag on the Island. (It was also on the "Kildalkey" that a French scientist, E. Aubert de la Rue, travelled to Heard Island in 1929[22] to undertake a geological survey of the northern part of the Island).

By the 1930s sealing had ceased on Heard Island. The operations of the Kerguelen Sealing and Whaling Company were crippled by financial loss and later investigation of seal stocks by a Western Australian company revealed insufficient numbers to restart sealing activities.

2.2 The Scientific Era

The first scientific observations on Heard Island were made well after the peak of sealing. In 1874, H.M.S. "Challenger" landed a small party of scientists at Atlas Cove for a few hours to make geological and botanical collections. The scientists learnt that about 40 sealers occupied the beaches around the Island and described a number of sealers as being Portuguese taken from the Canary Islands and living in deplorable conditions[23]. H.M.S. "Challenger" also undertook a survey of the McDonald Islands' coastline, but no landing on the Islands was attempted. In 1902, a visit to Heard Island by Baron E. Von Drygalski on the vessel "Gauss" increased considerably scientific knowledge of the Island. During its brief stay, the German expedition completed comprehensive studies of the Island's geology, flora and fauna. The expedition found the beaches around the Island to be deserted. Subsequent visits by scientists were made in 1929 by the French geologist E. Aubert de la Rue and a small party from the "Discovery". The 1929 voyage of the "Discovery", under the aegis of the British Australian and New Zealand Antarctic Research Expedition (B.A.N.Z.A.R.E.) was led by Sir Douglas Mawson. Mawson was later to play a leading role in the establishment of a permanently-manned research station on Heard Island in 1947.

Interest in McDonald Islands and the occupation of Heard Island from 1947 to present contrast vividly with the activities of earlier occupants. The need to maintain a presence on Heard Island, for whatever combination of reasons, was primarily politically motivated.

Campbell[24] gives an account of the organisation and establishment of regular Australian National Antarctic Research Expeditions (ANARE) to Heard Island, crediting Sir Douglas Mawson for arousing government interest to support such a venture. Mawson had a proven record in Antarctic and subantarctic exploration and research and had proclaimed a sizeable portion of the Antarctic continent in the name of the British Sovereign during the 1929 BANZARE. Mawson and others urged that Macquarie Island, administered by the Tasmanian State Government, be afforded special legislation to protect its flora and fauna. The need for such protection was recognised and, in 1933, the Tasmanian Government declared the Island a Wildlife Sanctuary.

Political motivation within Australia for increased activity in the Antarctic and the subantarctic was gradually aroused between 1935-1939 and, after the Second World War, by the increasing rate of international expeditions into these regions. In particular, a number of American expeditions and a Norwegian expedition undertook detailed oceanographic and mapping programs in that area of Antarctica proclaimed by Mawson in 1929. Of particular concern at the time was Ellsworth's second expedition of 1938-1939 which included an aerial survey from the Rauer Islands (Lat 68.51S long. 72.50E) inland and south of the Ingrid-Christensen Coast. The area in the heart of the territory already proclaimed by Mawson was, to the concern of the Australian Government, proclaimed "American Highland" by Ellsworth for the United States of America.

These circumstances led the Australian government to step up Australian Antarctic operations and provide funds to purchase Ellsworth's expedition ship "Wyatt Earp" in 1939. The outbreak of War, however, thwarted Antarctic operations which had been planned.

Against a background of heavily supported American Antarctic expeditions such as the 1946-1947 U.S. Navy Developments Project code named "Operation High Jump", the 1947-1948 Ronne Antarctic Research Expedition and the 1947 U.S. Navy Second Developments Project code named "Operation Windmill", the Australian Cabinet, in August 1947, proposed that permanently-manned meteorological-scientific stations be established on Heard and Macquarie Islands for a period of at least 5 years. This represented the initial phase of a systematic reconnaissance of the coastal margin of Australian Antarctic Territory with a view to establishing similar stations on the continent.[25] In a matter of 4 months, an expedition was organised on the lines prescribed by the newly-formed Antarctic Planning Committee[26] which was created to advise government on the means to establish permanent stations in Australian Antarctic Territory and on priority areas for scientific research.

In December 1947, the same month that the first Australian National Antarctic Research Expedition (ANARE) sailed for Heard Island, Sovereignty of HI&McDIs was formally transferred from the United Kingdom to the Australian Commonwealth Government by an "exchange of letters". An identical transfer of responsibilities over the Prince Edward Islands and Marion Island from the United Kingdom to the South African Government occurred at about the same time.

On 11 December 1947, H.M.A.S."Labuan" (LST 3501) arrived at Heard Island and established the first research station under the aegis of ANARE. The scientific aims of the expedition were to commence on-going meteorological, biological, geophysical and upper atmospheric studies. The first ANARE also saw the introduction of sheep to serve as a prime meat source, and sledging dogs to assist in travel around the Island. The introduction of sheep proved unsatisfactory due to the severity of climate and inadequate

stock feed. Sledging dogs proved well suited to the prevailing conditions but served little useful purpose on the Island. Crevassed terrain made sledging hazardous and the dogs were later transferred to Antarctic continental stations. Sledging dog diet was based mainly on seal meat and it was not uncommon to supplement expedition meat supplies with seal and penguin meat.

The continuous occupation of Heard Island by ANAREs increased immensely scientific understanding of the environment of subantarctic islands. Research contributions from these expeditions, as well as providing most of the collected scientific data of the Island, were of considerable value in testing fundamental biological principals such as the zonation of related avian species postulated by Murphy[27] and as a contribution to presently accepted concepts such as the theory of island biogeography.

Permanent occupation of Heard Island by ANAREs ceased in 1954 to enable the limited logistic resources available to be directed towards establishing a scientific research station on the Antarctic continent. Nevertheless, subsequent ANAREs to Heard Island occurred in 1963, 1969, 1971 and 1980. (The 1971 ANARE program was incorporated into a larger French Expedition). During the 1971 expedition, the first recorded landing was made on the McDonald Islands, using a French helicopter.[28] Total duration of the visit was in the order of an hour allowing only a cursory investigation of the Islands. A more detailed investigation of the biology and geology of the McDonald Islands was made in March 1980 when a total of 4 days were spent on two of the islands in the group.

Between March 1969 and April 1970, a United States Army "TOPOCOM" expedition wintered on Heard Island, contributing to an American-sponsored world-wide research program to observe the passage of satellites to determine the geodetic shape of the earth. A Soviet oceanic research vessel also visited the Island in 1971.

Visits were also recorded by independent expeditions to Heard Island in 1965 and 1972. In the first instance, the South Indian Ocean Expedition to Heard Island (SIOEHI) landed a party of 5 on the Island to climb "Big Ben" and to undertake a multidisciplinary scientific survey of the Island. The party completed the first ascent of Big Ben and estimated the summit to be 2745 metres above sea level.[29] In 1972, the French yacht "Damien" visited Heard Island. "Damien's" visit was primarily recreational and details of the party's activities on the Island are limited to log book notes recovered on Heard Island in 1980. Importantly, the visit represented the first purely tourist visit to the Island which included, as well, a number of other subantarctic islands such as Macquarie and Campbell Islands. The Antarctic cruise ship "Lindblad Explorer" visited Heard Island early in 1981 reflecting the growing awareness of the tourist potential of the Islands.

The last twenty years have also been important for the start of large-scale deep-sea fishing and shipboard scientific inquiry into the Southern Indian Ocean. According to the United Nations Food and Agricultural Organisation (FAO),[30] commercial fishing operations in the rich seas surrounding Iles Kerguelen commenced in 1966. Russian deep-sea trawlers accounted for the majority of total catch throughout the duration of fishing operations which have gradually declined since 1971. FAO figures reveal the 1966 total catch by all nations to be 81 500 tons, peaking in 1971 to a total catch of 272 000 tons, and declining in 1974 to a total catch of 237 500 tons. It is not known precisely how far south from Iles Kerguelen fishing operations extended. It may be assumed that fishing was not conducted off Heard Island or the McDonald Islands because of their location well south of the Antarctic convergence.

Shipboard scientific research has focussed on marine biology projects aimed at gaining a deeper understanding of the Southern Ocean ecosystem and at marine geoscientific investigation of the sea floor. The main

platform for research was the USNS "Eltanin" which operated for a decade from 1961 conducting a systematic multi-disciplinary survey of some 80% of the Southern Ocean between 38°S and the Antarctic continent.[31] The cruises were sponsored by the National Science Foundation as part of its contribution to the United States Antarctic Research Program.

From 1961 to 1972, the "Eltanin" operated seven cruises to the Southern Indian Ocean region and, during the 1970-71 summer, and in June 1972, conducted a co-ordinated marine and geoscientific investigation of the Kerguelen Plateau on which HI&McDIs are sited. The Kerguelen Plateau is an isolated sea floor feature and rises some 3 700m above the adjacent deep sea floor and, along its NW-SE trending axis, exceeds 2 000 km in length. The objectives of the "Eltanin" cruises to this region were to investigate the petrology and sedimentology of the plateau and, thereby, to determine whether it is of oceanic or continental origin. No landings were made on the Islands.

2.3 CONCLUSION

A summary of important dates for HI&McDIs is given in Table 2.1.

As with other subantarctic islands, the stimulus for discovery and the basis for settlement was the exploitation of seal and later penguin populations for their oil. Fur seals were also hunted for their pelts which were traded with China by Britain and America.

Heard Island was discovered by Kemp in 1833 at a time when seal and penguin populations on other islands had been exhausted and, commencing in the 1850s, the Island became a focus for Southern Ocean sealing for over thirty years.

TABLE 2.1 SUMMARY OF IMPORTANT EVENTS IN THE HISTORY OF HEARD ISLAND AND THE McDONALD ISLANDS

OVERY	1833	Heard Island sighted by British explorer P. Kemp. Kemp's objectives were the exploration of the Antarctic coast and an assessment of potential whale and seal stocks. No attempt was made to land on Heard Island.
	1849	Reported sighting of Heard Island by Cptn. T. Long.
	1853	Heard Island sighted by American Cptn. Heard. Cptn. Heard contested the authenticity of previous discoveries and is the basis for American claim over the island.
	1854	Cptn. McDonald of the British sealer "Samarang" sighted Heard Island. Sailing west he later discovered a small island group which is now named the McDonald Islands.
	1854	Heard Island sighted another three times.
SEALING ERA	1855	First landing on Heard Island by Cptn. E. Rodgers of the American whaler "Corinthian". Rodgers estimated enough seals to fill 100,000 barrels with oil.
	1855-56	The American vessel "Laurens" under command of Cptn. Smith operating from Heard Island.
	1857	Cptn. H. Rodgers of the American brig "Zoe" landed 25 men to winter on Heard Island. This was the first year round occupation on Heard Island.
	1858-1875	Innumerable visits by sealing gangs to Heard Island.
	1874	"Challenger" expedition made a brief visit to Heard Island.
	1902	E. Von Drygalski on the "Gauss" undertook a scientific survey of Heard Island.
	1907	Licence granted by the British Government to Kerguelen Sealing and Whaling Company of Capetown to conduct sealing on Heard Island.
	1929	Brief visit to Heard Island by French Geologist E. Aubert de la Rue.
	1929	BANZARE under the command of Sir Douglas Mawson made brief visit to Heard Island.
SCIENTIFIC ERA	1947	Establishment of an ANARE station at Atlas Cove, Heard Island. Station was manned continuously to the end of 1954. Subsequent visits by ANARE personnel were made in 1963, 1969, 1971 and 1980.
	1965	South Indian Ocean Expedition to Heard Island. Undertook the first successful climb of "Big Ben".
	1971	First recorded landing on the McDonald Islands. Party landed by helicopter.
	1972	French yacht "Damien" visited Heard Island. The first tourist visit to the island
	1980	First detailed scientific survey of the McDonald Islands undertaken by an ANARE. First recorded landing on the islands by sea.
	1981	Cruise Ship "Lindblad Explorer" visited Heard Island.

The location and riches of Heard Island were deliberately kept secret by the early sealers and many aspects of the early history of the Islands remain a mystery. The sealing era on Heard Island extended to the 1920s when insufficient seals stifled efforts to re-establish sealing operations. Also at this time, a change in philosophy towards the Islands is evident. Interest was directed to studying and protecting Island wildlife. Similar concern was evident for other subantarctic islands such as Macquarie Island which was declared a Nature Reserve in 1933.

The second period of occupancy, the scientific era, was politically motivated and was characterised by extensive biological research, especially in the period 1947-1954 when an ANARE station was established on Heard Island. In 1950, the British and Australian Governments agreed that sovereignty over the Islands should be transferred to Australia. This was ratified in 1953. To some extent, interest in the Islands, scientific and political, was sapped at the time by efforts to establish an ANARE station in Australian Antarctic Territory. Mawson station was established on the Antarctic continent in 1954, and the station on Heard Island closed, signalling the end of year-round occupation by Australians. Subsequently, American and French expeditions visited Heard Island, the former for a year's duration.

Scientific curiosity has continued to be the main stimulus to visit the Islands in recent times. Several ANAREs have made brief visits to the Islands, including one expedition to carry out a detailed biological and geological survey of the McDonald Islands in 1980. In the absence of other records, it is assumed that this was the second visit to the McDonald Islands, the first landing being made in 1971.

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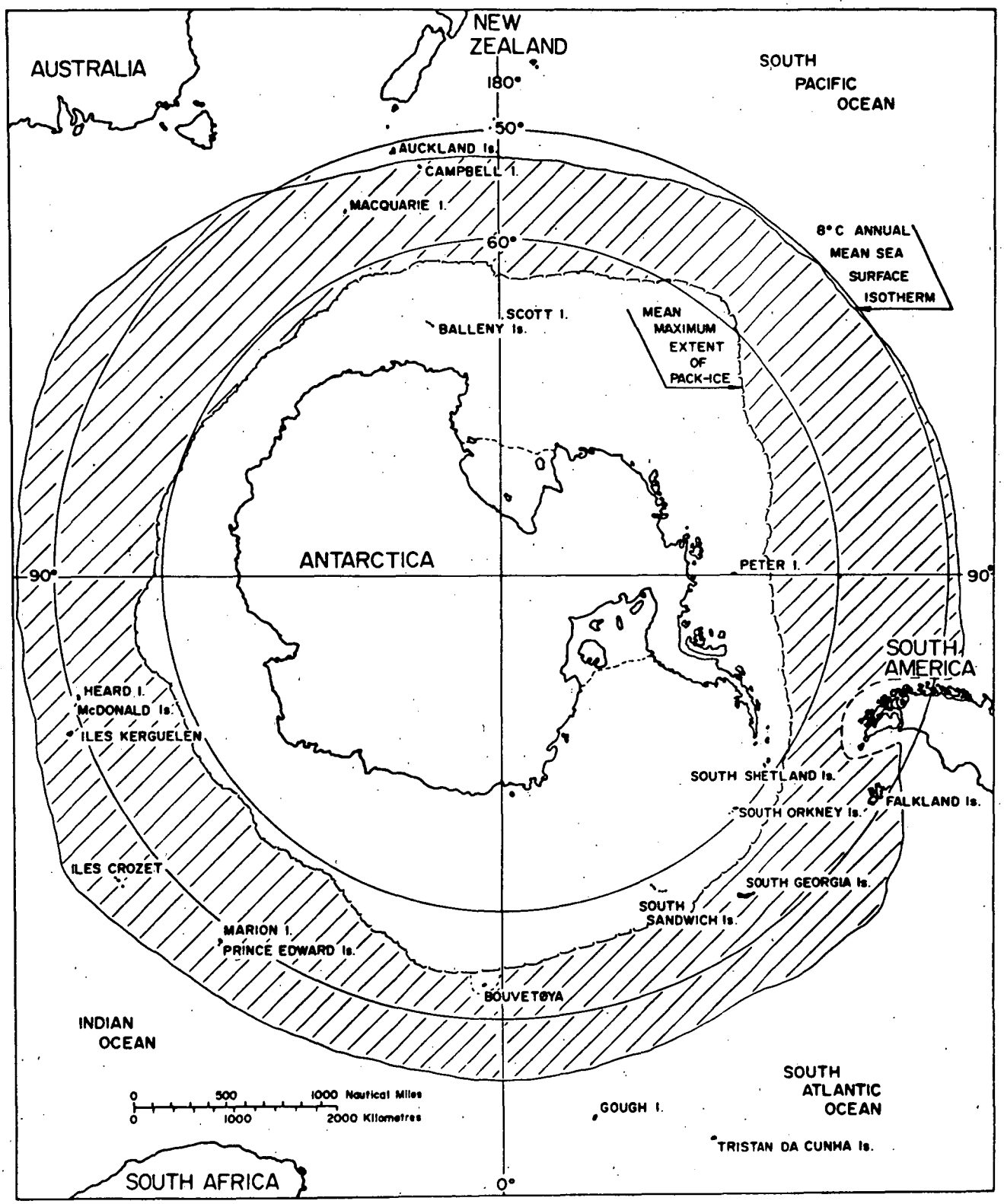
3. HEARD AND THE McDONALD ISLANDS - THE SUBANTARCTIC ENVIRONMENT

3.1 The Subantarctic Region

Heard Island and the McDonald Islands are situated in the Southern Ocean, an unobstructed oceanic belt which surrounds the Antarctic continent. The northern extent of the Southern Ocean is the Antarctic convergence, a distinguishable boundary between the colder polar water mass and the warmer mid-latitude water bodies of the Indian, Pacific and Atlantic Oceans.[1] South from the Antarctic convergence a range of climatic regimes occur, becoming less oceanic and more indicative of the Antarctic continent. Similarly, there are distinctive variations in biological features with increasing latitude and colder climate.

The subantarctic environment is determined by oceanic conditions and has a circumpolar distribution at the northern extent of the Southern Ocean. For the purposes of this study, the $8^{o}C$ annual mean sea surface isotherm is used to define the northern boundary of the subantarctic region, with the southern boundary given by the mean maximum extent of Antarctic pack ice. The 8^{o} isotherm chosen approximates the mean locations of the subantarctic convergence as mapped by Ivanov[2], but is more definable due to the density of station and shipboard sea surface temperature observations and the incorporation of relief and latitude factors in mapping. Islands located south of the line of mean maximum extent of Antarctic pack ice experience a colder climate with comparatively greater temperature range, both diurnally and annually, and generally have a less oceanic climate by virtue of the presence of sea ice for a number of months. A map showing the sea area and islands considered within these boundaries is given in Figure 3.1.

