

Management Plan for Antarctic Specially Protected Area No. 117

AVIAN ISLAND, MARGUERITE BAY, ANTARCTIC PENINSULA

Introduction

The primary reason for the designation of Avian Island, Marguerite Bay, Antarctic Peninsula (67°46'S, 68°54'W; 0.49 km²) as an Antarctic Specially Protected Area (ASP) is to protect environmental values and primarily the abundance and diversity of breeding seabirds on the island.

Avian Island is situated in northwestern Marguerite Bay, 400 m south of Adelaide Island on the western side of the central Antarctic Peninsula. It was originally designated as Site of Special Scientific Interest (SSSI) No. 30 under Recommendation XV-6 in 1989 after a proposal by the United Kingdom. Included was the island together with its littoral zone, but excluded was a small area near a refuge on the northwestern coast of the island. Values protected under the original designation were described as the abundance and diversity of breeding seabirds present on the island, that the southern giant petrel (*Macronectes giganteus*) colony is one of the most southerly known breeding population of this species, and that the Antarctic shags (*Phalacrocorax [atriceps] bransfieldensis*) are breeding close to the southern limit of their range. The Area was therefore considered of outstanding ornithological importance, meriting protection from unnecessary human disturbance.

Designation as an SSSI was terminated with redesignation of Avian Island as a Specially Protected Area (SPA) through Recommendation XVI-4 (1991, SPA No. 21) after a proposal by the United Kingdom. The boundaries were similar to the original SSSI, but included the entire island and the littoral zone without the exclusion zone near the refuge on the northwestern coast. After re-designation as ASPA 117 through Decision 1 (2002), the ASPA Management Plan was approved through Measure 1 (2002).

The Area fits into the wider context of the Antarctic Protected Area system by protecting the breeding site of seven seabird species, including southern giant petrels which are vulnerable to disturbance. No other ASPA in the region protects such a wide diversity of breeding bird species. Resolution 3 (2008) recommended that the Environmental Domains Analysis for the Antarctic Continent be used as a dynamic model for the identification of Antarctic Specially Protected Areas within the systematic environmental-geographical framework referred to in Article 3(2) of Annex V of the Protocol (see also Morgan et al., 2007). Using this model, Avian Island is described as Domain E (Antarctic Peninsula and Alexander Island main ice fields), which is also found in ASPAs 113, 114, 126, 128, 129, 133, 134, 139, 147, 149, 152 and ASMA 1 and 4. However, given that Avian Island is predominantly ice-free this domain may not be fully representative of the environment encompassed within the Area. Although not specifically described as such in Morgan et al., Avian Island may be better represented by Domain B (Antarctic Peninsula mid-northern latitudes geologic). Other protected areas containing Domain B include ASPAs 108, 115, 129, 134, 140 and 153 and ASMA 4. The ASPA sits within Antarctic Conservation Biogeographic Region (ACBR) 3 Northwest Antarctic Peninsula (Terauds et al., 2012; Terauds and Lee, 2016). Through Resolution 5 (2015) Parties recognised the usefulness of the list of Antarctic Important Bird Areas (IBAs) in planning and conducting activities in Antarctica. Important Bird Area ANT095 Avian Island has the same boundary as ASPA 117, and qualifies on the basis of the Adélie penguins (*Pygoscelis adeliae*), Antarctic shags (*Phalacrocorax [atriceps] bransfieldensis*), and south polar skuas (*Stercorarius maccormicki*).

1. Description of values to be protected

The outstanding environmental value of the Area, which is the primary reason for designation as an ASPA, is based on the following:

- the Adélie penguin (*Pygoscelis adeliae*) colony is one of the largest in Palmer Land, containing around 77,515 breeding pairs;

- the Antarctic shag (*Phalacrocorax [atriceps] bransfieldensis*) colony is one of the largest known breeding sites in the Antarctic and is close to the southern limit of this species' breeding range;
- the outstanding and unique attribute of being the only known site on the Antarctic Peninsula where seven seabird species are breeding in such close proximity to each other within the confined space of a single, small island, with unusually high population densities and virtually the whole island occupied by breeding birds throughout the summer;
- the southern giant petrel (*Macronectes giganteus*) colony is one of the two largest on the Antarctic Peninsula;
- the kelp gull (*Larus dominicanus*) colony is also large and is breeding near the southern extent of its range; and
- the moss *Warnstorfia fontinaliopsis* on Avian Island is near the southern limit of its known range.

2. Aims and objectives

The aims and objectives of this Management Plan are to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- prevent or minimise the introduction to the Area of non-native plants, animals and microbes;
- minimise the possibility of the introduction of pathogens which may cause disease in fauna populations within the Area;
- allow scientific research in the Area provided it is for compelling reasons which cannot be served elsewhere and which will not jeopardize the natural ecological system in that Area; and
- preserve the natural ecosystem of the Area as a reference area for future studies.

3. Management activities

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

- A copy of this Management Plan shall be made available at Teniente Luis Carvajal Station (Chile; 67°46'S, 68°55'W), Rothera Research Station (UK; 67°34' S, 68°07'W) and General San Martín Station (Argentina; 68°08' S, 67°06'W).
- The Management Plan shall be reviewed at least every five years and updated as required.
- Visiting field parties shall be briefed fully by the national authority on the values that are to be protected within the Area and the precautions and mitigation measures detailed in this Management Plan.
- All scientific and management activities undertaken within the Area should be subject to an Environmental Impact Assessment, in accordance with the requirements of Annex I of the Protocol on Environmental Protection to the Antarctic Treaty.
- Copies of this Management Plan shall be made available to vessels and aircraft planning to visit the vicinity of the Area.
- All pilots operating in the region shall be informed of the location, boundaries and restrictions applying to entry and over-flight in the Area.
- Markers, signs or other structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition and removed when no longer required.
- In accordance with the requirements of Annex III of the Protocol on Environmental Protection to the Antarctic Treaty, abandoned equipment or materials shall be removed to the maximum extent possible provided doing so does not adversely impact on the environment and the values of the Area.
- National Antarctic Programmes operating in the Area shall consult together with a view to ensuring the above management activities are implemented.

4. Period of designation

Designated for an indefinite period.

5. Maps and photographs

Map 1. Avian Island, ASPANo. 117, 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 (ASPANo. 107 at Emperor Island (Dion Islands), ASPANo. 115 at Lagotellerie Island, and ASPANo. 129 at Rothera Point) are also shown. Inset: the location of Avian Island on the Antarctic Peninsula.

