

**The
Distribution and Abundance
of
Antarctic and Subantarctic
Penguins**

Compiled on behalf of the SCAR
Bird Biology Subcommittee

by

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Published by the
Scientific Committee on Antarctic Research (SCAR)
Scott Polar Research Institute
Lensfield Road
Cambridge CB2 1ER
United Kingdom

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First published 1993

ISBN 0 948277 14 9

Printed by University Printing Services,
Cambridge, England

Cover: Emperor penguin colony on the sea ice beneath the cliffs of the Brunt Ice Shelf, Coats Land,
eastern Weddell Sea. (Photograph by D G Allan)

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Introduction

This report provides the second comprehensive summary of the global distribution and abundance of Antarctic and Subantarctic penguins. It replaces the previous treatment by Wilson (1983), which reviewed data up to and including the 1978/79 Antarctic summer season, by incorporating the extensive new information produced over the last decade.

Background

The production of this report and its predecessor both stem from an original initiative of the Scientific Committee on Antarctic Research (SCAR) Bird Biology Subcommittee in 1976. This committee, whose task is to provide a forum for discussion and co-ordination of ornithological research in the Antarctic and to advise SCAR, through its Working Group on Biology, on such matters, recommended a concerted effort to census breeding populations of Antarctic penguins. This recommendation arose from the recognition that penguins were likely to be important top consumers in the Antarctic food web, and particularly of Antarctic Krill *Euphausia superba*, and that accurate data on their population sizes were crucial to quantifying their role. In addition, the investigation of trends in the status of Antarctic penguin populations and their use as part of regional monitoring programmes required good baseline data.

Additional impetus to penguin census operations was given by the inauguration in 1977 by SCAR and the Scientific Committee on Oceanic Research (SCOR) of the 10-year Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS) programme. The goal of this programme was "to gain a deeper understanding of the structure and dynamic functioning of the Antarctic marine ecosystem as a basis for the future management of potential living resources". For marine mammals and birds the specific objectives including stock assessment, understanding tropho-dynamic and competitive interactions and formulation of management and conservation procedures. Again, a knowledge of the distribution and abundance of the principal species was clearly a fundamental requirement. Within birds, attention was focused on penguins which were believed to comprise 65% of avian stocks, and 90% of biomass. However, no realistic basis existed for these assessments because there had been no Antarctic-wide review of the breeding populations of any species of seabird. To facilitate planning and conducting censuses of penguin populations and to provide a synopsis of existing data, the BIOMASS Working Party on Bird Ecology (which also functioned as the SCAR Subcommittee on Bird Biology for the duration of the BIOMASS programme) promoted a variety of regional reviews, and in 1980 commissioned a synthesis of these and all other available information (Wilson 1983).

As a result of this and the other concurrent initiatives, many surveys were undertaken of areas never or infrequently visited. At better known sites new intensive surveys, using improved techniques, often significantly modified earlier assessments. In a few cases there was evidence of changes in population size.

This review summarises all the new information, which includes major regional surveys of the Antarctic Peninsula (Poncet & Poncet 1987), the South Orkney Islands (Poncet & Poncet 1985), the South Shetland Islands (Jablonski 1984, Shuford & Spear 1988), the Weddell Sea (Hempel & Stonehouse 1987), the Ross Sea (Wilson & Taylor 1984), Adélie Land (Thomas 1984) and much of east Antarctica (Woehler & Johnstone 1991).

Scope

All eight species of penguin breeding in Antarctica and on the Subantarctic islands are included. These are: Emperor, King, Adélie, Chinstrap, Gentoo, Macaroni, Royal and Rockhopper Penguins; their scientific names are given in the main text. For these species, all available information on their distribution and abundance, throughout their global range, is summarised. The emphasis, and the greatest detail, is for Antarctica and the islands which lie close to and south of the Antarctic Polar Front. Figure 1 shows the principal areas and islands covered in this review and Appendix 1 lists the geographical coordinates of the main islands.

Excluded from this review are five other species of penguin, (four in the New Zealand region and one in the South American region), which breed within the overall geographical bounds of the area considered here but outside the area of main interest. These species are: Erect-crested Penguin *Eudyptes sclateri* (Bounty, Antipodes, Auckland and Campbell islands), Snares Crested Penguin *E. robustus* (Snares Islands), Fiordland Crested Penguin *E. pachyrhynchus* (southern South Island of New Zealand), Yellow-eyed Penguin *Megadyptes antipodes* (southern South Island of New Zealand) and the Magellanic Penguin *Spheniscus magellanicus* (central and southern Chile and Argentina and the Falkland Islands). Further information on the status of the New Zealand species is given in Robertson & Bell (1984).

All literature published or made available between 1980 and the end of 1990 has been reviewed for this account. The latest Antarctic field season for which unpublished data are incorporated is 1989/90.

Presentation of data

All tabulated data originally included in Wilson (1983) are presented here without change, except that references to unpublished sources have been attributed to Wilson (1983). For each species there is a brief introduction, a list of the breeding localities and one or more distribution maps. The introduction describes the general distribution of that species, and where appropriate, population trends, breeding chronology, factors influencing survey and census operations and important gaps in coverage. In view of the nature of the survey data, and the known wide annual fluctuations in the breeding populations, few comments on population trends are made in this update, particularly when the changes are within known bounds. The introduction also includes an estimate of the minimum total breeding population (breeding pairs). These estimates have been taken directly from the data presented in this update. Where there are no data for localities, these breeding sites have been excluded from the totals. Reasons for changes in species' totals compared with the assessment of Wilson (1983) are discussed.

The listing of breeding localities for each species begins in the Weddell Sea at 0° Longitude, and works clockwise (eastwards) around the continent, then northwards through the Scotia arc. Each locality is numbered and only these numbers appear on the distribution maps. Unofficial place names are in inverted commas.

For each locality, the most recent or best available data on the number of breeding pairs, the year the data were collected, and a code showing the nature of that count are given. Where frequent recent counts (e.g. as part of monitoring studies) exist, this is noted in the species' introduction. A list of all sites at which penguin breeding populations are regularly counted is at Appendix 2. This includes all sites included in the CCAMLR (Commission for the Conservation of Antarctic Marine Living Resources) Ecosystem Monitoring Programme (SC-CAMLR 1991). New data (i.e. additional to Wilson 1983) are given in **bold type** at the appropriate place.

The level of detail given differs widely between different areas and simply reflects the nature of the material presented in or available to the source reference. The figures given

for the number of colonies at a locality is an attempt to indicate the number of discrete sites at which penguins have been reported to breed. There is no attempt to standardise the definition of colony between localities or authors. All population estimates are of breeding pairs, unless indicated to the contrary.

The nature and accuracy of the original counts and estimates vary greatly and codes are used to reflect this, following Croxall and Kirkwood (1979). The types of count are coded as follows:

- a. Nest counts, designated N, are the most accurate counts because they are of breeding pairs, made during incubation. They are underestimates of the total number of breeding pairs because some pairs will have failed before the time of the count and sometimes also because not all pairs will have laid when the count was made.
- b. Chick counts, designated C, are often used, but are difficult to interpret due to wide annual fluctuations in breeding efforts and success (see Ainley *et al.* 1983, Croxall *et al.* 1988, Whitehead *et al.* 1990).
- c. Estimates based on counts of total birds or adults, designated A, are less accurate, since the number of birds ashore varies widely with the stage of breeding cycle. Around egg-laying, both members of each pair are present, but during the late chick period few adults are ashore. Non-breeders are also present in varying numbers (see also Ainley *et al.* 1983). Following Croxall & Kirkwood (1979) and Wilson (1983) such counts have been converted to breeding population estimates by dividing by two.
- d. The letter B shows that no estimate of numbers was available. In these cases a colony or colonies are known to exist at that locality, but no further data are available.

The accuracy of each count is coded as follows:

1. Pairs/nest essentially individually counted, count probably accurate to better than $\pm 5\%$.
2. Number of pairs in a known area counted individually and, knowing the total colony area, the overall total calculated. Also included are head counts from photographs taken overlooking the rookery. Count accuracy: ± 5 to 10%.
3. Accurate estimate: count accurate perhaps to ± 10 to 15%.
4. Rough estimate: possibly accurate to ± 25 to 50%.
5. Guesstimate: accurate only to nearest order of magnitude (e.g. a few, hundreds, thousands).

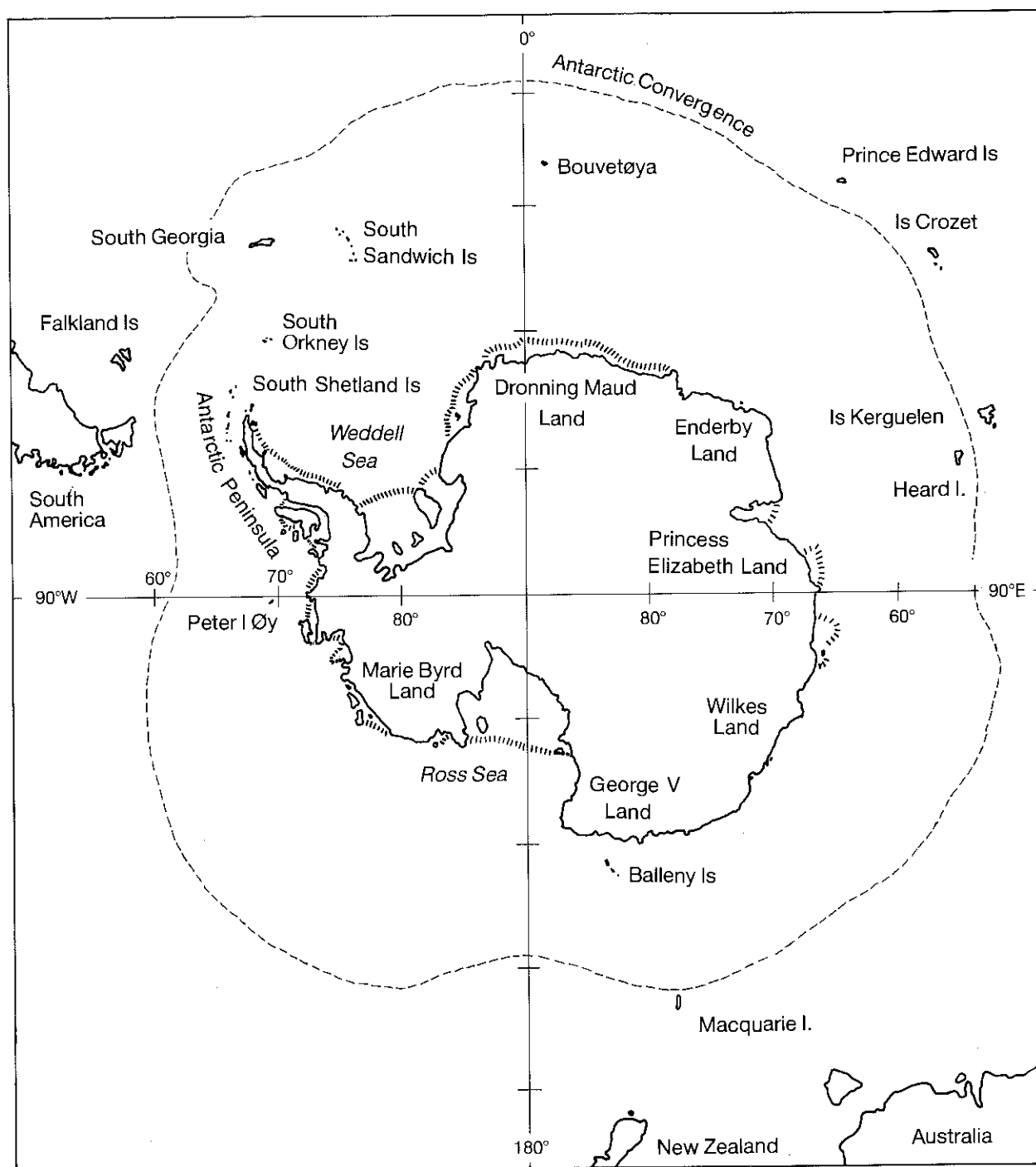
It was often difficult, sometimes impossible, to ascertain the basis on which an estimate was made, and this is indicated by incomplete or absent codes. Where a single locality refers to several colonies, a code showing the size of the colonies is given in the remarks column.

The codes used are:

VS	very small	1-99 breeding pairs
S	small	100-999 breeding pairs
M	medium	1000-7499 breeding pairs
L	large	7500-19 999 breeding pairs
VL	very large	20 000-99 999 breeding pairs
EL	extra large	>100 000 breeding pairs

Remarks are used only for points of special note.

The references cited in the tabulation are numbered in alphabetical order, and only the reference number is given in this section. Full references are placed at the end of the review.



Map 1. Major islands and areas mentioned in the text.

Emperor Penguin *Aptenodytes forsteri*

The breeding distribution of the Emperor Penguin is the most southerly of any penguin, being restricted to the Antarctic continent and Antarctic Peninsula. The eggs are laid early in the Antarctic winter, and the chicks fledge in December. Colonies occur chiefly in three main areas: the Weddell Sea and Dronning Maud Land, Enderby and Princess Elizabeth lands, and the Ross Sea.

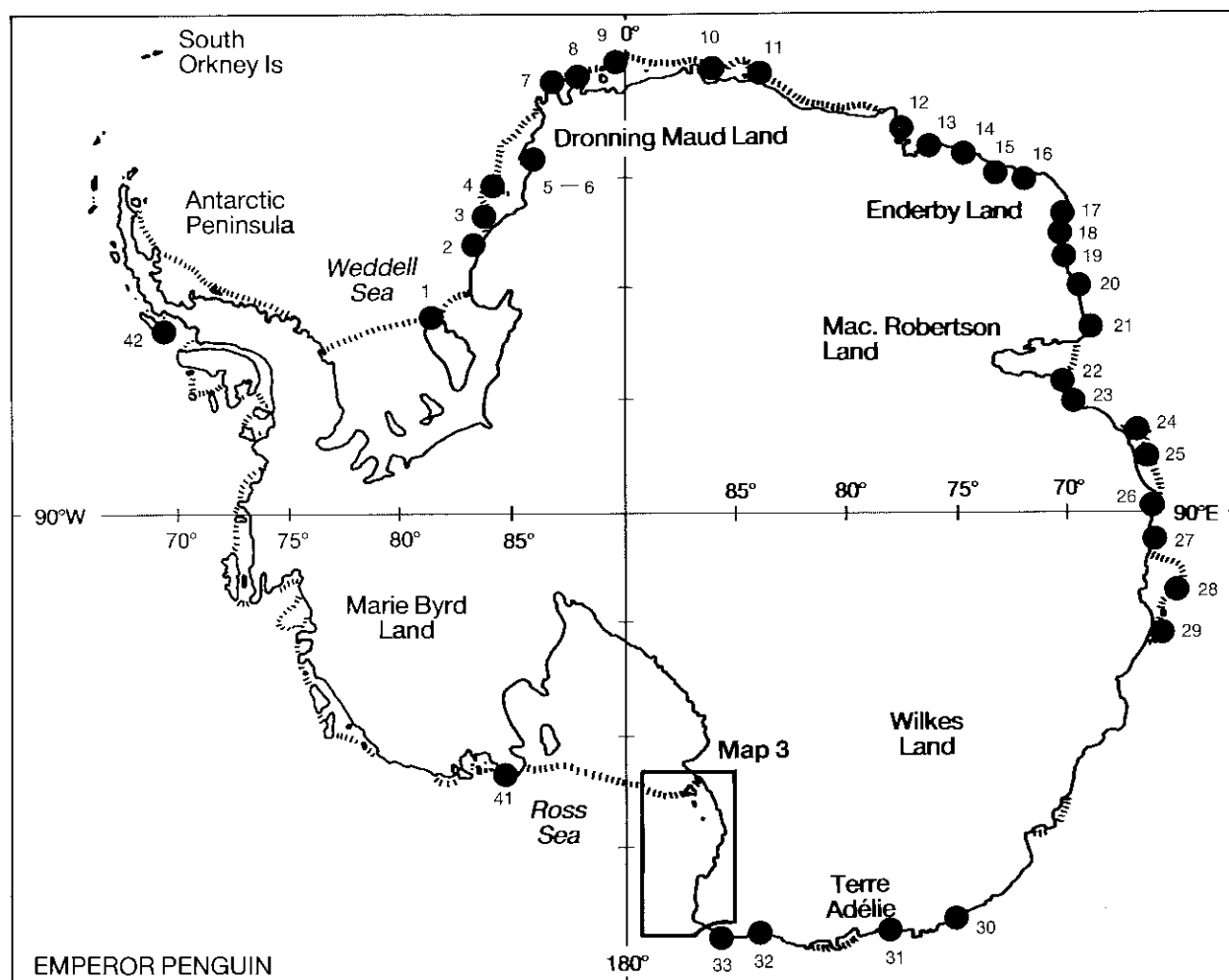
Seven new colonies of Emperor Penguins were discovered between 1979 and 1990. Five of these colonies are in the Weddell Sea, one is in Enderby Land and the other is in the Ross Sea. The minimum breeding population for these six new colonies is 32 200 pairs and the minimum total breeding population is 195 400 pairs in 42 colonies (Table 1). Two colonies in George V Land, East Antarctica, both poorly documented, were overlooked by Wilson (1983).

Many colonies have not been counted for many years, and in some cases the most recent data were obtained in the 1950s and 1960s. Current data are required from the Lazarev Sea area and the colonies in eastern Princess Elizabeth and Wilkes lands. The major obstacle to counting Emperor Penguins is logistical, since the best counts (those of incubating males) are obtained in the middle of the Antarctic winter. The exact timing of these winter counts will vary, depending on the latitude of the colony and the distance to open water, since these factors, among others, will determine the dates of departure for post-laying females and their re-arrival at hatching.

Some colonies in East Antarctica and the Ross Sea are apparently increasing, although most other colonies appear to be stable. The colony at Pointe Géologie in Terre Adélie, East Antarctica, has decreased in size from over 6000 pairs in 1952 to 2000 pairs in 1987. The major cause for this decrease has been attributed to either disturbance from station activities or the retreat of the nearby Astrolabe Glacier (Jouventin *et al.* 1984). The populations at Pointe Géologie and Taylor Glacier are being monitored on an annual basis, whereas the colonies at Kloo Point, Fold Island and Auster are monitored frequently (Anon. 1989 and Appendix 2).

EMPEROR PENGUINS IN DRONNING MAUD LAND (MAP 2)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
1	Gould Bay 77°30'S	48°30'W	1	7500 (C4)		(70,125)	
2	Dawson-Lambton 76°30'S	29°00'W	1	11 700 (C2)	1986	(46)	
3	Halley Bay 75°40'S	27°14'W	1	14700 (C1)	1977	(125)	Original breeding population estimated to be 23000 pairs.
			1	15700 (C1)	1986		P. Aslin, unpublished BAS data for 1986 and 1987 counts.
				14300 (C1)	1987		
4	Stancomb-Wills Prom 74°00'S	22°50'W	1			(119)	Colony reported in 1915, but no longer extant.
				3000 (A5)	1986	(46)	Estimated chick count.
5	Drescher Inlet 72°52'S	19°25'W	1	6600 (C2)	1986	(38,46,61)	
6	Riiser Larsen 72°00'S	17°00'W	1	5900 (C2)	1986	(46)	



Map 2. The breeding distribution of Emperor Penguins.