Figure 3.1. The Subantarctic Region and Islands



From Figure 3.1, it can be seen that, within the subantarctic region, only a handful of islands occur. The islands are all remotely located but share distinctive climatic and biological features. They all experience an oceanic climate characterised by extreme constancy of temperature at sea level and westerly atmospheric circulation with high relative humidity. Biologically, the vegetation cover is largely restricted to non-woody vascular species. The combined area of the islands is relatively small, but they represent significant ice-free land exposures and are a critical foothold for the biological life typical of the region.

3.2 Climate

Aspects of atmospheric circulation and climate of the Southern Ocean have been covered by several workers[3] with particular reference being paid to the contribution of Southern Ocean conditions to the weather experienced in Australia.[4] In general, most meteorological studies of the Southern Ocean and, therefore, the subantarctic, have been of a synoptic nature directed towards weather forecasting elsewhere.

Comparative analyses of meteorological observations from subantarctic islands and from information collected by ships in the region have rarely been attempted. The sole comparative analyses of surface weather observations from a spread of subantarctic islands, roughly equi-distant around Antarctica, was completed by Fabricus[5] nearly thirty years ago. A similar study for the Falkland Islands and Dependencies was made around the same time by Pepper[6]. The scarcity of recording stations and the short duration of occupation of a number of islands (including Heard Island) has hindered such research elsewhere.

The subantarctic region experiences westerly atmospheric circulation. From wind roses compiled by Fabricus[7] and Pepper[8], on average, winds with a westerly component account for 70% of the winds with a westerly the islands studied. A summary of frequency of wind speeds by Fabricus[9] shows that wind velocities between 16 and 30 km/hour are dominant in the region with velocities between 31 and 62 km/hour slightly less frequent. All islands experience blustery conditions and can be expected to encounter 130 km/hour gusts for periods longer than a day at least once a year.

The northward migration of westerly circulation from the high southern latitudes is constrained by low pressure features, generally of continental origin, which extend south-eastward from South Africa, Australia and South America.[10] Within the subantarctic region, the flow of westerly air is interrupted by cyclonic activity and high pressure ridges which cause considerable cloud over the region.

Precipitation is largely latitude dependent and increases with lower latitudes, but is greatly influenced by island topography. The influence of island topography is worth noting. Because atmospheric temperatures at sea level are close to zero throughout the year, temperature decrease with elevation of the island topography has a pronounced effect on the overall climate of islands, particularly in combination with orographically derived precipitation usually falling as snow or rime. Precipitation usually occurs at the fronts of depressions which move from west to east at frequent intervals. It is not atypical for precipitation in the form of rain or snow to occur daily at subantarctic islands.

As previously mentioned, a climatic characteristic of the subantarctic region is the extreme constancy of temperature, both diurnally and annually. The difference between mean temperatures for winter and summer for islands

in the region is in the order of 6°C. The annual temperature pattern is sinusoidal with the mean maximum temperature and mean minimum temperatures occurring in February and September respectively.

The climate of Heard Island has been studied by Gibbs and co-workers[11] who analysed meteorological data collected in 1948, and by glaciologists[12] using data collected during the period 1948-1954 for surveys of the mass balance of glaciers on the Island. Meteorological data for Heard Island were obtained continuously from 1948 to 1954 by ANAREs. Average monthly records for this period are given in Table 3.1. Meteorological observations have not been made on the McDonald Islands.

Ambient temperatures at sea level on Heard Island show little seasonal variation with average winter temperatures around 5°C colder than in summer. Average monthly temperatures at sea level are close to freezing. From the data collected, the mean maximum temperature is 3.2°C occurring in February with the mean minimum temperature of -0.6°C occurring in August, a month earlier than most other subantarctic islands which generally have a more northern distribution. The time of mean minimum temperature correlates with the northernmost extent of the Antarctic sea-ice cover, a characteristic observed on the other subantarctic islands studied by Fabricus and Pepper.

Precipitation on Heard Island is relatively constant throughout the year with a slight decrease in winter. Average monthly precipitation ranges from 94 mm in July to 158 mm in April, giving a total annual precipitation of 1380 mm. The atmosphere is near saturated throughout the year with a slight decrease in relative humidity (1%) during the winter.

The effect of local topography on precipitation and the flow of air has a marked effect on the local climate of Heard Island. The obstruction to air flow by the steeply rising land feature of "Big Ben" (2 745 m above sea level)

Table 3.1.

CLIMATOLOGICAL SUMMARY, HEARD ISLAND 1948-54

Month	Station level Pressure (Mb.) 49 m.a.s.l.	Mean Temp. °C	Mean Dew Point °C	Rel. Humidity %	Mean Daily Max. °C.	Mean Daily Min. °C.	Precipitation mm.	No. of Days	Wind m/sec.
Jan	994.5	3.2	1.4	89	5.2	1.5	139	27	7.2
Feb	998.8	3.4	1.5	88	5.2	1.7	145	25	7.6
Mar	999.9	3.0	1.1	86	4.8	1.2	146	27	7.7
April	997.5	2.5	0.7	87	4.2	0.7	158	27	8.1
May	994.5	1.4	-0.9	85	3.1	-0.4	148	25	8.4
June	989.9	-0.2	-2.7	83	1.4	-2.3	95	23	8.3
July	992.6	-0.4	-2.9	84	1.3	-2.5	94	21	8.8
Aug	994.1	-0.6	-3.1	83	1.2	-2.7	57	21	9.3
Sept	992.7	-1.1	-3.8	81	0.8	-3.3	67	20	9.3
Oct	992.7	-0.1	-1.8	87	1.5	-2.0	100	20	8.5
Nov	991.5	0.7	-1.5	84	2.3	-0.8	100	21	9.0
Dec	994.1	2.2	0.5	88	4.1	0.7	132	24	7.3
Average	994.4	1.2	-1.0	85	2.9	-0.7	115	23	8.3
						Total =	1380	276	

Source: Commonwealth of Australia, Department of External Affairs., 1948-1954; A.N.A.R.E. Reports., Series D, Meteorology.

forces the uplift of moist air and consequent orographically derived precipitation in the form of snow or rime. There are no direct measurements on Heard Island of temperature and precipitation with elevation above sea level, but the relationship between variables has been estimated by Allison[13].

In winter, it is expected that the average rate of temperature decrease with elevation above sea level is 0.75°C/100 m in the first 1000 m, decreasing to 0.5°C/100 m at the summit of the main volcanic cone of Big Ben. Mean temperature at the summit is estimated to be around -16°C in winter and -10°C in summer. Average annual snowfall at the summit is estimated to amount to in excess of 4 m of water/year. Due to the presence of permanent ice cover on Heard Island and the channeling of onshore wind by steeply-rising topography, microclimatic differences between HI&McDIs are expected to occur.

The location of HI&McDIs in the stream of westerly air flow is indicated by the constant average wind speed recorded. Average monthly wind speeds range from 7.2 m/sec in January to 9.3 m/sec in August and September. Similar wind conditions are observed at Iles Kerguelen approximately 240 nautical miles NW from Heard Island. Hence, although the McDonald Islands may vary in microclimate, their major weather features are likely to be identical with those on Heard Island.

3.3 Geology and Landforms

As discussed in Section 2.2, HI&McDIs are located on the Kerguelen Plateau, an isolated sea floor feature which rises some 3 700 m above the adjacent deep sea floor and along its NW-SE trending axis, exceeding 2 000 km in length. The plateau's morphology has been investigated by Watkins[14], Houtz and others[15], and Brock[16], who suggested that the feature is unlikely to be of continental origin, but is an uplifted part of the mesozoic

ocean floor that existed west of Australia before Australia separated from Antarctica.

Uplifted limestones are the oldest geological sequence found on Heard Island and contain foraminifera indicating marine origins in the lower tertiary period[17]. Limestone outcrops are visible only at a few locations on the Island, being overlain by glacial sediments and interbedded volcanic lavas which may be as much as 250 m thick[18].

Volcanism has been an important geological occurrence. The dominant geological feature of Heard Island is the conic structure of the subdued volcano, Big Ben. At sea level, the base of Big Ben averages 20 km in diameter and rises to 2745 m. Laurens Peninsula, which is separated from Big Ben by a narrow isthmus, is also volcanic in origin with its highest feature, Anzac Peak, rising to 715 m above sea level. On Big Ben and Laurens Peninsula and at several points around the coast there are a number of remnant, major cones and subsidiary vents with present-day volcanic activity visible intermittently at the summit of Big Ben. The Island is, therefore, the only active volcano in Australian Territory.

Heard Island is all but covered by permanent snow and ice and extensive glaciation occurs. Glacial activity has been studied by Budd and Stephenson[19], and Budd and Allison[20], but systematic study of the Island's glaciers has not been conducted. Because of the proximity of Heard Island to the Antarctic convergence, glaciers have been considered inherent indicators of climatic change in the Southern Ocean region, and investigations have focused on mass balance studies of a number of glaciers.

The glaciers themselves are among the most dynamic in the world having a relatively short turnover period. Glacial movement is enhanced by steep bedrock slope and increased annual snow precipitation with elevation above

sea level. Ice velocities in the order of 250 m per year have been estimated by Budd and Allison[21] for the equilibrium line of the Vahsel Glacier.

Glacial action has resulted in extensive erosion and reworking of volcanic material and glacial sediments. In addition, marine processes have been active in the formation of the isthmus linking Laurens Peninsula with the main part of the Island and in the building of the narrow spit extending seaward from the south-eastern end of the Island. Where glacial activity does not extend to the sea, grey volcanic sand beaches have been formed.

Together, climate and the nature of parent material prevent appreciable development of soil on HI&McDIs. Bacterial action in the soil is so slow that little humus is formed and vegetative cover is restricted to communities of either azorella and poa grass or moss and lichen communities.

3.4 Biology

The islands which occur in the subantarctic region are isolated land masses which are located at intervals about the Southern Ocean and maintain a distinctive flora and fauna. Marine mammals and seabirds, many of which are migratory with feeding ranges in the Antarctic and subantarctic, are attracted to the islands in summer to breed and form the principle fauna of the islands. Non-woody vascular plant species are the common flora of the region which has been described by several workers as impoverished and disharmonic, reflecting the recent volcanic origin of most islands, present and past climatic conditions, and the extreme geographical remoteness of the islands which has proved to be an effective barrier in preventing

colonisation by other plant and animal species. The characteristic features of the subantarctic ecosystem are summarised by Holdgate and Wace[22], and are given below:

(a) Poverty in numbers of native species. The extreme remoteness of the islands and the recent occurrence of glacial and periglacial conditions on present-day ice-free land outcrops has restricted the numbers of species capable of colonising the islands.

(b) The absence of important animal and plant groups. Difficulties of long-range dispersal across the oceans has prevented important animal and plant species from colonising the islands, and many common species found elsewhere are not represented. The absence of certain predators has favoured particular species; for example, the absence of cats, rats and mice has permitted the development of ground-nesting and flightless birds found in these latitudes.

(c) Modified ecological behaviour of species. In the absence of predators, species have evolved distinctive behavioural patterns, and some species fill niches from which they would normally have been excluded.

(d) Evolution of endemic species. The geographic remoteness of the islands has prevented interbreeding with continental parent stocks resulting in divergent evolution in sympathy with the island environment. Endemism may also exist because of the absence of predator species; this allows species' continuation when continental counterparts have been eliminated.

Consequently, the subantarctic islands maintain simple ecosystems which have proved sensitive to pressures placed on them by humans. The vulnerability of island wildlife and habitats is a product of three inter-related factors. Firstly, species which occur on the islands have colonised them in response to their dispersal capability and have proved to be

unsuccessful in competition with introduced species. Secondly, island ecosystems have few interacting species and alteration of any one element has escalating effects on the whole ecosystem. Finally, island species are not adapted to conditions produced by humans and introduced species readily replace indigenous populations.

Commencing in the late 1700s, and before the development of scientific interest in subantarctic islands, island biotas were gradually modified through the activities of sealing gangs and shore-based whaling communities. In their natural state, the islands could not maintain a supply of fresh meat for the settlers and a variety of grazing animals were deliberately introduced for this purpose. Cats, rats and mice were also spread to most islands. The island biotas which had evolved in the absence of human introduced predators, floras, faunas and parasites were, consequently, affected while seal and penguin populations were indiscriminately slaughtered and exterminated on some islands. The permanent modification of island ecosystems was all but complete except for HI&McDIs which, despite extensive sealing on Heard Island in the period 1857-1929, remain today as the only landmasses in the subantarctic region without human introduced animal and plant species.

As the only unmodified islands in the subantarctic region, HI&McDIs are of unique scientific value. Knowledge of their biology comes from research carried out by ANAREs which occupied Heard Island from 1947 to 1954. Subsequent ANAREs to Heard Island were made in 1963, 1969, 1971 and 1980. The flora and fauna on the McDonald Islands were surveyed in 1971 and 1980 but are not so well known as the biota on Heard Island.

This Section summarises information gathered by expeditions on the flora and fauna of the Islands. Comparisons with the biology of other subantarctic islands are also made to illustrate the uniqueness of the islands under study and their vulnerability to alien species.

3.4.1 Flora

Checklists of alien plant and animal species occurring on subantarctic islands are given by Holdgate and Wace[23] and by Greene and Walton[24] respectively. Both studies conclude that, for the majority of the islands, the effects of species introduction on the environment are irreversible and that island floras and faunas are more vulnerable to human interference than continental regions with comparable climate and terrain.

The first scientific description of the vegetation on Heard Island was made by Moseley[25], a naturalist on the "Challenger" expedition which landed at Heard Island for a matter of hours in February 1874. To Moseley, the Island was a barren outcrop and "miserably poor in flora, even for the higher latitudes of the southern hemisphere".

The vegetation on the Islands was similar to that found on Iles Kerguelen, Marion and Prince Edward Islands which the expedition had previously visited. The same islands were subsequently grouped by Greene and Greene[26] in their identification of the subantarctic botanical zone, a classification which has won wide acceptance.

The vegetation on Heard Island and, to a lesser extent, the McDonald Islands has been studied by ANAREs from 1947, with the most recent survey being undertaken in 1980. However, present understanding of the Islands' botanical taxonomy, distribution and relative abundances of plants is far from complete.

The dominant vegetation on the Islands is herbaceous with tussock grasses, Azorella, Acaena and Kerguelen cabbage, Pringlea antiscorbutica, providing most ground cover. A total of eight vascular species are known to occur on Heard Island and five on the McDonald Islands. Five vegetation cover types have been described by Jenkin [27]. These are: the poa complex found on relatively well-drained hill slopes, grasslands, meadow, herb and fell-field. Plant species are typically subantarctic in distribution and have proven favourable for the introduction of reindeer, rabbits, sheep, and goats onto other islands. A list of flowering plants, mosses and lichens so far recorded on HI&McDIs is given in Table 3.2.

An investigation of subantarctic plant ecology has been completed by Jenkin [28] for Macquarie Island which hosts several plants recorded on HI&McDIs. The plants have a high annual production and efficiently utilise low levels of radiation and low temperatures. Seasonal variation in plant biomass is attributed to variation in radiation. The vegetation is also extremely well salt-adapted and is able to tolerate salt-laden winds without evidence of transpiration stress. However, in comparison with Macquarie Island and Iles Kerguelen, very few vascular species occur on Heard Island. It has also been observed that, for some species (such as Kerguelen cabbage), plant size at maturity is smaller than at other subantarctic islands, but there have been no studies to measure plant size and variations in growth rates on an inter-island basis. These anomalies may be in part explained by the colder climate, the physical nature of exposed land and the quality of soil available for plant colonisation on Heard Island.

3.4.2. Fauna

Whereas the botanical species on HI&McDIs are few and have remained relatively undisturbed since the Islands were discovered,

TABLE 3.2 Vegetation Recorded for Heard Island and the McDonald Islands

1. HERBS AND GRASSES

Azorella selago Hook f.
Poa cookii Hook f.
Colobanthus kerguelensis Hook f.
Festuca kerguelensis Hook f.
Callitriche antarctica Engelm ex Hegelm
Acaena magellanica (Lam.) Vahl.
Pringlea antiscorbutica R. Br, ex Hook f.

There is no comprehensive work dealing with the botany of the subantarctic islands.

2. MOSSES

Andreaea sp.
Amblystegium serpens B. et S.
Bartramia papillata H.f. et W.
Bartramia diminutiva Broth.
Bartramia robusta H.f. et W.
Blindia robusta Hampe
Blindia contecta (Schwaeg.) Par.
Brachythecium salebrosum (Web. et Mohr) B. S. G.
Ceratodon purpureus (Hedw.) Brid.
Dicranoloma billardieri (Schwaeg.) Par.
Dicranoweisia grimmiacea (C.M.) Broth.
Ditrichum immersum van Zanteu
Ditrichum subaustrale Broth.
Drepanocladus uncinatus (Hedw.) Warnst.
Grimmia immerso-leucophaea (C.M.) Kindb.
Muelleriella crassifolia (H.f. et W.) Dus.
Pogonatum alpinum (Hedw.) MiH.
Rhacomitrium crispulum (H.f. et W.) H.f. et W.
Rhacomitrium lanuginosum (Hedw.) Brid. var. prúinosum H.f. et W.
Schistidium apocarpum (Hedw.) B. et S. in B. S. G.
Tortula rubra Mitt.
Verrucidens tortifolius (H.f. et W.) Reim.

SOURCES:

CLIFFORD, H.T., 1953; The Mosses of Macquarie Island and Heard Island, A.N.A.R.E. Reports, Series B.II, Botany, 1-12; Government Printer, Melbourne.

SEPPELT, R.D., personal communication

the reverse is true for the animal species. Indeed, the zoological balance of Heard Island is still recovering from intensive sealing which occurred on the Island during the last century. To recapitulate from Section 2, the numbers of seals slaughtered was enormous. Moseley[29] described the situation:

> The plain (Atlas Cove) was strewn with bones of the Sea Elephant and Sea Leopard, those of the former being most abundant. There were remains of thousands of skeletons, and I gathered a good many tusks of old males. The bones lay in curved lines, looking like tide lines, on either side of the plain above the beaches, marking the rookeries of old times and tracks of slaughter of the sealers.

The sealers also made food of the penguins and used the oil-rich skins for heating and lighting fuel. The biological devastation which followed was considerable and included the near extermination of the Kerguelen fur seal, a dangerous reduction in the elephant and leopard seal populations, and the near total cropping of the king penguins which are now recolonising the island.

