Management Plan

for Antarctic Specially Protected Area No. 107 EMPEROR ISLAND, DION ISLANDS, MARGUERITE BAY, ANTARCTIC PENINSULA

1. Description of values to be protected

The Dion Islands (Latitude 67°52′ S, Longitude 68°42′ W), on the western side of the central Antarctic Peninsula in north-western Marguerite Bay, were originally designated as Specially Protected Area (SPA) No. 8 through Recommendation IV-8 in 1966 after a proposal by the United Kingdom. All of the islands in the Dion Islands archipelago were included. Values protected under the original designation were described as the presence of the only colony of emperor penguins (*Aptenodytes forsteri*) known to exist on the west side of the Antarctic Peninsula and that the isolation of this colony from others of the same species makes it of outstanding scientific interest. A management plan for the Area was adopted through Recommendation XVI-6 (1990), which reaffirmed the values of the Area. The boundaries were extended to include the intervening sea between the islands to ensure protection of the emperors at sea or on sea-ice in the immediate vicinity. Attention was drawn to the additional important value of the colony being one of only two known in which breeding occurs on land. It was also noted as the most northerly and probably the smallest of Emperor colonies, with annual numbers fluctuating around 150 pairs.

The values of the emperor penguin colony are reaffirmed in this revised management plan. The boundaries of the Area are now defined more precisely.

2. Aims and objectives

Management at Emperor Island aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- allow scientific research on the ecosystem and physical environment, particularly on the avifauna, provided it is for compelling reasons which cannot be served elsewhere;
- minimise the possibility of introduction of pathogens which may cause disease in bird populations within the Area;
- minimise the possibility of introduction of alien plants, animals and microbes to the Area;
- gather data on the population status of the emperor penguin colony on a regular basis, preferably at least once every five years;
- allow visits for management purposes in support of the aims of the management plan.

3. Management activities

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

Maps showing the location of the Area (stating the special restrictions that apply) shall be displayed prominently at any operational research station located within 50 km of the Area, where copies of this management plan shall also be made available.

Markers, signs or other structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition.

Visits shall be made as necessary (preferably no less than once every five years) to assess whether the Area continues to serve the purposes for which it was designated, and in particular to conduct bird censuses, and to ensure management and maintenance measures are adequate.

4. Period of designation

Designated for an indefinite period, provided the Emperor penguins continue to breed in the Area.

5. Maps and photographs

Map 1: Emperor Island, Dion Islands, ASPA No. 107, in relation to Marguerite Bay, showing the locations of the stations Teniente Luis Carvajal (Chile), Rothera (UK) and General San Martín (Argentina). The location of other protected areas within Marguerite Bay (ASPA No. 117 at Avian Island, ASPA No. 115 at Lagotellerie Island, and ASPA No. 129 at Rothera Point) are also shown. Inset: the location of Dion Islands on the Antarctic Peninsula.

Map 2: Emperor Island, Dion Islands, ASPA No. 107: topographic map. Map specifications: Projection: Lambert Conformal Conic; Standard parallels: 1st 67° 0′ 00″ W; 2nd 68° 00′

00″S; Central Meridian: 68° 42′ 30″ W; Latitude of Origin: 68° 00′ 00″ S; Spheroid:

WGS84; Datum: Mean sea level. Horizontal accuracy: ± 1.5 m; Vertical accuracy ±1 m (best accuracy of the control points); Vertical contour interval 5 m (index contour interval 15m).

Map 3: Emperor Island, ASPA No. 107: topographic map. Map specifications as for Map 2.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

GENERAL DESCRIPTION

The Dion Islands (Latitude 67°53′ S, Longitude 68°42′ W, within a region of approximately 12 km^2), situated 13.5 km south of the south-western extremity of Adelaide Island in north-western Marguerite Bay (Map 1), is a small archipelago comprising the following islands, rocks and reefs: Envoy Rock, Regent Reef, Consort Islands (approximately 3 ha), Emperor Island (approximately 5 ha), Jester Rock, Noble Rocks, Courtier Islands (approximately 8 ha), Embassy Islands and Consul Reef. The islands are generally small, rocky and precipitous, especially Emperor Island, which at a maximum elevation of 46 m is also the highest. The island group contains numerous offshore islets, rocks and reefs, which are potentially hazardous to shipping. The Dion Islands have only been visited occasionally and detailed descriptions of the Area have yet to be made.