EMPEROR PENGUINS IN DRONNING MAUD LAND (MAP 2) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
7 'Norsel Bay'	71°03'S	10°56'W				(39,125)	Adults and 2 juveniles reported 1949-52, but breeding not confirmed.
8 Atka Bay	70°30'S	9°00'W	1	8000 (C5)	1986	(46)	
9 SANAE	70°19'S	2°21'W	3	113 (C1-3)	1979	(16)	
10 Lazarev Sea	70°S	19°W & 70°S 11°E				(62,125)	2 groups observed, but breeding not confirmed.
11 Lazarev Ice Shelf	69°25'S	15°30'E	1	4000- 5000 (A4)		(68,125)	

EMPEROR PENGUINS IN ENDERBY & MAC.ROBERTSON LANDS (MAP 2)

12 Riiser-Larsen Peninsula						(49,125)	
	68°50'S	34°40'E	1	5750	1975		
				7000 (C)	1990		Y. Naito, pers. comm.

EMPEROR PENGUINS IN ENDERBY & MAC.ROBERTSON LANDS (MAP 2) continued

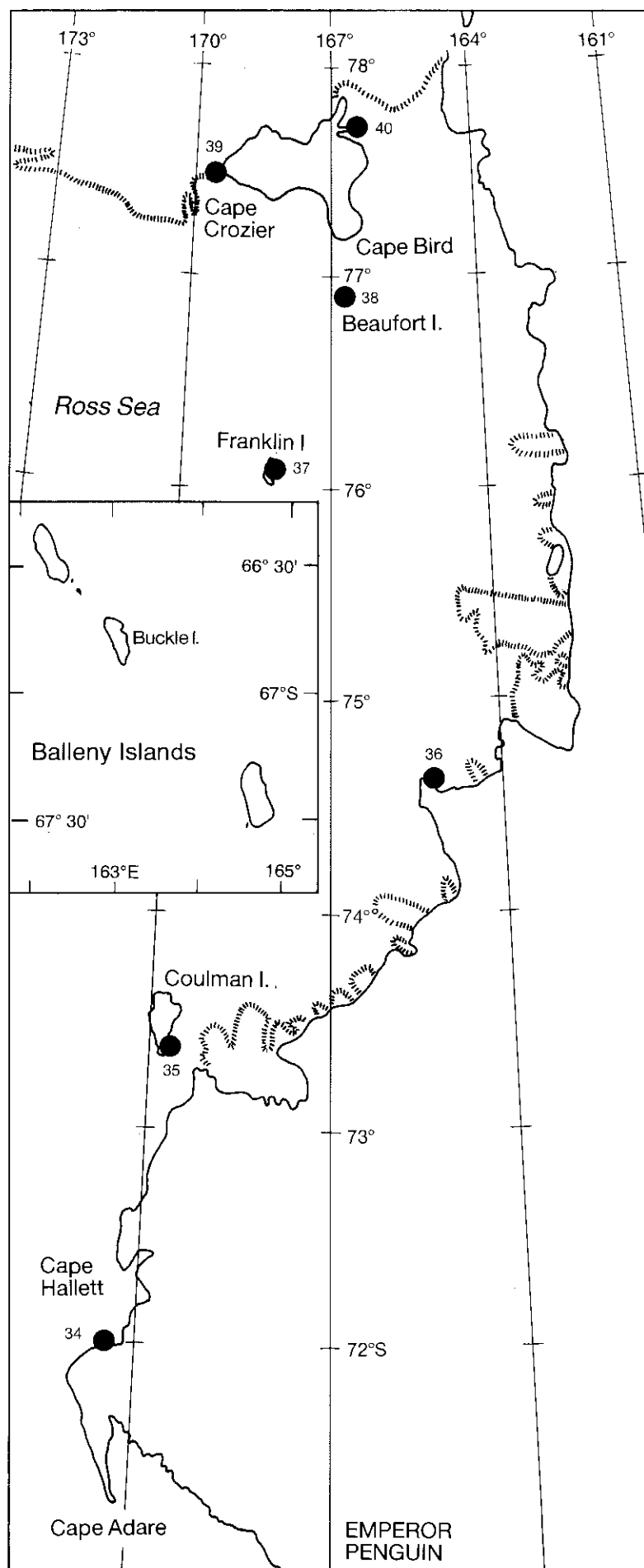
Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
13 Ongul I	69°01'S	39°32'E				(42,125)	Birds seen, but no colony found.
14 Umebashi Rock	68°03'S	43°07'E	1	220-250 (C)	1990		Y. Naito, pers. comm.
15 Casey Bay	67°30'E	48°00'E		B	1961	(12,129)	Not mentioned in recent reports
16 Amundsen Bay	66°55'S	50°00'E		B	1958	(12,129)	Not mentioned in recent reports
17 Kloo Pt	66°38'S	57°19'E	1	3050 (C1) 4500 (C2)	1977 1985	(48) (129)	Frequent counts since 1957
18 Fold I	67°20'S	59°23'E	1	450 (C1) 348 (C2)	1977 1985	(48) (129)	Frequent counts since 1956.

EMPEROR PENGUINS IN PRINCESS ELIZABETH LAND (MAP 2)

19 Taylor Glacier	67°28'S	60°53'E	1	1725 (A3) 2900 (A3)	1980 1988	(48)	Frequent counts since 1954, annual since 1968. G. G. Robertson, pers. comm.
20 Auster	67°23'S	64°02'E	1	10000 (A3) -12000 11000 (A4)	1978 1988	(48)	Frequent counts since 1957. G. G. Robertson, pers. comm.
21 Cape Darnley	67°50'S	69°45'E	1	5000 (A3)	1961	(48)	
22 Sandefjord Bay	69°40'S	73°20'E	1	200 (C2)	1968	(48)	

EMPEROR PENGUINS IN WILKES LAND & TERRE ADELIE (MAP 2)

23 Amanda Bay	69°16'S	76°50'E	1	1500 (A3) 2339 (C2) 9000 (C3)	1961 1983 1987	(48) (20) (129)	
24 Pingvin I (=Penguin I)	65°55'S	81°55'E	3	15000 (A5)	1960	(65)	
25 Karelín Bay	66°30'S	85°30'E	1	500 (A5)	1958	(65)	
26 Gaussberg	66°13'S	89°35'E	1	2000 (A5)	1960	(65)	
27 Haswell I	66°33'S	92°58'E	1	9000 (A4) 17000 (A4)	1962 1970	(84)	Unpublished data obtained from Russians by ANARE inspection team in 1987. Reported to have decreased since 1970 due to visits by personnel.



Map 3. The breeding distribution of Emperor Penguins in the Ross Sea Area.

EMPEROR PENGUINS IN WILKES LAND & TERRE ADELIE (MAP 2) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
28	Shackleton Ice Shelf 64°40'S	97°30'E	1	5000 (A5)	1960	(65)	
29	Bowman I 65°05'S	102°50'E	1	1500 (A5)	1960	(65)	
30	Pointe Géologie 66°40'S	140°01'E	1	3020 (N1)	1981	(58)	Annual counts since 1962. Decrease from c. 6000 pairs 1954-1975.
				3119 (A1)	1984	(109)	
				2300 (C1)	1987	(59)	
31	Ninnis Glacier 68°12'S	147°12'E		B	1959	(129)	
32	Wilson Hills 69°40'S	158°30'E		90 (A4)	1959	(129)	

EMPEROR PENGUINS IN THE ROSS SEA (MAP 3)

33	Yule Bay 70°44'S	166°50'E		B	1980-2	(126)	
34	Cape Roget 71°59'S	170°31'E	1	11700 (C3) 3851 (C2)	1964 1983	(22)	G. L. Kooyman, pers. comm.
35	Coulman I 73°24'E	169°45'E	1	21000 (C2) 22137 (C2)	1964 1983	(22)	
36	Cape Washington 74°39'S	165°25'E		2500 (C4) -3800 16384 (C2) 19364 (C2)	1968 1983 1986	(101) (64)	G. L. Kooyman, pers. comm.
37	Franklin I 76°07'S	168°15'E	1	1700 (C3) 200-300 4989 (C2)	1964 1965 1983	(102) (125)	
38	Beaufort I 76°56'E	167°03'E	1	1787 (C1) 179 (C1)	1976 1983	(112)	G. L. Kooyman, pers. comm.
39	Cape Crozier 77°31'S	169°23'E	1	118 (C1) 40 (C1) 78 (C1)	1975 1977 1983	(3) (112) (63)	
40	Inaccessible I 77°39'S	166°21'E	1	4 (N1)	1973	(57)	One egg laid 1974; not seen in subsequent years.

EMPEROR PENGUINS IN MARIE BYRD LAND (MAP 2)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
41	Edward VII Peninsula						
	77°40'S	158°30'W				(119)	Many birds seen in 1902 & 1940, but no colony located. Many birds also seen in December 1976 (D. G. Ainley pers. comm.)
				Nil	1987		No colony seen by Broady <i>et al.</i> (1989), but some areas unsearched.

EMPEROR PENGUINS ON THE ANTARCTIC PENINSULA (MAP 2)

42	Dion Is						
	67°52'S	68°43'W	1	500 (A5)	1977	(17,23)	
			1	85 (N1)	1978		S. & J. Poncet, pers. comm.

King Penguin *Aptenodytes patagonicus*

Breeding populations of King Penguins are found on Subantarctic islands in the Indian and South Atlantic Oceans and at Macquarie Island. King Penguins were hunted during the 19th and 20th centuries, with some populations drastically reduced and others locally extirpated. Many of the populations are still recovering. Wilson (1983) had estimated a total breeding population of approximately 700 000 pairs, and the difference between these and the present data is largely due to increasing populations and accurate surveys at most breeding localities.

The minimum breeding population is approximately 1.07 million pairs at seven localities (Table 1). However, this may well be an underestimate, and the total may be as high as 1.5 million pairs, since King Penguins breed twice every three years if successful (Stonehouse 1960). The counts reported below are taken directly from published and unpublished accounts, and no corrections for breeding frequency have been made.

A further complication is the very long laying season, caused by successful early layers of one summer breeding late in the next summer, (and, if successful again, not breeding in the following season). This makes breeding numbers difficult to estimate and interpret. It is preferable to make counts of chicks because these are less ambiguous, in terms of estimating breeding populations, than counts of adults, unless the latter are based on counts of incubating birds of both early and late populations. Despite these problems, increases in the breeding populations at Iles Crozet (Jouventin *et al.* 1984, Jouventin & Weimerskirch 1990), Macquarie Island (Rounsevell & Copson 1982), South Georgia (Croxall *et al.* 1988) and Heard Island (Woehler 1991) have been reported.

Monitoring of King Penguin breeding populations is undertaken at Heard Island, Ile de la Possession, Iles Kerguelen and Marion Island at varying time intervals (Anon. 1989 and Appendix 2). The data from colonies on the Prince Edward Islands and the smaller colonies on Iles Crozet are now out-dated, and should be updated at an early opportunity.

KING PENGUINS ON THE PRINCE EDWARD ISLANDS (MAP 4)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
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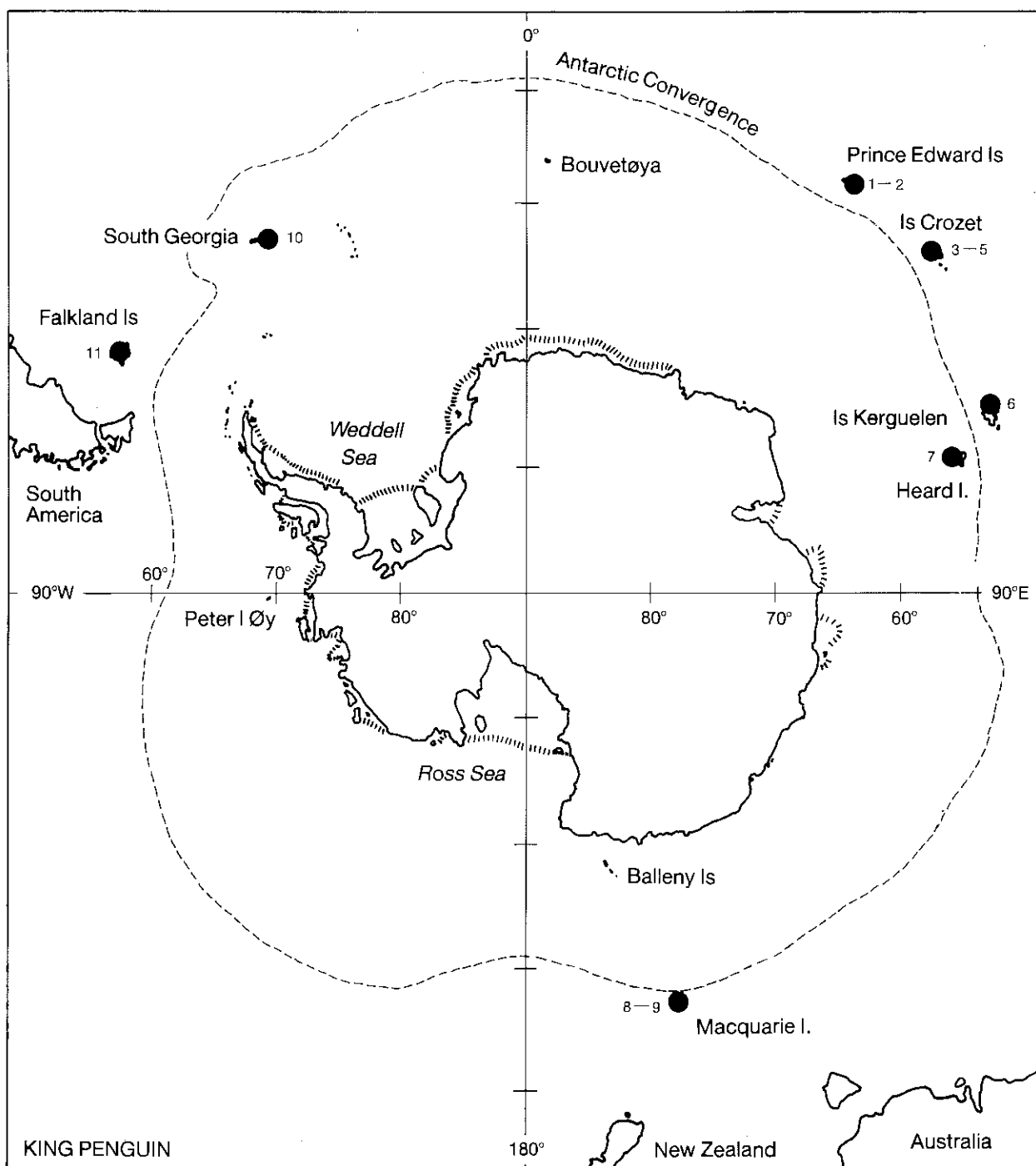
1	Marion I		10	215230 (A1-3)	1974-7	(124,121)	
2	Prince Edward I		3	5000 (A1-3)	1974-7	(124)	

KING PENGUINS ON THE ILES CROZET (MAP 4)

3	Ile de la Possession		4	64658 (A,N4)	1966	(30,125)	
					1968	(116)	VS,M,VL
				55000	1981/2	(58)	
				95600	1985/6		Increasing (H. Weimerskirch <i>et al.</i> unpublished data)
4	Ile de l'Est		6	81133 (A4)	1970/1	(30)	VS,L,VL
				100000	1981/2	(58)	
5	Ile aux Cochons		3	200600 (A5)	1963/4,	(28)	S,EL
					1974		
			5	300000	1985	(58,117)	

KING PENGUINS ON THE ILES KERGUELEN (MAP 4)

6	Iles Kerguelen		9	173000 (A2)	1985-7	(122)	Increasing, detailed counts reported in (122).
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Map 4. The breeding distribution of King Penguins.

KING PENGUINS ON HEARD ISLAND (MAP 4)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
7	Heard I		7	3800 (C1)	1987/8	(128)	Increasing.

KING PENGUINS ON MACQUARIE ISLAND (MAP 4)

8	Lusitania Bay		1	41454 (C1)	1978	(90,91)	Biannual counts suggest a total population of >70000 pairs.
			1	46595 (C1)	1980	(91)	
				55000 (C1)	1984		D. E. Rounsevell, pers. comm.

KING PENGUINS ON MACQUARIE ISLAND (MAP 4) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
9	Sandy Bay		1	80 (NI)	1980	(48)	Newly established since 1975.
				1000 (C1)	1988		D. E. Rounsevell, pers. comm.

KING PENGUINS ON SOUTH GEORGIA (MAP 4)

10	South Georgia		28	34000 (A2)	1978	(82)	G. S. Clark & J. P. Croxall pers. comm. Population may be 183000, based on breeding cycle. See also Croxall <i>et al.</i> (1988).
			34	122000 (C1)	1985/6		

KING PENGUINS ON THE FALKLAND ISLANDS (MAP 4)

11	Falkland Is		≥3	150 (A2)		(24)	
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KING PENGUINS IN SOUTH AMERICA (MAP 4)

Individuals have been reported on various islands off the south coast of Tierra del Fuego, but with no evidence of breeding. G. S. Clark (pers. comm.) saw no evidence of breeding in the Cape Horn area in 1984.

Adélie Penguin *Pygoscelis adeliae*

The Adélie Penguin is the most widely distributed, but not the most numerous, of the Antarctic penguins. Breeding populations are found around the Antarctic continent and Antarctic Peninsula, and on the Subantarctic islands.

Surveys conducted in the Antarctic Peninsula (Poncet & Poncet 1987), the Ross Sea (Wilson & Taylor 1984, Taylor *et al.* 1990) and the Australian Antarctic Territory (Whitehead & Johnstone 1990, Woehler *et al.* 1989, Woehler *et al.* 1991) have increased the known breeding population of Adélie Penguins. The minimum total breeding population is 2.47 million pairs (Table 1). The major concentrations of this species are in the Ross Sea area (952 000 pairs), the Antarctic Peninsula and Scotia arc (685 000 pairs), and Prydz Bay in Princess Elizabeth Land, (325 000 pairs). The breeding populations of Adélie Penguins are increasing at many localities, and combined with new survey data, have resulted in the upward revision of Wilson's (1983) estimate of 2 million pairs.

At monitored sites, increases in the sizes of breeding populations have been reported from the Ross Sea (R. H. Taylor *et al.* pers. comm.), Terre Adélie (Thomas 1986), Prydz Bay (Whitehead & Johnstone 1990), and at Signy Island in the South Orkney Islands (Croxall *et al.* 1988). Monitoring of Adélie Penguin populations is now undertaken by some 10 nations at 15 localities around the Antarctic continent and Antarctic Peninsula (Anon. 1989 and Appendix 2), and it is likely that more programmes will be initiated as the CCAMLR Ecosystem Monitoring Program (CEMP) develops (SC-CAMLR 1986, 1987, 1990).

Recent census data are absent from Novolazarevskaya Base, Alasheev Bight, Haswell Islands, the Marie Byrd Land coast, the north east of the Antarctic Peninsula and associated islands and parts of the South Shetland Islands.

ADELIE PENGUINS ON BOUVETØYA (MAP 5)

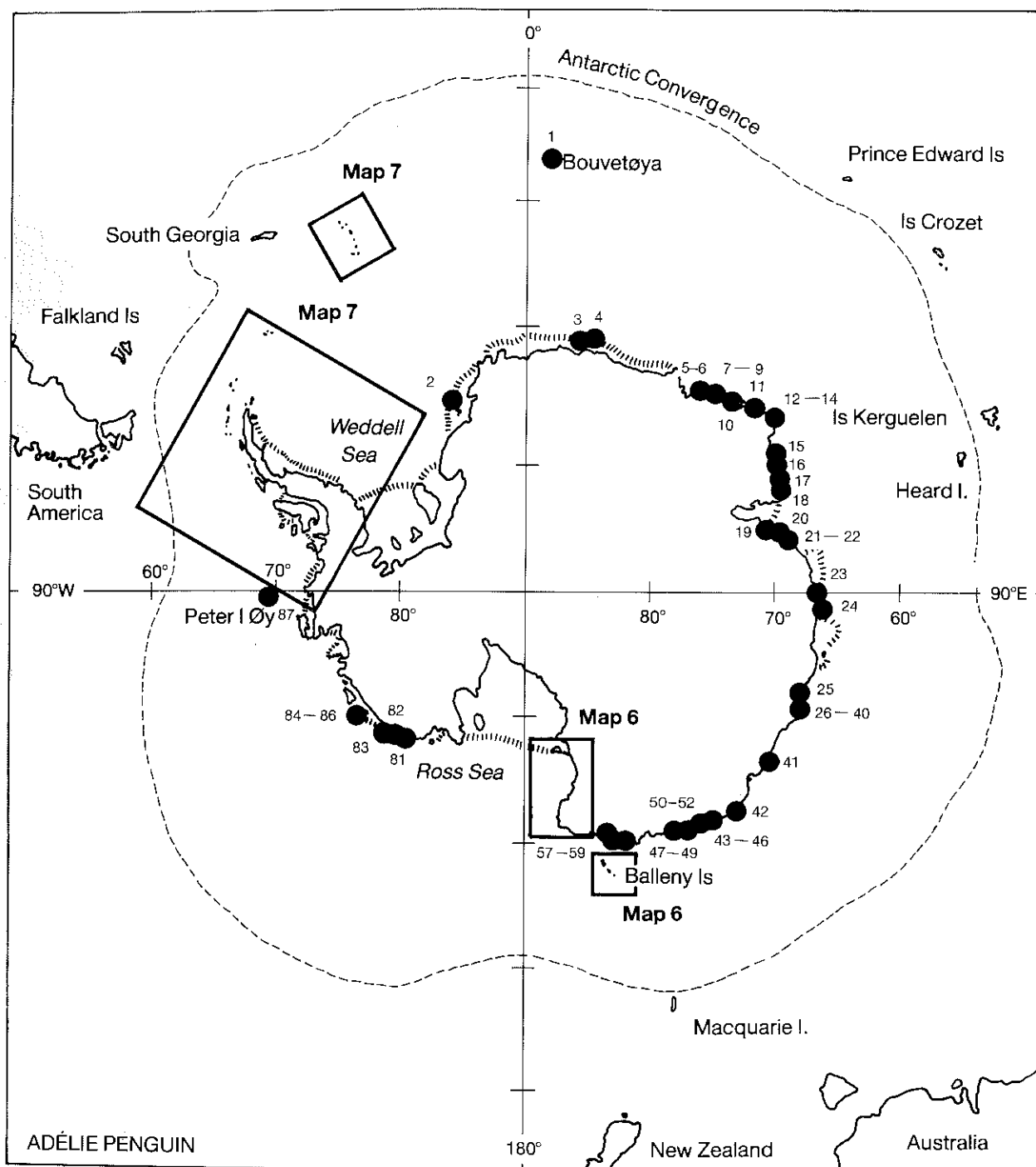
Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
1	Bouvetøya		1-2	60 (A1, A2)	1978/9	(41)	In mixed colony with Macaroni Penguins.
				4	1981	(120)	
				Nil	1989/90	(6)	

ADELIE PENGUINS IN DRONNING MAUD LAND (MAP 5)

2	Halley	75°30'S	25°30'W			(119)	No colony here now. J. P. Croxall, pers. comm.
3	Schirmacher Ponds	70°45'S	11°40'E			(5)	Recently established. No counts made, VS or S.
	Schirmacher Oasis		2	3 (N1)	1983	(40)	
4	Novolazarevskaya Base area	69°58'S	12°55'E			(62)	No information.

ADELIE PENGUINS IN ENDERBY & MAC.ROBERTSON LANDS (MAP 5)

5	Meholmen I	68°58'S	39°32'S	1	1 (N1)	1984	(52)
6	Syowa Coast	69°10'S	39°30'E	10	896 (A1)	1975,77	(49,50)
				10	1645 (A5)	1981	(51)
				10	1737 (A5)	1982	(51)



Map 5. The breeding distribution of Adélie Penguins.