The marine mammals which were once heavily exploited are now repopulating Heard Island in increasing numbers. The Southern Elephant Seal (Mirounga leonina) has recolonised Heard Island in much the same manner as on other subantarctic islands since the cessation of sealing. In 1951, about 40 000 Elephant Seals populated Heard Island with the major concentration (70%) being located in the Spit Bay area, followed by the Atlas Cove area. Favourable beach and tussock locations for seal colonies are available at other parts of the Island and may be utilised as population pressures dictate. Elephant seals in any number have not been observed on the McDonald Islands, which have rugged boulder-strewn beaches.

The breeding season starts during the last week in August when the first cows begin to haul out onto the beaches and, by early September, cows are marshalled by bulls into permanent harems. Depending on the behaviour of the bull, harems may gradually increase in size and hold as many as 200 cows but generally number 40 to 50 cows. Pupping occurs from late October to December, peaking in late October with pups averaging 50 kg at birth[30].

The time at which cows are inseminated is variable ranging from the time of suckling till after the pups have been weaned. After weaning is completed, females return to sea to feed and, in November, haul ashore to moult. Moulting takes about 2-3 weeks and, during this time, seals do not return to sea and take cover in Azorella hummocks or in wallows to reduce the irritation of moulting. By autumn, most seals have returned to sea to feed and replenish their blubber, but some immature seals infrequently visit Heard Island during winter.

Studies of elephant seal populations at Iles Kerguelen have shown an increase of several-fold from 1960 to 1970, with a decreasing rate of increase from 1970 to 1977[31]. Comparable studies have not been completed for Heard Island populations, but it is not unreasonable to expect similar trends occurring as seal populations readjust to the available food resources.

HI&McDIs are important breeding grounds for the Kerguelen fur seal (Arctocephalus tropicalis gazella) which was virtually exterminated by the sealers. Elsewhere, its numbers are steadily increasing with the next largest colonies occurring at South Georgia, and nearby Bird Island and Wills Island. Two hundred animals have recently been recorded on South Georgia[32]. The situation on HI&McDIs is more reassuring.

Heard Island census data collected by Budd[33] in 1963 and 1969 show a five-fold increase in numbers from 439 to 2 662 animals. However, at the time, only a few pups were observed and the actual number of breeding pairs on the Island could not be determined. During the first landing on the McDonald Islands, Budd[34] recorded 46 pups (only one beach on the Islands was investigated) thereby establishing the Islands as the only known breeding colony in the Indian Ocean. It is, therefore, assumed that the McDonald Islands (and possibly also Shag Island which has not been investigated) are an important source of fur seals which are now recolonising Heard Island at an increasing rate. A census of fur seals at HI&McDIs conducted during 1980 shows a ten-fold increase in the total recorded population for 1963, with well established breeding colonies on both Heard Island and McDonald Island. It is estimated that around 4 000 fur seals, mainly adolescent males, inhabit Heard Island with only a small number of pups. On the McDonald Islands, the total population is estimated to be 300 animals, including 100 pups. The high numbers of adolescent males and relatively few pups on Heard Island suggest that the population is steadily on the increase in contrast to that on McDonald Island which is in an equilibrium state[35]. Little is known of the fur seal breeding cycle on these Islands. Large breeding colonies of fur seals once existed on Iles Kerguelen before sealing operations were begun, but have not become re-established there.

The third species of seal to frequent the Islands is the Leopard Seal (Hydrurga leptonyx). Unlike the elephant and fur seals, it does not breed on the Islands but visits in large numbers from early winter, peaking in September[36]. The numbers of Leopard Seals observed on Heard Island have not been equalled at other subantarctic islands. Law and Burstall[37] estimated the total leopard seal population in the region of Heard Island to be 900.

Little is known of Leopard seal behaviour, distribution and abundance. The seal's breeding habitat is the Antarctic pack ice and the time of maximum occurrence of Leopard seals on Heard Island corresponds with the northernmost extent of the Antarctic pack. Leopard seals are sighted less frequently at Iles Kerguelen and Macquarie Island which are more distant from the winter pack ice margin.

HI&McDIs have particular importance for the study of the subantarctic avifauna. The Islands host a range of seabirds and, because of their extreme isolation, are well suited for investigation of the effects of geographic isolation and climate on the divergent development of species. A comprehensive study of the bird life of Heard Island has been completed by Downes and others[38] using information gathered by ANAREs from 1947 to 1954. A list of birds on Heard Island and their status (which has been revised from the original list given by Downes and others[39]) is given in Table 3.3.

In general, the avifauna on Heard Island resembles, with few exceptions, that of South Georgia but lacks a number of species represented on other subantarctic islands. Species which nest at South Georgia and at Iles Kerguelen which have not been found on Heard Island are: Grey-headed Albatross (Diomedea chrysostoma), Cape Hen (Procellaria aequinoctialis), and the Grey-backed Storm-Petrel (Garrodia nereis).

Species' breeding cycles are not uniform for all subantarctic islands. Downes and others[40] compare egg-laying times of species occurring at Heard Island, Iles Kerguelen and Macquarie Island to illustrate the lateness, of up to six weeks for some species, in egg-laying dates at Heard Island and the consequent shortness of breeding season. Subsequent work by Warham[41] on the breeding season of the crested penguins shows a close correlation between the time of egg-laying at several islands and the mean annual sea temperature.

TABLE 3.3 List and Status of Birds at Heard Island

	Family SPHENISCIDAE:	
King Penguin	Aptenodytes patagonicus Miller, 1778	*F
Gentoo Penguin	Pygoscelis papua (Forster, 1781)	*A
Chinstrap Penguin	Pygoscelis antarctica (Forster, 1781)	*SF
Adelie Penguin	Pygoscelis adeliae (Hombron and Jacquinot, 1841)	VR
Rockhopper Penguin	Eudyptes chrysocome (Forster, 1781)	*SC
Macaroni Penguin	Eudyptes chrysolophus (Brandt, 1837)	*SA
Emperor Penguin	Aptenodytes forsteri (Gray, 1844)	VR
	Family DIOMEDEIDAE:	
Wandering Albatross	Diomedea exulans Linnaeus, 1785	*VR
Black-browed Albatross	Diomedea melanophris Temminck, 1828	*SF
Light-mantled Sooty Albatross	Phoebetria palpebrata Forster, 1785	*SF
Southern Giant-Petrel	Macronectes giganteus (Gmelin, 1789)	*C
Northern Giant-Petrel	Macronectes halli Mathews, 1912	F
Southern Fulmar	Fulmarus glacialoides (Smith, 1840)	R
Antarctic Petrel	Thalassoica antarctica (Gmelin, 1789)	R
Cape Petrel	Daption capense (Linnaeus, 1758)	*F

Snow Petrel	Pagodroma nivea (Forster, 1777)	R
Blue Petrel	Halobaena caerulea (Gmelin, 1789)	R
Antarctic Prion	Pachyptila desolata (Gmelin, 1789)	*A
Fulmar Prion	Pachyptila crassirostris (Mathews, 1912)	*C
White-chinned Petrel	Procellaria aequinoctialis Linnaeus, 1758	F
	Family OCEANITIDAE:	
Wilson's Storm-Petrel	Oceanites oceanicus (Kuhl, 1820)	*SC
Black-bellied Storm-Petrel	Fregetta tropica (Gould, 1844)	VR
	Family PELECANOIDIDAE:	
Common Diving-Petrel	Pelecanoides urinatrix (Gmelin, 1789)	*A
South Georgian Diving-Petrel	Pelecanoides georgicus (Murphy and Harper, 1916)	*SA
	Family PHALACROCORACIDAE:	
Blue-eyed Shag sub.sp.	Phalacrocorax atriceps King, 1828	*F
	Family CHIONIDIDAE:	
Lesser Sheathbill sub.sp.	Chionis minor Hartlaub	*C
	Family STERCORARIIDAE:	
Great Skua sub.sp.	Stercorarius skua (Brünnich, 1764)	*SC

	Family LARIDAE:	
Kelp Gull	Larus dominicanus Lichtenstein, 1823	*C
Arctic Tern	Sterna paradisaea Pontoppidan, 1763	SF
Antarctic Tern	Sterna vittata Gmelin, 1789	*SC

KEY:

A	-	Abundant
*	-	Breeding
C	-	Common
F	-	Few
R	-	Rare
S	-	Summer Resident
VR	-	Very Rare

SOURCES:

DOWNES, E.N., EALEY, E.H.M., GWYNN, A.M., and YOUNG, P.S., 1959; The Birds of Heard Island, A.N.A.R.E. Report, Series B, Vol. 1, Zoology; Government Printer, Melbourne.

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For most birds, breeding cycles on each Island are well synchronized and attuned to seasonal climatic conditions. In the case of birds which scavenge for food or prey on other nesting birds, egg-laying dates closely correlate with the time of maximum food availability.

The most abundant birds found on the Islands are the penguins which, with the exception of the Gentoo and King Penguins (which are resident) migrate annually to the Islands to breed. The King Penguin, lays and hatches its eggs in the summer, and rears its chicks during the winter. The Islands are occasionally visited by the Emperor and Adelie Penguins indicating that the Islands lie near the limit of their pelagic range. The penguins mostly colonise the tussock and grassland of the coastal fringe of Heard Island and the coastal flats and gullies on the McDonald Islands, exposed areas being occupied by the albatrosses and the petrels.

The King Penguin (Aptenodytes patagonicus) is presently recolonising Heard Island. Records show that, over the past 50 years, they were rarely sighted, and nearly exterminated by the sealers. During the sealing era, the King Penguins were highly vulnerable, since they lived on the Islands throughout the year and bred every second year. They are the largest bird to breed on the Islands.

King Penguin numbers increased steadily from 100 pairs, including 23 breeding pairs in 1963, to over 200 pairs and 103 breeding pairs in 1969. These figures represent a real increase of five-fold in the total breeding population and mirror increases in King Penguin populations which have occurred at other subantarctic islands since the cessation of sealing. For example, at Macquarie Island, their numbers rose from 2 000 pairs in 1937 to 10 000 pairs in 1956. The 1980 survey of King Penguin populations on Heard Island has confirmed this trend,

and a number of firmly established rookeries are to be found[42]. The recolonisation of Heard Island by the King Penguin and the fur seal are of particular scientific interest in the study of population growth and adjustment to the availability of food and effects of the insular environment. Monitoring of changes in abundance and distribution of wildlife is presently being co-ordinated internationally by the Scientific Committee on Antarctic Research (SCAR) in order to assess changes in the ecosystem stemming from commercial exploitation.

The most abundant penguin species on the Islands is the Macaroni (Eudyptes chrysolophus). The largest rookery on Heard Island is below the southern slopes of Mt Olsen where hundreds of thousands of pairs nest. There are several other well established rookeries on each Island and, in one rookery on the McDonald Islands, 160 000 pairs have been estimated by Johnstone[43]. The breeding habitat of the Macaroni Penguin is variable, ranging from the shelter of rock boulders on Red Island to exposed rock ledges on the north coast of Laurens Peninsula. Rookeries have well defined beach areas and walk-ways to provide access to and from the sea. The Macaroni Penguin does not occur on Macquarie Island where it is replaced by the closely (some consider subspecifically) related Royal Penguin (E. schlegeli). Macaroni Penguins populate Iles Kerguelen and Marion and Prince Edward Islands, as well as those dose to the Antarctic Peninsula and the southern tip of South America, Heard Island being the most easterly location for these birds to breed.

The congeneric Rockhopper Penguin has a more uniform circumpolar distribution than the Macaroni. It is not as numerous as the Macaroni on HI&McDIs but competes directly for nesting sites. It is smaller than the Macaroni and arrives later on the islands to commence breeding.

The Gentoo Penguin, which has the largest breeding range of any penguin in the subantarctic, is presnt year-round on the Islands. Its breeding grounds are the tussock grasslands.

The breeding cycles of the Great Skua (Stercorarius skua), Kelp Gull (Larus dominicanus) and the Sheathbill (Chionis minor nasicornis) are closely attuned to the breeding cycle of the seal and penguin populations. These birds are scavengers, feeding on such things as seal placentas, unguarded penguin eggs and chicks. The Sheathbill, which is resident on Heard Island, is a poor flyer and elsewhere has been easy prey for cats as well as rats which upset its ground nest. Sheathbill numbers have been greatly reduced on other islands; those on HI&McDIs remain today as the only breeding population unaffected by introduced predators.

Of the three species of albatross which nest on the Islands, the Wandering Albatross (Diomedea exulans) is the most recent to be recorded. The Wandering Albatross was first reported to breed on Heard Island in 1980 at Cape Gazert. The Black-Browed Albatross (Diomedea melanophrys) and the Light-mantled Sooty Albatross (Phoebetria palpebrata) have well established breeding populations on Heard Island. Black-Browed Albatross nesting sites are located in or in close proximity to Jacka Valley while the Light-mantled Sooty Albatross nest wherever suitable exposed sites are found. Nest sites may vary from sloping sides of Azorella covered hillock to rocky crags which are also preferred as nesting sites by Cape Petrels (Daption capense).

Cape Petrels and Wilson's Storm-Petrels (Oceanites oceanicus) which are common to many other subantarctic islands are found in large numbers on HI&McDIs. Cape Petrels prefer precipitous coastal cliffs for nesting sites and are present at Heard Island through the greater part of the year with nest sites generally deserted from April to May. Cape Petrels re-occupy their nests at the end of August with egg-laying commencing in late November. Wilson's Storm-Petrels flock to the Islands in late December and egg-laying quickly follows.

Great Skuas (Stercorarius skua) which nest throughout the subantarctic region and including the northern half of the Antarctic Peninsula also breed on HI&McDIs. The Southern Giant-Petrel (Macronectes giganteus) which have breeding sites around the Antarctic continental coastline are also well represented.

The occurrence of a resident shag (or cormorant) which is endemic to HI&McDIs highlights the urgency to upgrade nature protection measures. The Heard Island Shag (Phalacrocorax atriceps) is known to have two breeding sites: one at Saddle Point and the other on top of a rocky stack 60m offshore at the southern end of Sydney Cove. It is possible that other breeding sites exist on nearby Shag Island.

In the absence of a comprehensive study, the breeding population has been estimated by several ANAREs to be less than 100 pairs. Plumage and markings are distinct from other shags reflecting the evolution of the species in complete isolation. Egg-laying occurs in mid-October with chicks completing their moult by the end of January. Despite the fact that the Shag is unique to the Islands, not abundant and with few nesting sites, it has not been recognised under current or past nature conservation legislation as being worthy of special protection.

Independent divergent evolution from common stock, which reflects a very long period of geographical isolation, is most apparent in the insects on the Islands. Brown[44] in his study of the insects on Heard Island, described five new species not previously known to science and several sub-species peculiar to the Island. With one exception, all non-indigenous insect species found on Heard Island have a subantarctic distribution. Three introduced insects were also recorded. These were a common "silver-fish" and two moths introduced accidentally during the course of ANARE expeditions. The introduced insects' habitats were the heated buildings used by expeditioners, and it is now considered that the insects no longer persist on the Island. Brown[45] considers the maintenance of native vegetation cover and the non-occurrence of introduced grazing animals, cats and dogs has allowed the Islands' insects to remain virtually unaffected by humans.

3.4.3 CONCLUSION

The fate of other subantarctic islands has revealed the susceptibility of the subantarctic land systems to intrusion by humans. The fact that HI&McDIs remain today as the only unmodified examples of subantarctic islands should have a strong bearing on the future administration and management of the Islands.

In order to protect the wildlife and natural habitats of the Islands, it is essential that the interactions, qualities and needs of the Islands' ecosystem be given the highest priority in establishing a plan of management. It would also be useful to incorporate the Islands into an internationally accepted conservation category to give universal recognition to the biological status of the Islands and as areas deserving special protection.

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4. THE ADMINISTRATIVE SETTING

4.1 Government

Although Australia lays claim to HI&McDIs, this claim rests on the recognition of British discovery of Heard Island by Kemp in 1833, and the discovery of the McDonald Islands by Captain McDonald in 1854. Other than the issue (and recognition) of sealing licences and whaling permits commencing in the late 1800s, and continuing to the 1930s, the British Government exercised few sovereign rights over the Islands and, in 1950, agreed with the Australian Government that sovereignty would be transferred to Australia. However, based on the "discovery" of Heard Island by the American, Captain Heard in 1853, it is understood that the British, and therefore the Australian, claim to Heard Island is not recognised by the United States of America. No evidence can be found to suggest that Australia's claim to Heard Island and the McDonald Islands is contested by other countries.

The Heard Island and McDonald Islands Act 1953 signifies Australia's acceptance of sovereignty and vests in Australia the legislative, administrative and judicial authority for all matters pertaining to the Territory. Responsibility for administering the Islands was initially vested in the Minister for the Interior. Sections 5, 9 and 10 of the Heard Island and McDonald Islands Act define the laws current in the Territory, the judicial procedure and the authority of the Governor-General to make and revise Ordinances in respect of the Territory.

Section 5 of the Act states that the laws in force from time to time in the Australian Capital Territory (ACT), so far as applicable to the Territory (HI&McDIs), are in force in the Territory as if the Territory

formed part of the ACT. In addition, Section 9 allows for procedures relating to the continuance of laws in the Territory and the powers of Ministerial delegation to be defined by reference to the following Acts:

(a) Seat of Government Acceptance Act 1909-38, and the

(b) Seat of Government (Administration) Act 1910-48, and the Schedule to that Act.

Section 10 of the Act provides for the Governor-General to make Ordinances for the peace, order and good government of the Territory. Experience has shown that, with respect to other External Territories, the powers vested in the Governor-General have proved to be an effective avenue to have Ordinances prepared or revised and, in some situations, for the initiation of Government enquiries into nature conservation matters.

The legal status of the Islands as defined by the Heard Island and McDonald Islands Act, 1953 is, therefore, that of an Australian External Territory. The other Australian External Territories are Norfold Island, the Coral Seas Islands, Ashmore and Cartier Islands, Cocos (Keeling) Islands, Christmas Island and the Australian Antarctic Territory (AAT). The Territory of Heard Island and the McDonald Islands and the AAT are the only Territories to have had ACT laws applied to them, but administrative and nature conservation procedures for the AAT have continued to evolve as a result of the Antarctic Treaty and international agreements made within the treaty framework which relate to the Antarctic ecosystem.

In the absence of human inhabitants or living and non-living resources which can be commercially exploited at present, there as been little legislative activity with respect to the Territory of Heard Island and the McDonald Islands since 1953. Legislative changes which have occurred in the period 1953-1980 have been largely in response to international nature conservation treaties signed by Australia which apply, as is the case

with other Australian Territories, to the Islands. In contrast, there have been notable achievements in the area of nature conservation in other External Territories, the most recent being the declaration, on 21 February 1980, of a National Park on Christmas Island to protect the habitat of endangered bird species. A nature conservation program was also established on Norfolk Island in 1978 concerned with the revegetation of nearby Philip Island. However, the special needs of HI&McDIs have never been recognised by legislators despite the fact that the Islands can be made subject to the conservation legislation adopted in other External Territories. Consequently, it is not surprising that legislation which applies directly to HI&McDIs does not allude to the physical and biological features which make them unique among Australian Territories. In practice, the Islands have been afforded a large measure of protection in the past by their extreme geographical isolation.