The islands are generally ice-free in summer, although there are a few small patches of permanent ice and persistent snow. A meltwater pond is located on the northern side of Emperor Island.

Terrain suitable for breeding birds is limited, and the colonies present are relatively small, mostly found on Emperor Island. For a detailed description of the geology and biology of the Area see Annex 1.

BOUNDARIES

The designated Area of just over 3 km^2 comprises Emperor Island and the marine environment (including sea ice when present) within 1000 m of the coastline of Emperor Island (Maps 2 and 3). The 1000 m boundary is set as a precautionary limit to avoid disturbance to breeding Emperor penguins. Within this zone landing and overflight restrictions apply to aircraft during the period 1 April to 15 December (see Section 7(i) below). However, the area does not include the terrestrial areas of the Consort Islands in the north, Jester Rock in the east, or the Courtier Islands in the southwest.

6(ii) Restricted and managed zones within the Area

None.

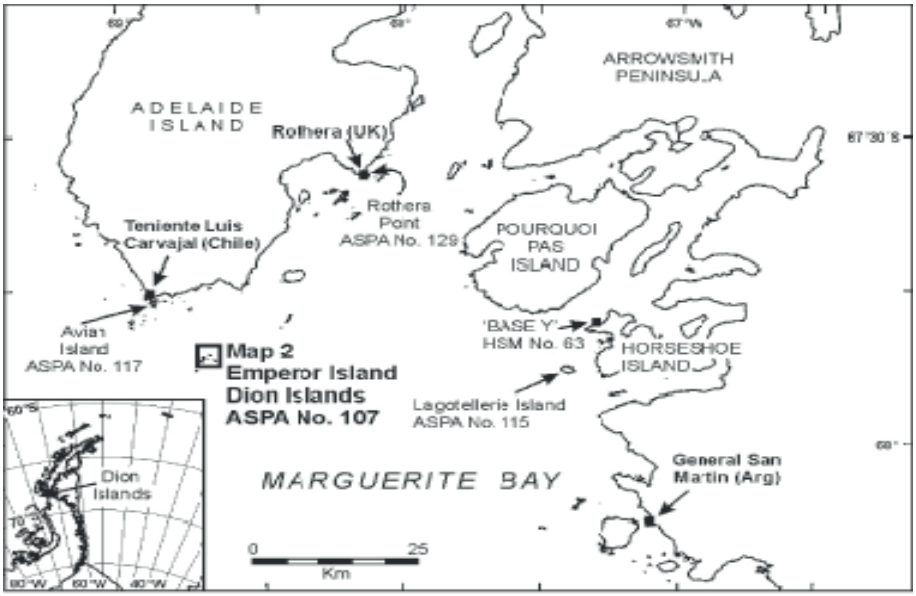
6(iii) Structures within and near the Area

No structures are known to be present within the Area. A GPS survey station, consisting of a nail driven into a rock marked by a small cairn, was installed on the northeastern side of the largest of the Courtier Islands in March 1997 (Gray and Fox 1997).