ADELIE PENGUINS IN ENDERBY & MAC.ROBERTSON LANDS (MAP 5) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
7	Prince Olav Coast						
	68°30'S	41°30'E	3	420 (A1)	1972,75	(49,50)	
			3	570 (A4)	1981	(51)	
8	Tenmondai Rocks						
	68°25'S	41°41'E	1	19 (C1)	1981	(51)	
9	Alasheev Bight						
	67°40'S	40°00'E	3	>1000 (N1,A5)	1972	(125)	S

ADELIE PENGUINS IN ENDERBY & MAC.ROBERTSON LANDS (MAP 5) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
10	Casey Bay 67°30'S	48°00'E		B	1961	(129)	
11	Mount Biscoe 66°13'S	51°22'E		5000 (A3)	1985	(8,129)	
12	Aagaard Is 65°51'S	53°40'E		Nil	1984	(18)	
13	Proclamation I 65°51'S	53°41'E		5000 (A3)	1984	(18,129)	
14	Cape Batterbee 65°51'S	53°48'E		B	1984	(18,129)	
15	Kidson I 67°11'S	61°10'E		1000 (A3)	1989	(88)	
16	Mawson Coast 67°35'S	62°45'E					
	Rookery Islands		15	44800 (N2)	1988	(130, 129)	Full details for region in (130)
	Mawson area		10	37695 (N2)	1981,88	(130,129)	
17	Scullin Monolith 67°50'S	66°50'E	1	100000 (A4) 49500 (A2)	1972 1987	(48) (4,129)	More accurate count rather than decrease.
18	Murray Monolith 67°46'S	66°55'E	1	extensive 20000 (A3)	1972 1987	(48) (4,129)	EL More accurate count rather than decrease.

ADELIE PENGUINS IN PRINCESS ELIZABETH LAND (MAP 5)

19	Larsemann Hills 69°25'S	76°10'E		Nil		(125) (123,129)	No information.
20	Bolingen Is to Svenner Is 69°15'S	76°47'E	12	24965 (A2)	1981	(123,129)	
21	Rauer Is 68°51'S	77°50'E	2 11	1800 (A3,N2) 103916 (A2)	1974 1981	(48) (123,129)	S
22	Vestfold Hills and offshore islands 68°33'S	78°15'E	28	196592 (A2)		(123,129)	

ADELIE PENGUINS IN THE DAVIS SEA (MAP 5)

23	Gaussberg 66°48'S	89°12'E	1	7500 (A4)	1956/7	(48,66)	
24	Haswell Is 66°32'S	93°00'E	4+	48380 (A2-4)	1956/7 1962 1966/7	(60,66,84)	
				11300 (A3)	1979	(100,129)	

ADELIE PENGUINS IN WILKES LAND (MAP 5)

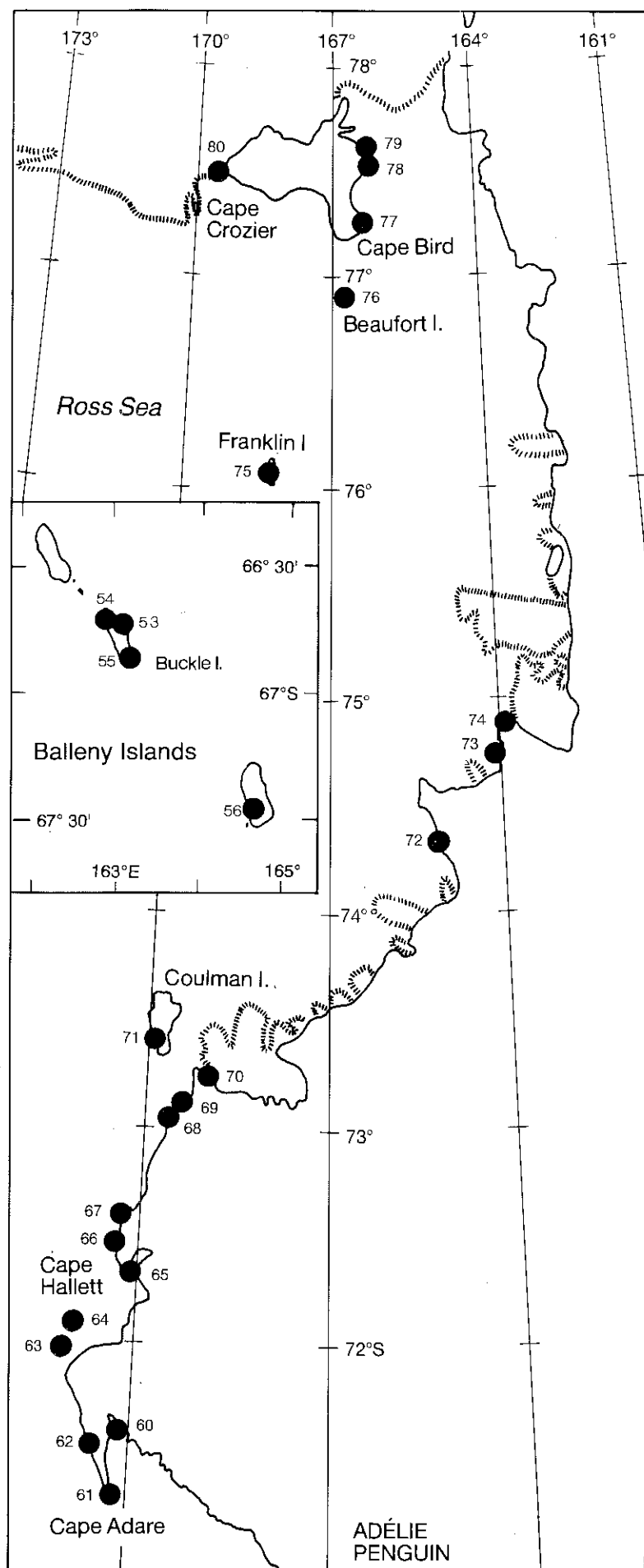
25	Davis I 66°39'S	108°24'E	1	550 (C4)	1960	(48)	
	Windmill Is	Detailed data for Windmill Islands 1959-89 provided in (131)					
26	Nelly I 66°12'S	110°11'E	3	554 (N2)	1989	(131)	

ADELIE PENGUINS IN WILKES LAND (MAP 5) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
27	Chappel I 66°11'S	110°26'E	44	5780 (N2)	1989	(131)	
28	Berkley I 66°13'S	110°39'E	59	5141 (N2)	1989	(131)	
29	Cameron I 66°13'S	110°37'E	13	1347 (N2)	1989	(131)	
30	Blakeney Pt 66°14'S	110°35'E	29	5604 (N2)	1989	(131)	
31	Whitney Pt 66°15'S	110°32'E	30	3803 (N1)	1989	(71,131)	
32	Shirley I 66°17'S	110°30'E	52	7637 (N2)	1989	(131)	
33	Beall I 66°18'S	110°29'E	28	5224 (N2)	1989	(131)	
34	Hollin I 66°19'S	110°24'E	18	2801 (N2)	1989	(131)	
35	Midgley I 66°20'S	110°24'E	37	7436 (N2)	1989	(131)	
36	Odbert I 66°22'S	110°33'E	58	10689 (N2)	1989	(131)	
37	Holl I 66°25'S	110°25'E	56	11875 (N2)	1989	(131)	
38	O'Connor I 66°25'S	110°28'E	5	4748 (N2)	1989	(131)	
39	Peterson I 66°28'S	110°32'E	83	20453 (N2)	1989	(131)	
40	Balaena Is 66°01'S	111°06'E		B	1956	(129)	
41	Chick Is 66°50'S	121°00'E	2	273 (A4, C1)	1960	(48)	VS,S

ADELIE PENGUINS IN TERRE ADELIE (MAPS 5 and 6)

42	Lewis I 66°07'S	134°22'E	1	1200 (N2)	1960	(48)	
43	Pointe Géologie 66°40'S	140°00'E	6 24	38440 birds 29182 (A1)		(125,80) 1984 (109)	
44	Cape Bienvenue 66°43'S	140°31'E				(125)	Penguin colony shown on map but numbers unknown.
				6000 -10000 (A5)	1984	(109)	
45	Cape Jules 66°44'S	140°55'E				(125)	Penguin colony shown on map but numbers unknown.
				5000 -15000 (A5)	1984	(109)	
46	Port Martin 66°49'S	140°24'E				(125,93)	
				8000 -16000 (A5)	1984	(109)	



Map 6. The breeding distribution of Adélie Penguins in the Ross Sea and the Balleny Islands.

ADELIE PENGUINS IN TERRE ADELIE (MAPS 5 and 6) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
47	Rocher Janet & Rocher X 66°33'S 139°10'E			<10000 (A5)	1984	(109)	
48	MacKellar Is 66°58'S 142°40'E		1	200000 (A4) 27260 (C1, C4)	1931 1980	(35) (125)	
49	Cape Denison 67°00'S 142°40'E		1	2000 (A3) 2898 (C1) 4898 (C1)	1974 1982 1982	(48) (125) (34)	VS & L
50	Way Archipelago 67°40'S 144°00'E		26	21234 (C1, C4,C5) 23084	1982 1982	(125) (34,129)	VS, M, S.
51	Watt Bay 68°00'S 144°30'E		2	1850 (C5)	1982	(125)	
52	Aviation Is 69°15'S 158°30'E		1	300 (C5)	1961	(67)	
	Dome I		1	161 (N2)	1985	(107)	
	Conical I		1	128 (N3)	1985	(107)	
	Southwest I		1	804 (N3)	1985	(107)	
53	Balleny Is Buckle I 66°50'S 163°12'E		3-6	900 (A3,A5)	1973, 1978	(125,86)	
	Cape Cornish		1	533 (N3)	1984	(107)	
	Cape Davis		1	502 (N2)	1984	(107)	
	South West Promontory		1	325 (N3)	1984	(107)	
	Young I, Monolith				1973,78	(125, 86)	Colonies reported by early expeditions, not seen in 1965, 1973 or 1984.
54	Sabrina I 66°57'S 163°17'E		1	2000 (N4) -3000 3471 (N3)	1978 1984	(125) (107)	
55	Chinstrap I 66°57'S 163°18'E		1	2000 (A3) 1999 (N2)	1978 1984	(125) (107)	
56	Sturge I 67°28'S 164°38'E		1	10 (A3)	1973	(86)	Not seen in 1984 (R. H. Taylor, pers. comm.)
	Thala I 70°37'S 166°06'E			Small	1980-82	(126)	Incorrect site in ref (126), colonies are on Nella I only, (R. H. Taylor pers. comm.)
57	Nella I 70°37'S 166°04'E		1	181 (N2)	1985	(107)	
58	Unger I 70°41'S 166°55'E			<50 (A4) 118 (N2) 166 (N2)	1980-82 1984 1985	(126) (107) (107)	
59	Sentry Rocks 70°46'S 167°22'E			c 20 (A4) 119 (N5)	1980-82 1985	(126) (107)	

ADELIE PENGUINS IN THE ROSS SEA (MAP 6)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
60 Duke of York I							
	71°37'S	170°02'E	1	1750 (C2)	1982	(44,125)	
				4749 (N1)	1985	(107)	
				4454 (N3)	1988		R.H. Taylor, pers. comm.
61 Cape Adare							
	71°18'S	170°09'E	1	220900 (C2)	1982	(44,125)	
				282307 (N2)	1986	(107)	
				272338 (N3)	1988		R.H. Taylor, pers. comm.
62 Downshire Cliffs							
	71°33'	171°22'E	1	4000 (C4)	1982	(44,125)	
				23695 (N2)	1986	(107)	
				22589 (N3)	1988		R.H. Taylor, pers. comm.
63 Possession I							
	71°53'S	171°11'E	1	110000	1964	(21)	
				-150000			
				142483 (N2)	1986	(107)	
64 Sven Foyn I							
	71°57'S	171°09'E	1	25000	1964	(21)	
				-30000			
				39567 (N2)	1986	(107)	
				35037 (N3)	1988		R.H. Taylor, pers. comm.
65 Cape Hallett							
	72°19'S	170°12'E	1	43000 (N1)	1967	(44,108)	Numbers decreased 1959 (62900)-1967.
				66319 (N1)	1987	(127)	Increased 1981 to 1987
				56153 (N3)	1988		R.H. Taylor, pers. comm.
66 Cape Cotter							
	72°28'S	170°20'E	1	40000	1964	(21)	
				-50000			
				27050 (N1)	1981	(126)	
				58776 (N2)	1987	(107)	
				43423 (N3)	1988		R.H. Taylor, pers. comm.
67 Cape Wheatstone							
	72°37'S	170°14'E	1	1517 (N1)	1964	(21)	
				2180 (N1)	1983	(126)	
				2812 (N2)	1987	(107)	
68 Cape Phillips							
	73°04'S	169°36'E	1	4482 (N2)	1987	(107)	
				4616 (N3)	1988		R.H. Taylor, pers. comm.
69 Mandible Cirque							
	73°07'S	169°15'E	1	19361 (N2)	1987	(107)	
				18755 (N3)	1988		R.H. Taylor, pers. comm.
70 Cape Jones							
	73°17'S	169°10'E	1	839 (N1)	1964	(21)	
				Deserted	1983	(126)	
				167 (N3)	1987	(107)	
				133 (N3)	1988		R.H. Taylor, pers. comm.
71 Coulman I							
	73°30'S	169°50'E	3	13000	1964	(21)	M & L
				-17000			
			4	30754 (N2)	1987	(107)	
				25796 (N3)	1988		R.H. Taylor, pers. comm.

ADELIE PENGUINS IN THE ROSS SEA (MAP 6) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
72	Wood Bay 74°19'S	165°04'E	1	1300 (A2) 1802 (N2) 2491 (N1) 1792 (N3)	1981 1984 1987 1989	(44,105) (107)	L. Greenfield, pers. comm. R.H. Taylor, pers. comm.
73	Terra Nova Bay 74°45'S	165°05'E	1	10000 (A4) 5900 (A1) 13052 (N2) 9852 (N3)	1982 1982 1987 1989	(44) (126) (107)	R.H. Taylor, pers. comm.
74	Inexpressible I 74°53'S	165°45'E	1	11000 (A3) 9217 (A2) 18762 (N2) 28715 (N2) 23528 (N3)	1963 1982 1984 1987 1989	(103) (44) (107)	L. Greenfield, pers. comm. R.H. Taylor, pers. comm.
75	Franklin I 76°07'S	168°15'E	2 1 1 2	>47300 (A2) 47300 (N2) 62432 (N2) 71412 (N2) 55773 (N3)	1981 1981 1983 1986/7 1989	(44,105) (126) (107) (107)	R.H. Taylor, pers. comm.
76	Beaufort I 76°56'S	167°03'E	1	21000 (A3) 34600 (A1) 46001 (N1) 42561 (N3)	1963 1981 1987 1989	(103) (44) (107)	R.H. Taylor, pers. comm.
77	Cape Bird 77°13'S	166°28'E	3	36236 (N1) 43515 (N1) 59757 (N1) 41976	1981 1983 1987 (N3) 1989	(44) (126) (107)	M, I, VL, annual counts continue R.H. Taylor, pers. comm.
78	Cape Royds 77°33'S	166°09'E	1	2039 (N1) 2604 (N1) 3986 (N2) 3011 (N3)	1980 1983 1987 1989	(44) (126) (107)	Annual counts began 1979 R.H. Taylor, pers. comm.
79	Cape Barne 77°35'S	166°13'E	1	5 (N1) 4 (N1)	1988 1989	(106)	Southernmost colony for this species. Recolonised during mid 1980s. R.H. Taylor, pers. comm.
80	Cape Crozier 77°31'S	169°23'E	2	105000 177083 (N1) 136249 (N3)	1970 1987 1989	(74) (107)	R.H. Taylor, pers. comm.

ADELIE PENGUINS IN MARIE BYRD LAND (MAP 5)

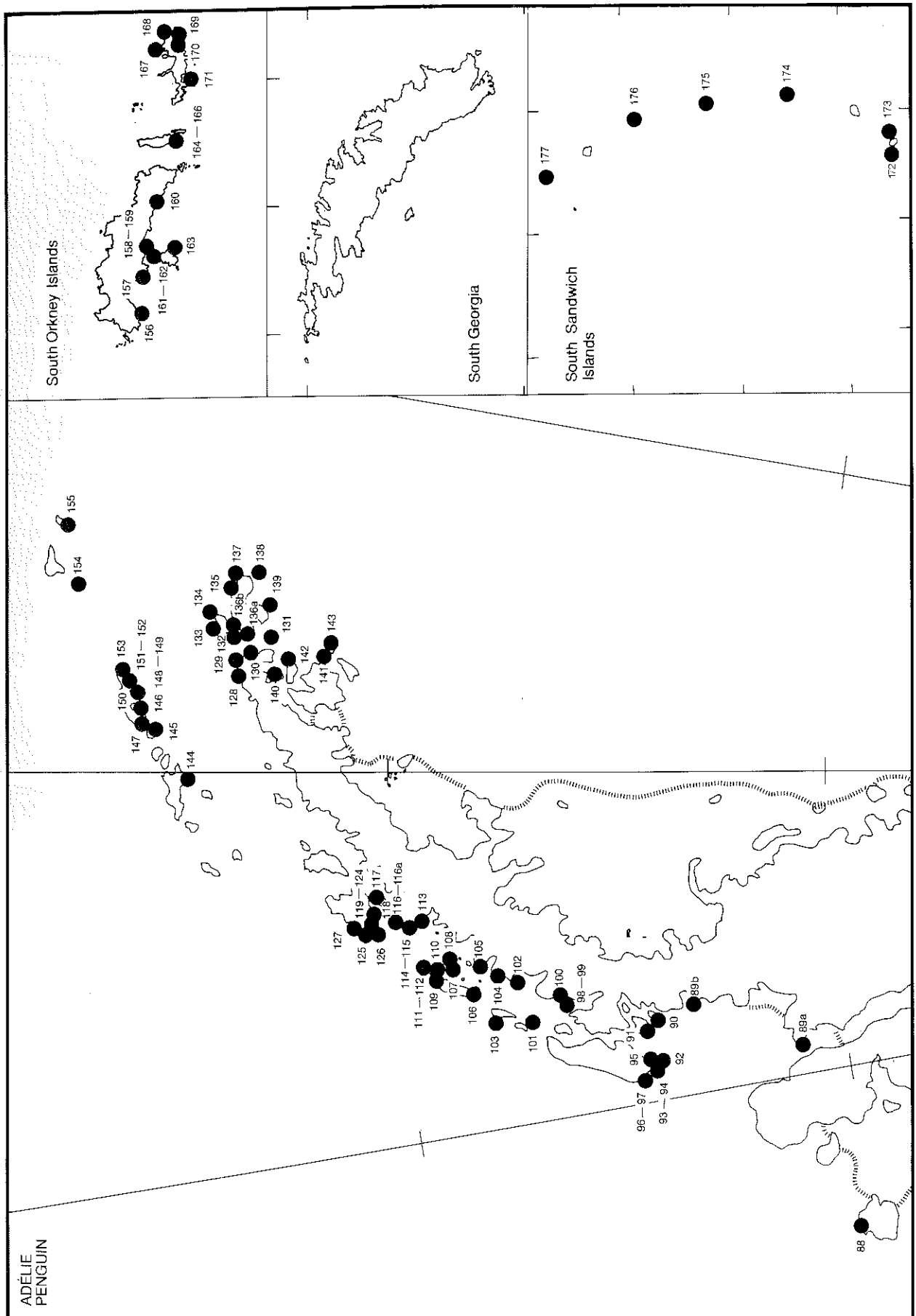
81	Cruzen I 74°45'S	140°W	1	100 (N3)	1977	(104)	
82	Cape Burks 74°45'S	136°53'W		97 (N1)	1990		P. Cleary & R.H. Taylor, pers. comm.

ADELIE PENGUINS IN MARIE BYRD LAND (MAP 5) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
83	Shepard I 74°17'S	132°30'W	2	40000 (N4)	1977	(104)	
84	Lovill Bluff 73°22'S	126°50'W	2	61533 (N3)	1983		R. H. Taylor & K. J. Barton, pers. comm.
85	Maher I 72°58'S	126°20'W	1	4722 (N3)	1983		R. H. Taylor & K. J. Barton, pers. comm.
86	Lauf I 73°03'S	126°10'W	1	1167 (N3)	1983		R. H. Taylor & K. J. Barton, pers. comm.
87	Peter 1 Øy 68°45'S	90°40'W	2	20 (A3)	1948, 1970	(47,113)	
			1	25 (C3) 50 (C1)	1987 1990		F. Mehlum, pers. comm. C. de Marliave, pers. comm. to S. & J. Poncet

ADELIE PENGUINS IN THE ANTARCTIC PENINSULA (MAP 7)

88	Charcot I 69°32'S	75°15'W	1	50 (C3)	1977	(23)	
Marguerite Bay south							
89a	Rhyolite Is 69°40'S	68°47'W	1	48 (N1)	1948	(23)	
			1	35 (N1)	1989		S. & J. Poncet, pers. comm.
Marguerite Bay north							
89b	Red Rock Ridge 68°18'S	67°11'W	1	1200 (C1)	1984	(79)	
90	Lagotellerie I 67°53'S	67°23'W	1	1700 (C1)	1983	(79)	
91	Pourquoi Pas I 67°44'S	67°45'W	1	700 (N3/4)	1984	(79)	
92	Emperor I 67°52'S	68°43'W	1	700 (N4/5)	1986	(79)	
93	Avian I 67°46'S	68°54'W	1	35600 (C2)	1979	(125)	
			1	35600 (N2)	1978	(79)	
94	Adelaide I 67°45'S	69°00'W		B			
95	Ginger I 67°45'S	68°42'W	1	3000 (C1,C3)	1983	(79)	
96	Cone I 67°41'S	69°10'W	1	3000 (N4/5)	1983	(79)	
97	Chatos I 67°40'S	69°10'W	1	100 (N4/5)	1983	(79)	
Crystal Sound							
98	Andressen I 66°53'S	66°40'W	2	2200 (N3/4)	1984	(79)	
99	Detaille I 66°52'S	66°47'W	5	1725 (A4) 900 (C1)	1958 1986	(23,125) (79)	
100	Holdfast Pt 66°48'S	66°35'W	3	625 (N3/4)	1984	(79)	



Map 7. The breeding distribution of Adélie Penguins in the Antarctic Peninsula.