Map 2. Avian Island, ASPANo. 117, topographic map. Map specifications – projection: Lambert conformal conic; standard parallels: 1st 67° 30' 00"S; 2nd 68° 00' 00"S; central meridian: 68° 55' 00"W; latitude of origin: 68° 00' 00"S; spheroid: WGS84; datum: mean sea level; vertical contour interval 5 m; horizontal accuracy: ±5 m; vertical accuracy ±1.5 m.

Map 3. Avian Island, ASPANo. 117, breeding wildlife sketch map. Positions of nests and colonies are accurate to ±25 m. Information was derived from Poncet (1982). Map specifications – projection: Lambert conformal conic; standard parallels: 1st 67° 30' 00"S; 2nd 68° 00' 00"S; central meridian: 68° 55' 00"W; latitude of origin: 68° 00' 00"S; spheroid: WGS84; datum: mean sea level; vertical contour interval 5 m; horizontal accuracy: ±5 m; vertical accuracy ±1.5 m.

6. Description of the Area

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

General description

Avian Island (67°46'S, 68°54'W, 0.49 km²), is situated in the northwest of Marguerite Bay, 400 m south of the southwestern extremity of Adelaide Island (Map 1). The island is 1.45 km long by 0.8 km at its widest, and is of roughly triangular shape. It is rocky with a low relief of generally less than 10 m in the north, rising to about 30 m at the centre, and 40 m in the south where several rock and ice slopes of up to 30 m drop steeply to the sea. The coastline is irregular and rocky with numerous offshore islets, although there are several accessible beaches on the northern and eastern coasts. The island is usually ice-free in summer. It contains habitat particularly suitable for a variety of breeding birds: well-drained north-facing slopes suitable for Antarctic shags (*Phalacrocorax [atriceps] bransfieldensis*); broken rock and boulders with crevices suitable for small nesting birds such as Wilson's storm petrels (*Oceanites oceanicus*); elevated rocky heights suitable for southern giant petrels (*Macronectes giganteus*); extensive expanses of snow-free ground for Adélie penguins (*Pygoscelis adeliae*). The presence of the latter attracts skuas (*Stercorarius maccormicki* and *Stercorarius antarcticus*) and kelp gulls (*Larus dominicanus*).

Boundaries

The designated Area comprises the whole of Avian Island and the littoral zone, offshore islets and rocks, and a buffer zone of the surrounding marine environment (including sea ice when present) within 100 m of the shoreline of the main island (Map 2). Boundary markers have not been installed because the coast forms a visually obvious reference for the marine boundary.

Climate and sea ice

No extended meteorological records are available for Avian Island, but records from 1962-74 for Adelaide Base (formerly UK; now Teniente Luis Carvajal, Chile), 1.2 km distant, 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). The same general pattern was observed in year-round observations made on the island in 1978-79 (Poncet and Poncet, 1979). Precipitation on the island in this year was usually as snow, most of which fell between August and October, but with occasional snowfalls and some rain in the summer.

Marguerite Bay may freeze in winter, although the extent and character of sea ice shows considerable inter-seasonal variation. Despite the extent and frequent persistence of regional sea ice, a recurrent polynya has been observed near Avian Island, which can provide ice-free conditions locally from October onward. In addition, strong tidal currents around Avian Island help to keep surrounding waters ice-free for much of the year, which facilitates easy access to feeding grounds for several species. The island is not particularly

windy, with an annual average of 10 knots in 1978-79. However, the strong katabatic winds that descend from Adelaide Island, perhaps for 1-3 days a few times every month, reduce snow accumulation on the island and push sea ice away from the coast, helping to form the polynya. The relatively snow-free conditions are important for bird colonisation.

Geology, geomorphology and soils

The bedrock of Avian Island forms part of a down-faulted block at the southwestern end of Adelaide Island and is composed of interbedded lithic-rich and feldspar-rich volcanoclastic sandstones. Bedded tuffaceous sandstones, pebbly sandstones rich in volcanic lithics, and a volcanic granule breccia also occur. The latter is probably a primary volcanic deposit, while the rest of the sequence is largely composed of reworked volcanic material. The sequence forms part of the Mount Liotard Formation of Adelaide Island and is probably late Cretaceous in age (Griffiths, 1992; Moyes et al., 1994; Riley et al., 2012). Apart from rock outcrop, the surface consists mainly of frost-shattered rock with permafrost. Ornithogenic soils are widespread, particularly in the north; organic peat soil is virtually absent, but where present is not well-developed and is associated with moss growth. Several raised beaches have been noted on Avian Island, but the geomorphology has not otherwise been described.

Streams and lakes

Avian Island has several ephemeral freshwater ponds of up to 10,000 m² and of about 40 cm in depth, the largest being on the eastern coast, at about 5 m altitude, and on the north-western coast near sea level. Numerous small pools and meltwater channels develop from seasonal snow melt, and small streams drain valleys in the vicinity of the ponds. Both the ponds and melt-pools freeze solid in winter. Freshwater bodies on the island are organically enriched by guano, a source of nutrients, and in summer a number of the ponds show a rich benthic flora and fauna of algae, Phyllozoa, Copepoda, Nematoda, Protozoa, Rotifera, and Tardigrada. Large numbers of the crustacean *Branchinecta* sp. have been observed (Poncet and Poncet, 1979). The freshwater ecology of the island has not been studied in detail.

Breeding birds

Seven species of birds breed on Avian Island, which is a high number compared to other sites on the Antarctic Peninsula. Several species have unusually high populations, being some of the largest for their species in the Antarctic Peninsula region (Map 3). Detailed year-round data for all species were collected in 1978-79 (Poncet and Poncet, 1979), while data are otherwise sporadic. Descriptions below are thus often based on a single season's observations and it should be emphasised that these data are therefore not necessarily representative of longer term population trends. However, this is the best information that is presently available.

The Avian Island Adélie penguin (*Pygoscelis adeliae*) colony occupies the northern half and central eastern coast of the island (Map 3). The initial management plan referred to the Adélie penguin colony as "the largest on the Antarctic Peninsula [containing] a third of the total population breeding in the region". While this is not substantiated by recent data (e.g. one Antarctic Peninsula colony has over 120,000 pairs (Woehler 1993)), the Avian Island colony still represents one of the largest breeding populations in Palmer Land. Recent research suggests that Adélie penguin numbers are decreasing at almost all locations on the Antarctic Peninsula (Lynch et al., 2012). The most recent population estimate for Adélie penguins on Avian Island is for the 2015/16 season which recorded 65,888 breeding pairs (W. Fraser, pers. comm. 2018). Two sets of population data available for Adélie penguins on Avian Island collected in 2013 indicated populations of 77,515 breeding pairs ($\pm 5\%$; January 2013) (W. Fraser, pers. comm. 2013; Sailley et al., 2013) and 47,146 pairs (Casanovas et al., 2015), although the reasons for the discrepancy between counts is unclear. These data compare with an estimate of Adélie penguin numbers, based on aerial photographs taken in December 1998, that revealed 87,850 birds (± 0.16 S.D.; Woehler, 1993) and an earlier count recorded on 11 November 1978, of 36,500 breeding pairs (Poncet and Poncet, 1979).