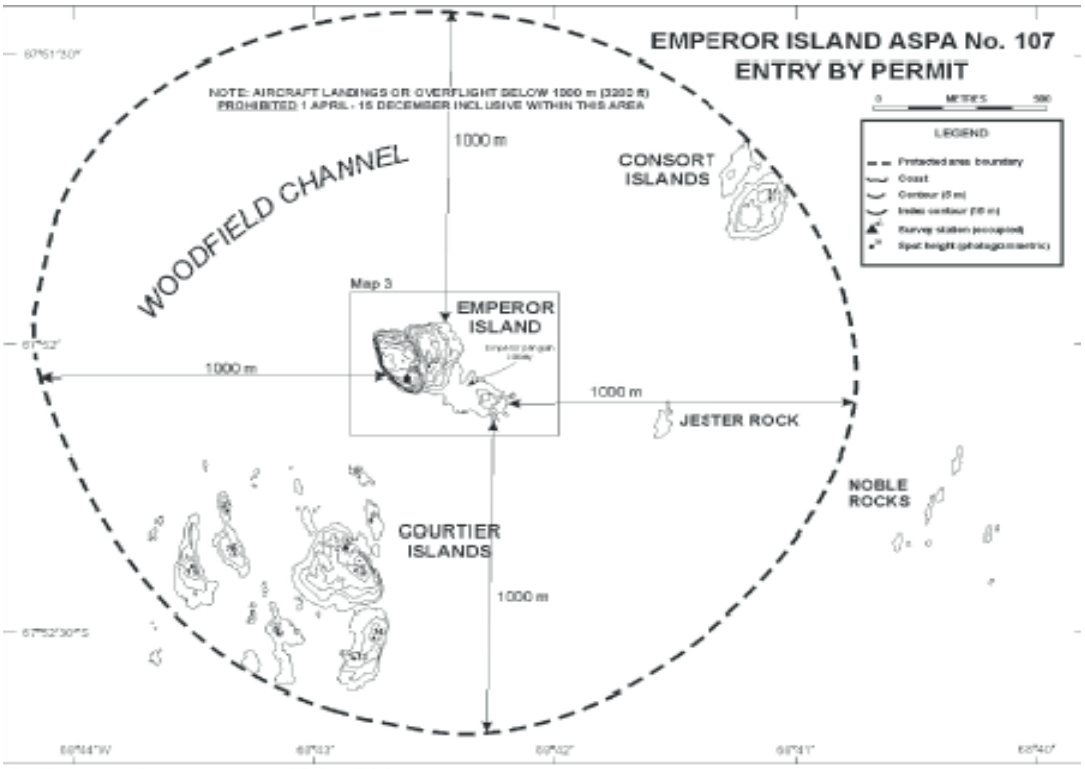
The nearest scientific research station is 14 km north-west at Teniente Luis Carvajal (Chile), on southern Adelaide Island (Latitude 67°46′ S, Longitude 68°55′ W), a summer-only facility operated from October until March since 1982. Over this period the station has generally accommodated up to 10 personnel. Formerly, this facility was established and operated by the UK year-round from 1961 until 1977. The nearest year-round scientific station is Rothera Research Station (UK), 41 km to the north-east on Rothera Point, also on Adelaide Island.

6(iv) Location of other protected areas within close proximity of the Area

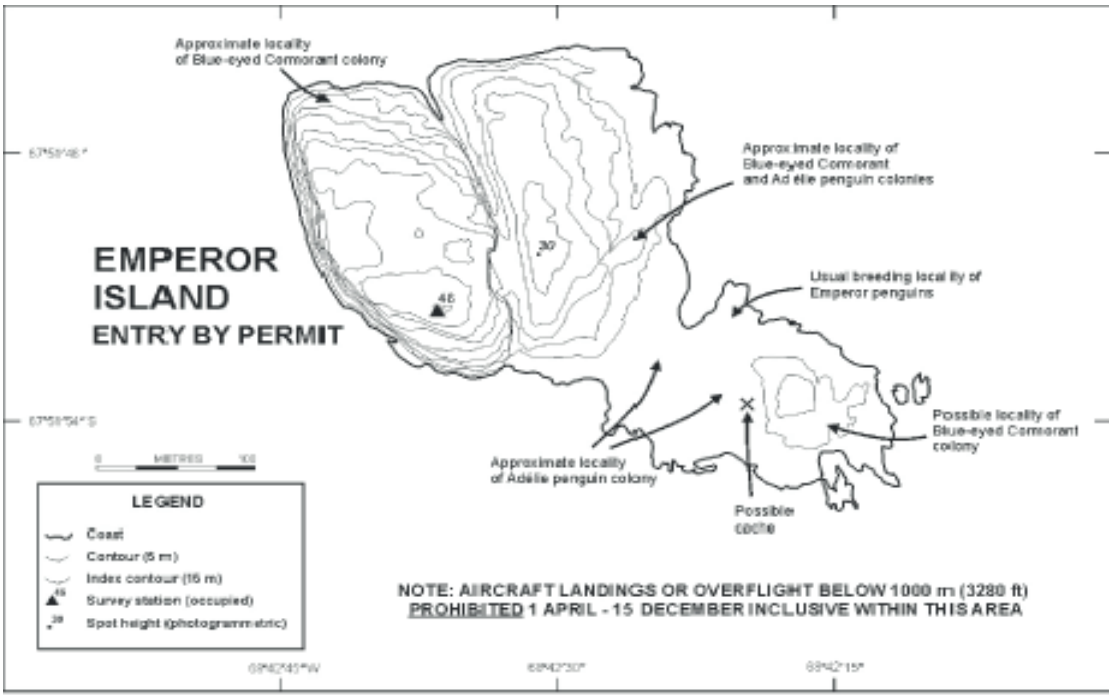
The nearest protected areas to Emperor Island are Avian Island (ASPA No. 117) about 12.75 km NNW, Lagotellerie Island (ASPA No. 115) 58 km east, and Rothera Point (ASPA No. 129) 41 km to the NE (Map 1).