ADELIE PENGUINS IN THE ANTARCTIC PENINSULA (MAP 7) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
101	Barcroft Is 66°25'S	67°10'W	17	1600 (N3/4)	1983	(79)	
102	Darbel I 66°23'S	65°35'W	2 3	>300 (A3,A5) 650 (N3/4)	1958 1984	(23) (79)	
103	Lavoisier I 66°10'S	66°55'W	1	150 (N4)	1987	(79)	
104	Cape Evensen 66°09'S	65°42'W	2	1100 (N3/4)	1990		S. & J. Poncet, pers. comm.
Grandidier Channel							
105	Fish Is 66°01'S	65°21'W	12	4000 (N3/4)	1984	(79)	
106	Armstrong Reef 65°52'S	66°15'W	6	12800 (C1, N3/4)	1984	(79)	
107	'Kim Is' 65°41'S	65°20'W	2	1300 (C1)	1983	(79)	
108	Vieugué I 65°39'S	65°14'W	1	1000 (N4)	1986	(79)	
109	Pitt Is, south 65°30'S	65°42'W	2	50 (C1)	1983	(79)	
110	Fizkin I 65°31'S	65°30'W	1	250 (N3/4)	1984	(79)	
111	Pitt Is, north 65°25'S	65°20'W	9	3900 (C1, N3/4)	1984	(79)	
112	Trundle I 65°23'S	65°21'W	6	650 (N3)	1989		S. & J. Poncet, pers. comm.
Wilhelm Archipelago							
113	Berthelot Is 65°20'S	64°08'W	1	1300 (N1)	1982	(79)	
114	Yalour I 65°15'S	64°11'W	10 13	>10400 (N1, N3,B) 8000 (N1)	1958 1973 1982	(23) (125) (79)	S,M
115	Petermann I 65°11'S	64°10'W	1 1	400 (N1) 1080 (N3)	1982 1988	(79)	M.L. Tasker, pers. comm.
116	Booth Is 65°04'S	64°03'W	3	>1208	1903-09	(23)	S
				(A5,C1,C3,B)			
116a	Port Charcot 65°04'S	64°00'W	1 1	100 (C1) 61 (N1)	1983 1990	(79)	S. & J. Poncet, pers. comm.
117	Port Lockroy, Wiencke I 64°50'S	63°30'W	1 1	500 (A5) 970 (NI) Nil	1900 1979 1983	(23) (125) (79)	
Anvers Island							
118	Biscoe Pt 64°49'S	63°47'W	1 1	3020 (N3) 2754 (N1) 3500 (C1)	1971 1984 1987	(23) (75) (79)	

ADELIE PENGUINS IN THE ANTARCTIC PENINSULA (MAP 7) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
119	Arthur Harbour 64°46'S	64°04'W	5-6 5	13812 (N1) 20000 (N1)	1979 1987	(23) (79)	S-L
	Arthur Harbour:						Decreasing in area
120	Humble I		1	2525 (N1)	1984	(75)	
121	Litchfield I		1	549 (N1)	1984	(75)	
122	'Christine I'		1	1459 (N1)	1985	(75)	
123	Cormorant I		1	905 (N1)	1984	(75)	
124	Torgersen I		1	8732 (N1)	1983	(75)	
125	Dream I 64°44'S	64°15'W		11263 (N3)	1985	(75)	
126	Joubin Is: 64°46'S	64°24'W	4 4	952 (N1-5) 1251 (N3/4)	1984/5 1990	(75)	S. & J. Poncet, pers. comm.
127	Gerlache I 64°36'S	64°15'W	1	171 (N1)	1985	(75)	
	Trinity Peninsula						
128	Duroch Is 63°18'S	57°50'W	1	800 (N4)	1990		S. & J. Poncet, pers. comm.
129	Gourdin I 63°12'S	57°17'W	2	300 (N4)	1969	(23)	
130	Hope Bay 63°23'S	57°00'W	1	117095 (N1) 123850 (N2)	1979 1985	(125) (73)	
131	Jonassen I 63°33'S	56°40'W		B	1901	(23)	Large colony
	Joinville Is						
132	Bransfield I 63°10'S	56°35'W	1	100 (N3)	1960	(23)	
133	d'Urville I 63°00'S	56°30'W	1	70 (N3)	1960	(23)	
134	Wideopen Is 63°00'S	55°51'W	1	100 (N3)	1960	(23)	
135	Patella I 63°08'S	55°31'W	1	>1000 (N5)	1960	(23)	
136	Joinville I 63°18'S	56°29'W	1	35000 (A4)	1953	(125)	
	Small colonies		c.9	6450 (A3-5 N3-5, B)	1953, 1960	(23,125)	VS-M
136a	Joinville I (Ambush Bay) 63°11'S	55°23'W	1	B	1978	(32)	
136b	Joinville I (Gibson Bay) 63°18'S	55°53'W	1	B	1985	(23)	
137	Etna I 63°06'S	55°10'W	1	25 (N3)	1960	(23)	
138	Danger Is 63°24'S	54°38'W	>3 ≥5	15000 (N4) B	1960 1978	(23) (32)	
139	Paulet I 63°35'S	55°46'W	1 13	100000 (A3) 60000 (A3)	1981 1984	(23) (55)	

ADELIE PENGUINS IN THE ANTARCTIC PENINSULA (MAP 7) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
James Ross I							
140	Vortex I						
	63°44'S	57°38'W	1	300 (A4)	1947	(23)	
141	Cockburn I						
	64°12'S	56°50'W		B	1901	(23)	Large colony
142	Devil I						
	63°48'S	57°17'W	1	B	1945	(23)	Large colony
143	Seymour I						
	64°18'S	56°45'W	2	1050 (N3)	1981	(23)	
				21954 (N2)	1985	(73)	

ADELIE PENGUINS ON THE SOUTH SHETLAND ISLANDS (MAP 7)

Livingston I

144	Hannah Pt						
	62°39'S	60°37'W	1	2 (N1)	1987		S. & J. Poncet, pers. comm.
145	Nelson I						
	62°18'S	59°14'W				(23)	10000 recorded in 1957-8, but none seen on subse- quent visits.
				Nil		(23)	Chinstrap Penguins not Adélie Penguins

King George I

146	Llano Pt						
	62°11'S	58°27'W	15	7095 (N1-3)	1980	(54)	
147	Ardley I						
	62°13'S	58°57'W		1074	1983	(132)	
				1331	1984	(77)	
			15	960 (N1)	1980	(54)	
				1160 (N1)	1986/7		J. Valencia pers. comm.
148	Stranger Pt						
	62°16'S	58°37'W	77	19372 (N3)	1971	(23)	
			36	18412 (N1-3)	1980	(54)	
149	Pt Thomas						
	62°10'S	58°27'W	2	9310 (N1)	1980	(54)	
150	Lions Rump						
	62°08'S	58°08'W	14	12345 (N1-3)	1980	(54)	
151	Penguin I						
	62°06'S	57°56'W	1	1710 (C2)	1979	(53)	
			1	3114 (N1-3)	1980	(54)	
152	Turret Pt						
	62°05'S	57°57'W	2	1918 (N1)	1980	(54)	
153	Three Sisters Pt						
	62°05'S	57°55'W	4	6202 (N1-3)	1980	(54)	
154	Gibbs I						
	61°30'S	55°29'W	1	2 (N1)	1971	(23)	
155	Clarence I						
	61°19'S	54°06'W	2	119 (N1,N4)	1976	(23)	VS

ADELIE PENGUINS ON THE SOUTH ORKNEY ISLANDS (MAP 7)

Coronation I

156	Gosling Is						
	60°38'S	45°55'W	1	5700 (C3)	1984	(78)	

ADELIE PENGUINS ON THE SOUTH ORKNEY ISLANDS (MAP 7) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
157 Stene Pt	60°39'S	45°42'W	1	1500 (N3/4)	1984	(78)	
158 Cape Hansen	60°40'S	45°35'W	1	10000 (N4)	1978	(23)	
159 Shingle Cove	60°39'S	45°34'W	1	3000 (N4)	1978	(23)	
160 Amphibolite Pt	60°41'S	45°20'W	1	4000 (N4)	1965	(23)	
Signy I							
161 North Pt	60°40'S	45°38'W	1	10504	1978	(27)	
162 Spindrift Rocks	60°41'S	45°39'W	1	7021	1978	(27)	
163 Gourlay Peninsula	60°44'S	45°35'W	3	19682 37200	1978 1978/9	(27) (89)	
164 Powell I	60°44'S	45°02'W	2	6000 ->7500 (A5,B) 7500 (C1,C3)	1965 1983	(23) (78)	S,M
165 Michelsen I	60°44'S	45°02'W		9000 (C1,C3)	1983	(78)	
166 Christoffersen I	60°44'S	45°03'W		250 (C1,C3)	1983	(78)	
Laurie I							
167 Watson Peninsula	60°40'S	44°31'W	1	985 (N3)	1983	(78)	
168 Ferrier Peninsula	60°43'S	44°24'W	2	61000 (N4,N5)	1983	(78)	
169 Graptolite I	60°43'S	44°27'W	1	30000 (N4,N5)	1983	(78)	
170 Fitchie Bay	60°43'S	44°28'W	2	3000 (N4)	1983	(78)	
171 Port Martin	60°46'S	44°42'W	c.4	24600 (N4,N5)	1983	(78)	
South Orkney Is (total)			18	187000 (A4)	1960s		
					-70s	(25)	
			c.20	198000 (N1-4)	1983	(78)	

ADELIE PENGUINS ON THE SOUTH SANDWICH ISLANDS (MAP 7)

172 Hewison Pt, Thule I	59°28'S	27°15'W	1	10092 (N1)		(125)	
173 Bellingshausen I	59°25'S	27°03'W		B			
174 Montagu I	58°25'S	26°20'W		B			
175 Ashen Hills, Saunders I	57°45'S	26°27'W	1			(125)	L-VL

ADELIE PENGUINS ON THE SOUTH SANDWICH ISLANDS (MAP 7) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
176	Candlemas I 57°05'S	26°40'W				(23)	Small numbers are present in the vast Chinstrap Penguin colonies.
177	Zavodovski I 56°20'S	27°35'W		B			
	South Sandwich Is (total)		5	30000 (A5)		(25)	

Chinstrap Penguin *Pygoscelis antarctica*

The breeding distribution of Chinstrap Penguins is almost entirely confined to the Antarctic Peninsula and Scotia Sea region, and very few are found outside this area.

The Chinstrap Penguin is the second most abundant penguin in the Antarctic and Subantarctic regions, with a minimum breeding population of 7.49 million pairs (Table 1). Based on the major survey of the Antarctic Peninsula (Poncet & Poncet 1987) and an initial estimate of the population at the South Sandwich Islands (Croxall *et al.* 1984b), the estimated population has thus increased substantially from the previous estimate of 1.25 million pairs (Wilson 1983).

Population increases and decreases have been reported at various localities in the Antarctic Peninsula (Poncet & Poncet 1987), South Shetland Islands (Jablonski 1984, Shuford & Spear 1988) and Elephant Island (Croxall *et al.* 1984b). The reported occurrence of breeding at Heard Island has still to be confirmed (Woehler 1991).

The monitoring of breeding populations of Chinstrap Penguins is undertaken on Elephant Island and nearby Seal Island, Ardley Island, Point Thomas, King George Island and Signy Island (Anon. 1989 and Appendix 2).

Recent data are absent from the small populations at the Balleny Islands. The data for the massive populations at the South Sandwich Islands are very imprecise; this location should be the primary target for surveys of this species.

CHINSTRAP PENGUINS ON BOUVETØYA (MAP 8)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
1	'Westvindstranda'		1	8228 (A2)	1978/9	(41)	Mixed colony with Macaroni and Adélie Penguins
	Other colonies		2-4		1978/9	(41)	Some Chinstrap amongst Macaroni Penguins
	Bouvetøya			7000 (N4)	1981	(120)	
				≥7000 (A3)	1981	(6)	Nyrøysa (Westvindstranda) only.
			≥1	2700 adults	1989/90	(6)	Nyrøysa (Westvindstranda) only. Another 53525 adults (Chinstrap & Macaroni) present around shores.

CHINSTRAP PENGUINS ON HEARD ISLAND (MAP 8)

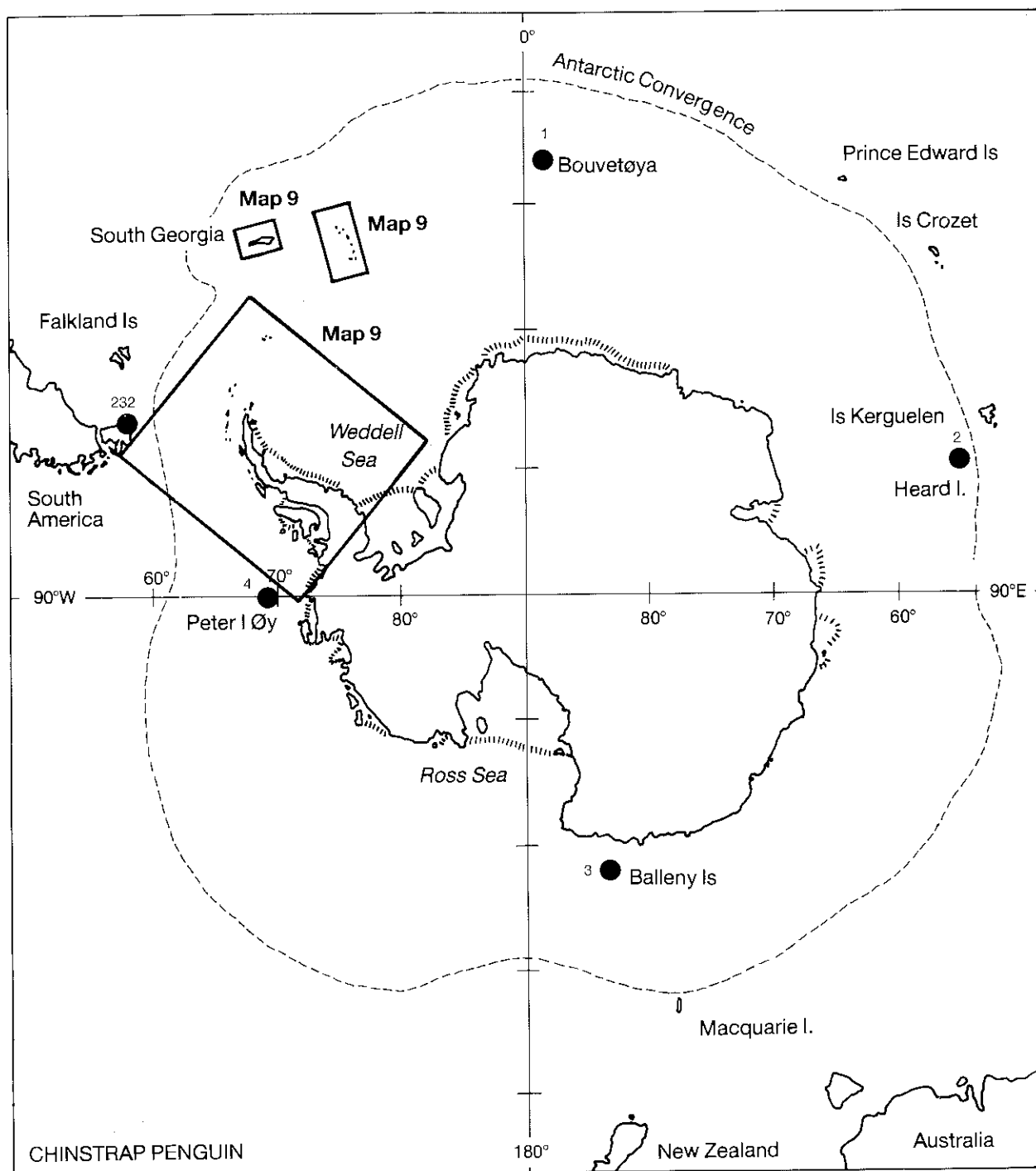
- 2 Chinstrap penguins occasionally breed on Heard Island (Downes *et al.* 1959). No successful breeding has been reported (Woehler 1991 [128]).

CHINSTRAP PENGUINS ON THE BALLENY ISLANDS (MAP 8)

- 3 Chinstrap Islet 10 (A3) 1973 (86)

CHINSTRAP PENGUINS ON PETER 1 ØY (MAP 8)

- 4 Peter 1 Øy 4 (A4) (47,113)
Nil 1990 C. de Marliave, pers. comm. to S. & J. Poncet



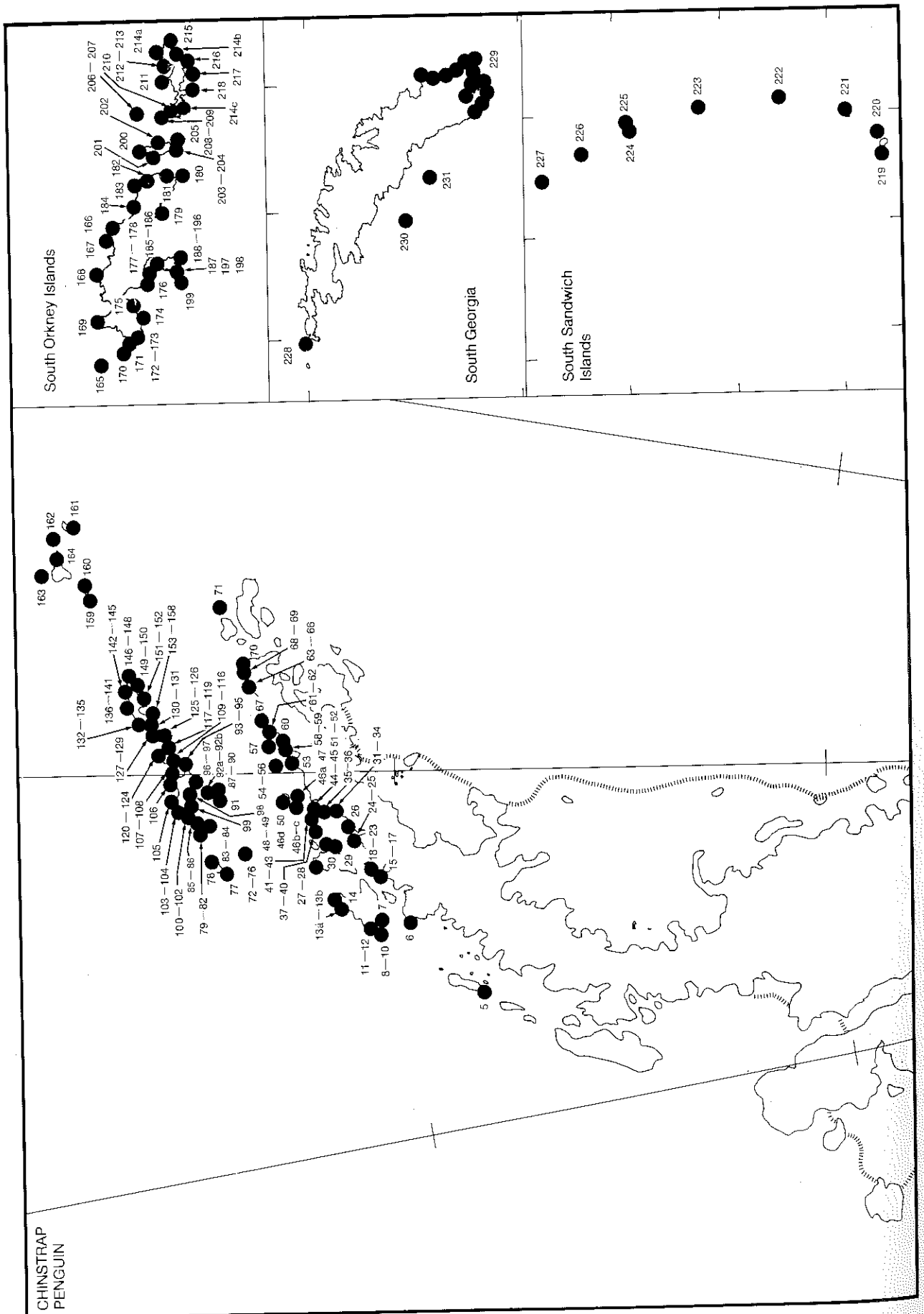
Map 8. The breeding distribution of Chinstrap Penguins.