In 1978-79 Adélie penguins were recorded on the island from October until the end of April, with egg laying occurring through October and November, and the first chicks hatching around mid-December. Chick

crèches were observed around mid-January, with the first chicks becoming independent near the end of January. Most of the moulting adults and independent chicks had departed the island by the third week of February, although groups returned periodically throughout March and April.

A large colony of Antarctic shags (*Phalacrocorax [atriceps] bransfieldensis*) has been recorded in three groups located on the south-western coastal extremity of the island (Map 3). However, during a visit on 26-27 January 2011, it was noted that the two more northerly colony sites were not occupied and the nesting mounds were in a poor state, suggesting that these sites may have been abandoned for some time. Stonehouse (1949) reported about 300 birds present in October 1948; a similar number of birds was recorded in mid-November 1968, most of which were breeding (Willey 1969). Poncet and Poncet (1979) observed 320 pairs in 1978, and approximately 670 pairs on 17 January 1989 (Poncet, 1990). A count on 23 February 2001 recorded 185 chicks, although it is probable some had departed by the time of the count; approximately 250 nest sites were counted. A count in mid- to late January 2013 recorded 302 breeding pairs (W. Fraser, pers. comm., 2013). In 1968 Antarctic shags were observed to be present on the island from 12 August, with egg laying occurring from November, and chicks hatching in December (Willey 1969). In 1978-79 they were observed from September until June, with egg laying occurring from November through to January, when the first chicks hatched, and chicks started to become independent in the third week of February (Poncet and Poncet, 1979).

Of the southern giant petrel (*Macronectes giganteus*) colonies known south of the South Shetland Islands, Avian Island is one of the two largest, and may comprise a substantial proportion of the breeding population in the southern Antarctic Peninsula region (estimated at 1190 pairs in 1999/2000; Patterson et al., 2008). In 1979 the southern giant petrels occupied principally the elevated rocky outcrops of the central and southern half of the island in four main groups (Map 3). Data on the numbers of birds present on the island are shown in Table 1.

Table 1: Southern giant petrel (*Macronectes giganteus*) numbers at Avian Island.

Year	Number of birds	Number of pairs	Number of chicks	Source
1948	~100	n/a	n/a	Stonehouse, 1949
1968	400	163	n/a	Willey, 1969
1979	n/a	197	n/a	Poncet and Poncet, 1979
1989	n/a	250	n/a	Poncet, 1990
2001	n/a	n/a	237	Harris, 2001
2013	n/a	470	n/a	W. Fraser, pers. comm., 2013

n/a - not available.

In 1978-79 the birds were present on Avian Island from mid-September through to as late as June. In this season, egg laying occurred from late October through to the end of November, with hatching occurring throughout January and chicks generally achieving independence by April. In the 1978-79 austral summer up to 100 non-breeders were observed on the island during the courtship period in October, with these numbers decreasing to a few non-breeders as the season progressed.

Approximately 200 adult kelp gulls (*Larus dominicanus*), of which over 60 pairs were breeding, were recorded on Avian Island in 1978-79. These birds were distributed widely, but principally in the elevated central and southern parts of the island (Poncet and Poncet 1979) (Map 3). In the 1978-79 austral summer the majority of breeders arrived in early October, followed by egg laying around mid-November and hatching a month later. Detailed data are not available because of concern that human disturbance by data collection would seriously impair the breeding performance of this species. However, no more than 12 chicks were observed on the island near the end of January 1979, which would suggest breeding performance in this season was low: the exact cause – whether human disturbance or natural factors – could not be determined. In 1967, 19 pairs and 80-120 birds were recorded (Barlow, 1968).

An estimate of at least several hundred pairs of breeding Wilson's storm petrels (*Oceanites oceanicus*) on the island was made in 1978-79 (Poncet and Poncet, 1979). Wilson's storm petrels were observed on the island from the second week of November, with laying and incubation probably occurring through to mid-December. Departure of adults and independent chicks was largely complete by the end of March. Most of the rocky outcrops on the northern half of the island and all of the stable rocky slopes in the south are ideal habitat for this species.

In 1978-79 about 25-30 pairs of south polar skuas (*Stercorarius maccormicki*) were breeding on Avian Island. The skua nests were distributed widely over the island, although the majority were on the central and eastern part of the island, especially on slopes overlooking the Adélie penguin colony (Map 3). Large groups of non-breeders (around 150 birds; Poncet and Poncet 1979) were observed to congregate around the shallow lake on the eastern side of the island. Barlow (1968) reported approximately 200 non-breeding birds in 1968. Approximately 195 pairs of south polar skuas were breeding in the central and eastern parts of the island in 2004 (W. Fraser pers. comm. 2015), with 880 non-breeding individuals also counted on the island (W. Fraser pers. comm. 2015, in correction of data reported in Ritz *et al.* 2006). In the 1978-79 austral summer the south polar skuas took up residence around the end of October, with egg laying in early December and hatching complete by the end of January. Independent chicks and adults generally departed by the end of March, with some late-breeders remaining until mid-April. A breeding success of one chick per nest was reported in the 1978-79 austral summer. Barlow (1968) reported 12 breeding pairs of brown skuas (*Stercorarius antarcticus*), although this number could include south polar skuas. One breeding pair of brown skuas was recorded on the southwest of the island in the 1978-79 austral summer. This is the southernmost record of this species breeding along the Antarctic Peninsula. Several non-breeding brown skuas were also recorded in the same season.

Several other bird species, known to breed elsewhere in Marguerite Bay, are frequent visitors to Avian Island, notably Antarctic terns (*Sterna vittata*), snow petrels (*Pagodroma nivea*), and southern fulmars (*Fulmarus glacialis*). These species have not been observed nesting on Avian Island. Small numbers of Antarctic petrels (*Thalassoica antarctica*) have been seen on a few occasions. The cape petrel (*Daption capense*) was observed on Avian Island in October 1948 (Stonehouse, 1949). Solitary individuals of king (*Aptenodytes patagonicus*) and chinstrap (*Pygoscelis antarctica*) penguins were observed in 1975 and 1989, respectively.

Terrestrial biology

Vegetation on Avian Island is generally sparse, and the flora has not been described in detail. Phanerogams are absent from the island and there is a limited range of cryptogams, although there is a rich lichen flora. To date, nine moss and 11 lichen species have been identified within the Area.