Map 1. Emperor Island, Dion Islands, ASPA No. 107, location map.



Map 2. Emperor Island, Dion Islands, ASPA No. 107, topographic map



Map 3. Emperor Island (within ASPA No. 107) topographic map

7. Permit conditions

Entry into the Area is prohibited except in accordance with a Permit issued by an appropriate national authority. Conditions for issuing a Permit to enter the Area are that:

- it is issued only for compelling scientific reasons that cannot be served elsewhere, in particular for scientific study of the avifauna and ecosystem of the Area, or for essential management purposes consistent with plan objectives such as inspection, maintenance or review;
- the actions permitted will not jeopardise the values of the Area;
- any management activities are in support of the objectives of the management plan;
- the actions permitted are in accordance with the management plan;
- the Permit, or an authorised copy, shall be carried within the Area;
- a visit report shall be supplied to the authority named in the Permit;
- permits shall be issued for a stated period;
- the appropriate authority should be notified of any activities/measures undertaken that were not included in the authorised Permit.

7(i) Access to and movement within the Area

- Subject to the following restrictions, access to the Area shall be by boat, aircraft or over sea ice by vehicle or foot.
- Vehicles are prohibited on land within the Area and all movement on land within the Area shall be on foot.
- Access shall be conducted so as to minimise disturbance to any fauna that may be present, and vehicles or boats should not approach closer than 200 m to any breeding colony.
- There are otherwise no special restrictions on the locations where vehicle or small boat travel or landings may be made, but this shall be by the shortest route consistent with the restrictions in this plan and the objectives and requirements of the permitted activities.
- Aircraft are prohibited from landing within the Area or overflying the Area below 1000 m in the period 1 April to 15 December inclusive.
- Vehicle, aircraft or boat crew, or other people on vehicles, aircraft or boats, are prohibited from moving on foot beyond the immediate vicinity of their landing site unless specifically authorised by Permit.
- All movement should be undertaken carefully so as to minimise disturbance to breeding birds, the soil and vegetated surfaces.
- Pedestrian traffic should be kept to the minimum consistent with the objectives of any permitted activities and every reasonable effort should be made to minimise effects.

7(ii) Activities that are or may be conducted in the Area, including restrictions on time or place

- Scientific research that will not jeopardise the avifauna or ecosystem of the Area, and which is for compelling reasons that cannot be served elsewhere;
- Essential management activities, including monitoring;
- Restrictions on times and locations at which aircraft may operate within the Area apply, specified in Section 7 (i) of this Management Plan.

