

Management Plan for Antarctic Specially Protected Area No. 167

Hawker Island, Princess Elizabeth Land

Introduction

Hawker Island (68°38'S, 77°51'E, Map A) is located 7 km south-west from Davis station off the Vestfold Hills on the Ingrid Christensen Coast, Princess Elizabeth Land, East Antarctica. The island was designated as Antarctic Specially Protected Area (ASPAs) No. 167 under Measure 1 (2006), following a proposal by Australia, primarily to protect the southernmost breeding colony of southern giant petrels (*Macronectes giganteus*) (Map B). The Area is one of only four known breeding locations for southern giant petrels on the coast of East Antarctica, all of which have been designated as ASPAs: ASPA 102, Rookery Islands, Holme Bay, Mac.Robertson Land (67°36'S, 62°53'E) – near Mawson Station; ASPA 160, Frazier Islands, Wilkes Land (66°13'S, 110°11'E) – near Casey station; and ASPA 120, Pointe Géologie, Terre Adélie (66°40'S, 140°01'E) – near Dumont d'Urville. Hawker Island also supports breeding colonies of Adélie penguins (*Pygoscelis adeliae*), south polar skuas (*Catharacta maccormicki*), Cape petrels (*Daption capense*) and occasionally Weddell seals (*Leptonychotes weddellii*).

1. Description of values to be protected

The total population of southern giant petrels in East Antarctica represents less than 1% of the global breeding population. It is currently estimated at approximately 300 pairs, comprising approximately 45 pairs on Hawker Island (2010), 2-4 pairs on Giganteus Island (Rookery Islands group) (2007), approximately 250 pairs on the Frazier Islands (2001) and 8-9 pairs at Pointe Géologie (2005). Southern giant petrels also breed on other islands in the southern Indian and Atlantic Oceans and at the Antarctic Peninsula.

The southern giant petrel colony at Hawker Island was discovered in December 1963; at that time there were 40-50 nests present, "some with eggs" but it is unclear how many nests were occupied. Between 1963 and 2007, intermittent counts of adults, eggs or chicks were undertaken at various stages of the breeding cycle. Because of the variability in the timing of counts and the inconsistency of count units it is not possible to establish a long term trend for this population. Low numbers were previously reported for this colony because only the numbers of chicks banded in a given year rather than total chick numbers. The Area also supports a breeding colony of Adélie penguins, a limited number of flying birds and southern elephant seal haul out areas.

Southern giant petrels breeding in East Antarctica are sensitive to disturbance at the nest. Restrictions in activities permitted at breeding sites near Australian stations, including a prohibition of banding, were introduced in the mid-1980s.

At the South Shetland Islands and South Orkney Islands, the incidental bycatch of southern giant petrels in longline fisheries operating in the Southern Ocean is likely to have contributed to observed population decreases. Similar observations have not been made in East Antarctica. Until recently, southern giant petrels were listed as Vulnerable by the International Union for the Conservation of Nature (IUCN). However, a re-analysis of all data available for the global population indicated that the best case scenario over the past three generations or 64 years was a 17% increase of the total population, and the worst case scenario a 7.2% decrease. These figures are below the threshold set by the IUCN to be classified as Vulnerable. The conservation status for southern giant petrels has consequently been downgraded from Near Threatened to Least Concern. Hawker Island also supports breeding colonies of Adélie penguins (*Pygoscelis adeliae*), south polar skuas (*Catharacta maccormicki*), Cape petrels (*Daption capense*) and occasionally Weddell seals (*Leptonychotes weddellii*).

2. Aims and objectives

Management of the Hawker Island ASPA aims to:

- protect the breeding colony of southern giant petrels and other wildlife colonies;

- avoid human disturbance or other adverse impacts on the values of the Area, while still allowing research or other activities consistent with this Plan;
- protect the values of Hawker Island as a reference area for future comparative studies with other breeding populations of southern giant petrels; and
- minimise the possibility of the introduction of alien plants, animals and microbes to Hawker Island.