Mosses described are *Andreaea depressinervis*, *Brachythecium austro-salebrosum*, *Bryum argenteum*, *B. pseudotriquetrum*, *Ceratodon purpureus*, *Pohlia cruda*, *P. nutans*, *Sanionia georgico-uncinata*, *S. uncinata*, *Syntrichia magellanica* and *Warnstorfia fontinaliopsis*. The latter species is at the southern limit of its known range on Avian Island (Smith, 1996). Moss development is confined to those parts of the island that are unoccupied by breeding Adélie penguins or Antarctic shags, and occurs in moist depressions or by melt pools. Patches of moss of up to 100 m² surround the shore of a small pond on the hill in the south of the Area, at ca. 30 m elevation. The green foliose alga *Prasiola crispa* is widespread in wet areas of the island and a liverwort, *Cephaloziella varians*, has also been identified.

Lichens identified on Avian Island are *Acarospora macrocyclos*, *Cladonia fimbriata*, *C. gracilis*, *Dermatocarpon antarcticum*, *Lecanora dancoensis*, *Lecidea brabantica*, *Physcia caesia*, *Rinodina egentissima*, *Siphulina orphnina*, *Thamnolecania brialmontii*, and *Usnea antarctica*. The most extensive communities are on the rocky outcrops in the south of the island.

The microinvertebrate fauna, fungi and bacteria on Avian Island have yet to be investigated in detail. Thus far only one mesostigmatid mite (*Gamasellus racovitzai*) (BAS Invertebrate Database, 1999) has been described, although a Collembollan (springtail) and several species of Acari (mites) have been observed but not identified (Poncet, 1990). A number of nematode species (dominated by *Plectus* sp.) (Spaull, 1973) and one fungus (*Thyronectria hyperantarctica*) (BAS Invertebrate Database, 1999) have been recorded on the island.

Breeding mammals and marine environment

Weddell seals (*Leptonychotes weddellii*) were common on and around Avian Island in 1978-79. During the winter more than a dozen remained, hauled out on coastal ice (Poncet, 1990). Several pups were born on the shores of the island in the last week of September 1978. An elephant seal (*Mirounga leonina*) was reported pupping on the northeastern coast of Avian Island on 10 October 1969 (Bramwell, 1969). Aerial

photography taken on 15 December 1998 revealed 182 elephant seals hauled out in groups, mostly close to the ponds. Leopard seals (*Hydrurga leptonyx*) have been observed around the shoreline, and one was observed ashore in winter 1978. A number of non-breeding Antarctic fur seals (*Arctocephalus gazella*) were reported on the island in March 1997 (Gray and Fox, 1997), at the end of January 1999 (Fox, pers. comm., 1999) and January 2011. At least several hundred were present on 23 February 2001 (Harris, 2001), particularly on beaches and low-lying ground in the central and northern parts of the island. Crabeater seals (*Lobodon carcinophagus*) are regularly seen in Marguerite Bay, but have not been reported on Avian Island. The marine environment surrounding Avian Island has not been investigated.

Human activities / impacts

Human activity at Avian Island has been sporadic. The first record of a visit was made in October 1948, when members of the UK Stonington Island expedition discovered the large Adélie penguin colony on Avian Island (then referred to as one of the Henkes Islands). Subsequent visits have comprised a mixture of science, base personnel recreation, tourism and logistic activity (survey, etc.). Refuges were constructed on the island in 1957 and 1962 by Argentina and Chile, respectively (see section 6(iii)).

A geological field party of two camped for about 10 days on the southeast of the island in November 1968 (Elliott, 1969). In the same year, a UK Naval hydrographic survey team camped on the eastern coast of Avian Island over the summer. Permanent chains and rings for mooring lines to the survey vessel were installed in a small bay on the northwestern coast, and were still present in 1989 (Poncet, 1990).

In 1969, a field party camped on the island for a month conducting research on the common cold virus: accompanying dogs were inoculated with a virus and then returned to base (Bramwell, 1969). Dogs often accompanied personnel on the regular visits to Avian Island during the period of operation of the UK base on Adelaide Island, but impacts are unknown.

A two-person party spent a year on the island in 1978-79, based on the yacht *Damien II*, making detailed observations of the avifauna and other aspects of the biology and natural environment of the island (Poncet and Poncet, 1979; Poncet, 1982; Poncet, 1990). The yacht was moored in a small cove on the northwest coast. This yacht party regularly visited the island over the next decade before SPA designation.

Map survey work and aerial photography was conducted on and over the island in 1996-98 (Fox and Gray, 1997, Gray and Fox, 1997), and 1998-99 (Fox, pers. comm., 1999).

The impacts of these activities have not been described and are not known, but are believed to have been relatively minor and limited to transient disturbance to breeding birds, campsites, footprints, occasional litter, human wastes, scientific sampling and markers. Despite the likely transient nature of most disturbance, it has been reported that human visits have caused loss of eggs and chicks, either through nest abandonment or by opportunistic predation. Several species, such as southern giant petrels and kelp gulls are particularly vulnerable to disturbance, and have been observed to abandon nests at particular periods of the nesting cycle, perhaps at the sight of people as much as 100 m distant (Poncet, 1990). Approximately 140 people, including a tour vessel of 100, were reported to have visited Avian Island in the 1989-90 summer. Growing concern over the number and unregulated nature of visits prompted SPA designation.

The most lasting and visually obvious impacts are associated with the two refuges and two beacon structures described in section 6(iii), which are situated close to breeding birds. Both refuges were in poor repair in February 2001 and, during an environmental management visits in January 2011 and January 2016, further deterioration was noted in both refuges. Birds and seals were observed among rubbish around the refuges in February 2001, January 2011 and January 2016. The refuge erected on the eastern coast (67°46'26"S, 68°53'01"W) in 1957 was open to the weather; the door, having come off its hinges, lay on the floor and the base of the southern wall of the refuge contained a large hole (c. 0.25 m²). Rusting tins and broken glass were found on the floor. Rusting metal work, (including corrugated cladding, stakes and guy lines), decomposing timber fragments and broken glass were found in the immediate area around the refuge. To the south of the hut lay an empty corroding 205 L fuel drum.

In January 2011, the larger refuge erected on the northwestern coast (67°46'08"S, 68°53'29"W) in 1962 was also in a poor state of repair. The refuge showed significant deterioration due to damp, with warping of timbers and extensive areas of mould and algae on the walls and ceiling material. A large portion of the

ceiling had collapsed revealing the roof above. In January 2016 it was observed that attempts had been made to secure the refuge from further degradation (e.g. the windows and door have been boarded).