7(iii) Installation, modification or removal of structures

Structures shall not be erected within the Area except as specified in a Permit and permanent structures or installations are prohibited. Small temporary refuges, hides, blinds or screens may be constructed for the purpose of scientific study of the avifauna. Installation (including site selection), removal, modification or maintenance of structures shall be undertaken in a manner that minimises disturbance to breeding birds. All scientific equipment or markers installed within the Area must be clearly identified by country, name of the principal investigator and year of installation. All such items should be made of materials that pose minimal risk of harm to bird populations or of contamination of the Area. Removal of specific structures, equipment or markers for which the Permit has expired shall be a condition of the Permit.

7(iv) Location of field camps

Temporary camping within the Area is allowed when necessary for purposes specified in the Permit. Specific campsite locations have not been designated, but camping within 200 m of the emperor penguin colony should be avoided.

7(v) Restrictions on materials and organisms that can be brought into the Area

No living animals, plant material, pathogens or microorganisms shall be deliberately introduced into the Area and the precautions listed in 7(ix) below shall be taken against accidental introductions. In view of the presence of breeding bird colonies on Emperor Island, no poultry products, including products containing uncooked dried eggs, including wastes from such products, shall be released into the Area, including into the sea. No herbicides or pesticides shall be brought into the Area. Any other chemicals, including radio-nuclides or stable isotopes, which may be introduced for scientific or management purposes specified in the Permit, shall be removed from the Area at or before the conclusion of the activity for which the Permit was granted. Fuel is not to be stored in the Area, unless specifically authorised by Permit for specific scientific or management purposes. All materials 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 that risk of their introduction into the environment is minimised. If release occurs which is likely to compromise the values of the Area, removal is encouraged only where the impact of removal is not likely to be greater than that of leaving the material *in situ*. The appropriate authority should be notified of any materials released and not removed that were not included in the authorised Permit.

7(vi) Taking or harmful interference with native flora or fauna

Taking or harmful interference with native flora or fauna is prohibited, except by Permit issued in accordance with Annex II to the Protocol on Environmental Protection to the Antarctic Treaty.

Where taking or harmful interference with animals is

involved, the *SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica* should be used as a minimum standard.

7(vii) Collection or removal of anything not brought into the Area by the Permit holder

Collection or removal of anything not brought into the Area by the Permit holder shall only be in accordance with a Permit and should be limited to the minimum necessary to meet scientific or management needs. Permits shall not be granted in instances where it is proposed to take, remove or damage such quantities of soil, native flora or fauna that their distribution or abundance within the Area would be significantly affected. Samples of flora or fauna found dead within the Area may be removed for analysis or audit without prior authorisation by Permit. Anything 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 removal is likely to be greater than leaving the material *in situ*: if this is the case the appropriate authority should be notified.

7(viii) Disposal of waste

All wastes, except human wastes, shall be removed from the Area. Human wastes shall be removed from the Area or disposed of into the sea.

7(ix) Measures that are necessary to ensure that the aims and objectives of the management plan can continue to be met

1. Permits may be granted to enter the Area to carry out monitoring and site inspection activities, which may involve the small-scale collection of samples for analysis or review, or for protective measures.
2. Any specific long-term monitoring sites shall be appropriately marked.
3. To help maintain the ecological and scientific values found at Emperor Island visitors shall take special precautions against introductions. Of concern are pathogenic, microbial or plant introductions sourced from other Antarctic sites, including stations, or from regions outside Antarctica. Visitors shall ensure that sampling equipment or markers brought into the Area are cleaned or sterilised. To the maximum extent practicable, footwear and other equipment used or brought into the Area (including backpacks, carry-bags and tents) shall be thoroughly cleaned before entering the Area.
4. Poultry products and other introduced avian products, which may be a vector of avian diseases, shall not be released into the Area.

7(x) Requirements for reports

Parties should ensure that the principal holder for each Permit issued submits to the appropriate authority a report describing the activities undertaken. Such reports should include, as appropriate, the information identified in the Visit Report form suggested by SCAR. Parties should maintain a record of such activities and, in the Annual Exchange of Information, should provide summary descriptions of activities conducted by persons subject to their jurisdiction, which should be in sufficient detail to allow evaluation of the effectiveness of the management plan. Parties should, 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 management plan and in organising the scientific use of the Area.