The legal controls relating to nature conservation which may be considered to apply to the Islands over time are best thought of in two components. The following Section (4.2) will be handled in this manner, according to the component descriptions below.

The first component, deals with the period 1953-80. Although no longer applicable to the Islands, it is useful to note the degree of protection these Ordinances provided over the 27 year period they were in operation. The second component is concerned with legal controls which may be considered to currently apply to the Islands at present.

The adequacy of legislation is assessed and contrasted with international conservation and scientific treaties and research programs which also apply to the Islands. These undertakings reflect the growing concern for the protection of wildlife and are important in giving direction and scope to future nature conservation measures on HI&McDIs.

4.2 Legal Controls Relating to Nature Conservation

4.2.1 Nature Conservation Legislation 1953-1980

With the passage of the Heard Island and McDonald Islands Act in 1953 and up until 1980, ACT Ordinances which may be considered to have provided for nature conservation on the Islands were:

(a) Animal and Birds Protection Ordinance 1918;
(b) Animal and Birds Protection Ordinance 1928; and
(c) Wildflower and Native Plants Ordinance 1936.

The first two Ordinances provided the backbone legislation governing the conservation of nature in the ACT, with certain specified exceptions. The species listed as exceptions are of a kind which may be found in the ACT and in no way reflected the biological situation occurring on HI&McDIs. However, the Ordinances applied to the Islands essentially because definitions of terms such as "wildlife", "animal", "plant", etc. were wide enough to include species found in the subantarctic.

In theory, all wild animal and plant species on HI&McDIs were protected with the exception of the Heard Island cormorant. The schedule listing animals and birds considered not worthy of protection which accompanied the Animal and Bird Protection Ordinance included cormorants, a ludicrous situation when extended to the HI&McDIs where the resident cormorant species is endemic and not abundant.

The effectiveness of the ACT nature conservation Ordinances for the period 1953-1980 was also restricted by inadequate wording and a lack of concern for the biology of the Islands over which they applied. For example, under Section 7 of the Animal and Birds Protection Ordinance 1918, killing, capturing and injury to protected fauna was an offence. However, the mere presence of a person during

critical stages in the breeding cycle of the avifauna, particularly of the kind found on HI&McDIs may molest and hence, decrease the likelihood of survival by the offspring. Ordinances had no provisions to restrict access (to the Islands) other than by common law (e.g. trespass). It is assumed that, in the absence of a list of definitions accompanying the Animals and Birds Protection Ordinance, the common dictionary meaning applies thereby encompassing invertebrates.

Ordinances had provision for the Minister responsible for administering the Act to appoint inspectors and provide penalties where an offence was committed. Penalties were far from severe. Contravention of the Animal and Birds Protection Ordinance could incur a penalty not exceeding $100. By comparison, the same offence under the Antarctic Treaty (Environment Protection) Act 1980 may incur penalties of up to $2000 and/or 6 months imprisonment. The Antarctic Treaty (Environment Protection) Act came into operation on 6 December 1980 and gives effect to Australia's obligations flowing from the Agreed Measures for the Conservation of Antarctic Fauna and Flora (article IX, Antarctic Treaty). The Act applies only to the Australian Antarctic Territory.

Previous Ordinances were also insufficient in their approach to protect native fauna and flora. Conservation measures were species orientated in that they provided protection without recognising the equivalent need to protect species habitat.

During the period 1953 to 1980, there have also been changes in administrative arrangements relating to the Heard Island and the McDonald Islands Act. With the passage of the Act in 1953, the Delegate of the then Minister of State for the Interior appointed the Officer-in-charge (OIC) of the 1947 Australian National Antarctic Research Expedition (ANARE) overwintering party as an Inspector under Section 11 of the Animals and Birds Protection Ordinances. The OIC was accordingly authorised to grant permits "to collect

natural history specimens for any special investigation or for any scientific institution or museum".

1954 was the last year-round occupation of Heard Island by ANAREs and subsequent visits by American (1969) and French (1971) expeditions were not subject to the requirements of the ACT Ordinances. Australian observers did, however, accompany each expedition.

In recent years, the Minister for Science and the Environment - now (1981) Technology, through the Antarctic Division as the main government agency operating and undertaking scientific research in the region, has been delegated responsible for the administration of HI&McDIs in accordance with the Heard Island and the McDonald Islands Act. However, in practice, responsibility was shared with the Minister for the ACT who retained authority to grant permits to collect specimens from the Islands for scientific research in Australia. These procedures were reactivated in February 1980 when an ANARE briefly visited the Islands.

Increasing concern for the protection of rare species which occur on HI&McDIs, and the inadequacies of nature conservation legislation relating to the Islands, prompted the Department of Science and the Environment in March 1980 to introduce interim guidelines to protect the environment of HI&McDIs while more appropriate legislation was prepared and brought into operation. Although a convenient interim solution, the guidelines have no legal effect.

4.2.2 Current Nature Conservation Legislation

Current Ordinances relating to nature conservation on HI&McDIs are listed below:

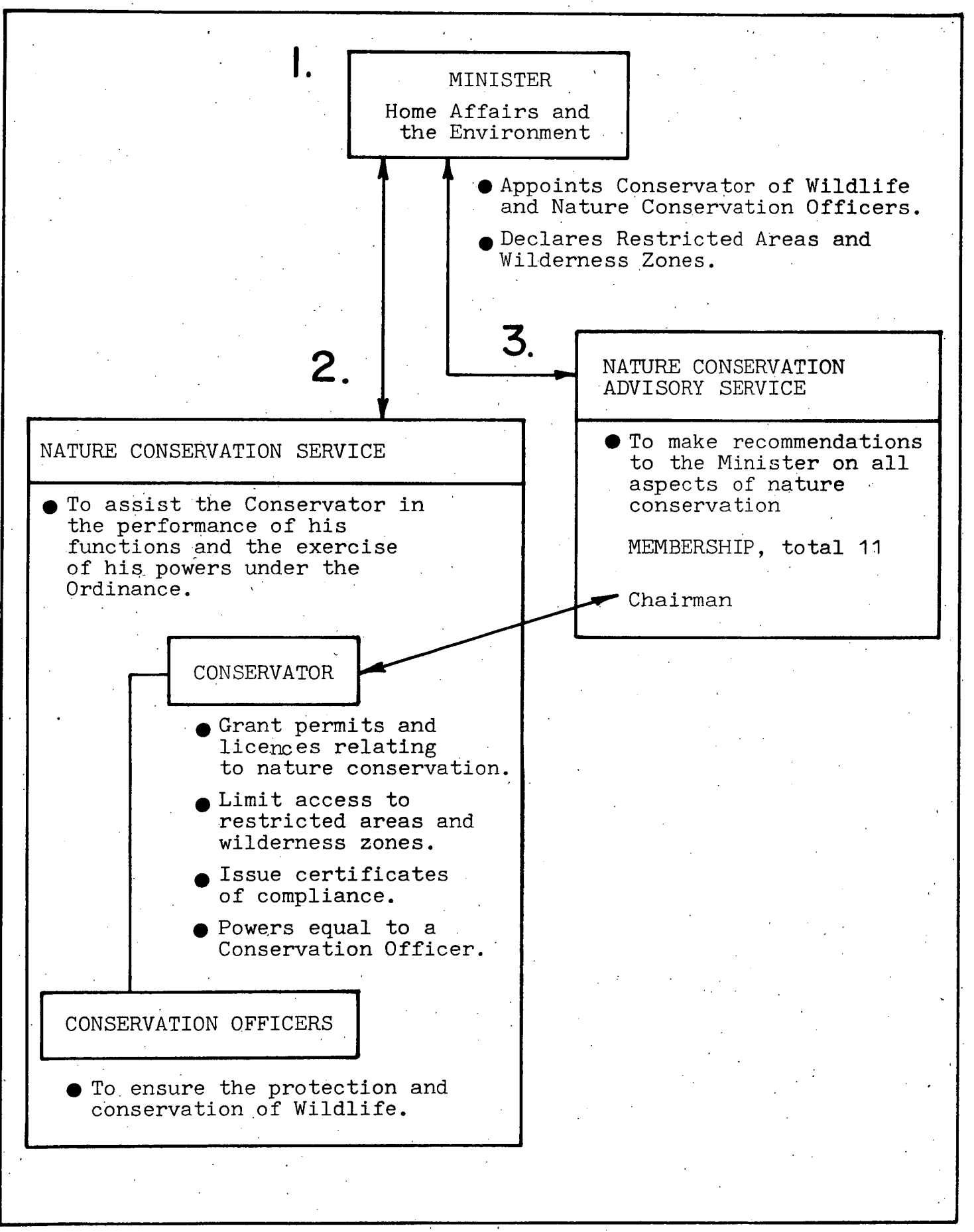
Ordinance	Date of Proclamation
ACT Nature Conservation Ordinance 1980	8 July
Protection of Endangered Species of Wild Fauna and Flora 1980	6 August
Protection of Migratory Birds 1980	6 August

The coming into operation of these Ordinances is not a response to an overall reassessment of nature conservation, but is due, rather, to international nature conservation commitments by Australia which extend to Australian External Territories, and growing pressures to update Ordinances with respect to the Australian Capital Territory.

The Endangered Species Ordinance 1980 ratifies Australia's obligation flowing from the Convention on International Trade in Endangered Species of Wild Fauna and Flora signed by Australia in March 1973. Likewise, the Migratory Birds Ordinance 1980 ratifies Australia's obligations stemming from the agreement between Australia and Japan for the protection of Migratory Birds and Birds in Danger of Extinction and their Environments, signed in Tokyo, February 1974. The schedule to the Migratory Birds Ordinance lists species which occur on HI&McDIs. These are the Wilson's Storm-Petrel (Oceanites oceanicus) and the Great Skua (Stercorarius skua). Comparatively speaking, both species are well represented on the Islands and appear to be less endangered than many others.

The legislative mainstay for the protection and conservation of wildlife on the Islands is the Nature Conservation Ordinance 1980. The Ordinance supplants those detailed in Section 4.1.2. The administrative structure established by the Nature Conservation Ordinance is illustrated in Figure 4.2. Essentially, three interacting subsections can be identified. Firstly, there is the

FIGURE 4.2: Administrative structure and functions established by the Nature Conservation Ordinance 1980.



Ministerial subsection with the responsibility of appointing a Conservator of Wildlife and Conservation Officers, combining to form the Nature Conservation Service. The Minister is also responsible for declaring Restricted Areas and Wilderness Zones under Part 6 of the Ordinance. Secondly, there is the Nature Conservation Service which is composed of Conservation Officers charged with the responsibility of assisting the Conservator of Wildlife in the performance of his duties and in the exercise of his powers. The Conservator of Wildlife has the powers of a Conservation Officer and, in addition, has authority to grant permits and licences relating to wildlife, issue certificates of compliance on the successful termination of licences, and to limit access to Restricted Areas. Thirdly, there is the Nature Conservation Advisory Service which is concerned with all aspects of nature conservation and charged with the authority to make recommendations to the Minister relating to nature conservation in the Territory. Membership of the Nature Conservation Advisory Service is set at eleven and is composed of the Conservator of Wildlife in the capacity of Chairman, not less than three and not greater than eight members drawn from residents in the Territory not being officers or employees of the administering department, and two officers or employees from the administering department.

As a specific piece of legislation with respect to the ACT, the Ordinance incorporates desirable changes to preceding legislation. A precise definition of "animal" is given which excludes Homo sapiens, invertebrates and fish (with the exception of those specified in the schedule accompanying the Ordinance). A broad meaning is given to "plants" encompassing plant seeds which may take the form of fruit or plant spores.

Basic controls to facilitate nature protection and conservation such as species habitat protection, the power to restrict access to areas which may be endangered and the need to manage plant and animal populations were incorporated into the new Ordinance. Section 53 gives the Conservator the power to restrict or prohibit access to a reserved area or part thereof, where he is of the opinion that public safety would be endangered, or the management of the reserved area, or components of the reserved area would be interfered with. Sections 54-57 govern human behaviour in restricted areas. For example, the lighting or the use of fires, the erection of buildings, the use of motor vehicles and vessels, camping, the use of firearms, disturbance to historical and archaeological artifacts and the entry into a reserved area of an animal that is not defined as "wildlife" and the introduction of noxious plants is prohibited. Contravention of these provisions incurs a penalty of $200 with the exception of a $500 penalty relating to the use of fire (Section 55).

Section 65 specifies procedures relating to applications for permits and licences and the way applications are assessed. In particular, in determining applications the Conservator shall have regard to:

(a) the effect the carrying on of the activity in respect of which the permit or licence is sought is likely to have on -
    (i) a species of wildlife already found in the Territory; and
    (ii) the major ecosystems of the Territory.

The Nature Conservation Ordinance is superior to preceding legislation in several ways. The Ordinance provides a single administrative system where, before, a range of administrative procedures, grants, licences, royalties

and penalties existed. The Nature Conservation Advisory Service is innovative in that it provides a feedback mechanism to review and assess aspects of nature conservation and protection and, at the same time, is in a position to recommend to the Minister strategies of improvement. The setting aside of restricted areas and wilderness zones was, hitherto, not possible. Significantly, the Nature Conservation Ordinance embraces the protection and conservation of nature from an ecological viewpoint rather than the "jig-saw" approach evident with earlier Ordinances dealing with plants, birds, timber and seaweed. In doing so, its administrative structure and advisory service are centrally placed to monitor and assess ecological status and to articulate and recommend protection and conservation measures where and when required.

Although an important and progressive piece of legislation, the ACT Nature Conservation Ordinance 1980 does not apply (for the most part) to the Territory of Heard Island and the McDonald Islands because of the definition of "wildlife" which omits animals and plants indigenous to Australian External Territories. The net effect of this is to place the question of nature protection and conservation on the Islands into a legal void.

Consequently, the majority of species which occur on the Islands are considered not to be "wildlife" in a legal sense and, accordingly, are omitted in schedules 2, 3, 4 and 5 of the Ordinance which list restricted plant and animal life, and "exempt animals, being animals that are wildlife". The definition of "wildlife" given in Part 2 of the Ordinance is reproduced below:

> "wildlife" means -
> (a) animals and plants that are indigenous to Australia;

(b) animals and plants that are indigenous to the Australian coastal sea or the sea-bed and sub-soil beneath that sea;

(c) animals and plants that are indigenous to the continental shelf of Australia or the superjacent waters;

(d) migratory animals that periodically or occasionally visit Australia, the Australian coastal sea or the sea over the continental shelf of Australia; and

(e) animals and plants of a kind introduced into Australia, directly or indirectly, by Aboriginals before the year 1788, other than noxious animals or noxious weeds.

Some migratory animal species found on the Islands fall within item (d) of the definition but inclusion of animals on this basis is a haphazard exercise. Large portions of the Ordinance are, therefore, not applicable to the Territory of Heard Island and the McDonald Islands unless Sections of the Ordinance specifically cite animals, "whether wildlife or not". Sections of the Ordinance which do not contain a citation to this effect include:

Section	Title
25	Killing Animals
26	Taking of Animals
40	Escape of Animals
41	Special Safeguards Applicable to Birds
42	Picking of Plants
43	Protection of Plants Generally
45	Attachment of Tags to Plants
46	Entry into Land (by a Conservation Officer) for the purpose of carrying out examination
47	Conservator may give advice regarding conservation
48	Compliance with Advice of Conservator
49	Disease of Wildlife

Also the definition of "Wildlife" utilised in the Ordinance excludes invertebrates. Little is known about invertebrates which occur in the subantarctic terrestrial ecosystem, and the vulnerability of the ecosystem to intrusion by man. As it now stands, it would be possible to kill, take or harass animal life on the Islands without fear of legal penalty.

The importation and exportation of animals to and from the Islands may be conducted without penalty provided that the purpose of such action is not sale or trade. The Ordinance is equally inadequate with respect to the protection of plants generally. Indigenous plants on the Islands may be interfered with, destroyed or disadvantaged by the introduction plant species without penalty to the party responsible.

The Ordinance does have provision for regulating access through the declaration of the Islands as restricted area or wilderness zone, or by the non-issue of permits or licences (Section 65). In addition, Section 52(4), an open-ended clause, gives power to the Conservator to take actions "in a wilderness zone as are, in his opinion, necessary for the management of the wilderness zone". The Conservator's considerations would cover questions of access, permitted activities and behaviour generally in the wilderness zone. There have, however, been no positive steps taken to have HI&McDIs declared a restricted area or a wilderness zone. While use of this mechanism would provide legal protection to the environment of the Islands, it is by no means a substitute for legislation specific to the Islands, whether or not in the form of an Ordinance.

4.3 International Conservation Treaties

International conservation treaties have, in the past, proved to be an important mechanism in upgrading nature conservation legislation on HI&McDIs. They are also important in setting the objectives of future legislation which may be framed for the Islands.

Significantly, treaties have placed special importance in protecting wild areas and their existence emphasises inadequacies in Australian nature conservation legislation over HI&McDIs. In chronological order, treaty commitments which apply to HI&McDIs are:

1. The Convention Concerning the Protection of the World Cultural and Natural Heritages adopted in 1972. Article 2 of the Convention defines "natural heritage" as inter alia "geological and physiological formations and precisely defined areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation". Australia has ratified the Convention but has not reported to the United Nations on its administration of HI&McDIs as there are no indigenous human habitants.

2. The Agreement between Australia and Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environments, signed in February 1974 (refer Section 4.2.2), Protection of Endangered Species of Wild Fauna and Flora Ordinance 1980, and the Protection of Migratory Birds Ordinance 1980.

3. The Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), May 1980. As previously stated, the CCAMLR is based on an ecosystem approach and establishes conservation standards to be observed in the area south of a line representing the Antarctic Convergence. The Convention applies to the water around HI&McDIs.

Australia is also an active participant in scientific research programs sponsored and directed by the Scientific Committee on Antarctic Research (SCAR) which was established in 1958 by the International Council for Scientific Unions (ISCU). SCAR has a mandate to co-ordinate research in the region extending from the Antarctic continent to the Antarctic Convergence. Accordingly, it is regarded by Antarctic Treaty Consultative Parties (of which Australia is one) as an important source of scientific information and advice. In 1979 SCAR accepted the recommendation of its Working Group on Biology that certain seabird and seal species should be monitored at selected localities in order to detect whether changes in species abundance may be in response to artificial influences such as pollution or commercial harvesting. HI&McDIs included in the inventory of locations under study. Scientific attention is now focused on a wide range of species occurring on the Islands.