The older of the two beacon structures is disused and its iron structure, while standing, is rusting and deteriorating. The new beacon, erected in February 1998, appeared to be in good repair in January 2011.

6(ii) Access to the Area

- Small boat landings should be made at the designated locations on the central north western coast (67°46'08.1"S, 68°53'30.1"W) or on the central eastern coast of the island (67°46'25.5"S, 68°52'57.0"W) (Map 2). If sea or ice conditions render this impractical, small boat landings may be made elsewhere along the coast as conditions allow.
- Access by vehicle to the coast when sea ice is present should also use these access points, and vehicles shall be parked at the shore.
- Travel by small boat or vehicle within the marine part of the Area is not confined to specific routes, but shall be by the shortest route consistent with the objectives and requirements of the permitted activities.
- Vehicle or boat crew, or other people on vehicles or boats, are prohibited from moving on foot beyond the immediate vicinity of the landing site unless specifically authorised by Permit.
- Aircraft should avoid landing within the Area throughout the year
- A Permit may be granted for helicopter use when this is considered necessary for essential purposes and where there is no practical alternative, such as for the installation, maintenance or removal of structures. In such instances the need for helicopter access, including alternatives, and the potential disturbance to breeding birds shall be adequately assessed before a Permit may be granted. Such a Permit shall clearly define the conditions for helicopter access based on the findings of the assessment.

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

Two small abandoned refuges and two beacon structures are present within the Area. A refuge erected by Chile in 1962 is located on the northwestern coast of the island at 67°46'08"S, 68°53'29"W. A refuge constructed by Argentina in 1957 is 650 m SE of this position, on the eastern coast at 67°46'26"S, 68°53'01"W. Both refuges were in a poor state of repair in January 2016. Attempts have been made to secure the Chilean refuge from further degradation. Taking into account the construction date of the Argentine refuge, which was prior to the signing of the Antarctic Treaty, Argentina will review the potential historical value of its remains. Action will then be taken to ensure appropriate protection of any historical values and ensure the refuge does not cause damage to the environment.

An old iron frame structure, believed to have been erected by the UK during the operation of Adelaide Base and used as a navigational aid, is located at approximately 38 m near the highest point of the island (67°46'35.5" S, 68°53'25.2" W). The structure remains standing, although is rusting.

A new beacon was constructed by Chile in February 1998 on an adjacent site at a similar elevation (67°46'35.3" S, 68°53'26.0" W). This structure is a solid cylindrical painted iron tower of approximately 2 m diameter and 2.5 m in height, set in a concrete pad of approximately 2.5 x 2.5 m. A lit beacon, protective rails and solar panels are fixed to the top of the structure. No other structures are known to exist on the island.

Four survey control markers were installed on the island on 31 January 1999 (Map 2). The southernmost marker is located adjacent to the navigation beacon and consists of a survey nail in bedrock covered by a cairn. A similar marker is installed on the high point of the low ridge on the northeastern coast of the island, also covered by a cairn. The remaining two markers are survey nails affixed to the roof of each of the refuges.

The nearest scientific research station is 1.2 km northwest at Teniente Luis Carvajal (Chile), on southern Adelaide Island (latitude 67°46'S, longitude 68°55'W). Since 1982 this has been operated as a summer-only facility, open from October until March. Over this period the station has generally accommodated up to 10

personnel. Formerly, this facility was established and operated continuously by the UK from 1961 until 1977.

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

Other protected areas in the vicinity include:

- ASPA 107, Emperor Island, Dion Islands, Marguerite Bay, Antarctic Peninsula, 67°52'S, 68°42'W, 12.5 km south-southeast;
- ASPA 129, Rothera Point, Adelaide Island, 67°34'S, 68°08'W, 40 km to the northeast; and
- ASPA 115, Lagotellerie Island, Marguerite Bay, Graham Land, 67°53'20"S, 67°25'30"W, 65 km east (Map 1)

6(v) Special zones within the Area

None.

7. Permit conditions

7(i) General 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 for compelling scientific reasons which cannot be served elsewhere, or for reasons essential to the management of the Area;
- the actions permitted are in accordance with this Management Plan;
- any management activities are in support of the objectives of this Management Plan;
- the actions permitted will not jeopardise the natural ecological system in the Area;
- the activities permitted will give due consideration via the environmental impact assessment process to the continued protection of the environmental or scientific values of the Area;
- the Permit shall be issued for a finite period; and
- the Permit, or an authorised copy, shall be carried when in the Area.

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

- Land vehicles (skidoos, quad bikes, etc.) are prohibited on land within the Area.
- All movement on land within the Area shall be on foot. Pedestrian traffic should be kept to the minimum necessary to undertake permitted activities and every reasonable effort should be made to minimise trampling effects.
- Movement within the Area on foot shall be by routes that minimise any disturbance to breeding birds, and to achieve this it may be necessary to take a longer route to the destination than would otherwise be the case.
- Walking routes have been designated with the intention of avoiding the most sensitive bird breeding sites, and should be used when it is essential to traverse across the island (Map 2). Visitors should bear in mind that specific nest sites may vary from year to year, and some variations on the recommended route may be preferable. Routes are provided as a guide, and visitors are expected to exercise good judgement to minimise the effects of their presence. In other areas, and where practical and safe, it is usually preferable to adopt a route that follows the coastline of the Area. Three routes are designated (Map 2): Route 1 crosses the central part of the island, linking the Chilean and Argentine refuges. Route 2 facilitates access to the beacons on the south of the island, and extends from the central eastern coast up the eastern slopes of the hill. However, during a management visit in 2011, this route was found to be colonized by birds. Consequently, Route 3 has also been designated, which runs directly east from the Argentine refuge to a narrow inlet on the western side of the island, and then proceeds southwest up a gully/slope to a flat area above the abandoned (as of January 2011) Antarctic shag colonies. From this point the route proceeds east to the beacons. Care should be taken to avoid

trampling moss patches in the vicinity of a melt water pool c. 70 m north of the beacons.

- Access into areas where southern giant petrels are nesting (Map 3) shall only be undertaken for purposes specified in the Permit. When access to the beacon is necessary (e.g. for maintenance), visitors shall follow the most appropriate designated access route as closely as possible, trying to avoid nesting birds. Much of the area leading up to and surrounding the beacon is occupied by breeding petrels, so great care must be exercised.
- Movements should be slow, noise kept to a minimum, and the maximum distance practicable should be maintained from nesting birds.
- Visitors shall watch carefully for signs of agitation and preferably retreat from approach if significant disturbance is observed.
- The operation of aircraft over the Areas should be carried out, as a minimum requirement, in compliance with the 'Guidelines for the operations of aircraft near concentrations of birds' contained in Resolution 2 (2004).
- Overflight of bird colonies within the Area by Remotely Piloted Aircraft Systems (RPAS) shall not be permitted unless for scientific or operational purposes, and in accordance with a permit issued by an appropriate national authority.