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Annex 1.

6(i) Additional information on the natural features of the Area.

CLIMATE AND SEA ICE

Extended meteorological records are not available for Dion Islands, but records from 1962-74 for Adelaide Base (formerly UK; now Teniente Luis Carvajal, Chile), show a mean daily maximum temperature of 3°C in February (extreme maximum 9°C) and a mean daily minimum of -8°C in August (extreme minimum -44°C). This general pattern is consistent with observations at the Dion Islands recorded by Stonehouse (1953) during the winter of 1949, who also noted that the dominant winds occurred from a northerly direction. The islands are surrounded by fast ice up to 2 m thick for about seven months of the year, with a variable presence of open water and pack ice during the summer.

GEOLOGY, GEOMORPHOLOGY AND SOILS

The geology of the Dion Islands consists of dark fine-grained lavas and tuffs of Jurassic to Early Tertiary age belonging to the Antarctic Peninsula Volcanic Group (Dewar 1970, Moyes *et al* 1994). Andesitic and basaltic lavas and pyroclastic rocks dominate toward the south, while in the north are found well-bedded sedimentary and volcaniclastic rocks. Shales, sandstones, grits and conglomerates are also present, usually as thin units of up to about 1 m thick (Skinner 1969).

Poorly preserved plant fossils have been observed on Consort Islands and Noble Rocks, where indeterminate carbonaceous compressions, presumably representing tree trunks, of up to 1 m across occur (Thomson 1972). Flattened, carbonised and mineralised logs, up to 4 m long and 50 cm across, are common in siltstones on these islands (Thomson and Griffiths 1994). Small veins of copper are prominent as green streaks on the rocks.

There is virtually no soil development in the island group, except for small pockets of ornithogenic mud composed largely of guano, decayed moss and *Prasiola crispa*, notably on Emperor Island. Deposits of pure guano 10-30 cm thick have been observed on the edge of the Emperor Island cormorant colony. On the raised pebble beach on the largest of the Courtier Islands, periglacial circles of a yellowish-brown clay suggest an ornithogenic origin, although bird colonies do not presently occupy the site. In moist depressions this soil type is colonised by the moss *Sanionia uncinata* (=*Drepanocladus uncinatus*). The soils have exceptionally high concentrations of Ca, P and Mg, and also of Na in soils associated with the seabird colonies, as, for example, near the cormorant colony on Emperor Island (Smith 1996).

Several small low-lying areas on the Courtier and Emperor islands consist of large pebbles, suggesting raised beach deposits. The deposits occur on the south-eastern side of Emperor Island and on the largest of the Courtier Islands. Small sorted soil circles are evident in the deposits at about 6 m above mean sea level on this island. The geomorphology of the Dion Islands has otherwise not been described.

BREEDING BIRDS

Six species of birds have been recorded as breeding on Dion Islands. Owing to the difficulties of access, however, data are few and dated. Descriptions below are thus often based on limited and/or old observations and it should be emphasised that these data are therefore not necessarily representative of present numbers or trends.

The outstanding feature of the avifauna is the presence of a small colony of emperor penguins which typically breeds on a low-lying shingle beach and rocky headland on the northern coast of south-eastern Emperor Island. The colony was discovered in October 1948 by Stonehouse (1953), who studied the breeding behaviour and performance, while Glenister (1954) investigated emperor penguin embryology from specimens taken by Stonehouse. It is the only emperor penguin colony in this region of Antarctica; it is also the most northerly colony and possibly the smallest, and one of only two in which breeding occurs on land (the other is at Taylor Rookery, SPA No. 1). It is also the most isolated, being about 2500 km (by sea) from the nearest known breeding colony. Stonehouse (1953) reported that the birds spent most of their time on the low- lying beach, occupying an area of about 650 m^2.