There is also growing interest among a number of nations in the Indian Ocean region to form an Indian Ocean Alliance for Conservation. In April 1980, the Government of the Republic of Seychelles organised a seminar for representatives from interested nations to discuss the current conservation status of the region and to formulate what scope and direction the Alliance might take. Recommendations arising from the April meeting have been subsequently communicated to all Heads of Government around the Indian Ocean seeking their co-operation in implementing recommendations. Although Australia's position in relation to the Alliance is uncommitted, compliance would require immediate revamping of nature conservation Ordinances presently applying to HI&McDIs.

Finally, in addition to identifying international treaty commitments which directly apply to HI&McDIs it is important to recognise the dichotomy in conservation standards agreed by Australia in the

international forum with legislation presently in force. The Antarctic Treaty (Environment Protection) Act 1980, which came into operation on 6 December, gives effect to Australian obligations under the Agreed Measures for the Conservation of Antarctic Fauna and Flora (Article IX of the Antarctic Treaty). In view of the interdependent and adjacent subantarctic and Antarctic ecosystems, nature conservation presently in force in relation to HI&McDIs is at variance with conservation principles agreed by governments in the international arena.

4.4 CONCLUSIONS

ACT Nature Conservation Ordinances which may be considered to apply to HI&McDIs do not afford adequate legal protection for any species that occur on them. Legislation fails to recognise the sensitivity of the subantarctic ecosystem and the consequent need to provide special protection measures.

As a result of international agreements relating to nature conservation, Australia has an obligation to address immediately the conservation status of HI&McDIs. Although the Islands are located in the subantarctic region, they have significance for the Antarctic ecosystem as a whole and reluctance to facilitate their protection is at variance with the conservation principles agreed in the international arena.

It is probable, from the current understanding of the Islands' environment, that long-term protection can be assured. But this can be achieved only by appropriate recognition and legal protection. Current protection and conservation measures are grossly inadequate and are themselves a serious threat to the continuance of the ecosystem.

It should also be stressed that initiatives to bring the Islands under an appropriate international nature conservation convention would be a highly visible exercise of Australian sovereign rights over the Territory of Heard Island and the McDonald Islands. Reluctance to make provision for the protection of nature on the Islands may, on the other hand, enhance any claims by other nations to the Islands.

5. FUTURE NATURE CONSERVATION CONSIDERATIONS/OPTIONS

5.1 Introduction

This Section considers two questions: firstly, the need for legislation, and special elements which need to be taken into account in legislation to protect the subantarctic ecosystem and, secondly, what options exist to afford legal protection to HI&McDIs. Answers to the former devolve from preceding chapters which describe the history, landforms, biology and the fragility of the ecosystem to intrusion by man. The second question needs government action since Parliament ultimately has responsibility for implementing reform. The precise path reform may take will reflect government policy, particularly when a number of possible reform strategies involve government bodies which presently do not have an administrative or operational involvement on the Islands. The speed with which reform can be implemented will depend also on bureaucratic priorities and work demands. Suffice it to say that, as far as nature conservation is concerned, HI&McDIs have attracted little attention in the past.

5.2 Environmental/Legal Coherence

The legal and managerial systems which apply to the Territory of Heard Island and the McDonald Islands are those framed for the Australian Capital Territory (ACT), based on conservation objectives which are complex in comparison with the needs of the Islands and inadequate in providing for their legal protection. Ideally, conservation objectives should be formulated for specific areas as a basis for legal protection. In the present situation, nature conservation legislation has been applied to the Islands as an expedient without consideration of the physical and biological characteristics of the Islands and their consequent conservation needs. Indeed, the physical and

biological differences between the ACT (a small inland part of a continent) and the subantarctic Islands are so great it is hardly conceivable that legislation drafted for the ACT could be applied to the Islands and maintained for so long. This incongruity is accentuated by the fact that the steps which need to be taken to implement proper nature conservation over the Territory of Heard Island and the McDonald Islands are, relatively speaking, uncomplicated. Land on the Islands is Crown Land, there are no human inhabitants and the resources of the Islands (both living and non-living) are not presently exploited.

Generally, nations which have a vested interest in the subantarctic have not addressed the conservation status and special needs of the region and, consequently, nature conservation measures which have been implemented vary considerably in response to resource demands and the extent to which island environments have been already modified. For example, management guidelines for Macquarie Island take into consideration introduced plant and animal species which have successfully colonised the Island and now are integral to the ecosystem. Management guidelines established for the Tristan da Cunha Islands which, strictly speaking, are not subantarctic, are directed towards concentrating intensive agricultural and forestry activities on island lowlands and maintaining substantially undisturbed areas on the uplands. Management guidelines for neighbouring islands which are mostly uninhabited are aimed at conserving the existing ecosystems more or less intact.[1] At the other end of the spectrum, the French have been endeavouring for many years to populate the archipelago of the Iles Kerguelen, the closest island group to HI&McDIs, with a variety of foreign terrestrial and marine biota[2].

The variation in protection and conservation measures afforded to the subantarctic islands is again illustrated by the dichotomy between conservation measures afforded to

Macquarie Island and those under study. As detailed in earlier sections, Macquarie Island is a Nature Reserve administered by the Government of Tasmania and has the status of a World Heritage Area in accordance with the classification established by the International Union for the Conservation of Nature and Natural Resources (IUCN) of which Australia is a State member. Management guidelines have yet to be drafted for HI&McDIs as have been done for Macquarie Island, and they have not been given international recognition as a place of natural value.

In the expanse of the subantarctic, there are few land exposures and those which do occur are spectacular landforms and represent important platforms for the ecology of the region. It is sad to think that the conservation needs of the islands at large have been neglected and that survival of their natural order is in doubt. As discussed in Section 3, the subantarctic islands maintain a simple ecosystem which has, coincidentally, a high potential for vulnerability, particularly to human introduced agents. In complete isolation, the islands have evolved life forms peculiar to the region, some endemic to specific islands. Island ecosystems are easily disrupted and destroyed in comparison to more complex ecosystems which are more able to tolerate intrusion and appear relatively more resistant to disturbance. Given the sensitivity of the subantarctic ecosystem and the extent to which islands have been already modified, nations need to become vitally concerned for their conservation and for the protection of wildlife including the safeguarding of species' genetic diversity to ensure their continuing evolution. It is the contention of this work that, in view of the cultural and scientific value of the undisturbed biota found on HI&McDIs, Australia could best move in this direction by introducing strong legal provisions and management guidelines specific to the Islands.

Now is the time to upgrade nature protection and conservation measures. The natural order of the Islands has been maintained in the past only because of their extreme geographical isolation and inhospitable climate. However, today there is a growing awareness of remote areas and there are increasing pressures to visit and study these last outposts of nature. Heard Island and the McDonald Islands are no exception.

Similar pressures are being brought to bear on the Antarctic continent where there are strict legal provisions established by Antarctic Treaty nations to minimise human impact on the environment.[3] Nature conservation within the Australian Antarctic Territory (AAT) is provided through the Agreed Measures for the Conservation of Antarctic Fauna and Flora which devolve from the Antarctic Treaty[4]. The Agreed Measures are more detailed in the protection they afford to Antarctica than the present nature conservation Ordinance provides for HI&McDIs, and have been agreed by 12 Treaty Nations to apply to the whole Treaty area. The similarities and interdependence of the Antarctic and subantarctic ecosystems make the Agreed Measures a useful model in formulating legislation relating to the Islands.

Generally, the Agreed Measures are aimed at freedom of scientific research and are broader in their objectives than the ACT Nature Conservation Ordinance which is more concerned with the management of wildlife (as defined). Ecological tenets of the Agreed Measures which are absent in the ACT Ordinance include:

- a proper definition of "wildlife" embracing species which occur in the region through natural agencies of dispersal.
- the preparation and circulation of information concerning prohibited activities, and the setting aside of Specially Protected Areas which have, automatically, international recognition.

- strict codes of human behaviour (including the use of air transport) prohibiting interference with wildlife and naturally occurring ecosystems.
- quarantine regulations prohibiting the introduction of plant and animal species not indigenous to the Treaty area.

While the extension of similar provisions to HI&McDIs would be consistent with Australia's position in respect to living resources of the Antarctic, further strengthening is required simply because of the biological status of the islands in the subantarctic region. Strengthening should aim to prevent the introduction to the Islands of any wildlife (including mammals, birds or eggs), flora, geological specimens, or other artifacts as well as providing strict provisions dealing with the disposal of wastes arising during a visit to the Islands. These measures are important in minimising potential interference with the Island ecosystem, for example through the introduction of avian diseases which are known to occur on other subantarctic islands[5].

In addition to the provisions mentioned above, it would be useful to consider legal provision to allow for appropriately authorised persons to accompany visits to HI&McDIs as an added precaution to ensure that nature protection measures and management guidelines are adhered to. There would be additional reciprocal benefits from such an arrangement in that authorised personnel could advise prospective visiting groups on aspects of the Islands and ensure that visits are adequately planned.

These, then, are the essential elements which need to be implemented to protect the natural assets of HI&McDIs and which have been hitherto neglected. The measures are consistent with the Agreed Measures for the Conservation of Antarctic fauna and flora

and form the basis for drafting management guidelines for the Islands. However, all this is totally dependent on a comprehensive legal base which can ensure the application and enforcement of nature conservation measures.

5.3 Reform Options

Precisely how to effect legal reform is not clear from the current position. Reform is a formidable task which rests, in the first instance, with the Department of Home Affairs and the Environment which has administrative responsibility for the Islands.

It is possible to formulate a number of options which exist to bring about reform of the type envisaged. While there are options available, all with their own set of political problems and administrative complexities, each is based on the necessity to implement the conservation elements which have been described above. However, the choice as to which of these approaches is followed can be made only by government.

There are essentially three alternative approaches to strengthen nature conservation legislation with HI&McDIs. In order of discussion these are: firstly, to draft a new nature conservation Ordinance specific to the Islands; secondly, to proclaim the Islands a National Park in accordance with the Australian National Parks and Wildlife Conservation Act 1975-78; lastly, to bring the Islands under the Antarctic Treaty (Environmental Protection) Act 1980.

5.3.1 A new Nature Conservation Ordinance

The introduction of a new and separate nature conservation ordinance to reform nature protection measures is made possible through Section 10 of the Heard Island and

McDonald Islands Act 1957-73 which gives power to the Governor-General to make Ordinances for the peace, order and the good government of the Territory. The ACT Nature Conservation Ordinance (suitably amended) and the Agreed Measures for the Conservation of Antarctic Fauna and Flora serve as good models for an Ordinance specific to the Islands. While framed primarily at establishing rigorous protection measures for the Islands, a new Ordinance should aim also to provide continuity between Antarctic and subantarctic conservation measures.

As discussed in Section 5.2.1, legislative controls which need to be incorporated in future legislation to facilitate the protection and conservation of the Islands are not complex but need to anticipate future pressures on the Islands. With this in mind, consideration should be given to incorporating the following controls:

(a) provision made to require each group wishing to visit the Islands to make application to government and to provide a full report of activities on the islands, as soon as practicable, on completion of expeditions;

(b) inclusion of a Conservation Officer or suitably qualified and authorised officer on each visit to the Islands (including scientific investigations) to ensure that groups comply with the plan of management;

(c) extension of protection measures to cover the surrounding continental sea margin, sea bed and subsoil in order to minimise disturbance to the Islands.

There are several possible approaches for administering such an Ordinance, including drawing on arrangements established under the ACT Nature Conservation Ordinance, or incorporating other government bodies such as the Antarctic Division of the Department of Science and Technology, which has an

operational role in Antarctica and the Southern Ocean and administrative responsibility for the Antarctic Treaty (Environmental Protection) Act 1980. The Division previously shared administrative responsibility for the Territory of Heard Island and the McDonald Islands with the Department of the Capital Territory.

While the implementation of a Nature Conservation Ordinance specific to the Territory of Heard Island and the McDonald Islands is an appealing prospect because of its simplicity and relevance to the Islands, it has drawbacks. The major objection is that it introduces yet another piece of nature conservation legislation to conservation principles, controls and management standards already in existence. Indeed, it may be argued that the conservation aims and objectives proposed for the Islands can be accommodated in existing legislation, particularly those discussed in this chapter.

5.3.2 National Parks and Wildlife Conservation Act 1975-78

In accordance with Section 4 of the National Parks and Wildlife Conservation Act 1975-78 (NPWC), the Australian National Parks and Wildlife Service (ANPWS) has a role in every External Territory. The Act has been implemented in the External Territories of Christmas Island, Norfolk Island and the Coral Sea Islands, and its application to the Territory of Heard Island and the McDonald Islands must be seriously considered.

The Act is well suited to areas such as subantarctic islands which require special controls. It is broad in scope and has provision to prohibit a wide range of activities, many of which are not specified in the ACT Nature Conservation Ordinance. The Act has particular advantages for islands in that it can be applied to the continental coastal sea, the sea bed and the subsoil, thereby providing a greater margin of protection. This is a vital consideration so far as the subantarctic islands are concerned since ecosystems are closely tied to the sea.

As with the ACT Nature Conservation Ordinance, the Act provides for the declaration of various nature conservation categories, each with its own standard of controls and management emphasis. The National Park has become the most widely recognised conservation unit, but provision is also made for the proclamation of Parks, Reserves, Conservation and Wilderness Zones. Section 7(2) gives authority to the Governor-General to declare areas to be Parks, Reserves, and to specify the purpose(s) for which they are declared. The Governor-General may declare the whole, or a portion of a Park or Reserve to be a Wilderness Zone or National Park, and an area not within a Park or Reserve to be a Conservation Zone.

The steps leading to the proclamation of Parks, Reserves and Conservation Zones are technically straightforward but experience has shown, particularly in the case of the Coral Sea Islands and Christmas Island, that considerable delays can occur at each procedural step. In the process of gaining proclamation and in the preparation and acceptance of a plan of management for an area, the Director of National Parks and Wildlife is required to solicit public comment and to give due consideration to representations made. Following proclamation, the Director is then responsible for the preparation of a plan of management which is submitted to the responsible Minister (Home Affairs and the Environment) for consideration. With Ministerial approval, the plan of management is open to parliamentary scrutiny by either House of Parliament following which the plan may be approved and implemented or resubmitted for appropriate alteration.

Responsibility for the administration, management and control of Parks, Reserves and Conservation Zones is vested in the Director of National Parks and Wildlife. Functions of the Director are given in Section 16(1) and include:

(a) the administration, management and control of Parks, Reserves and Conservation Zones; protection, conservation, management and control of wildlife;

(b) surveys and monitoring;

(c) international co-operation in matters relating to the protection and conservation of nature;

(d) public awareness, training programs, and

(e) specialist advice and recommendations to the Minister in connection with Parks, Reserves, Conservation Zones and the protection and conservation of wildlife throughout Australia.

The Director is assisted in his functions by the Australian National Parks and Wildlife Service (ANPWS).

Once again, there are similarities and comparisons which can be made between the functions of the Conservator of Wildlife in ACT legislation and the Director of National Parks and Wildlife. Both are aided by a conservation service to implement and administer legislation, carry out surveys and monitoring programs and to provide specialist advice on conservation matters. There is, however, an important difference in their charter. Unlike the Conservator whose responsibilities are geographically limited, the Director has authority to be active in conservation programs sponsored by other countries and is, therefore, capable of effecting and contributing directly to conservation programs which are of regional or global scale.

As it now stands, the NPWC Act is framed sufficiently to provide adequate protection to wildlife on HI&McDIs. In particular, the Islands would be best served if they were proclaimed as a Wilderness Zone and thereby made subject to strict controls aimed at maintaining the natural order. Whether or not the upgrading

of nature protection measures via the NPWC Act is a viable option for the Islands is a political question. Nonetheless, its application, in line with its use in other External Territories, would serve to rationalise nature conservation legislation generally and reduce the proliferation of separate pieces of legislation based on differing conservation management objectives, standards and administrative procedures.

5.3.3 Antarctic Treaty (Environmental Protection) Act 1980

The Antarctic Treaty (Environmental Protection) Act 1980 came into operation on 6 December 1980, ratifying Australia's obligations flowing from the Agreed Measures for the Conservation of Antarctic Fauna and Flora. The Act applies to the AAT and provides for the protection of native plans and animals in the Antarctic, the proclamation of Specially Protected Areas (SPA) and Sites of Special Scientific Interest (SSSI), and the designation of Specially Protected Species. Although the terms and conditions of the Agreed Measures were determined by international negotiation with the Antarctic in mind, they set useful conservation standards and practices which can be readily transposed to the subantarctic environment which is equally sensitive to intrusion by man and the centre of complementary scientific investigation.

In contrast to the ACT Nature Conservation Ordinance 1980 and the National Parks and Wildlife Conservation Act 1975-78, the Antarctic Treaty (Environmental Protection) Act 1980 is aimed at the freedom of scientific research as well as nature protection. The Act is, therefore, broader in its objectives, establishing strict nature protection controls and a comprehensive administrative system for the issue of permits to undertake research, organised on an expedition basis. The Antarctic Division of the Department of Science and Technology, as the main government agency with an operational role in the Antarctic and the Southern

Ocean, currently has administrative responsibility for the Act.

Broadening the jurisdiction of the Act to include the Territory of Heard Island and the McDonald Islands would require only simple amendment. In doing so, HI&McDIs would receive rightful recognition as maintaining an ecosystem which is intimately related to the Antarctic and vulnerable to similar pressures. The scope of nature protection controls provided by the Act are adequate and, indeed, have particular advantages to the Islands not offered by other options. These include:

(a) Comprehensive and detailed terminology. If applied to the Territory of Heard Island and the McDonald Islands, definitions of terms such as "animal" and "plant" are adequate to include all life on the Islands. Wording of the Act also shows an understanding of the polar environment. For example, the terms "ice" and "snow" are included in the Act and can be interpreted to mean "land".

(b) Relevant conservation classifications. Proclamation of the Territory of Heard Island and the McDonald Islands as a Specially Protected Area (SPA) or Site of Special Scientific Interest (SSSI) would provide comprehensive nature protection controls, give international recognition to the Islands and, in the case of an SSSI, require the drafting of a plan of management. Entry into SPAs and SSSIs is restricted to research activities including the collection of specimens and for public educational purposes. The proclamation of an SPA has an indefinite term, but SSSIs are declared for a fixed period.