7(iii) Activities which may be conducted in the Area

Activities which may be conducted in the Area include:

- essential management activities, including monitoring;
- compelling scientific research that cannot be undertaken elsewhere and which will not jeopardize the ecosystem of the Area; and
- sampling, which should be the minimum required for approved research programmes.

Restrictions on times at which activities may be conducted apply within the Area, and are specified in the relevant sections of this Management Plan.

7(iv) Installation, modification or removal of structures

- Any new or additional permanent structures or installations are prohibited.
- Existing abandoned or dilapidated structures should be removed or renovated.
- Installation, modification, maintenance or removal of structures shall be undertaken in a manner that minimises disturbance to breeding birds. Such activities shall be undertaken between 1 February and 30 September inclusive to avoid the main breeding season.
- No structures are to be erected within the Area, or scientific equipment installed, except for compelling scientific or management reasons and for a pre-established period, as specified in a permit.
- All markers, structures or scientific equipment installed in the Area must be clearly identified by country, name of the principal investigator or agency, year of installation and date of expected removal.
- All such items should be free of organisms, propagules (e.g. seeds, eggs, spores) and non-sterile soil (see section 7(vi)), and be made of materials that can withstand the environmental condition and pose minimal risk of contamination of the Area.
- Removal of specific structures or equipment for which the permit has expired shall be the responsibility of the authority which granted the original permit and shall be a condition of the Permit.

7(v) Location of field camps

Camping should be avoided within the Area. However, when necessary for purposes specified in the Permit, temporary camping is allowed at two designated campsites: one on the central eastern coast of the island (67°46'25.8"S, 68°53'00.8"W), the other on the central northwestern coast of the Area (67°46'08.2"S, 68°53'29.5"W) (Map 2).

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

No living animals, plant material or microorganisms shall be deliberately introduced into the Area. To ensure that the floristic and ecological values of the Area are maintained, special precautions shall be taken against accidentally introducing microbes, invertebrates or plants from other Antarctic sites, including stations, or from regions outside Antarctica. All sampling equipment or markers brought into the Area shall be cleaned or sterilized. To the maximum extent practicable, footwear and other equipment used or brought into the Area (including bags or backpacks) shall be thoroughly cleaned before entering the Area. Further guidance can be found in the *CEP non-native species manual* (CEP, 2017) and the *Environmental code of conduct for terrestrial scientific field research in Antarctica* (SCAR, 2009). In view of the presence of breeding bird colonies within the Area, no poultry products, including wastes from such products and products containing uncooked dried eggs, shall be released into the Area, including the marine component of the Area.

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. Release of radio-nuclides or stable isotopes directly into the environment in a way that renders them unrecoverable should be avoided. Fuel or other chemicals shall not be stored in the Area unless specifically authorised by Permit condition. They shall be stored and handled in a way that minimises the risk of their accidental introduction into the environment. Materials introduced into the Area shall be for a stated period only and shall be removed by the end of that stated period. 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 anything released and not removed that was not included in the authorised Permit.

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

Taking of, or harmful interference with, native flora and fauna is prohibited, except in accordance with a permit issued in accordance with Annex II of the Protocol on Environmental Protection to the Antarctic Treaty. Where taking or harmful interference with animals is involved this should, as a minimum standard, be in accordance with the *SCAR code of conduct for the use of animals for scientific purposes in Antarctica* (2011). Any soil or vegetation sampling is to be kept to an absolute minimum required for scientific or management purposes, and carried out using techniques which minimise disturbance to surrounding soil and biota.

7(viii) The collection or removal of materials not brought into the Area by the permit holder

Material may be collected or removed from the Area only in accordance with 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, and which was not brought into the Area by the Permit holder or otherwise authorised may be removed from the Area unless the environmental impact of the removal is likely to be greater than leaving the material in situ: if this is the case the appropriate national authority must be notified and approval obtained. Permits shall not be granted if there is a reasonable concern that the sampling proposed would take, remove or damage such quantities of soil, native flora or fauna that their distribution or abundance on Avian Island 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.

7(ix) Disposal of waste

All wastes, except human wastes, shall be removed from the Area. Preferably, all human wastes should be removed from the Area, but if this is not possible, they may be disposed of into the sea.

7(x) Measures that may be necessary to continue to met the aims of the Management Plan

1. Permits may be granted to enter the Area to carry out scientific research, monitoring and site inspection activities, which may involve the collection of a small number of samples for analysis or to carry out protective measures.
2. Any long-term monitoring sites shall be appropriately marked and the markers or signs maintained.
3. Scientific activities shall be performed in accordance with the *Environmental code of conduct for terrestrial scientific field research in Antarctica* (SCAR, 2009).

7(xi) Requirements for reports

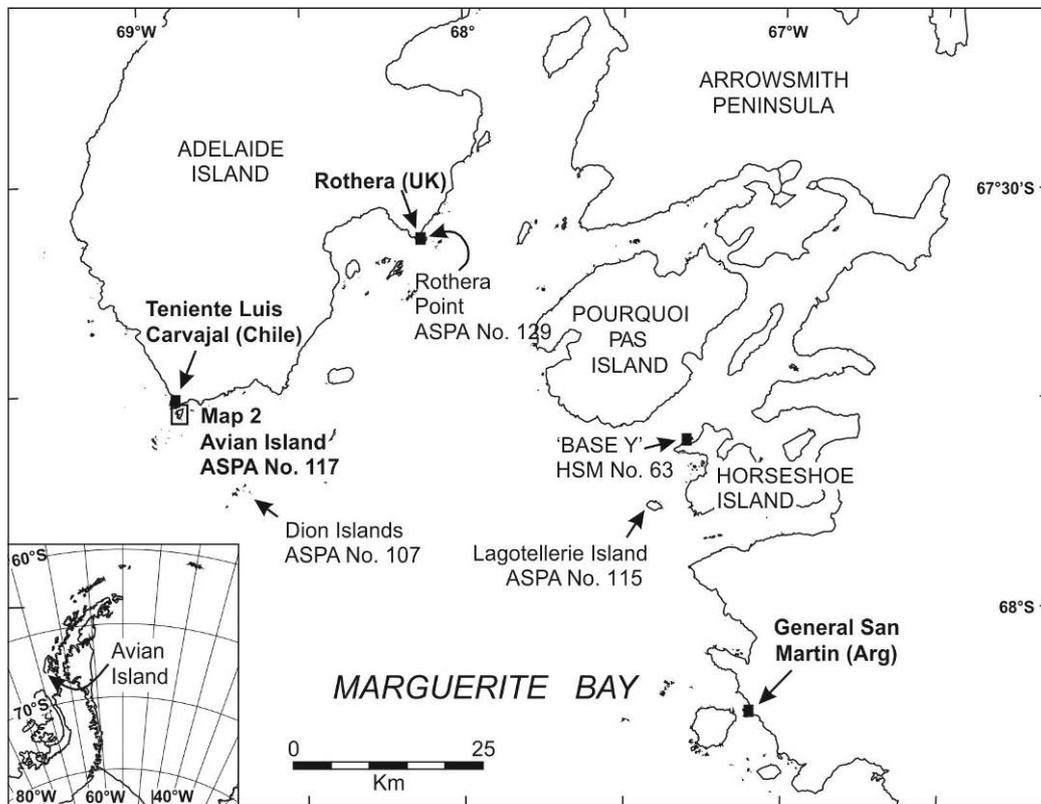
The principal Permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and no later than six months after the visit has been completed. Such reports should include, as appropriate, the information identified in the *Antarctic Specially Protected Area visit report form* contained in the *Guide to the preparation of Management Plans for Antarctic Specially Protected Areas* (Appendix 2). The appropriate authority should be notified of any activities/measures undertaken that were not included in the authorised Permit. Wherever possible, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan. Parties should, wherever possible, deposit originals or copies of such original visit reports in a publicly accessible archive to maintain a record of usage, for the purpose of any review of the Management Plan and in organising the scientific use of the Area.