Stonehouse (1953) reported numbers of adult birds varying between 100 and 183 during the 1949 winter (observations between 5 June – 15 August), and from egg counts it was estimated that about 150 breeding pairs were present. In the previous year 100 adults and 70 chicks were counted. Egg-laying occurred from around 1 June until 29 June, 1949, with most eggs laid in the first week. Birds laid one egg per pair, and replacement eggs were not laid if originals were lost. Initially, eggs were passed a number of times between pair partners, eventually being held by the male for incubation over several months while their partners were at sea, most of which returned around the end of July / early August when hatching occurred. The numbers of adult birds present increased after hatching, with frequent arrivals and departures. Observations made on chicks the previous year showed they had formed *creches* by October, and some evidence in the 1949 season suggested *creches* were formed around a month earlier. A chick mortality rate of less than 10% was estimated by Stonehouse for this season.

Fluctuations in numbers have been discussed by Conroy (1975), Croxall and Kirkwood (1979) and Woehler (1993). Approximately 150 breeding pairs were observed until about 1968, with some evidence (based on aerial photographs) of an increase (possibly to about 500 pairs) in 1977. However, it is probable this latter count included Adélie penguins which breed nearby, as only 70-80 adults and about 20 chicks were reported from a ground count in late July 1978 (Poncet 1982). The most recent count was made in July 1999, when only 14 males with eggs were counted in the same location on Emperor Island. It is not known whether this number is typical of recent seasons. If so, continued presence of the colony may be marginal.

A small colony of Adélie penguins (*Pygoscelis adeliae*) in several groups occupies the south- eastern part of Emperor Island. A rough count in 1948 indicated about 500 pairs, while a 1969 estimate indicated about 175 pairs. The most recent data available (a rough estimate made in 1986) indicated a population of 700 breeding pairs (Poncet and Poncet 1987, Woehler 1993). A small colony of blue-eyed cormorants (*Phalacrocorax atriceps*) was present in the Dion

Islands in October 1948, although numbers were not recorded (Stonehouse 1949). About 50 pairs were recorded on Emperor Island on 30 August 1968 (Willey 1969), while a more precise nest count at the same location in February 1969 recorded 107 pairs and 33 pairs in two adjacent groups. About 200 empty nests were counted on broad ledges on the steep north-western side of Emperor Island in July 1978, and there was evidence of the smaller breeding group closer to the location of the emperor penguin colony (BAS internal records, Bonner and Smith 1984). In February 1986, 388 pairs were recorded in two main colonies on Emperor Island, one in the north and one in the southeast. Eight pairs were recorded nesting within the Adélie penguin colony (Poncet pers comm., 1999).

Kelp gulls (*Larus dominicanus*) and brown skuas (*Catharacta loennbergi*) are numerous, with several pairs nesting on the larger islands (Bonner and Smith 1984). A breeding pair of kelp gulls with a chick was observed on Consort Islands on 24 February 1969 (BAS internal records).

Southern giant petrels (*Macronectes giganteus*), cape petrels (*Daption capensis*) and snow petrels (*Pagodroma nivea*) are frequently seen around the islands, but breeding of these or other seabirds that have been observed in the area is unconfirmed, the nearest major breeding site being Avian Island, 12.75 km to the north-west. A few Wilson's storm petrel (*Oceanites oceanicus*) nests were noted on Emperor Island in February 1969 (BAS internal records).

VEGETATION

Vegetation on Dion Islands is generally sparse, and the flora has not been described in detail. Collections have been made principally on Emperor and Consort islands. Phanerogams are absent from the island and there is a limited range of cryptogams, although there is a rich lichen flora.

The few taxa recorded on the islands are typical of maritime Antarctic sites exposed to strong winds, sea spray and nitrogenous enrichment from seabirds. The flora of the Area is not regarded as possessing properties that in itself merits special protection. To date, six mosses and at least 19 lichen species have been identified as present within the Area (BAS Plant Database 1999).

Bryophytes are restricted to small patches dominated by *Sanionia uncinata* (=*Drepanocladus uncinatus*) in moist hollows where there is some soil accumulation. The most substantial stands, covering several square metres, occur on the largest of the Courtier Islands. *Bryum pseudotriquetrum* (=*Bryum algens*), *Ceratodon purpureus* and *Pohlia nutans* are usually associated. The moss *Syntrichia princeps* (=*Tortula princeps*) has been recorded on Courtier Islands and *Polytrichastrum alpinum* (=*Polytrichum alpinum*) has been recorded on Emperor Island.