3. Management activities

The following management activities will be undertaken to protect the values of the Area:

- research visits to assess population levels and trends of the southern giant petrel colony and/or other wildlife shall be permitted. Wherever feasible, preference shall be given to activities and methodologies which minimise disturbance to the breeding colony (e.g. use of automated cameras);
- where practicable the Area shall be visited outside the breeding season of southern giant petrels (i.e. during the period mid-April to mid-September) as necessary, to assess whether it continues to serve the purposes for which it was designated and to ensure that management activities are adequate;
- information on the location of Hawker Island ASPA (stating the restrictions that apply) shall be produced and copies of this management plan shall be available at nearby stations. Informative material and the management plan should be provided to ships visiting the vicinity; and
- the management plan shall be reviewed at least every five years and updated/modified as required.

4. Period of designation

Designation is for an indefinite period.

5. Maps

Map A: Hawker Island Antarctic Specially Protected Area, Vestfold Hills, Ingrid Christensen Coast, Princess Elizabeth Land, East Antarctica.

Map B: Hawker Island, Antarctic Specially Protected Area, Vestfold Hills, Ingrid Christensen Coast, Princess Elizabeth Land, East Antarctica, Biota, Topography and Physical Features.

Specifications for maps:

Projection: UTM Zone 49
Horizontal Datum: WGS84

6. Description of the Area

6(i) Geographical co-ordinates, boundary markers and natural features

Hawker Island is located at 68°38'S, 77°51'E, approximately 300 m offshore from the Vestfold Hills. The Vestfold Hills are roughly triangular ice-free area of approximately 512 km² of bedrock, glacial debris, lakes and ponds. The Vestfold Hills are bound by the ice plateau to the east, the Sørsdal Glacier to the south, and Prydz Bay to the west and contain low hills (maximum height 158 m at Boulder Hill) and valleys, and are penetrated deeply by fjords and lakes. Numerous islands fringe the coast of the Vestfold Hills, and Hawker Island lies in the south-west, between Mule Island and Mule Peninsula.

Hawker Island is an irregularly shaped island of low elevation (maximum elevation of nearly 40 m), with two parallel ranges of hills running in a north south direction terminating in two small southern peninsulas. A third peninsula lies directly west and terminates with a 40 m hill with steep cliffs to the sea on the western and southerly aspects. A number of small freshwater lakes lie between the ranges of hills on the northern part of the island, with a number of small lakes lying on the flatter terrain on the eastern sector of the island. At its maximum extent the island is 2 km north to south and 1.7 km east to west.

The Hawker Island ASPA comprises the entire terrestrial area of Hawker Island, with the seaward boundary at the low water mark (Map B). The total area of the Hawker Island ASPA is approximately 1.9 km². There are no boundary markers.

Environmental domains analysis

Based on the Environmental Domains Analysis for Antarctica (Resolution 3 (2008)) Hawker Island is located within Environment T Inland continental geologic.

Human History

The first recorded sighting of the Vestfold Hills was by Douglas Mawson on the BANZARE voyage of the 'Discovery' on 9 February 1931. Four years later, on 20 February 1935, Captain Klarius Mikkelsen of the tanker *Thorshavn* (Lars Christensen Company), sighted and landed in the area. He named many features in the area and in the Vestfold Hills after his home province in Norway. The Vestfold Hills were again visited by Mikkelsen in early 1937, while undertaking an aerial survey of the coast.

In January 1939, the American explorer, Lincoln Ellsworth, and his Australian adviser, Sir Hubert Wilkins were the next recorded visitors to the area in the motor ship *Wyatt Earp*. Ellsworth flew some 400 km inland. In early 1947, the *USS Currituck* visited the Ingrid Christensen Coast as part of Operation Highjump. Photographic flights were conducted to survey the coastline.

The first Australian National Antarctic Research Expeditions (ANARE) to the area was led by Dr Phillip Law on *Kista Dan* and reached the Vestfold Hills on 1 March 1954. During January 1956, members of the Soviet Antarctic Expedition landed on the Ingrid Christensen Coast in preparation for the International Geophysical Year and established Mirny Station 595 km to the east. Australia established Davis station in the Vestfold Hills in 1957. Hawker Island was named for A.C. Hawker, radio supervisor at Davis station in 1957.