CHINSTRAP PENGUINS ON THE ANTARCTIC PENINSULA (MAP 9)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
Crystal Sound							
5	Armstrong Reef						
	65°52'S	66°15'W	1	1 (N1)	1984	(79)	S. & J. Poncet, pers. comm.
				6 (N1)	1990		
Wilhelm Archipelago							
6	Port Charcot, Booth I						
	65°04'S	64°03'W	1	3 (C1)	1983	(79)	S. & J. Poncet, pers. comm.
				3 (N1)	1990		

CHINSTRAP PENGUINS ON THE ANTARCTIC PENINSULA (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
Anvers I, south west coast							
7	Humble I						
	64°46'S	64°07'W	1	1 (N1)	1985	(45)	
8	Dream I						
	64°43'S	64°15'W	1	109 (N1)	1984	(75)	
			1	200 (N1)			S. & J. Poncet, pers. comm.
9	'Nameless I'						
	64°43'S	64°15'W	1	47 (N1)	1984	(75)	
			1	90 (N1)	1990		S. & J. Poncet, pers. comm.
10	Joubin Is						
	64°46'S	64°23'W	1	23 (N1)	1984	(75)	
			1	33 (N1)	1991		S. & J. Poncet, pers. comm.
Anvers I, west coast							
11	Anvers I south of Gerlache I						
	64°39'S	64°16'W	1	2 (N1)	1987	(79)	
12	Gerlache I						
	64°36'S	64°15'W	6	7000 (C1, N1,N5)	1985,7	(79,75)	
13a	Quinton Point south						
	64°21'S	63°42'W	4	4000 (N5)	1983	(79)	
				8000	1984	(75)	
			4	5000 (N3)	1990		S. & J. Poncet, pers. comm.
13b	Quinton Pt North						
	64°19'S	63°40'W	1	3500 (N3/4)	1990		S. & J. Poncet, pers. comm.
14	Lajarte Is						
	64°13'S	63°33'W	1	800 (N4)	1990		S. & J. Poncet, pers. comm.
Gerlache Strait south							
15	Waterboat Point						
	64°49'S	62°52'W	1	20 (C1)	1986	(79)	
			1	28 (N1)	1989		S. & J. Poncet, pers. comm.
16	Duthiers Point						
	64°48'S	62°49'W	1	140 (C1)	1986	(79)	
			1	97 (N1)	1989		S. & J. Poncet, pers. comm.
17	Useful I						
	64°43'S	62°52'W	4	100 (N3/4)	1984	(79)	
18	Ketley Point, Rongi I						
	64°42'S	62°46'W	1	250 (N3/4)	1984	(79)	
19	Georges Point, Rongi I						
	64°40'S	62°39'W		300 (N3/4)	1984	(79)	
			1	600 (N3)	1988		S. & J. Poncet, pers. comm.
20	Cuerville I						
	64°41'S	62°38'W	1	37 (N3)	1971	(23)	
			1	3 (C1)	1986	(79)	
				Nil	1987		S. & J. Poncet, pers. comm.
				2535 (N3)	1988		M.L. Tasker, pers. comm.
21	Orne I						
	64°39'S	62°40'W	2	340 (N5)	1985	(79)	
				860 (N3)	1987	(79)	
22	Spigot Peak						
	64°38'S	62°34'W	1	B	1983	(76)	
			5	3000 (N4,N5)	1983	(79)	



Map 9. The breeding distribution of Chinstrap Penguins in the Antarctic Peninsula.

CHINSTRAP PENGUINS ON THE ANTARCTIC PENINSULA (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
23 Delaite I	64°33'S	62°11'W	1	25 (N3/4)	1989		S. & J. Poncet, pers. comm.
24 Reclus Peninsula	64°31'S	61°51'W	1	300 (N4)	1983	(79)	
			1	16 (N3)	1989		S. & J. Poncet, pers. comm.
25 Gaston Is	64°29'S	61°50'W	1	500 (N3/4)	1987	(79)	
			1	250 (N1)	1989		S. & J. Poncet, pers. comm.
26 Eckener Pt	64°26'S	61°36'W	1	40 (N3/4)	1987	(79)	
Brabant I							
27 Claude Point	64°06'S	62°37'W	1	250 (N1)	1985	(79)	
28 Metchnikoff Point	64°03'S	62°34'W	1	5000 (N1,N5)	1983	(76,79)	
Gerlache Strait north							
29 Hunt I	64°20'S	62°07'W	1	400 (N4)	1987	(79)	
30 Bell I	64°16'S	61°59'W	1	25 (N4)	1986	(79)	
31 Sprightly I	64°17'S	61°09'W	2	85 (N3/4)	1984	(79)	
			2	60 (N4)	1990		S. & J. Poncet, pers. comm.
32 Alcock I	64°14'S	61°08'W	1	7710 (N3)	1971	(125)	
			1	10000 (N3)	1971	(79)	
				3000 (N4)	1990		S. & J. Poncet, pers. comm.
33 Charles Point	64°13'S	61°00'W	1	10 (N1)	1987	(79)	
34 Sterneck I	64°11'S	61°04'W	3	1100 (N4)	1987	(79)	
35 Midas I	64°10'S	61°07'W	1	2060 (N3)	1971	(125)	
			2	2000 (N3/4)	1987	(79)	
36 'Primavera I'	64°08'S	60°59'W	1	500 (N4)	1984	(79)	
37 Two Hummock I	64°09'S	61°46'W	1	3000 (A4/5)	1986	(79)	
			1	1000 (N3)	1990		S. & J. Poncet, pers. comm.
38 Cobalescou I	64°11'S	61°40'W	1	500 (N4/5)	1986	(79)	
39 Hydrurga Rocks	64°09'S	61°38'W	1	1000 (N4/5)	1986	(79)	
40 Lobodon I	64°05'S	61°38'W	1	10 (N1)	1986	(79)	
41 Small I	64°01'S	61°28'W	2	1000 (N4/5)	1986	(79)	
42 Grinder Rock	63°58'S	61°26'W	3	120 (N4/5)	1986	(79)	
43 Intercurrence I	63°53'S	61°24'W	2	500 (N4/5)	1986	(79)	
44 Cape Herschel SE	64°04'S	61°02'W	5	330 (N4)	1984	(79)	

CHINSTRAP PENGUINS ON THE ANTARCTIC PENINSULA (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
45	Melchior Is 64°19'S	62°55'W	1	B Nil	1941 1984	(79)	No colonies ever present S. & J. Poncet, pers. comm.
Trinity I							
46a	Trinity I east 63°53'S	60°41'W	1	2 (N1)	1984	(79)	
46b	Trinity I south west 63°53'S	60°54'W	c.12	1600 (N3-N5)	1987	(79)	
46c	Trinity I west 63°49'S	60°50'W	1	700 (N3/4)	1987	(79)	
46d	Trinity I north west 63°43'S	60°47'W	6	670 (N3/4)	1987	(79)	
47	Tetrad I 63°55'S	60°45'W	3	180 (N3/4)	1984	(79)	
48	Spert I 63°52'S	60°59'W	2	300 (N4/5)	1986	(79)	
49	Farewell Rock 63°52'S	61°01'W	1	100 (N4/5)	1986	(79)	
50	Megaptera I 63°40'S	60°50'W	2	900 (N3/4)	1987	(79)	
Palmer Coast							
51	Cape Herschel NE 64°03'S	61°00'W	3	450 (N3/4)	1987	(79)	
52	Monument Rocks 64°01'S	60°58'W	4	270 (N3/4)	1984	(79)	
53	Cape Kater 63°47'S	59°55'W	1	few 10 (N3/4)	1984 1989	(79)	S. & J. Poncet, pers. comm.
Tower I							
54	Cape Legouillou 63°33'S	59°53'W	5	1500 (N3/4)	1987	(79)	
55	Zig Zag I 63°38'S	59°50'W	1 1	1000 (A5) 500 (N3)	1987 1989	(79)	S. & J. Poncet, pers. comm.
56	Cape Dumontier 63°35'S	59°44'W	1	5 (C1)	1987	(79)	
57	Astrolabe I 63°18'S	58°40'W	12	3400 (N3, N3/4)	1987	(79)	
Trinity Peninsula							
58	Cape Kjellman 63°44'S	59°25'W	1	few 52 (N3)	1987 1990	(79)	S. & J. Poncet, pers. comm.
59	Beaver Rocks 63°41'S	59°23'W	1	100 (N3/4)	1987	(79)	
60	Blake I 63°35'S	59°03'W	1 2	5 (N3) 10 (N4)	1987 1990	(79)	S. & J. Poncet, pers. comm.

CHINSTRAP PENGUINS ON THE ANTARCTIC PENINSULA (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
61	Bone Bay						
	63°35'S	59°02'W	2	200 (N3/4)	1987	(79)	
			2	235 (N3/4)	1990		S. & J. Poncet, pers. comm.
62	Cape Roquemaurel						
	63°33'S	58°58'W	3	800 (N3)	1987	(79)	
63	Jaquinot Rocks						
	63°26'S	58°27'W	2	35 (N4)	1990		S. & J. Poncet, pers. comm.
64	Tupinier Is						
	63°21'S	58°17'W	>3	5000 (A4)	1969	(23)	
			c.25	15000 (N4)	1990		S. & J. Poncet, pers. comm.
65	Demas Is						
	63°21'S	58°01'W	3	1280 (N4)	1990		S. & J. Poncet, pers. comm.
66	Duroch Is						
	63°19'S	57°55'W	c.10	9400	1990		S. & J. Poncet, pers. comm.
67	Hombron Rocks						
	63°27'S	58°44'W	1	45 (N3)	1969	(23)	
				Nil	1990		S. & J. Poncet, pers. comm.
68	Lafarge Rocks						
	63°14'S	57°32'W	1	900 (N4)	1969	(23)	
69	Casy I						
	63°15'S	57°29'W	1	30 (N3)	1969	(23)	
70	Gourdin I						
	63°12'S	57°17'W	1	B	1969	(23)	Large colony.
Joinville Is							
71	Wideopen Is						
	63°00'S	55°50'W	1	(B)	1978	(23)	VS
		55°52'W		B	1978	(32)	

CHINSTRAP PENGUINS ON THE SOUTH SHETLAND ISLANDS (MAP 9)

Low Island

72	Cape Wallace						
	63°14'S	62°13'W		150000 (A4)	1987	(98)	
73	Jameson Pt						
	63°17'S	62°14'W		25000 (A4)	1987	(98)	
74	Cape Garry						
	63°21'S	62°14'W		110000 (A4)	1987	(98)	
75	Cape Hooker						
	63°18'S	61°55'W		10000 (A4)	1987	(98)	
76	North coast						
	63°14'S	62°05'W		50 (A3/4)	1987	(98)	

Smith I

77	Cape James						
	63°07'S	62°44'W		5000 (A3)	1987	(98)	
78	Cape Smith						
	62°52'S	62°18'W		2500 (A3)	1987	(98)	

Snow I

79	Byewater Pt						
	62°45'S	61°30'W		350 (A4)	1987	(98)	
80	Byewater Pt south						
	62°47'S	61°32'W		1300 (A4)	1987	(98)	

CHINSTRAP PENGUINS ON THE SOUTH SHETLAND ISLANDS (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
81	Castle Rock 62°47'S	61°35'W		2500 (A4)	1987	(98)	
82	Monroe Pt 62°49'S	61°32'W		1000 (A4)	1987	(98)	
83	Cape Conway 62°51'S	61°26'W		200 (A4)	1987	(98)	
84	Cape Conway east 62°51'S	61°24'W		1200 (A4)	1987	(98)	
85	Hall Peninsula 62°47'S	61°16'W		2500 (A4)	1987	(98)	
86	Presidents Head 62°44'S	61°13'W		50 (A4)	1987	(98)	
	Snow I (total)			9100 (A4)	1987	(98)	
Deception I							
87	Baily Head 62°58'S	60°30'W	1	50000 (A4)	1967		
				-75000		(23)	
			1	75000 (A5)	1987	(98)	
			1	100000 (N4/5)	1989		S. & J. Poncet, pers. comm.
88	Entrance Pt 63°00'S	60°34'W	3	2010 (N3)	1967	(23)	
			1	2000 (A4)	1987	(98)	
89	South Pt 63°01'S	60°39'W	1	400 (A3)	1967	(23)	
			1	2500 (A4)	1987	(98)	
90	South Point west 63°01'S	60°39'W	1	400 (A3)	1967	(23)	
			1	7000 (A4)	1987	(98)	
91	Vapour Col 63°00'S	60°44'W	1	10000 (A4)	1967	(23)	
			1	75000 (A4)	1987	(98)	
92a	Macaroni Pt west 62°54'S	60°36'W	1	1000 (A3)	1967	(23)	
			1	200 (A1)	1987	(98)	
92b	Macaroni Pt 62°54'S	60°33'W	1	5200 (N3,4)	1967, 1972	(23)	Error in Wilson (1983) for total
			1	600 (A3)	1987	(98)	
	Other colonies		7	3575 (A3,N3)	1967	(23)	VS,M Volcanic activity may influence the size and fate of colonies on Deception I.
	Deception I (total)			70000 (A1-4)	1987	(98)	
Livingston I							
93	Half Moon I 62°36'S	59°55'W	1	1197 (N3)	1966	(23)	
			1	2500 (N1)	1987		S. & J. Poncet, pers. comm.
94	Rugged Rocks 62°36'S	59°49'W	2	700 (N3)	1987		S. & J. Poncet, pers. comm.
95	Renier Pt 62°37'S	59°49'W	2	1428 (N3)	1987		S. & J. Poncet, pers. comm.

THE DISTRIBUTION AND ABUNDANCE OF ANTARCTIC AND SUBANTARCTIC PENGUINS

Plate 1. King penguins
at South Georgia.
(Photograph by C J
Gilbert)

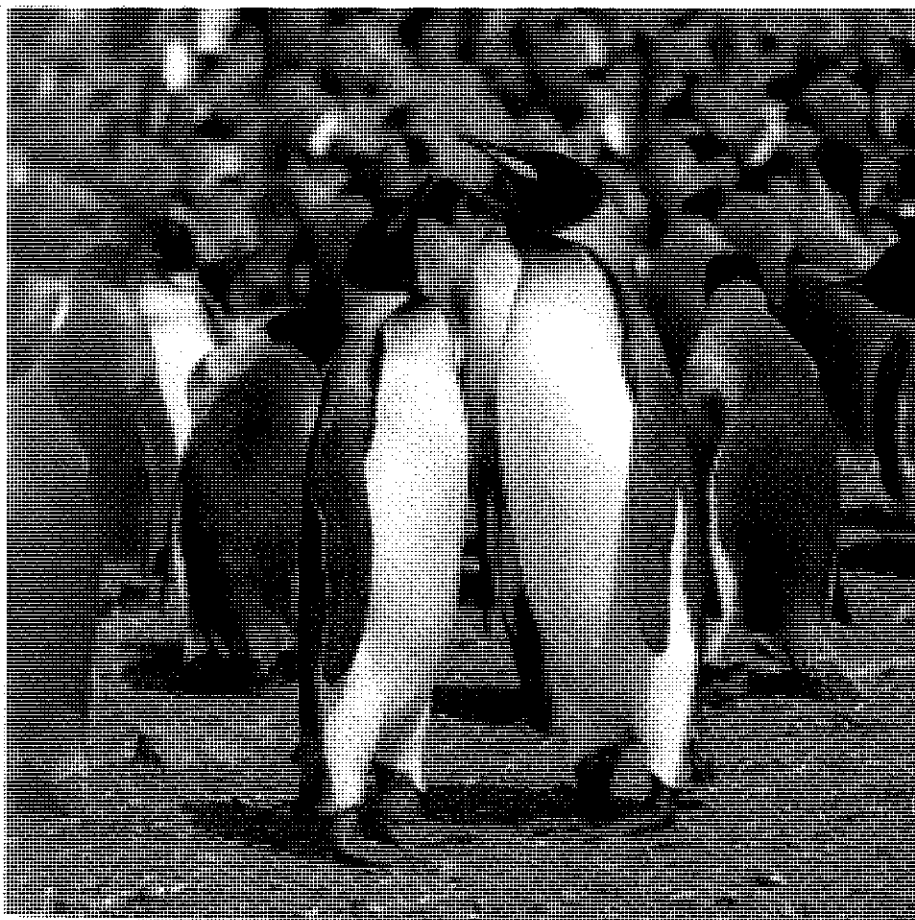
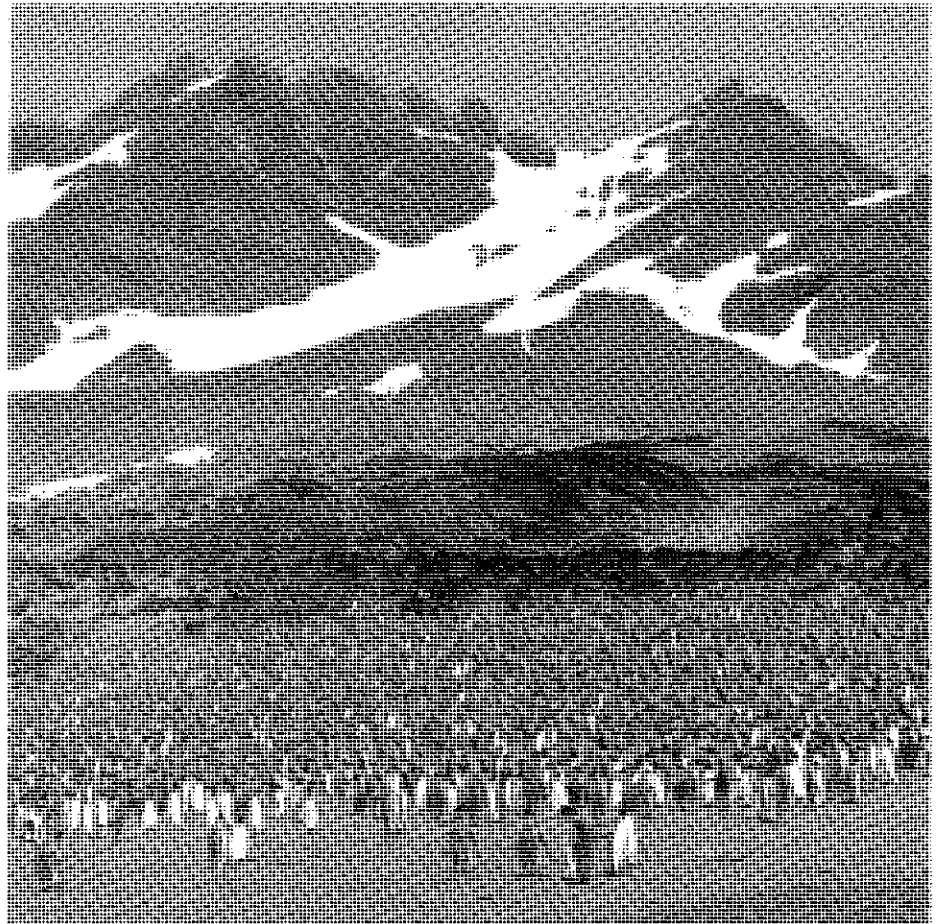


Plate 2. King penguins
at South Georgia.
(Photograph by C J
Gilbert)



Plate 3. Adélie penguins at South Orkney Islands. (Photograph by C J Gilbert)



Plate 4. Chinstrap penguin at South Orkney Islands. (Photograph by C J Gilbert)

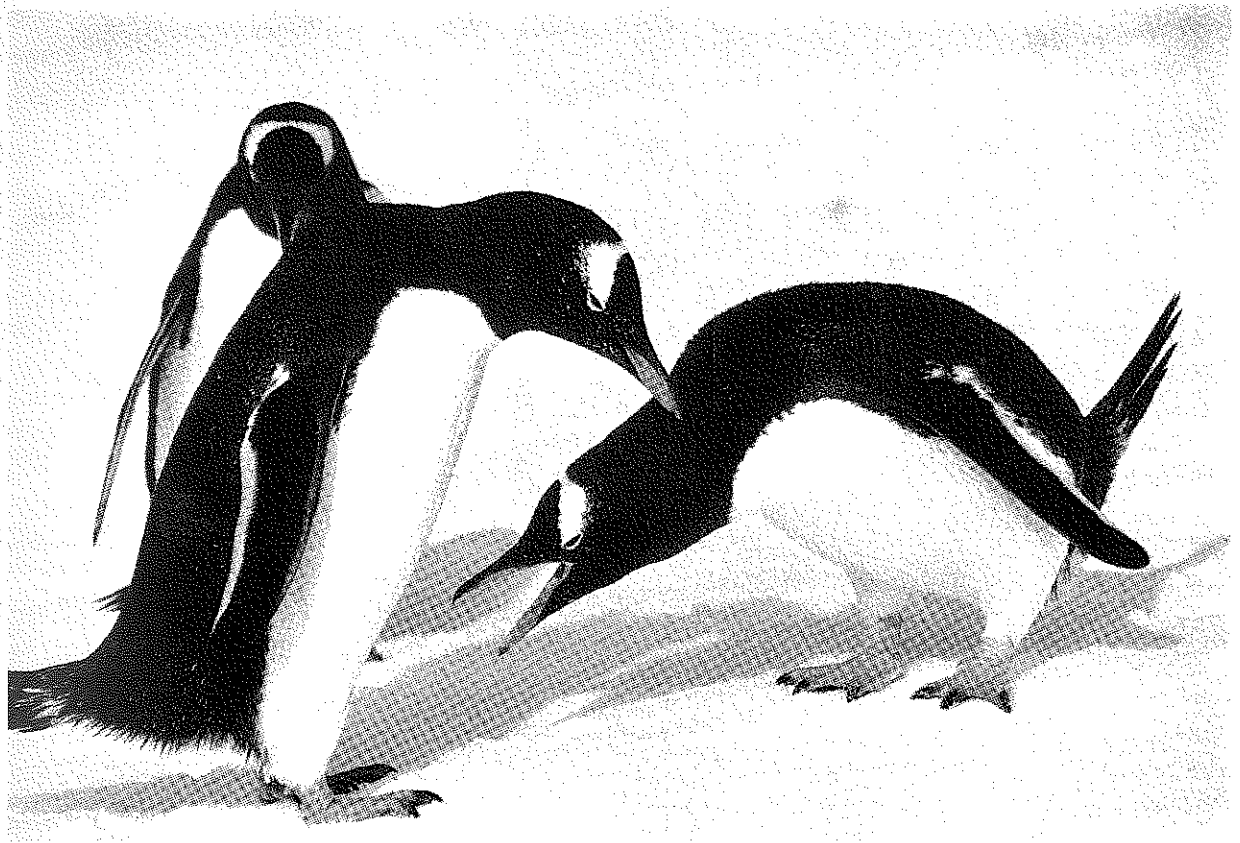


Plate 5. Gentoo penguins at South Orkney Islands. (Photograph by P Cooper)