The epipetric communities are composed entirely of lichens. Macrolichens, such as *Usnea* and *Umbilicaria*, are rare although are common in the general region. The most prominent lichens include *Acarospora macrocyclos*, *Amandinea petermannii*, *Buellia anisomera*, *B.* cf. *latemarginata*, *B. russa*, *Caloplaca cirrochrooides*, *C.* spp., *Lecania brialmontii*, *Lecanora* spp., *Lecidea atrobrunnea*, *L.* spp., *Mastodia tessellata*, *Physcia caesia*, *Usnea antarctica*, *Verrucaria elaeoplaca*, *V. psychrophilia*, *Xanthoria candelaria* and *X. elegans*. *Haematomma erythromma* is frequent on the largest of the Courtier Islands. The only soil encrusting lichen noted is *Candelariella vitellina*. Moist rock depressions and faces associated with sea bird colonies support small patches of the alga *Prasiola crispa* and cyanobactarium *Phormidium*.

INVERTEBRATES, FUNGI, BACTERIA

The microinvertebrate fauna, fungi and bacteria on Dion Islands have yet to be investigated in detail. Nine species of microinvertebrate fauna have been recorded from the island group (BAS Invertebrate Database 1999): two Collembola (*Cryptopygus antarcticus, Friesea grisea*); one mesostigmatid mite (*Gamasellus racovitzai*), four cryptostigmatid mites (*Alaskozetes antarcticus*, *Halozetes belgicae, Magellozetes antarcticus* and *Globoppia loxolineata* (=*Oppia loxolineata*)); and two prostigmatid mites (*Eupodes minutus* and *Pretriophtydeus tilbrooki*). The dominant species are *Cryptopygus antarcticus* and *Alaskozetes antarcticus*.

Nematodes have been recorded as abundant in *Sanionia uncinata* on the largest of the Courtier Islands, but were rare in *Prasiola* growing on Emperor Island (Bonner and Smith 1985). A sample of *Sanionia uncinata* intermixed with *Bryum pseudotriquetrum* from Emperor Island yielded several nematode taxa: mostly of the genus *Mesodorylaimus*, with *Plectus* and *Eudorylaimus* also present (Spaull 1973). Of the tardigrades in the sample, most were *Macrobiotus furciger* and *Hypsibius dujardini*, with a small proportion of *H. alpinum* and *H. pinguis* also present. Of nine specimens recovered from a soil sample from Consort Islands all were *H. renaudi* (Jennings 1976). Rotifers have been recorded on Emperor Island, although no protozoans. Three predacious fungi have been isolated from the Dion Islands: an unidentified endoparasite from *Sanionia uncinata* on Courtier Islands; and *Arthrobotrys robusta* and *Cephalosporium balanoides* from *Prasiola* on Emperor Island (Gray and Smith 1984).

BREEDING MAMMALS AND MARINE ENVIRONMENT

Crabeater seals (*Lobodon carcinophagus*) are common on ice floes near the islands, with Weddell seals (*Leptonychotes weddellii*) and Leopard seals (*Hydrurga leptonyx*) being less frequent visitors (Bonner ad Smith 1985). A single immature bull Elephant seal (*Mirounga leonina*) was seen on the largest of the Courtier Islands on 14 March 1981. The marine environment within the Area has not been investigated.

HUMAN ACTIVITIES AND IMPACTS

There has been little human activity at the Dion Islands. Visits have comprised a mixture of science and topographical survey. The impacts of activities such as these have not been described and are not known, but are believed to have been minor and limited to items such as transient disturbance to breeding birds, campsites, footprints, occasional litter, human wastes, scientific sampling and markers. A fuel drum, a box (possibly a food cache, as mentioned in 1969 field reports), and several poles were apparent in aerial photographs of Emperor Island taken in December 1998, although their status has not been assessed in the field.