In accordance with Section 8(4) of the Act, proclamation of an SSSI requires endorsement by the Scientific Committee on Antarctic Research (SCAR) of the International Council of Scientific Unions (ICSU).

There are a range of international scientific programs being carried out under the aegis of SCAR which require future research on HI&McDIs, e.g. the International Survey of Antarctic Seabirds (ISAS).

(c) A rigorous administrative system. Administrative arrangements in respect of the Act include the issue of permits to take, collect, and/or investigate wildlife, the appointment of inspectors, the keeping of a register of permits and the requirement for permit holders to submit a detailed report of their activities and of the ultimate disposition of samples collected. Contravention of provisions of the Act may incur up to $2 000 and/or imprisonment for up to 12 months.

(d) Awareness of the polar environment generally. In its entirety, the Act is mindful of the environment and the susceptibility of seals and flightless birds to human interference, and recognises the need for promulgation of research findings in order fully to understand and assess the status of ecosystems. Should the geographical mandate of the Act be extended to include the Territory of Heard Island and the McDonald Islands, Section 19 relating to offences to the environment would need minor alterations to ensure that <u>any</u> animal, plant, virus, bacterium, yeast or fungus is not introduced to the Islands.

For the reasons detailed above, and from the viewpoint of similarities in life and landforms between the Antarctic and the subantarctic islands under study, it seems logical that conservation standards for HI&McDIs be consistent with those established for the AAT. Furthermore, the future scientific contribution of the Islands in several research disciplines makes the application of the Act to the Islands, for its research orientation, particularly appealing. The Islands would be best served if they were proclaimed as a Specially Protected Area and wildlife on the Islands designated as Protected Species in accordance with sub-section 8(7) of the Act.

5.4 Summary of Options

The options discussed are considered to be practicable approaches to afford comprehensive legal controls to protect wildlife in the Territory of Heard Island and the McDonald Islands. While government must decide on the actual conservation method, it is the opinion of this study that the extension of the Antarctic Treaty (Environmental Protection) Act 1980 to include the Islands is the most desirable option. Benefits over other options are tabled in Figure 5.1. Most importantly, this approach would apply rigorous administrative arrangements and legal controls to the Islands as well as providing continuity in conservation measures between the Antarctic and subantarctic.

REFERENCES

1. WACE, N.M. and HOLDGATE, M.W., 1976; Man and Nature in the Tristan da Cunha Islands, I.U.C.N. Monograph 6; Unwin Brothers, England.

2. For example, see:

   (a) LESEL, R. and DERENNE, Ph., 1975; Introducing Animals to Iles Kerguelen, Polar Record 17 (110), 485-494.

   (b) YOUNG, S.B., 1971; Vascular Flora of the Kerguelen Islands, Antarctic Journal of the United States, July-August, 110-111.

3. For example, see:

   (a) POTTER, N., 1969; Natural Resource Potentials of the Antarctic, American Geographical Society, Occasional Publication 4; Lane Press, Vermont.

   (b) NATIONAL SCIENCE FOUNDATION (N.S.F.), 1980; Draft Environmental Impact Statement, United States of America Antarctic Research Program (USARP); National Science Foundation, Washington, D.C.

   (c) Background Paper on the Antarctic Environment with Particular Reference to the Proposed Rebuilding of Australian Antarctic Stations; Department of Housing and Construction and the Department of Science and Techology, 1981.

4. The Antarctic Treaty (Environmental Protection) Act 1980 ratifies Australia's obligations under the Agreed Measures for the Conservation of Antarctic Fauna and Flora.

5. See:

   (a) WACE, N.M. and HOLDGATE, M.W., 1976; see Note 1.

   (b) MORGAN, I.R., CAPLE, W.I., WESTBURY, H.A. and CAMPBELL, J., 1978; Disease Investigations of Penguins and Elephant Seals on Macquarie Island, A Joint Investigation carried out by the Animal Health Group, Department of Agriculture, Victoria and the Antarctic Division, Department of Science, Research Project Series No. 47; Melbourne.

   (c) LESEL, R. and DERENNE, P., 1975; Introducing Animals to Iles Kerguelen, Polar Record 17 (110), 485-94.

TABLE 5.1 Summary of Options to Upgrade Nature Conservation and Protection on Heard Island and the McDonald Islands

Options:
1. New Conservation Ordinance
2. National Parks and Wildlife Conservation 1975-78
3. Antarctic Treaty (Environmental Protection) Act 1980

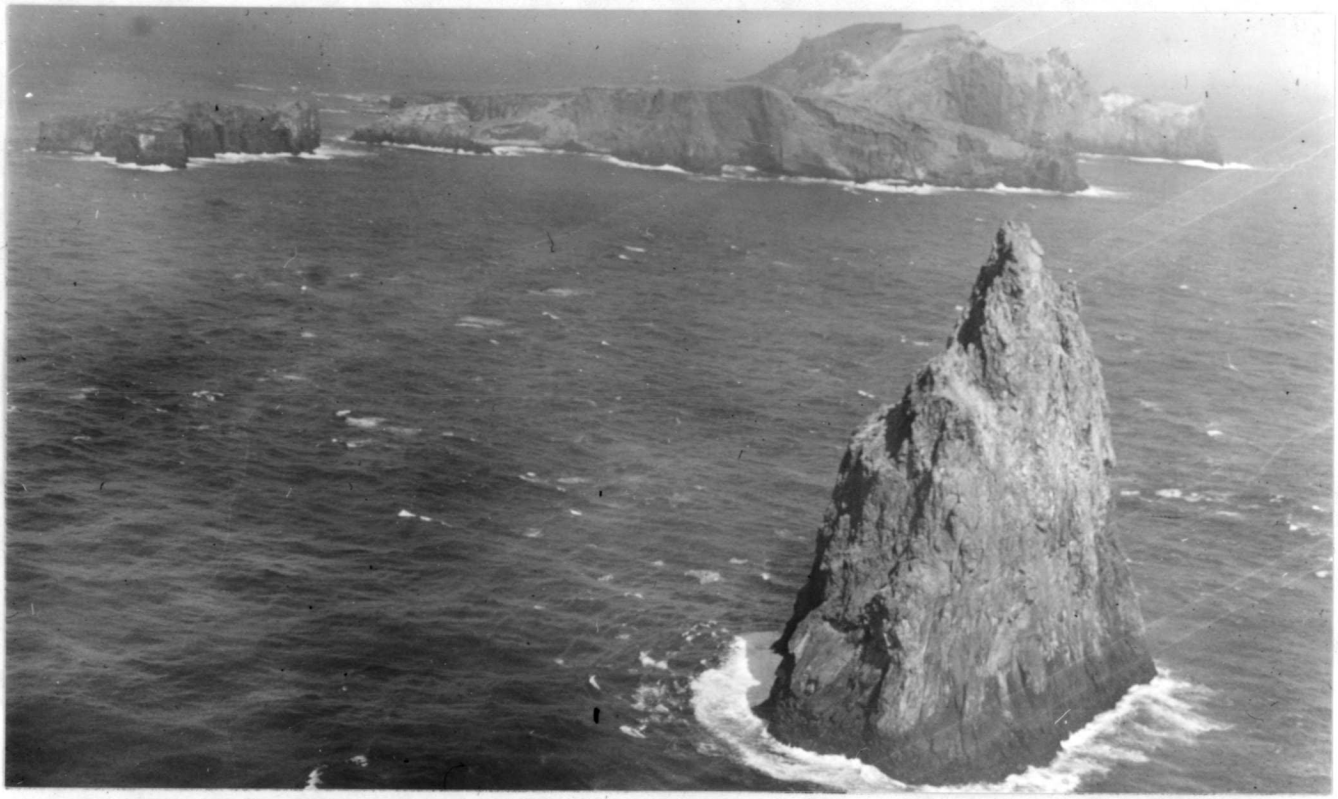
1.	2.	3.
Advantages . Ordinance would be specific to the special needs of the islands. General Comments . Would create a piece of nature conservation legislation in addition to that which already exists.	Advantages . Act is sufficiently broad in scope to accommodate the special needs of the islands. . Adequate nature conservation categories. . Extends to the islands National Park status, the most widely recognised conservation classification. . Implementation would rationalise nature conservation legislation in Australian External Territories. General Comments . Extends ANPWS responsibilities to uninhabitated areas. . ANPWS does not have an operational role in the subantarctic and would require logistic support.	Advantages . Act is framed to serve the Antarctic and subantarctic environments . Administrative framework established in the Antarctic Division which has an operational role in the region. . Appropriate nature conservation categories with provision for scientific research. . Act is designed to regulate access and activities in uninhabitated, remote areas. . Provides continuity between Antarctic and subantarctic conservation measures. General Comments . Act would facilitate research comparative with that which is being undertaken in the Antarctic Treaty area.

PHOTOGRAPHS

The photographs presented have been made available courtesy of the Antarctic Division of the Department of Science and Technology and by Dr G.W. Johnstone who visited Heard Island and the McDonald Islands in 1980. The co-operation of Mr R. Reeves and Mr S. Brown of the Antarctic Division in researching photographic archives and in the printing of photographs is a pleasure to record.

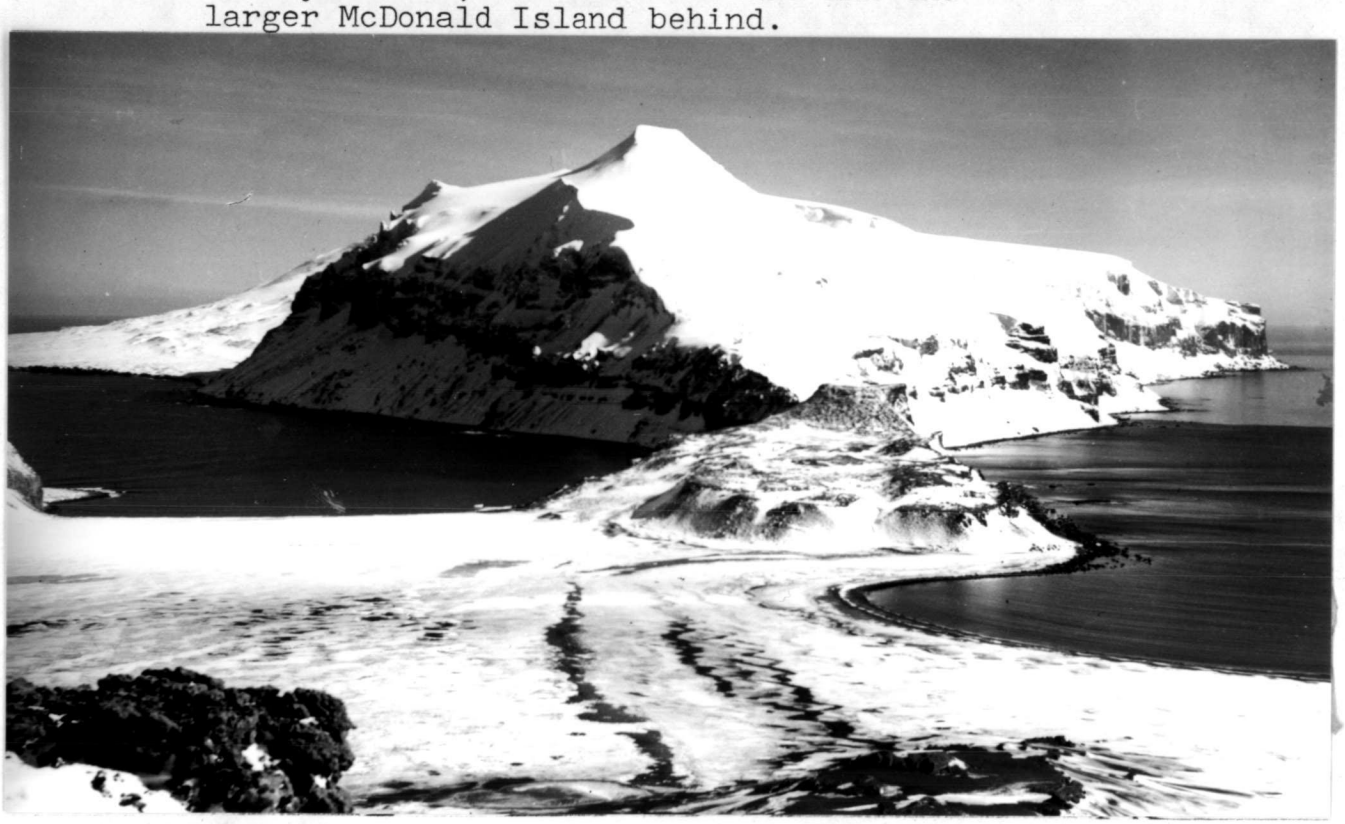
Prints cover the geography, biology and the history of human activity on the Islands and are presented in that order. Incomplete records prevent acknowledgement of the photographer in some cases.

The volcano "Big Ben" on Heard Island, erupting at night 1951. The volcano is quiescent at the present time.



G. Budd 1971

The McDonald Islands. In the foreground is Meyer Rock, with Flat Island and the larger McDonald Island behind.

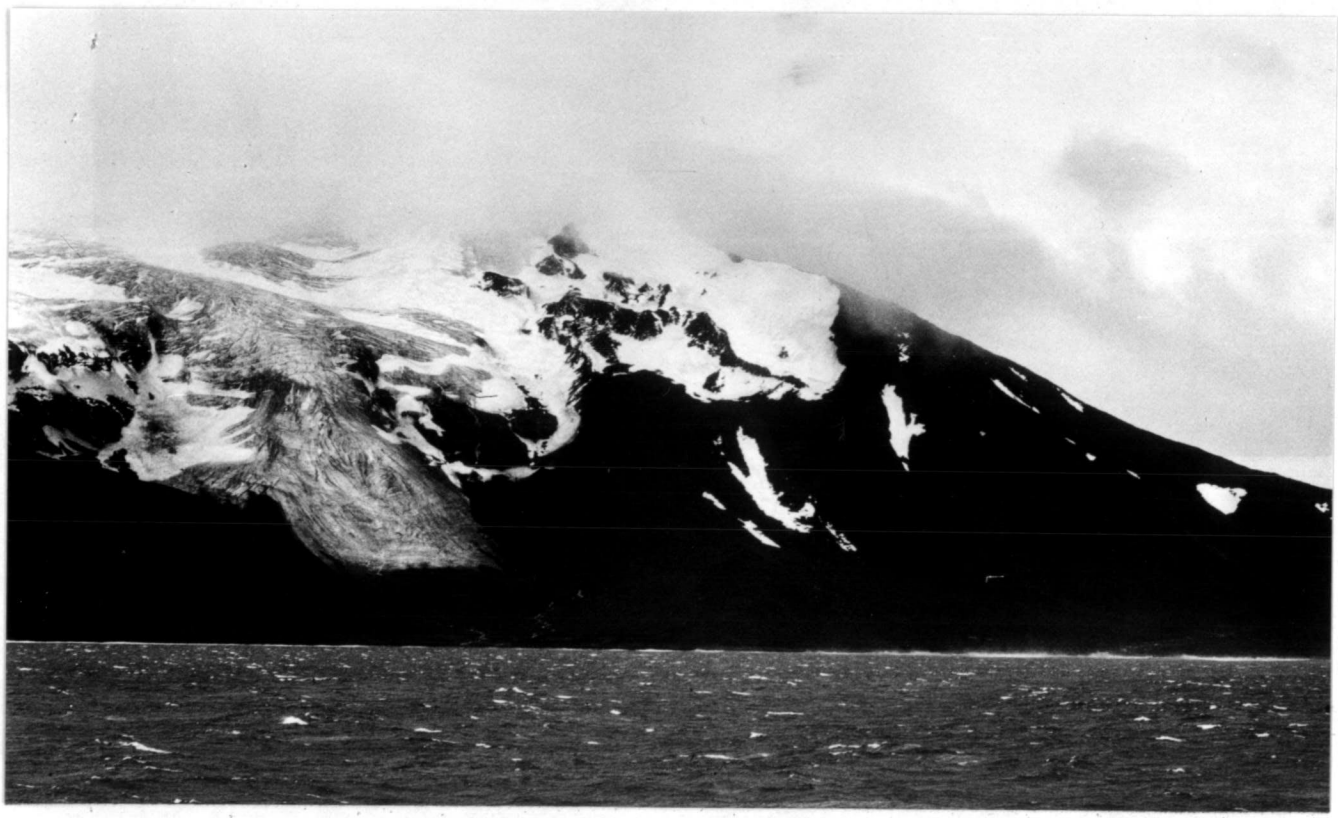


A. Campbell-Drury 1948

Mt Olsen, West Bay and Atlas Cove on the northern tip of Heard Island.

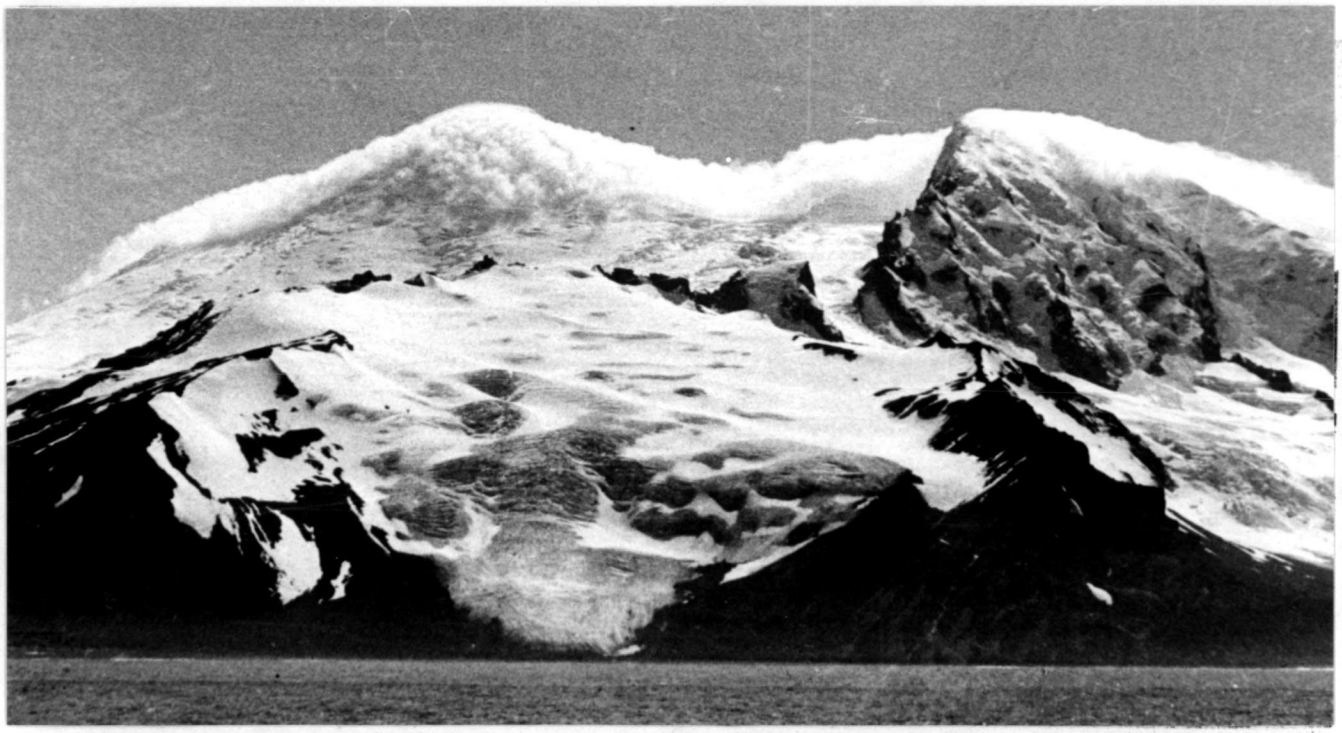
I. Dillon 1971

Fast-moving outlet glacier on Heard Island.