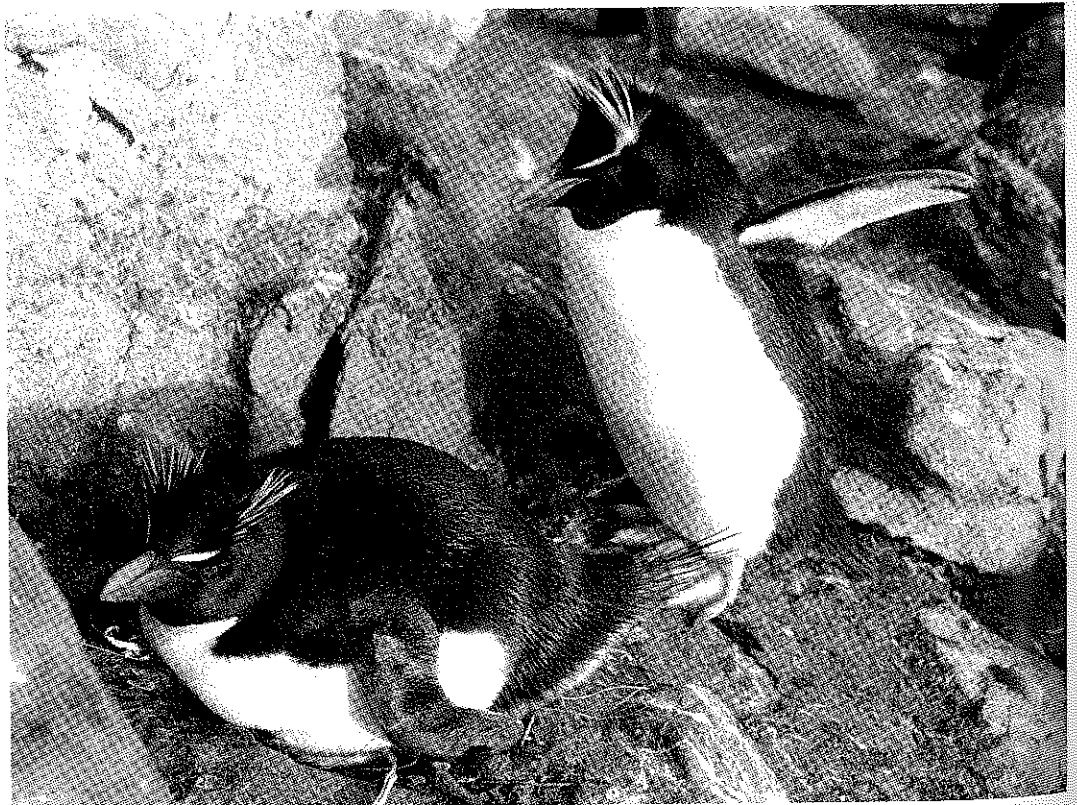
Plate 6. Macaroni penguins at South Georgia. (Photograph by T D Williams)

THE DISTRIBUTION AND ABUNDANCE OF ANTARCTIC AND SUBANTARCTIC PENGUINS

Plate 7. Royal penguins at Macquarie Island. (Photograph by H Dartnall)



Plate 8. Rockhopper penguins at the Falkland Islands. (Photograph by K Thompson)



CHINSTRAP PENGUINS ON THE SOUTH SHETLAND ISLANDS (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
96	Barnard Pt 62°45'S	60°20'W	4 3	8260 (N3) 13000 (N3/4)	1965 1987	(23)	S. & J. Poncet, pers. comm.
97	Miers Bluff 62°43'S	60°26'W	1	2000 (N3)	1987		S. & J. Poncet, pers. comm.
98	Hannah Pt 62°39'S	60°37'W	1	1000 (N4) 1500 (N3)	1958 1987	(23)	S. & J. Poncet, pers. comm.
99	Elephant Pt 62°41'S	60°52'W	1	250 (N3) 1000 (A4)	1958 1987	(23) (98)	
100	Vietor Rock 62°41'S	61°06'W		150 (A3)	1987	(98)	
101	Devils Pt 62°40'S	61°11'W	4	5300 (N3) 3000 (A4)	1965 1987	(23) (98)	
102	Window I 62°34'S	61°08'W		40 (A3)	1987	(98)	
103	Robbery Beaches 62°37'S	61°05'W	1	50 (N3) Nil	1958 1987	(23) (98)	
104	Lair Pt 62°37'S	61°02'W	1	156 (N3) 25 (A1)	1966 1987	(23) (98)	
105	Cape Shirreff 62°28'S	60°48'W	1	2000 (N3) 10400 (A3)	1958 1987	(23) (98)	
106	Wood I 62°29'S	60°18'W	1	3000 (A4)	1987	(98)	
107	Desolation I 62°27'S	60°01'W	2	9000 (A4)	1987	(98)	
108	Zed Is 62°26'S	60°11'W	2	4000 (A4)	1987	(98)	
	Other localities		6-7	4653 (N3 N4,B)	1958 1965/6	(23)	VS-M
	Livingston I (total)			38000 (A1-4)	1987	(98)	
Greenwich I							
109	Spencer Bluff 62°30'S	59°34'W	1	S	1987		S. & J. Poncet, pers. comm.
110	Fort Pt 62°33'S	59°35'W	1	1200 (N4)	1987		S. & J. Poncet, pers. comm.
111	Sartorius Pt 62°34'S	59°40'W	1	200 (N4)	1987		S. & J. Poncet, pers. comm.
112	Ongley I 62°26'S	59°54'W	1	S	1987		S. & J. Poncet, pers. comm.
113	Romeo I 62°23'S	59°56'W	1	250 (A4)	1987	(98)	
114	Aitcho Is 62°23'S	59°47'W	4	M	1987		S. & J. Poncet, pers. comm. (Includes 'Jorge I' [98])

CHINSTRAP PENGUINS ON THE SOUTH SHETLAND ISLANDS (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
115	Cecilia I 62°25'S	59°46'W	1	3500 (N4)	1966	(23)	
116	Dee I 62°26'S	59°47'W	1	1500 (N4)	1966	(23)	
Robert I							
117	Kitchen Pt 62°23'S	59°21'W	1	1300 (A3)	1987	(98)	
118	Robert Pt 62°27'S	59°23'W	1	2500 (A3)	1987	(98)	
119	Edwards Pt 62°28'S	59°30'W	1	47 (N1)	1966	(23)	
			1	20 (A3)	1987	(98)	
120	Cornwall I 62°21'S	59°43'W	1	110 (N3)	1987		S. & J. Poncet, pers. comm.
121	Island north of Cornwall I 62°20'S	59°43'W	1	3000 (N3)	1987		S. & J. Poncet, pers. comm.
122	Heywood I 62°19'S	59°42'W	1	23000 (N4)	1966	(23)	
				90000 (N4/5)	1987		S. & J. Poncet, pers. comm.
123	Island north of Heywood I 62°18'S	59°40'W	2	M (N4/5)	1987		S. & J. Poncet, pers. comm.
124	Newell Pt 62°20'S	59°33'W	1	9000 (A3)	1987		S. & J. Poncet, pers. comm.
Nelson I							
125	The Tor 62°20'S	59°09'W		15000 (N4)	1971	(23)	
				11000 (A4)	1987	(98)	
126	Harmony Pt 62°19'S	59°14'W		50000 (N4)	1972	(23)	
				151000 (A4)	1987	(98)	
127	Withen I 62°14'S	59°08'W		M	1987	(98)	
128	Nancy Rock 62°14'S	59°06'W		S	1987	(98)	
129	Fildes Strait west 62°14'S	59°05'W		800 (A3)	1987	(98)	
King George I							
130	Ardley I 62°13'S	58°56'W	5	210 (N1)	1980	(54)	
				91	1983	(132)	
				>238	1984	(77)	
				98 (N1)	1986/7		J. Valencia, pers. comm.
131	Flat Top Peninsula 62°13'S	59°02'W	1	18 (N1)	1980	(54)	
132	'West Foreland' 62°08'S	58°56'W	1	32 (N1)	1980	(54)	
133	Bell Pt area 62°06'S	58°52'W	9	7004 (N1-3)	1980	(54)	

CHINSTRAP PENGUINS ON THE SOUTH SHETLAND ISLANDS (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
134	'Zawadski Stacks'						
	62°05'S	58°50'W	3	450 (N1-3)	1980	(54)	
135	Stigant Pt area						
	62°01'S	58°44'W	8	10893 (N1-3)	1980	(54)	
136	Davey Pt area						
	61°58'S	58°32'W	8	19690 (N1-3)	1980	(54)	
137	Round Pt						
	61°55'S	58°25'W	2	1854 (N1-3)	1980	(54)	
138	Tartar I						
	61°55'S	58°26'W	9	18640 (N1-3)	1980	(54)	
139	Owen I						
	61°56'S	58°24'W		21551 (N1-3)	1980	(54)	
140	Kellick I						
	61°55'S	58°24'W	11	26890 (N1-3)	1980	(54)	
141	Pottinger Pt						
	61°56'S	58°22'W	35	55861 (N1-3)	1980	(54)	
142	False Round Pt area						
	61°54'S	58°00'W	12	49870 (N1-3)	1980	(54)	
143	Ridley I						
	61°51'S	58°00'W	5	4251 (N1-3)	1980	(54)	
144	'Gam Pt' area						
	61°55'S	57°57'W	4	456 (N1-3)	1980	(54)	
145	'Milosz Pt' area						
	61°55'S	57°45'W	4	17150 (N1-3)	1980	(54)	
146	North Foreland						
	61°54'S	57°40'W	5	23286 (N1-3)	1980	(54)	
147	Taylor Pt						
	61°56'S	57°39'W	2	598 (N1-3)	1980	(54)	
148	Cape Melville area						
	62°26'S	57°37'W	9	16278 (N1-3)	1980	(54)	
149	Turret Pt area						
	62°05'S	57°57'W	6	8120 (N1-3)	1980	(54)	
150	Penguin I						
	62°06'S	57°56'W	2	7581 (N1-3)	1980	(54)	
151	Lions Rump						
	62°08'S	58°08'W	2	10 (N1)	1980	(54)	
152	Chabrier Rock area						
	62°11'S	58°18'W	3	2083 (N1-3)	1980	(54)	
153	Point Thomas						
	62°10'S	58°29'W	16	10033 (N1)	1980	(54)	
154	Llano Pt						
	62°11'S	58°27'W	2	349 (N1)	1980	(54)	
155	Demay Pt area						
	62°13'S	58°26'W	4	2158 (N1)	1980	(54)	
156	Patelnia Pt						
	62°14'S	58°29'W	4	1498 (N1)	1980	(54)	
157	Stranger Pt						
	62°16'S	58°37'W	2	495 (N1)	1980	(54)	
158	Barton Peninsula						
	62°14'S	58°46'W	2	6298 (N1-3)	1980	(54)	

CHINSTRAP PENGUINS ON THE SOUTH SHETLAND ISLANDS (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
159	Aspland I 61°28'S	55°55'W	3	35200 (N3-5)	1977	(23)	M-VL
160	Gibbs I 61°30'S	55°30'W	3	40890 (N3-5)	1977	(23)	M,L
161	Clarence I 61°15'S	54°00'W	11	226800 (N3-5)	1977	(23)	Major concentration at the SE corner VS-VL
162	Cornwallis I 61°01'S	54°24'W	3	2200 (N3-4)	1977	(23)	S,M
163	Seal Is 60°55'S	55°23'W	1 1	>1000 (N4) 20000 (A4)	1970 1988	(23)	Initial estimate, awaiting analysis of aerial photo- graphs, J. L. Bengtson, pers. comm.
164	Elephant I 61°10'S	55°00'W	30	123070 (N3, N4)	1971	(23)	Two large colonies (35480 & 11500) others S & M.
Elephant I group (total)			65	448160 (A4)		(25)	

CHINSTRAP PENGUINS ON THE SOUTH ORKNEY ISLANDS (MAP 9)

165	Inaccessible Is 60°35'S	46°40'W	3	1000 (N3/4)	1986		S. & J. Poncet, pers. comm.
Coronation I							
166	Purdy Pt 60°32'S	45°27'W	1	5000 (N5)	1984	(78)	
167	Foul Point 60°32'S	45°30'W		B	1977	(23)	
168	Conception Pt 60°31'S	45°40'W		B	1977	(23)	
169	Penguin Pt 60°31'S	45°55'W	2	B	1977	(23)	
170	Larsen Is 60°36'S	46°06'W	c.3	10000 (N5)	1984	(78)	
171	Monroe I 60°36'S	46°03'W	c.13	28000 (N4/5)	1984	(78)	
172	Moreton Pt 60°36'S	46°02'W	5	24200 (N5)	1984	(78)	
173	Return Pt & Cheal Pt 60°38'S	46°00'W	17	38100 (N3/4)	1984	(78)	
174	Gosling Is 60°38'S	45°55'W	8	10764 (N3/4)	1984	(78)	
175	Norway Bight 60°37'S	45°51'W	4	180 (N3/4)	1984	(78)	
176	Stene Pt 60°39'S	45°43'W	3	1040 (N3/4)	1984	(78)	
177	Cape Vik 60°39'S	45°39'W	1	8000 (N4)	1965	(23)	
178	Cape Hansen 60°40'S	45°35'W		B	1965	(23)	

CHINSTRAP PENGUINS ON THE SOUTH ORKNEY ISLANDS (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
179 Amphibolite Pt	60°41'S	45°20'W	1	4000 (N4)	1984	(78)	
180 Robertson Is	60°45'S	45°09'W	24	34870 (N3/4)	1984	(78)	
181 Petter Bay (Spence Bay)	60°42'S	45°08'W	3	950 (N3/4)	1984	(78)	
182 Gibbon Bay	60°39'S	45°10'W	8	13210 (N3/4)	1984	(78)	
183 Cape Bennett	60°37'S	45°13'W	10	9050 (N3/4)	1984	(78)	
184 Crown Head	60°37'S	45°17'W	3	4200 (N4/5)	1984	(78)	
Coronation I (total)			103	183564 (N1, N3,A3-A5)1983		(78)	
Signy I							
	60°43'S	45°38'W					
185 North Pt				7126 (N3)	1978	(27)	
186 Spindrift Rocks				128	1978	(27)	
187 Fyr Channel				5109	1978	(27)	
188 Pandemonium Pt				13720	1978	(27)	
189 Confusion I				7298	1978	(27)	
190 McLeod Glacier (west)				1558	1978	(27)	
191 Shagnasty I				2676	1978	(27)	
192 McLeod Glacier (east)				650	1978	(27)	
193 Oliphant Channel				159	1978	(27)	
194 Oliphant Is				4247	1978	(27)	
195 Gourlay Pt				14572	1978	(27)	
196 Pageant Pt				1354	1978	(27)	
197 Pantomime Pt				6029	1978	(27)	
198 Moe I				10964	1978	(27)	
199 Mariholm				3914	1978	(27)	
Powell I							
200 Cape Faraday	60°37'S	45°02'W	4	5600 (N3/4)	1983	(78)	
201 West coast	60°42'S	45°03'W	1	8 (N3/4)	1983	(78)	
202 East coast	60°40'S	45°01'W	3	2000 (N3/4)	1983	(78)	
203 Powell, Michelsen I	60°44'S	45°01'W	1	4435 (N1)	1983	(78)	
204 Grey I	60°45'S	45°00'W	1	2350 (N3)	1983	(78)	
205 Fredricksen I	60°44'S	44°48'W	c.10	21320 (N3/4)	1983	(78)	
Laurie I							
206 Saddle I	60°37'S	44°49'W		>12000 (A4)	1903	(23)	

CHINSTRAP PENGUINS ON THE SOUTH ORKNEY ISLANDS (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
207	Weddell Is 60°38'S	44°49'W		B	1956	(23)	
208	Bruce Is 60°40'S	44°53'W		B	1956	(23)	Large colony
209	Ellium I 60°42'S	44°50'W	2	21400 (N3/4)	1983	(78)	
210	Cape Robertson 60°42'S	44°48'W	1	250000 birds (A5)	1903	(23)	
			1	32000 (N4)	1983	(78)	
211	Pirie Peninsula 60°42'S	44°40'W	22	17330 (N3/4)	1983	(78)	
212	Ferguslie Peninsula 60°41'S	44°34'W	10	16600 (N3/4)	1983	(78)	
213	Watson Peninsula 60°40'S	44°32'W	23	14000 (N3/4)	1983	(78)	
214a	North east coast 60°42'S	44°28'W	7	19700 (N3/4)	1983	(78)	
214b	South coast 60°45'S	44°34'W	13	15600 (N4)	1983	(78)	
214c	West coast 60°45'S	44°48'W	5	4800 (N3/4)	1983	(78)	
215	Ferrier Peninsula 60°43'S	44°24'W	12	14200 (N4/5)	1983	(78)	
216	Murray Is 60°46'S	44°30'W	3	1100 (N3/4)	1983	(78)	
217	Ailsa Craig 60°46'S	44°36'W	1	6000 (N4/5)	1983	(78)	
218	Port Martin 60°46'S	44°42'W	5	10000 (N4/5, N5)	1983	(78)	
	South Orkney Is (total)		50	590000 (A4)			
					1960s-70s	(25)	
			246	600000 (N1-5)	1983	(78)	

CHINSTRAP PENGUINS ON THE SOUTH SANDWICH ISLANDS (MAP 9)

219	Thule I 59°28'S	27°20'W	3	7520 (A1) >25000 (A5,B)	1966 1979	(125) (125)	Count for Hewison Pt only
220	Bellingshausen I 59°25'S	27°03'W		B			
221	Bristol I 59°02'S	26°31'W		B			
222	Montagu I 58°25'S	26°20'W		B			
223	Saunders I 57°45'S	26°27'W			1980	(125) (125)	Scattered groups at Nattriss Pt
224	Vindication I 57°06'S	26°47'W	3	(B)	1981	(125)	M,M, VL
225	Candlemas I 57°65'S	26°40'W	c.10		1981	(125)	M-EL

CHINSTRAP PENGUINS ON THE SOUTH SANDWICH ISLANDS (MAP 9) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
226	Visokoi I 56°42'S	27°12'W		B			
227	Zavodovski I 56°18'S	27°35'W	6+	500000 (A5)	1981 1966	(125) (43)	M-EL
	South Sandwich Is (total)			5 million		(25)	

CHINSTRAP PENGUINS ON SOUTH GEORGIA (MAP 9)

228	Bird I	2	7	1976 (83)	VS
		1	1-2	1990	P.A. Prince, pers. comm.
229	Southern end of mainland	13	1462	1936, (125, 1955, 83) 1971, 1972	VS
230	Annenkov &	6	472	1972/3 (83)	VS,S
231	Pickersgill Is		790	1989	P.A. Prince, pers. comm.
					Only eastern colonies surveyed.
	South Georgia (total)	8	6000 (A3)	(25)	

CHINSTRAP PENGUINS IN SOUTH AMERICA (MAP 8)

232 Isla Hornos
55°55'S 67°15'W 1 1000 (A5) 1978 (114)
G. S. Clark (pers. comm.) was unable to find this colony in 1984.

Gentoo Penguin *Pygoscelis papua*

The breeding distribution of Gentoo Penguins is circum-polar on the Subantarctic islands and the Antarctic Peninsula. The Gentoo Penguin is the least abundant of the pygoscelid penguins with a minimum breeding population of 298 000 pairs (Table 1). Greater accuracy of surveys and better coverage of breeding localities, rather than population increases, are responsible for the revision from Wilson's estimate of approximately 280 000 pairs. Recent surveys of Gentoo Penguin populations have been undertaken at the Prince Edward Islands (Adams & Wilson 1987), Iles Crozet (Jouventin & Weimerskirch 1990), Iles Kerguelen (Weimerskirch *et al.* 1989), Heard Island (Woehler 1991), Macquarie Island (Robertson 1986) and the Antarctic Peninsula (Poncet & Poncet 1987). However, only estimates of the populations are available for the South Sandwich Islands, South Georgia and the Falkland Islands.

Most published data indicate essentially stable population sizes which fluctuate substantially from year to year. Major concentrations of Gentoo Penguins are found at South Georgia (100 000 pairs), the Falkland Islands (70 000 pairs) and Iles Kerguelen (30 000 pairs). Monitoring of Gentoo Penguins is presently confined to South Georgia, the Antarctic Peninsula and Ile de la Possession (Anon. 1989 and Appendix 2).