8. Supporting documentation

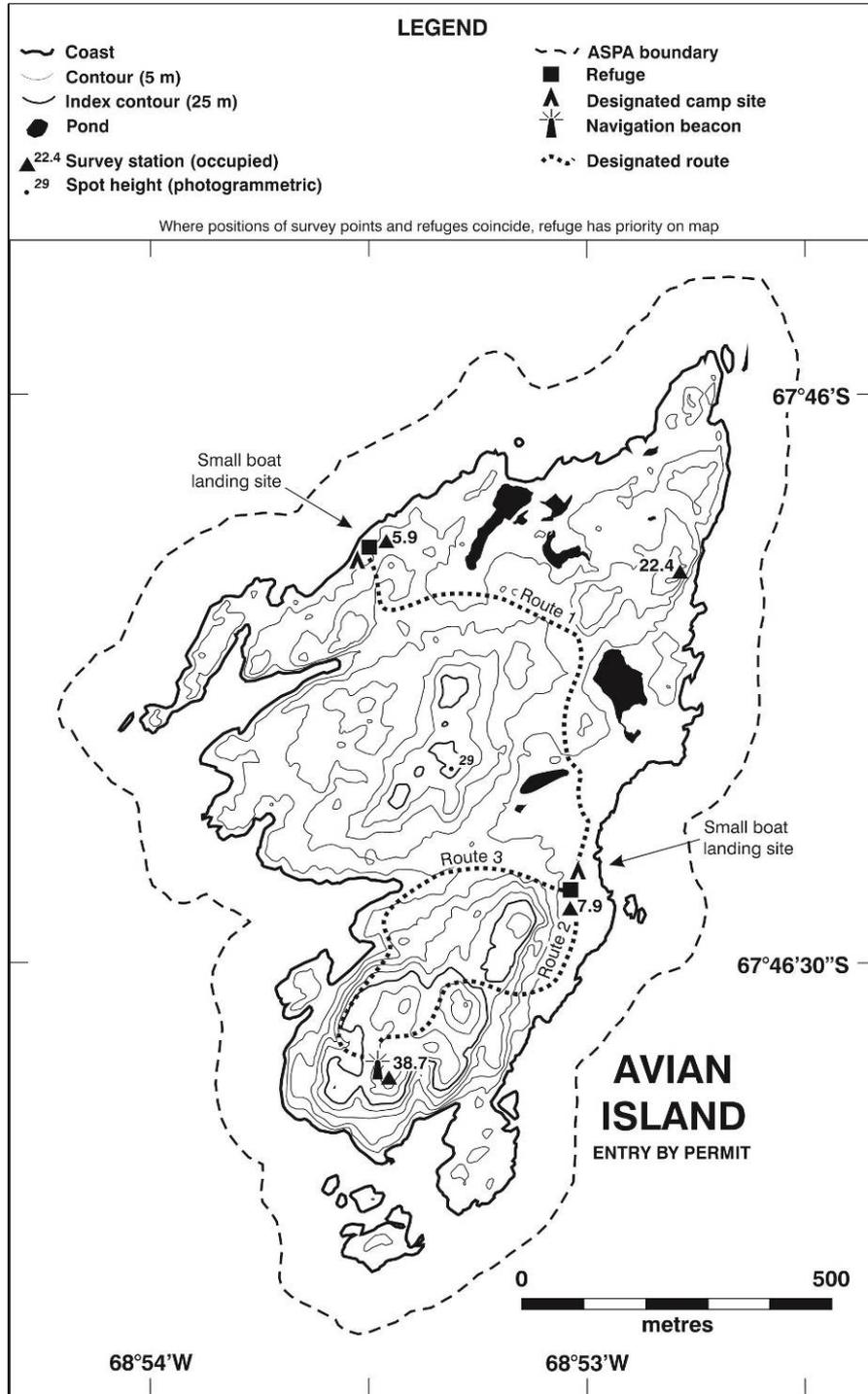
- Barlow, J. (1968). Biological report. Adelaide Island. 1967/68. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2T/1967/N.
- Bramwell, M.J. (1969). Report on elephant seal pupping on Avian Island. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2T/1969/N.
- Bramwell, M.J. (1970). Journey report: Avian Island 7 Oct – 4 Nov 1969. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2T/1969/K3.
- Casanovas, P., Naveen, R., Forrest, S., Poncet, J. and Lynch, H.J. (2015). A comprehensive coastal seabird survey maps out the front lines of ecological change on the western Antarctic Peninsula. *Polar Biology* 38: 927-940.
- Committee for Environmental Protection (CEP). (2017). Non-native species manual – 2st Edition. Manual prepared by Intersessional Contact Group of the CEP and adopted by the Antarctic Treaty Consultative Meeting through Resolution 4 (2016). Buenos Aires, Secretariat of the Antarctic Treaty.
- Elliott, M.H. (1969). Summer geological camp on Avian Island 26 Nov – 4 Dec 1968. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2T/1968/K3.
- Fox, A., and Gray, M. (1997). Aerial photography field report 1996-97 Antarctic field season. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2R/1996/L2.
- Gray, M., and Fox, A. (1997). GPS Survey field report 1996-97 Antarctic field season. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2R/1996/L1.
- Griffiths, C. (1992). Geological fieldwork on Adelaide Island 1991-92. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2R/1991/GL1.
- Harris, C.M. (2001). Revision of management plans for Antarctic protected areas originally proposed by the United States of America and the United Kingdom: Field visit report. Internal report for the National Science Foundation, US, and the Foreign and Commonwealth Office, UK. Environmental Research and Assessment, Cambridge.
- Harris, C.M., Lorenz, K., Fishpool, L.D.C., Lascelles, B., Cooper, J., Coria, N.R., Croxall, J.P., Emmerson, L.M., Fijn, R.C., Fraser, W.L., Jouventin, P., LaRue, M.A., Le Maho, Y., Lynch, H.J., Naveen, R., Patterson-Fraser, D.L., Peter, H.-U., Poncet, S., Phillips, R.A., Southwell, C.J., van Franeker, J.A., Weimerskirch, H., Wienecke, B., and Woehler, E.J. (2015). *Important Bird Areas in Antarctica 2015*. BirdLife International and Environmental Research & Assessment Ltd., Cambridge.