Climate

Meteorological data for the Area are confined almost entirely to observations at Davis station, 7 km northwest of Hawker Island. The Vestfold Hills area has a polar maritime climate that is cold, dry and windy. Summer days are typically sunny, with a midday temperature from -1°C to +2.9°C and a summer maximum of +5°C, but temperatures are below 0°C for most of the year falling to as low as -40.7°C in winter. The maximum temperature recorded at Davis station from 1957 to 2001 was +13°C. Long periods of relatively calm, fine conditions occur throughout the year. Winds are generally light. The yearly average is around 20 km/h. Violent winds and blizzards can commence with little warning, and gusts of over 200 km/h have been recorded. Snowfall averages 78 mm/yr, with the greater proportion of annual accumulation resulting from windblown drift. Apart from several permanent ice banks, the Vestfold Hills are virtually snow free in summer and lightly covered in winter. The record illustrates the seasonal climate expected for high latitudes, but on average Davis station is warmer than other Antarctic stations at similar latitudes. This has been attributed to the "rocky oasis" which results from the lower albedo of rock surfaces compared to ice, hence more solar energy is absorbed and re-radiated.

Geology

The Vestfold Hills consist of Archaean gneiss, upon which thin and often fossiliferous Pliocene and Quaternary sediments occupy depressions. The oldest known Cenozoic strata in the Vestfold Hills are the mid-Pliocene Sørsdal Formation, which contains a diverse marine fossil flora and fauna. Other younger Cenozoic strata attest to repeated glaciation, and several marine transgressions and regressions. The three major lithologies forming the Vestfold Hills are (in order of age) Chelnock Paragneiss, Mossel Gneiss and Crooked Lake Gneiss. This is repeated in units from east-north-east to west-south-west. Intruded into these, are groups of mafic dykes in a rough north-south orientation. The dykes are a major feature of the Vestfold Hills. Hawker Island comprises an extension of the Crooked Lake Gneiss of the northern portion of Mule Peninsula above Laternula Inlet. In common with the Archaean gneisses in the Vestfold Hills, the Hawker Island Crooked Lake Gneiss is cut by very distinctive, middle to early Proterozoic dolerite dykes.

Southern Giant Petrels

The Hawker Island southern giant petrel colony is situated on level ground about 20 m above sea-level at the northern end of the island (Map B). The same area has been used for breeding since the first records were made in 1963/64. The eastern side of the breeding area forms a slight ridge with the ground dropping away below, providing a good area for take-off into the prevailing north-easterly winds.

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The breeding season for southern giant petrels on Hawker Island commences in late September/early October and eggs are laid during the second half of October. Following an incubation period of about 60 days, hatching starts in the second half of December. Hatching continues over a period of three to four weeks until mid-January. About 14 – 16 weeks after hatching, the fledglings leave the colony from late March to early May. From the analysis of year round automated cameras and visits during recent winters, it is known that a small number of birds are present outside the breeding season; hence the requirement that visits to the Area at any time of the year be conducted in a manner that ensures minimal disturbance.

In the mid 1980s, a management strategy was implemented for all three southern giant petrels breeding localities in the vicinity of the Australian stations, to minimise human disturbance. Previously the Australian Antarctic Division restricted census visits to one in every three to five year period and implemented tight administrative controls over all other visits. At this time, this level of visitation was considered an appropriate compromise between the risk of disturbing the birds and the need to obtain meaningful population data. However, this management regime impacted on the level of visitation needed to assess population levels (and trends) and did not appear to significantly benefit the breeding success of the southern giant petrels. With the development of new technology (such as automated cameras), detailed information can now be obtained with little or no human presence during the breeding period.

In March 2011, 23 chicks and 64 adults were observed in the Area. Of these, four banded birds were sighted consisting of two birds banded in the Casey region (dated 1985) and two birds banded at Hawker Island (dated 1986). The two Casey banded birds were observed remaining near the same chicks and appeared to be breeding.

Other Birds

Adélie penguins breed along the Vestfold Hills coastline and on at least 17 offshore islands, including Hawker Island. The total number of Adélie penguins in the Vestfold Hills has been estimated at 130000 pairs. The Hawker Island colony is located in the vicinity of a small hill midway on the western side of the island and has been estimated at 2500 to 7500 pairs. There is evidence that the colony or some of the breeding groups within the colony have moved location periodically. The deserted areas are marked by deep deposits of guano, frozen eggs and the dehydrated carcasses of chicks. The first Adélie penguins usually appear in the area by the middle of October and eggs are laid about four weeks later. The interval between laying of the first and second egg is 2½ to 4½ days, and the incubation period is ranges from 32 to 35 days. The last moulted adults depart Hawker Island by the end of March.