GENTOO PENGUINS ON THE PRINCE EDWARD ISLANDS (MAP 10)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
1	Marion I			1300 (A1- A3)	1974-7	(124)	
				888	1984	(1)	
2	Prince Edward I			200 (A1-3)	1974-7	(124)	
			14	655	1984	(1)	

GENTOO PENGUINS ON THE ILES CROZET (MAP 10)

3	Ile de la Possession	11	2000	(A5)	1970	(29)	VS,S
				2000 (A3)	1972	(59)	
				1400			
				-1450 (A3)	1986	(59)	
				850 (A3)	1987	(59)	
4	Ile de l'Est	7	>1000	(A5)	1981/2	(58)	VS,S
5	Ile aux Cochons		9	2500	1974	(28)	VS,S
				-3000 (A5)			
			9	2430 (A4)	1982	(117)	

GENTOO PENGUINS ON THE ILES KERGUELEN (MAP 10)

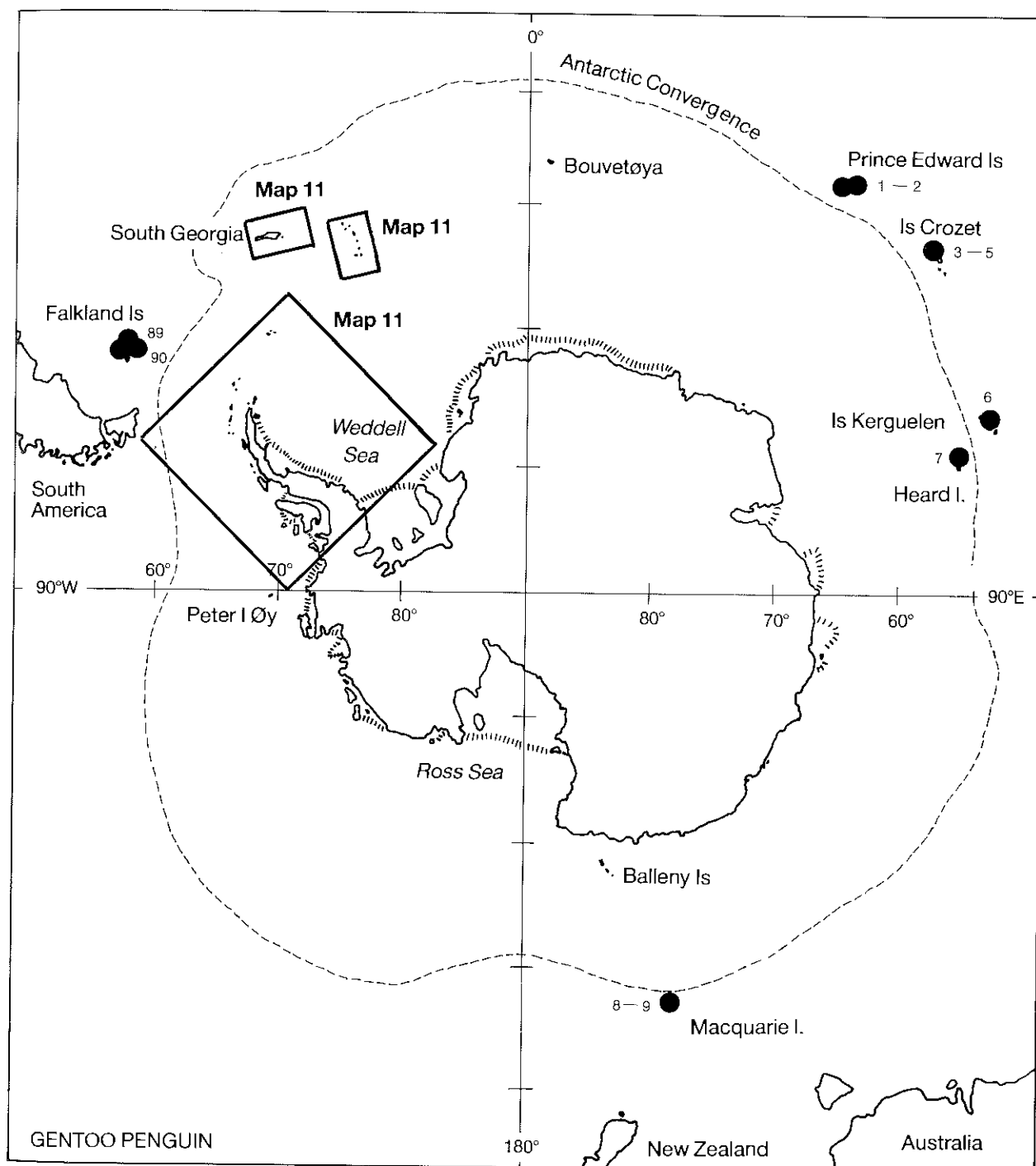
6	Iles Kerguelen			30000			
				-40000 (A4)	1985	(122)	VS, S, M

GENTOO PENGUINS ON HEARD ISLAND (MAP 10)

7	Heard I						
	53°05'S	73°30'E	16	16574 (N1)	1987	(128)	Possible increase 1953-87.

GENTOO PENGUINS ON MACQUARIE ISLAND (MAP 10)

8	Macquarie I		53	4700 (N1)	1984	(87)	
9	Bishop and Clerk Is				1965	(48)	Few amongst Royal Penguins: unlikely to breed.



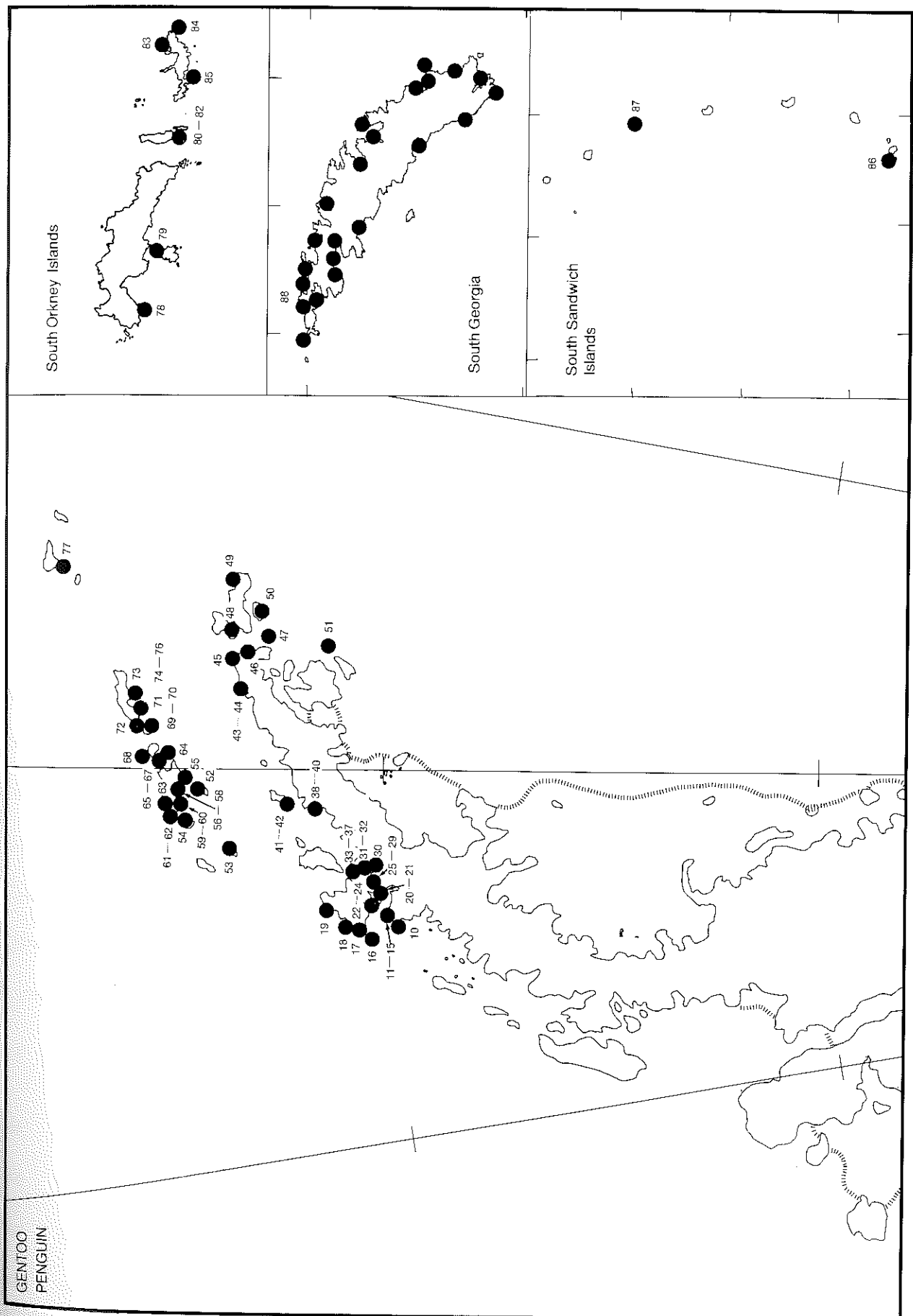
Map 10. The breeding distribution of Gentoo Penguins.

GENTOO PENGUINS ON THE ANTARCTIC PENINSULA (MAP 11)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
Wilhelm Archipelago							
10	Petermann I						
	65°11'S	64°10'W	1	400 (N1)	1982	(79)	M.L. Tasker, pers. comm.
				755 (N3)	1988		
11	Pléneau I						
	65°06'S	64°05'W	1	500 (N1)	1982	(79)	
12	Glandaz Point						
	65°05'S	63°58'W	1	100 (N1)	1982	(79)	

GENTOO PENGUINS ON THE ANTARCTIC PENINSULA (MAP 11) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
13	Port Charcot, Booth I 65°04'S	64°03'W	1	1500 1909 -2000 (A4)	(23)		
			1	400 (N1)	1983	(79)	
14	Loubat Point 65°03'S	63°55'W	1	250 (N1)	1983	(79)	
15	Humphries Heights 65°03'S	63°54'W	1	50 (N1)	1983	(79)	
Anvers I	64°30'S	64°00'W	6	>2000 (N1,A3, C1,B)	1914, (23) 1953,1975, 1979		VS,S includes nearby islands
16	Joubin Is 64°46'S	64°22'W	1	100 (C1) 61 (N1) 104 (N1)	1987 (79) 1984 (75) 1990		S. & J. Poncet, pers. comm.
17	Point south of Gerlache I 64°39'S	64°16'W	1	3000 (C3)	1987	(79)	
18	Gerlache I 64°36'S	64°15'W	1	1500 (N1)	1985	(79)	
19	Quinton Point 64°21'S	63°41'W	1	50 (N1) 42 (N1) 90 (N1)	1983 (79) 1983 (75) 1990		S. & J. Poncet, pers. comm.
Gerlache Strait south							
20	Truant I 64°55'S	63°26'W	2	1000 (C1, N3/4)	1987	(79)	
21	Pursuit Point 64°54'S	63°27'W	1	200 (N3/4)	1987	(79)	
22	Doumer I 64°53'S	63°36'W	3	1500 (N1)	1983	(79)	
23	Port Lockroy 64°50'S	63°31'W	2 2	1000 (C1) 1616 (N1)	1984 (79) 1988		S. & J. Poncet, pers. comm.
24	Damoy Point 64°49'S	63°31'W	1	900 (C1) 1663 (N3) 1658 (N1)	1987 (79) 1988 1990		M.L. Tasker, pers. comm. S. & J. Poncet, pers. comm.
25	Bryde I south 64°54'S	62°57'W	1	500 (C1)	1987	(79)	
26	Bryde I east 64°53'S	62°57'W	1	240 (N1)	1986	(79)	
27	Bryde I north 64°51'S	63°05'W	1	150 (N3)	1989		S. & J. Poncet, pers. comm.
28	'Nameless I' 64°49'S	63°06'W	1	100 (N1)	1988		S. & J. Poncet, pers. comm.
29	Waterboat Point 64°49'S	62°52'W	2	750 (C1)	1986	(79)	
30	Neko Harbour 64°51'S	62°32'W	1	250 (C1)	1987	(79)	



Map 11. The breeding distribution of Gentoo Penguins in the Antarctic Peninsula.

GENTOO PENGUINS ON THE ANTARCTIC PENINSULA (MAP 11) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
31	Beneden Head 64°46'S	62°42'W	3	500 (C1,C3)	1986	(79)	
32	Danco I 64°44'S	62°36'W	1	800 (C1)	1986	(79)	
33	Useful I 64°43'S	62°52'W	2	150 (N3/4)	1984	(79)	
34	Ketley Point, Rongé I 64°43'S	62°46'W	1	200 (N4/5)	1986	(79)	
35	Georges Pt, Rongé I 64°40'S	62°39'W	1	1100 (N1)	1988		S. & J. Poncet, pers. comm.
36	Rongé I east 64°41'S	62°39'W	1	214 (N1)	1988		S. & J. Poncet, pers. comm.
37	Cuvertville I 64°41'S	62°38'W	2 1	3700 (C3) 3200 (N1)	1986 1988	(79)	S. & J. Poncet, pers. comm.
Gerlache Strait north							
38	Charles Point 64°13'S	61°00'W	1	130 (N3)	1987	(79)	
39	Sterneck I 64°11'S	61°03'W	1	450 (N1)	1987	(79)	
40	Cape Spring 64°09'S	60°58'W	1	600 (N1)	1984	(79)	
Trinity I							
41	Skottsberg Point 63°55'S	60°49'W	1	300 (N3)	1987	(79)	
42	Mikkelsen Harbour 63°54'S	60°48'W	1	300 (N3/4)	1984	(79)	
Trinity Peninsula							
43	Cape Legoupil south 63°20'S	57°54'W	1	6 (N1)	1990		S. & J. Poncet, pers. comm. May have been previously referred to as Mt Jacquinot
44	Duroch Is 63°19'S	57°55'W		3500 (N4)	1990		S. & J. Poncet, pers. comm.
45	Gourdin Is 63°13'S	57°17'S	1	50 (N3)	1969	(23)	
46	Hope Bay 63°23'S	57°00'W	1	86 (N1)	1963	(23)	
47	Jonassen I 63°32'S	56°42'W	1	20 (N4)	1901	(23)	
Joinville Is							
48	Bransfield I 63°10'S	56°36'W	1	800 (N4)	1960	(23)	
49	Patella I 63°07'S	55°29'W	1	200 (N4) few	1960 1978	(23) (32)	
50	Dundee I 63°27'S	56°12'W	1	S	1948	(23)	

GENTOO PENGUINS ON THE ANTARCTIC PENINSULA (MAP 11) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
51	Seymour I 64°18'S	58°45'W		Nil	1985	(23) (73)	Status uncertain A. Myrcha, pers. comm. Note, an error occurred in translation of (73).
52	Deception I 62°55'S	60°35'W	1	B Nil	1952/3	(23)	No breeding: S. & J. Poncet, (pers. comm.)
Low I							
53	Cape Wallace 63°13'S	62°11'W	1	250 (N4)	1987	(98)	
Snow I							
54	Cape Conway 62°50'S	61°26'W	1	150 (N4)	1987	(98)	
Livingston I							
55	Barnard Pt 62°45'S	60°20'W	2	600 (N1)	1987		S. & J. Poncet, pers. comm.
56	Hannah Pt 62°39'S	60°36'W	2	1016 (N1)	1987		S. & J. Poncet, pers. comm.
57a	Hurd Peninsula east 62°42'S	60°22'W	1	100 (N3)	1987		S. & J. Poncet, pers. comm.
57b	Hurd Peninsula west 62°42'S	60°25'W	1	10 (N4)	1987		S. & J. Poncet, pers. comm.
58	Johnson's Dock 62°39'S	60°23'W	1	66 (N1)	1987		S. & J. Poncet, pers. comm.
59	Elephant Pt 62°41'S	60°52'W	2	400 (N4)	1958	(23)	
60	Stackpole Rocks 62°41'S	60°58'W	1	4 (N1)	1965	(23)	
61	Devil's Pt 62°40'S	61°13'W	2	750 (N3)	1965	(23)	
62	Robbery Beaches 62°36'S	61°00'W	2	900 (N3)	1965	(23)	
63	Cape Shirreff 62°28'S	60°48'W	1	300 (N4)	1987	(98)	
64	Greenwich I 62°30'S	59°45'W	6	4943 (N3 N4,B)	1952, 1966	(23)	VS-M includes nearby islands
65	Yankee Harbour 62°32'S	59°47'W		4000 (N3/4)	1990		S. & J. Poncet, pers. comm.
66	Triangle Pt 62°31'S	59°51'W	1	45 (N3)	1966	(23)	
67	Dee I 62°26'S	59°47'W		B	1966	(23)	
68	Aitcho Is 62°24'S	59°46'W	1	314 (N3)	1966	(23)	
Nelson I							
	62°18'S	59°10'W	2	>1642 (N1,B)	1966	(23)	

GENTOO PENGUINS ON THE ANTARCTIC PENINSULA (MAP 11) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
69	Duthoit Pt 62°18'S	58°50'W	1	400 (A3)	1987	(98)	
70	north of Duthoit Pt 62°17'S	58°51'W	1	450 (A3)	1987	(98)	
71	King George I 62°10'S	58°30'W	7-8	5944 (N1, N3,N4) N4,B)	1966, 1971, 1977-9 1966	(7,23, 125)	VS-M
72	Ardley I 62°13'S	58°56'W	25	3809 (N1-3) 1656 3105 3410 (N1)	1980 1983 1984 1986/7	(54) (132) (77)	J. Valencia, pers. comm.
73	Lions Rump 62°08'S	58°08'W		1105 (N1)	1987	(98)	
74	Point Thomas 62°10'S	58°29'W	14	623 (N1)	1987	(98)	
75	Llano Pt 62°11'S	58°27'W	34	1510 (N1)	1987	(98)	
76	Stranger Point 62°16'S	58°37'W	26	2584 (N1-3)	1987	(98)	
77	Elephant I 61°10'S	55°00'W	8	2600 (N1-5)	1970/1	(23)	VS,S

GENTOO PENGUINS ON THE SOUTH ORKNEY ISLANDS (MAP 11)

	Coronation I 60°40'S	46°00'W	1	320 (N3)	1956	(23)	
78	Gosling Is 60°38'S	45°55'W	1	2185 (N1)	1983	(78)	
	Signy I						
79	North Pt 60°40'S	45°38'W	1	378 (N1)	1978	(89)	
	Powell I 60°44'S	45°02'W	2	600 (A3,B) -750	1957, 1965	(23)	
80	South end 60°43'S	45°00'W	1	4322 (N1)	1983	(78)	
81	Michelsen I 60°43'S	45°00'W	1	2175 (N1)	1983	(78)	
82	Christoffersen I 60°43'S	45°00'W	1	810 (N1)	1983	(78)	
	Laurie I 60°45'S	44°30'W	4 2	(B) 430 (A3)	1903 1947	(23) (23)	
83	Watson Peninsula 60°40'S	44°31'W	1	70 (N1)	1983	(78)	
84	Ferrier Peninsula 60°43'S	44°24'W	1	1000 (N1)	1947	(23)	

GENTOO PENGUINS ON THE SOUTH ORKNEY ISLANDS (MAP 11) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
85	Port Martin						
	60°46'S	44°41'W	1	B	1903	(23)	Large colony
	South Orkney Is (total)		5	10940 (N1,N3/4)		(78)	

GENTOO PENGUINS ON THE SOUTH SANDWICH ISLANDS (MAP 11)

86	Thule I						
	59°28'S	27°20'W	1	64 (A1)	1966	(125)	
				700 (A1)	1979	(125)	
87	Candlemas I						
	57°05'S	26°40'W	1	275 (A3)	1964	(125)	
	Zavodovski I			B		(125)	
	Saunders I			B		(125)	
	Visokoi I			B		(125)	
	Bristol I			B		(125)	
	South Sandwich Is (total)		6	2000 (A3)		(25)	

GENTOO PENGUINS ON SOUTH GEORGIA (MAP 11)

88	South Georgia		180	83000			
				-100000 (A4)	1982	(25,59)	
			262	98600	1986		P.A. Prince, pers. comm.

GENTOO PENGUINS ON THE FALKLAND ISLANDS (MAP 10)

89	Falkland Is			99360	late 1960s		I. J. Strange, unpublished data
			86	108000		(24)	
				-121000 (A4)			
				70000			
				-100000		(110)	
90	Beauchêne I						
	52°45'S	59°09'W		525 (A3)	1980	(99)	

GENTOO PENGUINS IN SOUTH AMERICA

G. S. Clark (pers. comm.) found no evidence of breeding in the Cape Horn region in 1984.

Macaroni Penguin *Eudyptes chrysolophus*

The Macaroni Penguin is the most abundant of the Antarctic and Subantarctic penguins, with a minimum breeding population of 11.8 million pairs on the Subantarctic islands in the Indian and South Atlantic Oceans and the Antarctic Peninsula (Table 1). Recent surveys have revised local populations upwards from Wilson's under-estimate of approximately 8 million pairs. The major concentrations of Macaroni Penguins are South Georgia (5.4 million pairs), Iles Crozet (2.2 million pairs) and Iles Kerguelen (1.8 million pairs), with 1 million pairs each at Heard Island and the McDonald Islands.

Few recent surveys have been undertaken of the smaller colonies in the Scotia arc, and many of these have not been surveyed since the 1960s and 1970s. Macaroni Penguins are being monitored at South Georgia, Ile de la Possession, Marion Island and at localities in the Antarctic Peninsula (Anon. 1989 and Appendix 2), and are included in the CCAMLR Ecosystem Monitoring Program (SC-CAMLR 1986, 1987, 1990).

There have been no published accounts of population increases. In view of this species' abundance, it is crucial to obtain better estimates of the sizes of breeding populations, particularly at the major breeding localities.

MACARONI PENGUINS ON BOUVETØYA (MAP 12)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
1	Bouvetøya		6	100000 (A1 -A3)	1978/9	(120)	
				≥3000 (A3)	1981	(6)	Nyrøysa (Westvindstranda) only.
			≥1	5900 adults	1989/90	(6)	Nyrøysa (Westvindstranda) only. Another 53525 adults (Chinstrap & Macaroni) present around shores.