- Lynch, H. J., Naveen, R., Trathan, P. N., and Fagan, W. F. (2012). Spatially integrated assessment reveals widespread changes in penguin populations on the Antarctic Peninsula. *Ecology* 93:1367–1377.
- Moyes, A. B., Willan, C. F. H., Thomson, J. W., et al. (1994). Geological map of Adelaide Island to Foyt Coast, BAS GEOMAP Series, Sheet 3, Scale 1:250,000, with supplementary text. British Antarctic Survey, Cambridge.
- Patterson, D. L., Woehler, E. J., Croxall, J. P., Cooper, J., Poncet, S., Peter, H.-U., Hunter, S., and Fraser, W. R. (2008). Breeding distribution and population status of the northern giant petrel *Macronectes halli* and the southern giant petrel *M. giganteus*. *Marine Ornithology* 36: 115-124.
- Poncet, S., and Poncet, J. (1979). Ornithological report, Avian Island, 1978-79. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2R/1978/Q.
- Poncet, S. (1982). *Le grand hiver: Damien II base Antarctique*. Les Éditions Arthaud, Paris.
- Poncet, S., and Poncet, J. (1987). Censuses of penguin populations of the Antarctic Peninsula, 1983-87. *British Antarctic Survey Bulletin* 77: 109-129.
- Poncet, S. (1990). Avian Island, Marguerite Bay, Antarctic Peninsula, SPA proposal. Unpublished report to the SCAR Group of Specialist on Environmental Affairs and Conservation, 1990.
- Riley, T. R., Flowerdew, M. J. and Whitehouse, M. J. (2012). Litho- and chronostratigraphy of a fore- to intra-arc basin: Adelaide Island, Antarctic Peninsula. *Geological Magazine* 149: 768-782.
- Ritz, M. S., Hahn, S., Janicke, T., and Peter, H.-U. (2006). Hybridisation between South Polar Skua (*Catharacta maccormicki*) and Brown Skua (*C. antarctica lonnbergi*) in the Antarctic Peninsula region. *Polar Biology* 29: 153–159.
- Sailley, S. F., Ducklow, H. W., Moeller, H. V., Fraser, W. R., Schofield, O. M., Steinberg, D. K., Price, L. M., and Doney, S. C. (2013). Carbon fluxes and pelagic ecosystem dynamics near two western Antarctic Peninsula Adélie penguin colonies: an inverse model approach. *Marine Ecology Progress Series* 492: 253-272.
- SCAR (Scientific Committee on Antarctic Research). (2009). Environmental code of conduct for terrestrial scientific field research in Antarctica. ATCM XXXII IP4.
- SCAR (Scientific Committee on Antarctic Research). (2011). SCAR code of conduct for the use of animals for scientific purposes in Antarctica. ATCM XXXIV IP53.
- Smith, H. G. 1978. The distribution and ecology of terrestrial protozoa of sub-Antarctic and maritime Antarctic islands. BAS Scientific Report 95, British Antarctic Survey, Cambridge.
- Smith, R. I. L. (1996). Terrestrial and freshwater biotic components of the western Antarctic Peninsula. In Ross, R. M., Hofmann, E. E. and Quetin, L. B. *Foundations for ecological research west of the Antarctic Peninsula*. Antarctic Research Series 70: American Geophysical Union, Washington D.C.: 15-59.
- Stonehouse, B. (1949). Report on biological activities at Base E 1948-49. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2E/1948/N1.
- Stonehouse, B. (1950). Preliminary report on biological work Base E 1949-50. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2E/1949/N.
- Terauds, A., and Lee, J. R. (2016). Antarctic biogeography revisited: updating the Antarctic Conservation Biogeographic Regions. *Diversity and Distribution* 22: 836-840.**
- Terauds, A., Chown, S. L., Morgan, F., Peat, H. J., Watt, D., Keys, H., Convey, P., and Bergstrom, D. M. (2012). Conservation biogeography of the Antarctic. *Diversity and Distributions* 18: 726–41.
- Willey, I. M. (1969). Adelaide Island bird report 1968. Unpublished British Antarctic Survey report, BAS Archives Ref. AD6/2T/1968/Q.
- Woehler, E. J. (ed). (1993). The distribution and abundance of Antarctic and sub-Antarctic penguins. SCAR, Cambridge.

Map 1. Avian Island, ASPA No. 117, 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. 107 at Emperor Island (Dion Islands), ASPA No. 115 at Lagotellerie Island, and ASPA No. 129 at Rothera Point) are also shown. Inset: the location of Avian Island on the Antarctic Peninsula.



Map 2. Avian Island, ASPA No. 117, topographic map. Map specifications – projection: Lambert conformal conic; standard parallels: 1st 67° 30' 00"S; 2nd 68° 00' 00"S; central meridian: 68° 55' 00"W; latitude of origin: 68° 00' 00"S; spheroid: WGS84; datum: mean sea level; vertical contour interval 5 m; horizontal accuracy: ±5 m; vertical accuracy ±1.5 m.



Map 3. Avian Island, ASPA No. 117, breeding wildlife sketch map. Positions of nests and colonies are accurate to ± 25 m. Information was derived from Poncet (1982). Map specifications – projection: Lambert conformal conic; standard parallels: 1st $67^{\circ} 30' 00''$ S; 2nd $68^{\circ} 00' 00''$ S; central meridian: $68^{\circ} 55' 00''$ W; latitude of origin: $68^{\circ} 00' 00''$ S; spheroid: WGS84; datum: mean sea level; vertical contour interval 5 m; horizontal accuracy: ± 5 m; vertical accuracy ± 1.5 m.