A small colony of Cape petrels has been recorded on Hawker Island on the southern tip of the south western peninsula. Cape petrels are absent from the Area in winter; they return to their nesting sites during October, lay eggs from late November to early December and chicks fledge in late February and early March.

Seals

Weddell seals (*Leptonychotes weddellii*) breed in the Vestfold Hills and occasionally on the south-east part of Hawker Island. The seals start to appear inshore in late September and early October, and pupping occurs from mid-October until late November. Throughout summer, moulting Weddell seals continue to frequent firm sea-ice and haul out onto land. Most of the local population remains in the Vestfold Hills throughout the summer. Non-breeding groups of southern elephant seals (*Mirounga leonina*) haul out during the summer months in the vicinity of the south-western peninsula on Hawker Island. Their moulting areas contain deposits of hair and excrement that have accumulated over several thousand years, and could be considered as unique and sensitive areas.

Vegetation

The flora of the Vestfold Hills comprises at least 82 species of terrestrial algae, six moss species and at least 23 lichen species. The lichens and mosses are distributed chiefly in the eastern or inland sector and their distribution patterns reflect the availability of drift snow, time since exposure of the substrate from the ice plateau, time since the last glaciation, elevation and proximity to saline waters. Very few occurrences of lichens or mosses have been noted towards the salt-affected coastal margin including Hawker Island where the low terrain is densely covered with extensive sand and moraine deposits.

Terrestrial algae are widespread and are major primary producers in the Vestfold Hills. Sublithic (or hypolithic) algae have been reported from Hawker Island, developing on the undersurfaces of translucent

quartz stones that are partially buried in soil. The dominant algae, Cyanobacteria, particularly oscillatoriacean species, *Chroococidiopsis sp.*, and *Aphanothece sp.* occur with the greatest frequency together with the Chlorophyta species, *cf. Desmococcus sp. A* and *Prasiococcus calcarius*. The endaphic alga *Prasiola crispa* occurs as green crumpled sheet-like strands at melt flushes, usually associated with the diatom *Navicula muticopsis* and oscillatoriacean algae. The ornithophilous lichen *Candelariella flava* has been reported from Hawker Island, associated with seabird nesting sites.

Invertebrates

An extensive survey of terrestrial tardigrades was undertaken in the Vestfold Hills in 1981 from which four genera and four species of tardigrade were recovered. Although no tardigrades were recovered from the Hawker Island sample site it has been suggested that, as two species of tardigrade, *Hypsibius allisonii* and *Macrobiotus fuciger* (?) were recovered from Walkabout Rocks, they may be found in other coastal areas of similar ecology, associated with *Prasiola crispa*. The mite, *Tydeus erebus* is associated with breeding sites of Adélie penguins on the island.

6(ii) Access to the Area

Depending on sea ice conditions, the Area can be accessed by vehicle, small boat or aircraft, all of which must remain outside the Area. There are no designated landing sites.

6(iii) Location of structures within and adjacent to the Area

There are no permanent structures within or adjacent to the Area. At the time of writing a number of automatic cameras were temporarily located in proximity to the southern giant petrel colony, for the purposes of ongoing population monitoring.

6(iv) Location of other protected areas in the vicinity

The following Protected Area is located near Hawker Island:

Marine Plain, Antarctic Specially Protected Area No. 143 (68°36'S, 78°07'E).

6(v) Special zones within the Area

There are no special zones within the Area.

7. Terms and conditions for entry permits

7(i) General conditions

Visits to Hawker Island ASPA are prohibited except in accordance with a permit issued by an appropriate national authority. Permits to enter the Area may only be issued for compelling scientific research that cannot be undertaken elsewhere, or for essential management purposes consistent with the objectives and provisions of the management plan. Permits are only to be issued for research that will not jeopardise the ecological or scientific values of the Area, or interfere with existing scientific studies.

Permits shall include a condition that the permit or a copy shall be carried at all times when within the Area. Additional conditions, consistent with the objectives and provisions of the management plan, may be included by the issuing authority. The principal permit holder for each permit issued is required to submit to the permit issuing authority a visit report detailing all activities undertaken within the Area, and all census data obtained during the visit.