G. Budd 1963

Long Beach on the south west coast of Heard Island. In the background is the Winston Glacier which has receded in recent times.



Taken 1949

The south-west coast of Heard Island with
Big Ben behind, covered in cloud.

I. Allison 1971

The ice tortured coast of Heard Island.
Little Challenger and Baudissen Glaciers.

A. Campbell-Drury 1948

Heard Island Fur Seal. Prized for their pelts, the fur seals were brought close to extinction in the late 1800s. It is thought that seal populations which occur on the McDonald Islands have not been hunted by man and may have been breeding stock for the recolonization on Heard Island and other subantarctic islands.

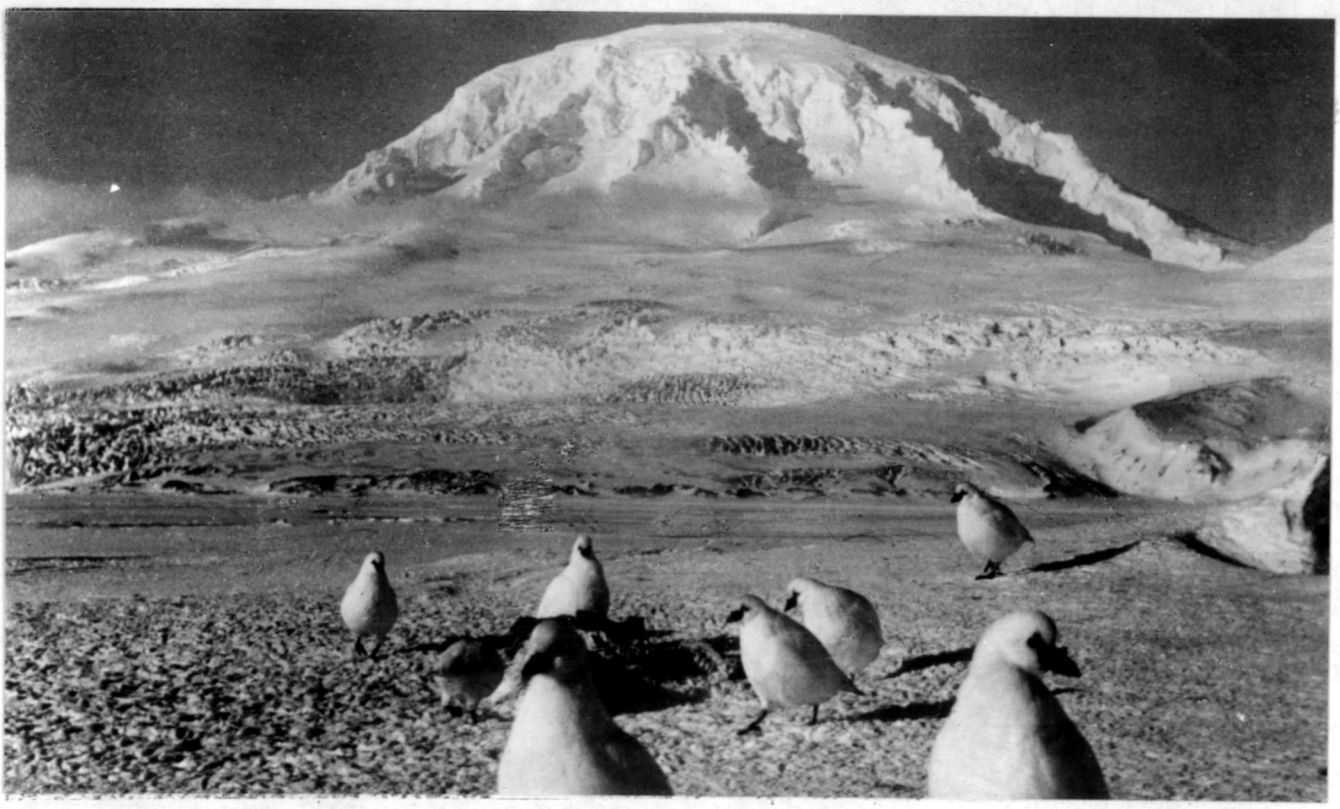
V. Cleland 1954.

Elephant Seals. Large, slow-moving and with no fear of man, the elephant seals were easy prey for the sealers who operated on Heard Island.

(Macquarie Island photograph)

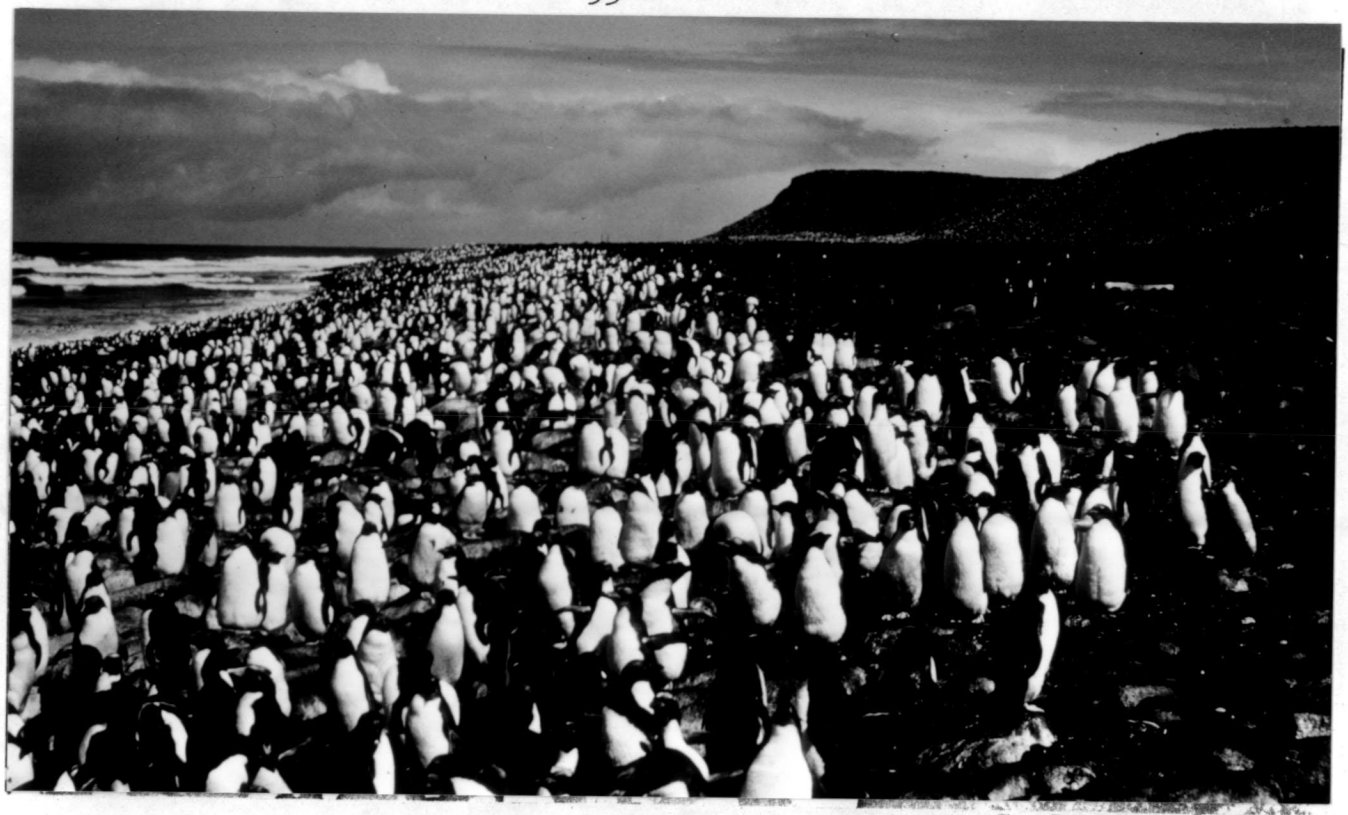
A. Campbell-Drury 1951

Leopard Seal. The Leopard seal occurs on Heard Island year round, with maximum numbers occurring in winter. Winter populations on Heard Island are the highest recorded in the world. Great skuas in company with the seal.



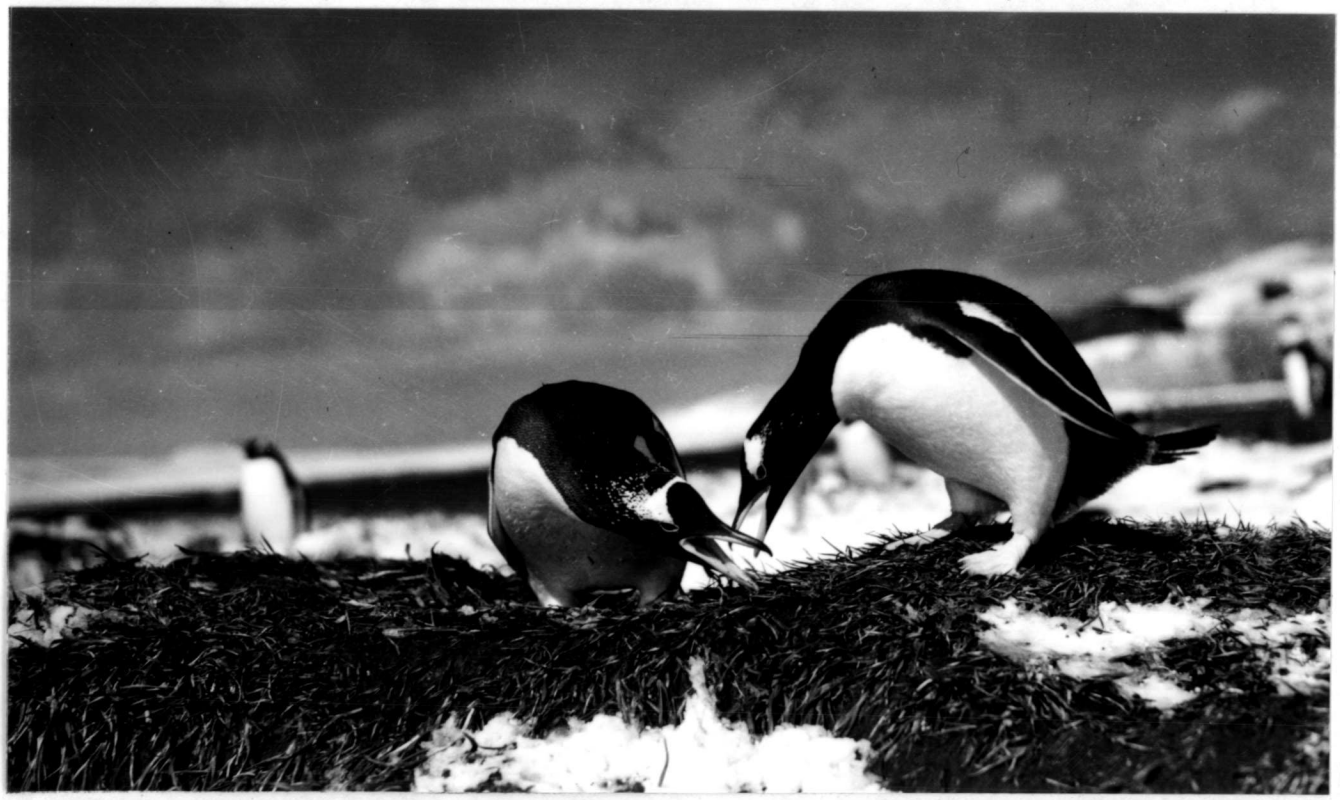
Warden 1949

Sheathbills. The sheathbill is a ground bird which occupies Heard Island year round and represents a subspecies endemic to the island. The birds have evolved and are dependent on an environment which does not host domestic avian diseases or animals such as cats, dogs, rats and mice.



G. Budd 1963

Extensive Macaroni Penguin rookery at Long Beach on the south-west coast of Heard Island. Extensive rookeries of Macaroni penguins are common also to the McDonald Islands.



Gentoo Penguins.

G.W. Johnstone.

Nesting Macaroni penguins, south-eastern corner of McDonald Island. The Island would rank among the world's largest penguin rookeries. The McDonald Islands have been visited only twice in recorded history; the first survey of the Islands' fauna and flora was undertaken in 1980.

G.W. Johnstone.

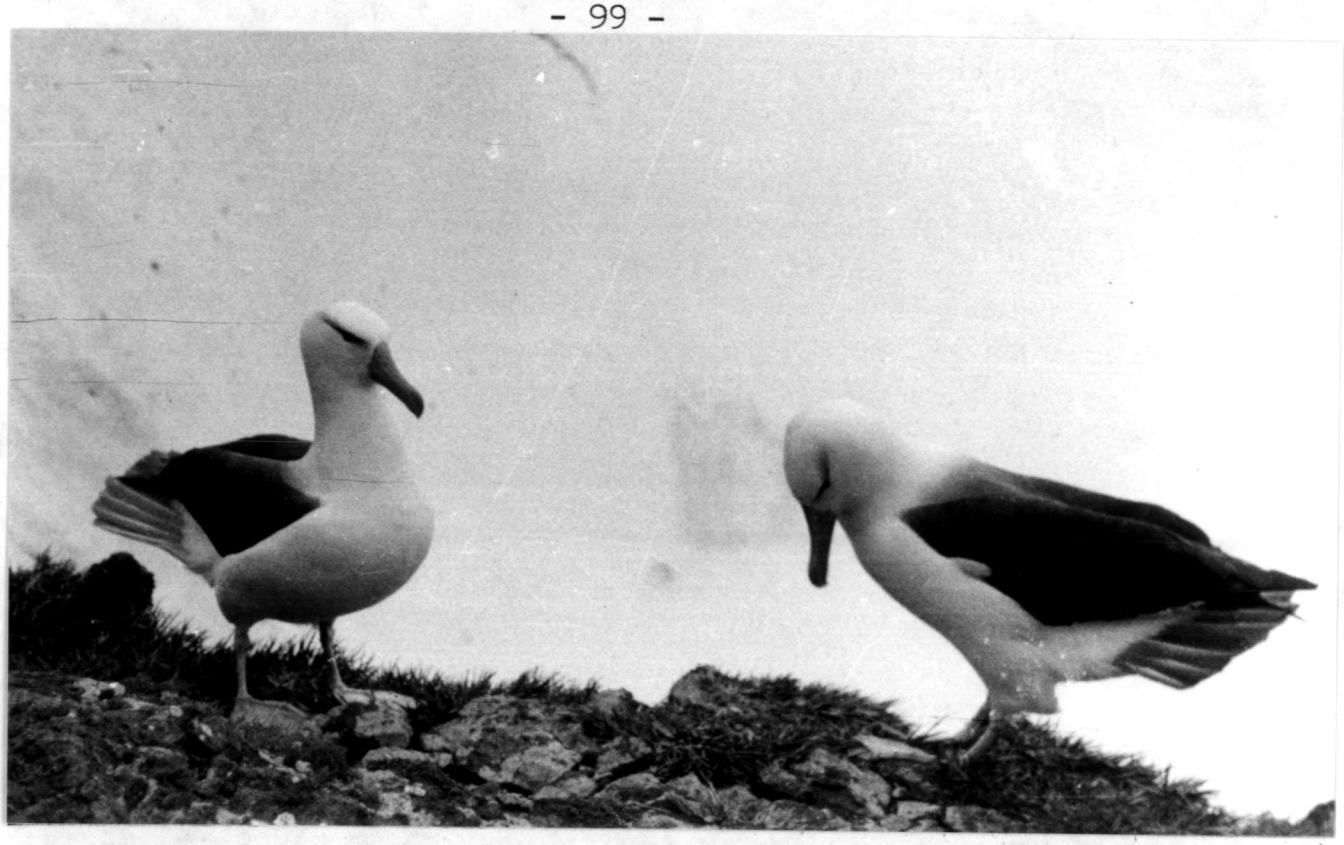
Wandering Albatross nesting on Heard Island, 1980. This is the first record of Wandering Albatross nesting on the Island and at a time when research has shown their numbers to be on the decline.

G.W. Johnstone

A panorama of the Macaroni penguin rookery at the southern tip of McDonald Island. The concentration of penguins gives an indication of the productivity of the surrounding seas in which the birds feed. The monitoring of penguin populations at nesting sites, such as this, over a long period will mirror fisheries harvesting by humans and, thus, be an important consideration in the management of future Southern Ocean fisheries.

G.W. Johnstone

Heard Island Cormorant. Endemic to the Islands and few in number, the cormorants have yet to be studied in detail.