Collaboration with other national programs is encouraged to reduce duplication of research and minimise disturbance of the southern giant petrels. National Antarctic programs planning research in this Area are encouraged to contact the Australian Antarctic Division, which maintains a regular population monitoring program on the island, to ascertain other projects that may be undertaken that season.

7(ii) Access to, and movement within or over the Area

- Vehicles are prohibited within the Area.

- Access to the Hawker Island ASPA boundary may be by watercraft or vehicle depending upon seasonal conditions. Boats used to visit the islands must be left at the shoreline. Movement within the Area is by foot only. Only personnel who are required to carry out scientific/management work in the Area are to leave the landing/parking site. Quad-bikes or other land vehicles used to visit the Area shall not be taken into the Area. Vehicles shall remain on the sea-ice at least 150 m (quad-bike) or 250 m (other land-vehicles) from the edge of the southern giant petrel colony (see Table 1);
- The minimum (closest) approach distances to wildlife are set out in Table 1. If disturbance of wildlife is observed, separation distance should be increased or the activity modified until there is no visible disturbance, unless a closer approach distance is authorised in a permit.
- Persons authorised in a permit to approach southern giant petrels to obtain census data or biological data, should maintain the greatest practical separation distance;
- To reduce disturbance to wildlife, noise levels, including verbal communication are to be kept to a minimum. The use of motor-driven tools and any other activity likely to generate significant noise (thereby cause disturbance to nesting southern giant petrels and other nesting birds) is prohibited within the Area during the breeding period for southern giant petrels (mid-September to mid-April);
- Overflights of the island during the breeding season are prohibited, except where essential for scientific or management purposes and authorised in a permit. Such overflights are to be at an altitude of no less than 930 m (3050 ft) for single-engined helicopters and fixed-wing aircraft, and no less than 1500 m (5000 ft) for twin-engined helicopters; and
- Landing of aircraft within 930 m for single-engined helicopters and fixed-wing aircraft and 1500 m (5000 ft) for twin-engined helicopters of a wildlife concentration is prohibited at any time other than an emergency.

Table 1: Minimum distances to maintain when approaching wildlife at Hawker Island

Species	Distances (m)			
	People on foot / ski (unless a closer approach distance is authorised in a permit)	Quad/ Skidoo	Hagglunds, etc.	Small watercraft
Giant petrels	100 m	Not permitted inside the Area. Parking shall be on the sea-ice and no closer than 150 m from wildlife colonies.	Not permitted inside the Area. Parking shall be on the sea-ice and no closer than 250 m from wildlife colonies.	Watercraft should not be landed within 50 m of wildlife; in particular, the Adelie penguin colony on the eastern shore. Care shall be taken when in close proximity to the island.
Adelie penguins in colonies Moulting penguins Seals with pups Seal pups on their own South polar skua on nest	30 m			
Penguins on sea ice Non breeding adult seals	5 m			

7(iii) Activities which are or may be conducted within the Area, including restrictions on time and place

The following activities may be conducted within the Area from 15 April to 15 September (southern giant petrel non-breeding period) as authorised in a permit:

- scientific research consistent with the provisions of this management plan which cannot be undertaken elsewhere or in the Area outside that period and which will not jeopardise the values for which the Area has been designated or the ecosystems of the Area;
- essential management activities, including monitoring; and
- sampling which should be the minimum required for approved research programs.

Activities undertaken within the breeding period of the southern giant petrel shall only be permitted if the activity is non-invasive and cannot reasonably be undertaken during the non-breeding period.

7(iv) Installation, modification, or removal of structures

- Permanent structures or installations are prohibited.
- Temporary structures or equipment, including cameras, shall only be erected within the Area in accordance with in a permit.
- Small temporary refuges, hides, blinds or screens may be constructed for the purpose of scientific study.
- Installation (including site selection), removal, modification or maintenance of structures or equipment shall be undertaken in a manner that minimises disturbance to breeding birds and the surrounding environment.
- All scientific equipment or markers installed within the Area must be clearly identified by country, name of the principal investigator and year of installation.
- Markers, signs or other structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition and removed under permit when no longer required. All such items should be made of materials that pose minimal risk of harm to wildlife or of contamination of the Area.

7(v) Location of field camps

- Camping is prohibited within the Area except in an emergency. Any emergency camp should avoid areas of wildlife concentrations, if feasible.

7(vi) Restrictions on materials and organisms that may be brought into the Area

- Fuel is not to be stored in the Area. Boat refuelling is permitted at landing sites. A small amount of fuel may be taken into the Area for an emergency stove.
- No poultry products, including dried food containing egg powder, are to be taken into the Area.
- No herbicides or pesticides are to be brought into the Area.
- Any chemical which may be introduced for compelling scientific purposes as authorised in a permit shall be removed from the Area, at or before the conclusion of the activity for which the permit was granted. The use of radio-nuclides or stable isotopes is prohibited.
- No animals, plant material or microorganisms shall be deliberately introduced into the Area and precautions shall be taken against accidental introductions; all equipment and clothing (particularly footwear) should be thoroughly cleaned before entering the Area.
- All material introduced shall be for a stated period only, shall be removed at or before the conclusion of that stated period, and shall be stored and handled so as to minimise the risk of environmental impact.

7(vii) Taking of or harmful interference with native flora and fauna

- Taking of, or harmful interference with, native flora and fauna is prohibited unless specifically authorised by permit issued in accordance with Article 3 of Annex II to the Protocol on Environmental Protection to the Antarctic Treaty. Any such permit shall clearly state the limits and conditions for such activities which, except in an emergency, shall only occur following approval by an appropriate animal ethics committee.
- Ornithological research shall be limited to activities that are non-invasive and non-disruptive to the breeding seabirds present within the Area.
- Disturbance of southern giant petrels or other wildlife should be avoided or minimised.

7(viii) Collection or removal of anything not brought into the Area by the permit holder

- Material may only be collected or removed from the Area as authorised in a permit and should be limited to the minimum necessary to meet scientific or management needs.
- Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the permit holder or otherwise authorised, may be removed unless the impact of the removal is likely to be greater than leaving the material *in situ*. If such material is found the appropriate National Authority must be notified.

7(ix) Disposal of Waste

- All wastes, including human wastes, shall be removed from the Area.

7(x) Measures that may be necessary to continue to meet the aims of the management plan

- GPS data shall be obtained for specific sites of long-term monitoring for lodgement with the Antarctic Master Directory through the appropriate national authority.
- Permits may be granted to enter the Area to carry out biological monitoring and management activities, which may involve the collection of samples for analysis or review; the erection or maintenance of temporary scientific equipment and structures, and signposts; or for other protective measures. Any specific sites of long-term monitoring shall be appropriately marked and a GPS position obtained for lodgement with the Antarctic Data Directory System through the appropriate national authority.
- To help maintain the ecological and scientific values of the Area, visitors shall take special precautions against introductions of non-indigenous organisms. Of particular concern are pathogenic, microbial or vegetation introductions sourced from soils, flora and fauna at other Antarctic sites, including research stations, or from regions outside Antarctica. To minimise the risk of introductions, before entering the Area visitors shall thoroughly clean footwear and any equipment, particularly sampling equipment and markers to be used in the Area.

7(xi) Requirement for reports

Parties shall ensure that the principal permit holder for each permit submits to the appropriate National Authority a report on activities undertaken. Such reports should include, as appropriate, the information identified in the visit report form contained in the Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas.

Parties shall maintain a record of such activities and, in the annual exchange of information, shall provide summary descriptions of activities conducted by persons subject to their jurisdiction, which shall be in sufficient detail to allow evaluation of the effectiveness of this management plan.

Parties shall, wherever possible, deposit originals or copies of such original reports in a publicly accessible archive to maintain a record of usage, to be used both in any review of the plan of management and in organising the scientific use of the Area.

A copy of the report shall be forwarded to the national authority responsible for development of the management plan to assist in management of the Area, and monitoring of bird and other wildlife populations. Additionally visit reports shall provide detailed information such as census data, locations of any new colonies or nests not previously recorded, a brief summary of research findings and copies of photographs taken of the Area.

7(xii) Emergency provisions

Exceptions to restrictions outlined in the management plan are in emergency as specified in Article 11 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol). A report of any such actions shall be provided to the relevant national authority.

8. Supporting documentation

Some or all of the data used within this paper were obtained from the Australian Antarctic Data Centre (IDN Node AMD/AU), a part of the Australian Antarctic Division (Commonwealth of Australia).

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