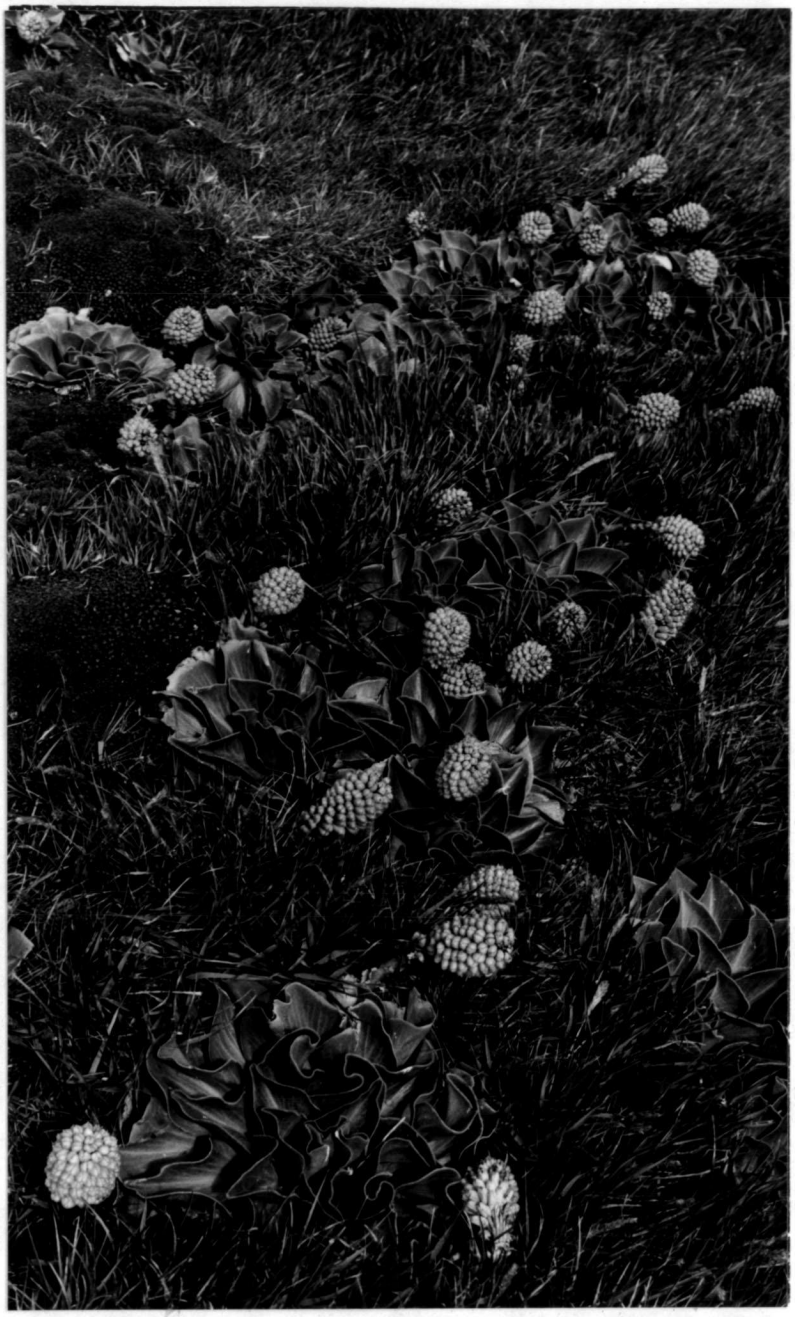


A. Campbell-Drury 1948

Black-Browed Albatross.

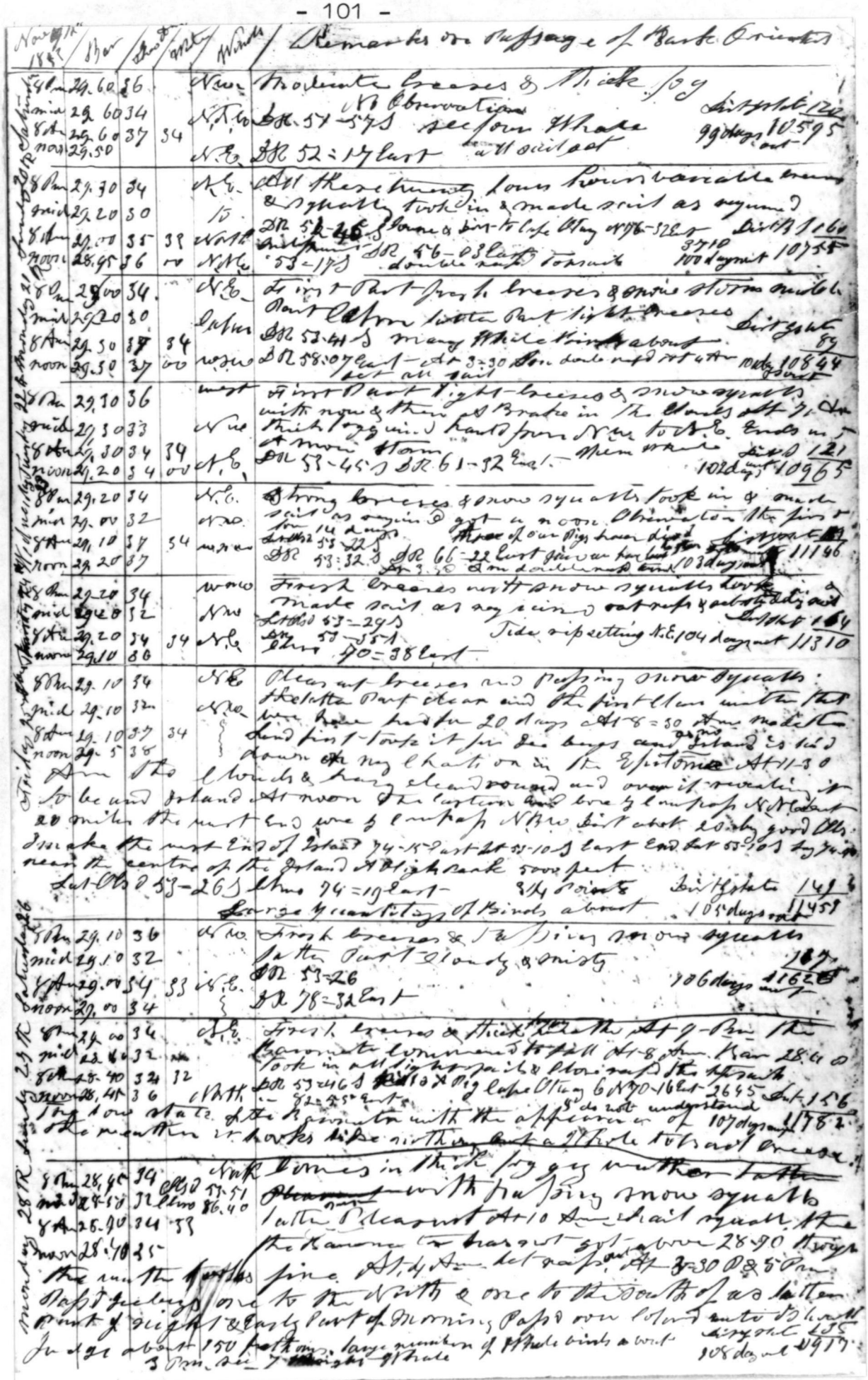
I. Allison 1971.

Small rookery of Macaroni penguins with the ice terminus of the Vahsel Glacier in the background.

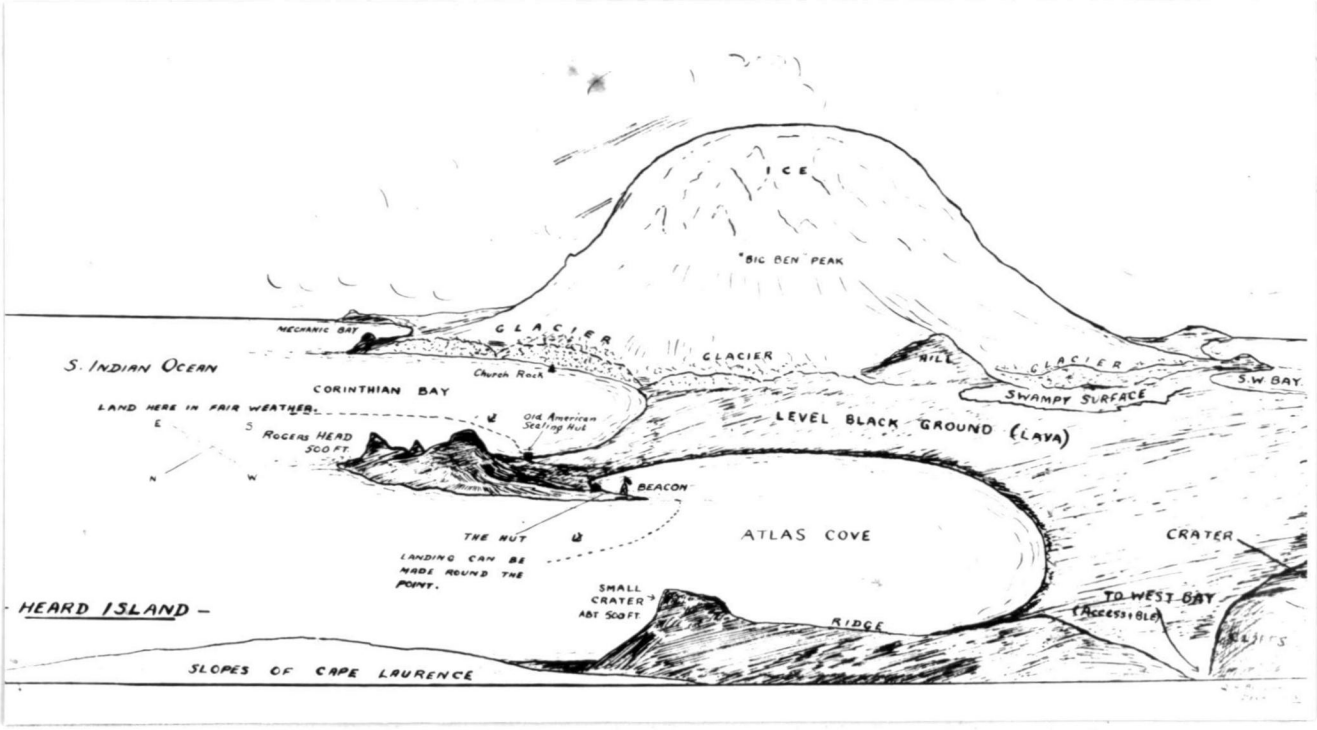


G.W. Johnstone

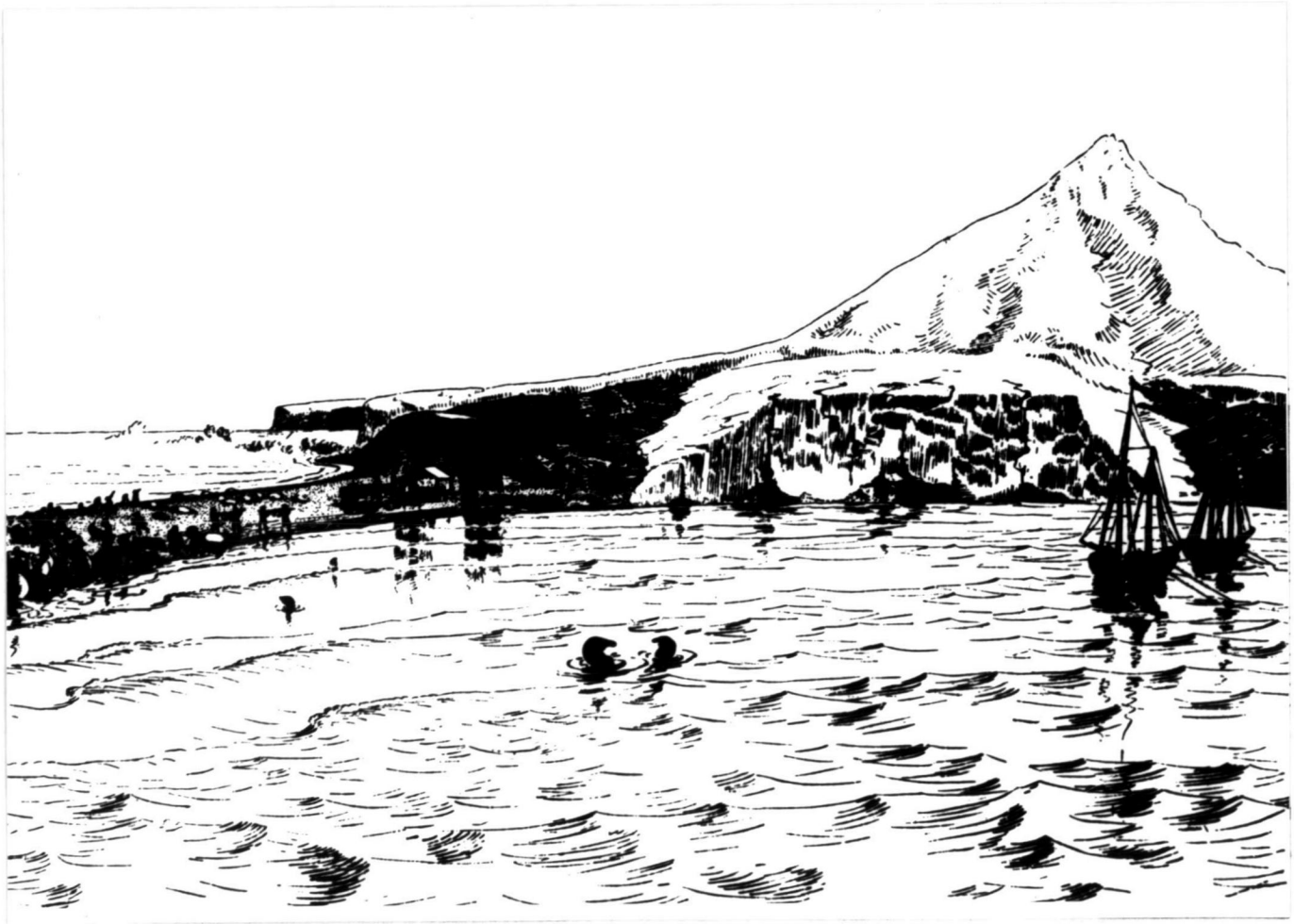
Kerguelen cabbage, poa grass and Azorella, vegetation cover typical of the lower slopes of Heard Island and the McDonald Islands.



Extract of Captain Heard's 1853 log of the barque "Oriental" reporting the sighting of an island (later named Heard Island) not marked on his chart.



A sketch by Q.H. Bullard in 1928, of the four bays area at the northern end of Heard Island.



An illustration of the sealing operations at Spit Bay, Heard Island in 1887. The origin of the illustration is thought to be from the publication by CLARK, A.H., 1887; The Antarctic Fur-Seal and Sea-Elephant Industries, Industries of the United States, 11 (18); Washington D.C.

G.W. Johnstone.

Tripots which were used by the sealers to "boil down" and purify elephant seal oil before barreling.

G.W. Johnstone.

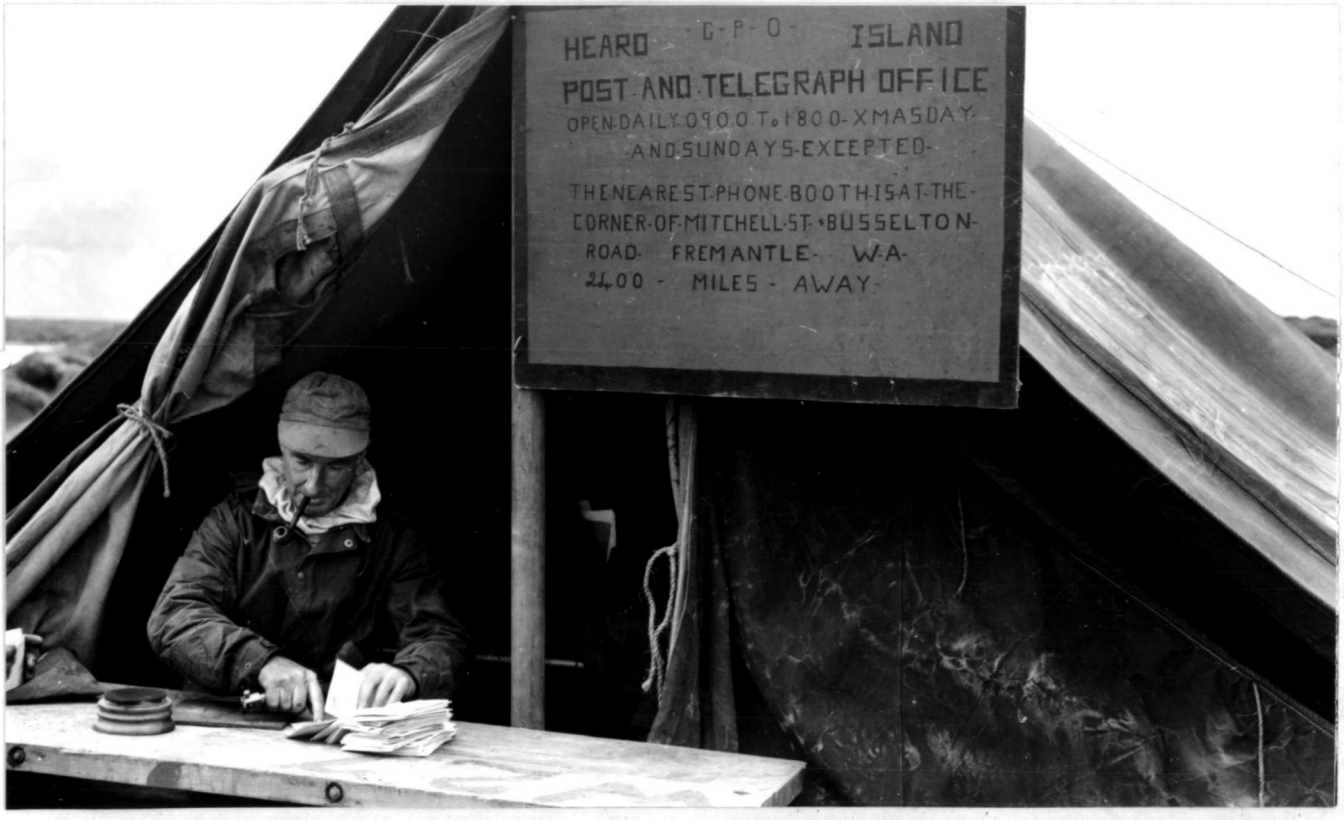
Oil barrels, Spit Bay, Heard Island. Barrels such as these were used to store seal oil derived from "boiled down" seal blubber collected by sealing gangs who wintered over on Heard Island.

J. Bechervaise

The Australian National Antarctic Research Expedition (ANARE) station established on Heard Island in December 1947. The station ceased to operate in the 1954-1955 austral summer.

G. McKinnon 1969

The ANARE sleeping huts on Heard Island 1969. The station was permanently manned from December 1947 to the end of 1954. The huts were the first buildings erected by Australian National Antarctic Research Expeditions.



A. Campbell-Drury 1947

Heard Island Post Office established in December 1947.
Acting Postmaster is Expedition Leader, S. Campbell.