MACARONI PENGUINS ON THE PRINCE EDWARD ISLANDS (MAP 12)

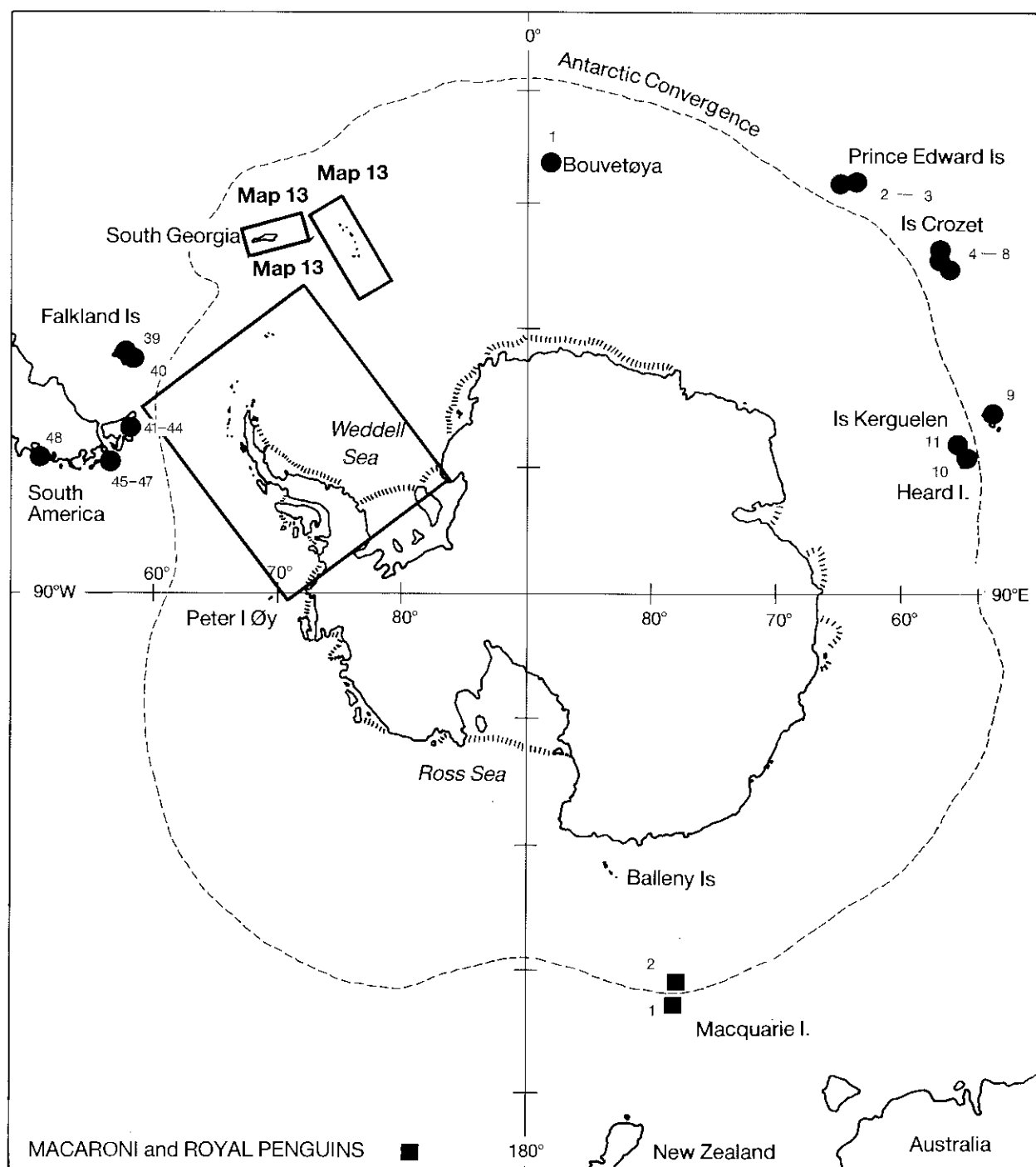
2	Marion I			450000 (A1 -A3)	1974-7	(124)	
			33	405084 (A3)	1983	(10,11,121)	
3	Prince Edward I		3	17000 (A1 -A3)	1974-7	(11,121)	

MACARONI PENGUINS ON THE ILES CROZET (MAP 12)

4	Ile de Possession		12	>400000	1981/2	(58)	
5	Ile de l'Est		12- 14	113000	1970/1	(30,125, 81)	M-VL
				>400000	1981/2	(58)	
6	Ile aux Cochons		20	272000	1974	(28)	VS-VL
				272000 (A4)	1982	(117)	
7	Ile des Apôtres			>100000	1981/2	(58)	
8	Ile des Pingouins			1000000	1981/2	(58)	More recent survey in 1986, (Dreux <i>et al.</i> 1988), results not yet available.

MACARONI PENGUINS ON THE ILES KERGUELEN (MAP 12)

9	Iles Kerguelen		41	1812000 (A4)	1985	(122)	
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Map 12. The breeding distribution of Macaroni and Royal Penguins.

MACARONI PENGUINS ON HEARD ISLAND (MAP 12)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
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10	Heard I			1000000 (A4)	1987	(128)	
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MACARONI PENGUINS ON THE McDONALD ISLANDS (MAP 12)

11	McDonald Is			1000000 (A4)	1980	(128)	
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MACARONI PENGUINS ON THE ANTARCTIC PENINSULA (MAP 13)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
12	Hope Bay 63°24'S	57°00'W				(23)	Breeding report apparently in error. None seen by Mougin in 1979.

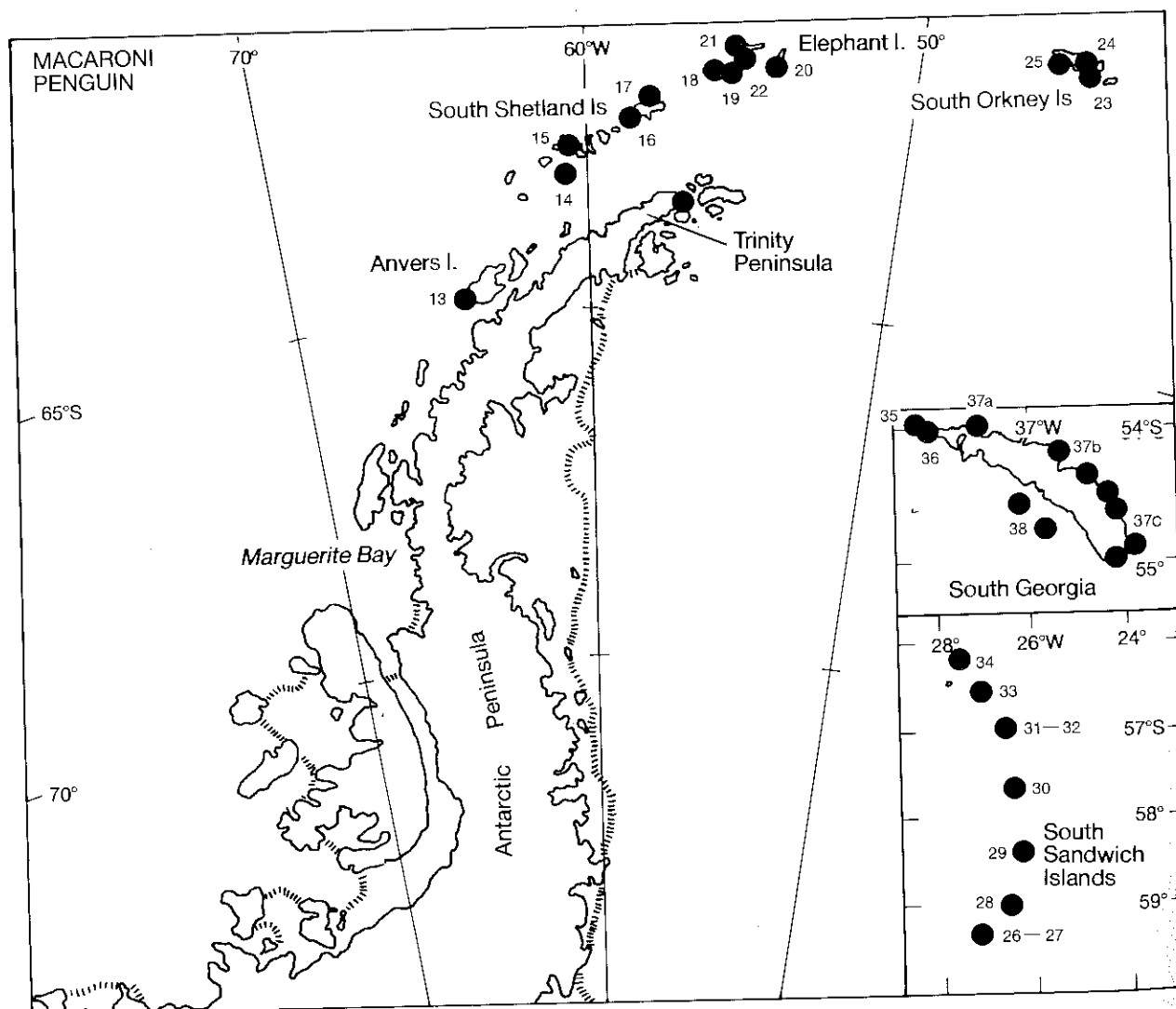
13	Humble I 60°46'S	64°06'W	1	1 (N1)	1985	(75)	
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MACARONI PENGUINS ON THE SOUTH SHETLAND ISLANDS (MAP 13)

14	Deception I 62°55'S	60°35'W	2-3	133 (N1, N3,B)	1909, 1957/8	(23)	VS,S
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Livingston I

15	Hannah Pt 62°39'S	60°37'W	1	8 (N1)	1987		S. & J. Poncet, pers. comm.
16	King George & Nelson Is 62°15'S	59°15'W	1-2	2 (B)	1976	(23)	



Map 13. The breeding distribution of Macaroni Penguins in the Antarctic Peninsula.

MACARONI PENGUINS ON THE SOUTH SHETLAND ISLANDS (MAP 13) continued

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
17	Ridley I						
	61°51'S	58°00'W	1	1 (N1)	1980	(54)	
18	Aspland I						
	61°30'S	50°55'W	1	21 (N1)	1977	(23)	
19	Gibbs I						
	61°30'S	55°30'W	2	1672 (N3-4)	1977	(23)	VS-M
20	Clarence I						
	61°10'S	54°00'W	5	4142 (N1-4)	1977	(23)	VS-M
21	Seal I						
	60°55'S	55°23'W	1	>50 (N4) 194 (C1)	1970 1989	(23)	J. L. Bengtson, pers. comm.
22	Elephant I						
	61°10'S	55°00'W	8	1159 (N1-5)	1971	(23)	VS, S other colonies suspected
			1	125 (A1)	1987	(97)	
	Elephant Island (total)		19	7080 (A4)		(25)	

MACARONI PENGUINS ON THE SOUTH ORKNEY ISLANDS (MAP 13)

23	Michelsen I						
	60°43'S	45°00'W	1	6 (N1)	1983	(78)	
24	Mathews I						
	60°44'S	45°10'W	1	1 (N1)	1970	(23)	
25	Signy I						
	60°40'S	45°38'W	4	11 (N1)	1979	(27)	
	South Orkney Is (total)			<50			S. & J. Poncet, pers. comm.

MACARONI PENGUINS ON THE SOUTH SANDWICH ISLANDS (MAP 13)

26	Thule I			few	1964	(125)	
27	Bellingshausen I			100	1964	(125)	
28	Bristol I			few	1964	(125)	
29	Montagu I			few	1964	(125)	
30	Saunders I		3	75-150	1964	(125)	
31	Vindication I			50-100	1964	(125)	
32	Candlemas I			30 (A4)	1964	(125)	
33	Visokoi I			few	1964	(125)	
34	Zavodovski I			few	1981	(125)	
	South Sandwich Is (total)	9		3000 (A4)		(25)	

MACARONI PENGUINS ON SOUTH GEORGIA (MAP 13)

35	Willis Is		c.20	5000000	1977	(26)	
36	Bird I		3	175000 (A2,A5)	1977	(26)	
37a	Mainland western peninsula		21	5000 (A5)	1977	(26)	M,L
37b	NE Coast		13	130000 (A5)	1977	(26)	M,L
37c	S Coast		17	90000 (A5)	1977	(26)	
38	Islands off SW Coast		6	30000 (A5)	1977	(26)	M,L
	South Georgia (total)	61		5400000 (A4)		(25)	

MACARONI PENGUINS ON THE FALKLAND ISLANDS (MAP 12)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
39	Falkland Is		≥9	50 (A4)		(24)	
40	Beauchêne I						
	52°45'S	59°09'W		16 (A2)	1980	(99)	

MACARONI PENGUINS IN SOUTH AMERICA (MAP 12)

41	Diego Ramirez Is						
	56°30'S	68°52'W		10000 (A4)			
				9246 (A4)	1980/1	(95)	
42	Isla Hornos						
	55°59'S	67°15'W		3 (A3)	1984	(14)	
43	Barnevelt Island						
	55°49'S	66°46'W		54 (A3)	1984	(14)	
44	Ildefonso Group						
	55°50'S	69°15'W		several thousand (A5)	1984	(14)	
45	Isla Noir			B	1983	(15)	
	54°30'S	73°02'W		25000			
				?12500 (A5)	1984	(15)	
46	Isla Recalada						
	53°30'S	74°10'W		small colonies			
47	Isla Desolacion						
	53°00'S	74°00'W		small colonies			
48	Isla Bueneventura						
	50°45'S	75°09'W		50 (A4)	1984	(15)	
	Chile region (total)			75000 (A5)		(125)	

Royal Penguin *Eudyptes schlegeli*

The Royal Penguin is treated here as a separate species from the Macaroni Penguin, following the Handbook of Australian, New Zealand and Antarctic Birds (1990). It is confined to Macquarie Island and the offshore islets. A ground survey of the colonies on Macquarie Island was undertaken in 1984/85, but Bishop and Clerk Islets have not been surveyed since 1976. The estimated breeding population is 848 700 pairs on Macquarie Island (Table 1). It is hoped to repeat the Macquarie Island survey at regular intervals (Copson & Rounsevell 1987).

ROYAL PENGUINS ON MACQUARIE ISLAND (MAP 12)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
1	Macquarie I		46	1000000		(118,13,48)	
			57	848719 (N1-4)	1984/5	(19)	
2	Bishop & Clerk Is		2	1000 (A4)	1976	(69)	

Rockhopper Penguin *Eudyptes chrysocome*

Although Jouventin (1982) suggested that Rockhopper Penguins could be separated into two species, the Northern, *E. moseleyi* and Southern, *E. chrysocome*, Rockhopper Penguins, this has not been done here because the taxonomic status of some island populations is not clear.

The minimum breeding population of Rockhopper Penguins is 3.67 million pairs (Table 1), considerably fewer than the 6.75 million pairs estimated by Wilson (1983). The difference between these data is due to the recent census data which are more accurate than the initial estimates of abundance. However, it should be noted that a real decrease of Rockhopper Penguins at Campbell Island was documented by Moors (1986); decreases have also been reported at Iles Amsterdam and Saint-Paul (H. Weimerskirch, pers. comm.), and may have occurred at Nightingale Island, Tristan da Cunha group, though it is possible that this simply reflects a greater accuracy in the more recent estimate. The major breeding concentration is at the Falkland Islands (1 million pairs), with smaller numbers at Gough Island (144 000 pairs) Tristan da Cunha and Marion Island (137 000 pairs each) and southern South America (100 000 pairs).

Monitoring is undertaken at Ile de la Possession, Campbell Island, Gough Island and Marion Island (Anon. 1989 and Appendix 2). Recent population data are absent from Prince Edward Island, some of the Iles Crozet, Heard and McDonald Islands, Macquarie Island, Auckland and Antipodes Islands and Staten Island. Rockhopper Penguins remain the Antarctic penguin species about which we know the least in terms of population numbers and probable changes.

ROCKHOPPER PENGUINS ON THE TRISTAN DA CUNHA GROUP (MAP 14)

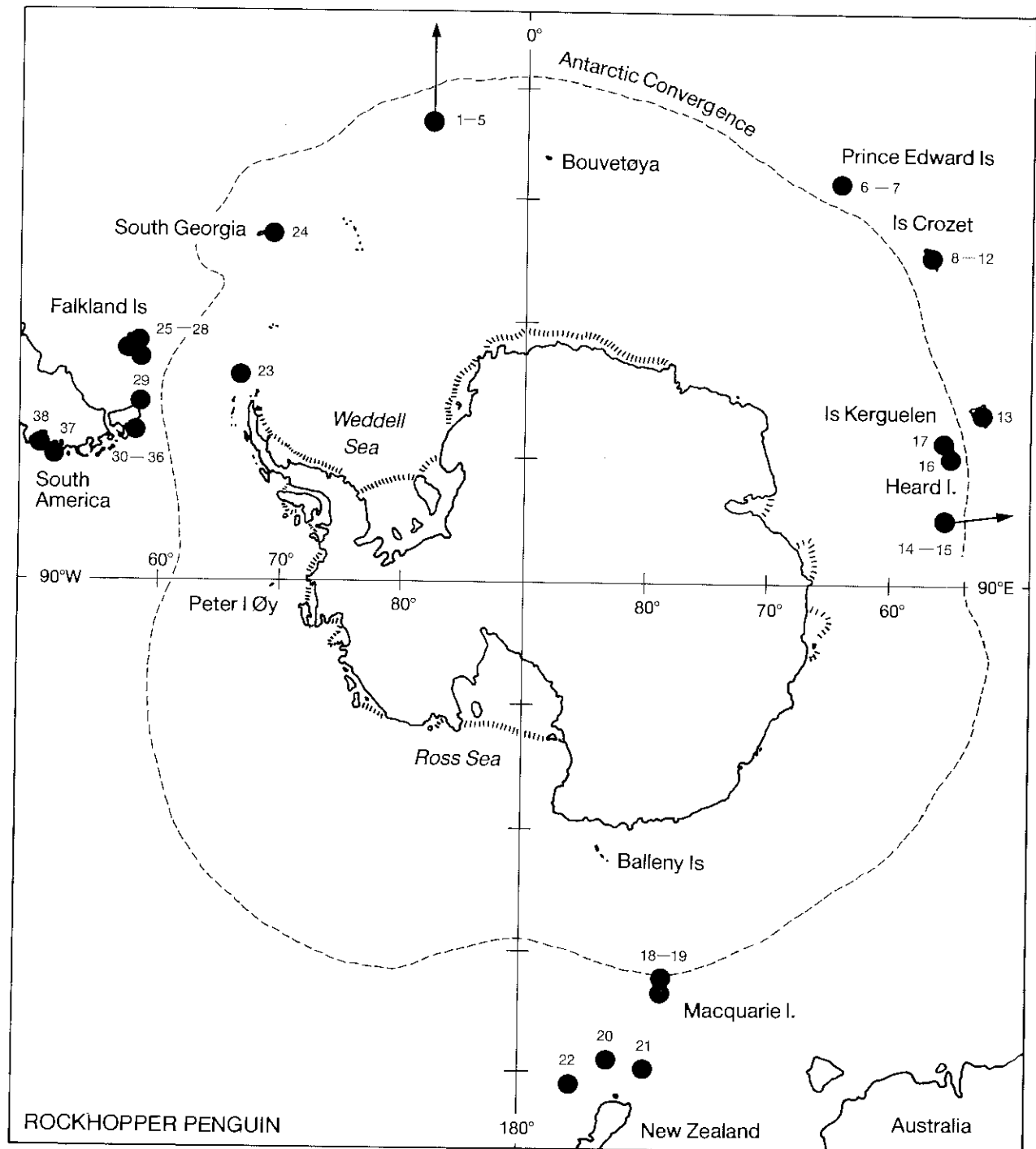
Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
1	Tristan I		9	5000 (A5) 7002 (N1-A4)	1952 1973	(33) (85)	
2	Nightingale I		1	250000 (A5) 25000 (N5)	1952 1973	(33) (85)	
3	Middle Island			100000 (N5)	1973	(85)	
4	Inaccessible I			25000 (A5)	1952	(33)	
	37°15'S	12°30'E		5000 -10000 (A5)	1982-7	(36)	Accurate counts, rather than decrease.
				17000	1988	(92)	
				-27000 (A4)			

ROCKHOPPER PENGUINS ON GOUGH ISLAND (MAP 14)

5	Gough Island			144235 (N3)	1984	(121)	
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ROCKHOPPER PENGUINS ON THE PRINCE EDWARD ISLANDS (MAP 14)

6	Marion I			93290 (A1-3) 137652 (A3)	1974-7 1987	(124)	FitzPatrick Institute, unpubl. data. Note that data in Brown (1989) [11] are incorrect.
7	Prince Edward I			35000 (A1-3)	1974-7	(124)	



Map 14. The breeding distribution of Rockhopper Penguins.

ROCKHOPPER PENGUINS ON THE ILES CROZET (MAP 14)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
8	Ile de la Possession		8	60000	1970/1	(30)	
9	Ile de l'Est		11	46500	1970/1	(30)	S-VL
10	Ile aux Cochons		20+	51000	1974	(28)	VS-L
				46000 (A4)	1982	(117)	
11	Iles des Apôtres			B	1974/5	(125)	Not numerous
12	Ile des Pingouins			300	1981/2	(58)	

ROCKHOPPER PENGUINS ON THE ILES KERGUELEN (MAP 14)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
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13	Iles Kerguelen			85500 (A2)	1985	(122)	
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ROCKHOPPER PENGUINS ON ILE AMSTERDAM & ILE SAINT-PAUL (MAP 14)

14	Ile Amsterdam		4	50000 (A5)	1969-71	(58,96)	
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			4	-100000	1981/2		
--	--	--	---	---------	--------	--	--

			4	100000	1969/70		
--	--	--	---	--------	---------	--	--

				11070			
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			4	50000	1981/2	(58)	
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B. Tollu, unpublished data.
H. Weimerskirch, pers.
comm.

15	Ile Saint-Paul		3	5000 (A5)	1970/1	(58,96)	
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				-10000	1981/2		
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			3	10000	1969/70		
--	--	--	---	-------	---------	--	--

				2050			
--	--	--	--	------	--	--	--

			3	5000	1981/2	(58)	
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B. Tollu, unpublished data.
H. Weimerskirch, pers.
comm.

ROCKHOPPER PENGUINS ON HEARD ISLAND (MAP 14)

16	Heard I		12	hundreds	1950	(31)	
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				>10000 (A5)	1987	(128)	
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Order of magnitude
estimate only.

17	McDonald Is		4	91 adults	1980	(48)	
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				(A1,C1) & 10 chicks			
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				>10 (A4)	1980	(128)	
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Order of magnitude
estimate only.

ROCKHOPPER PENGUINS ON MACQUARIE ISLAND (MAP 14)

18	Macquarie I			>100000 (A5)		(90)	
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			23	100000			
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				-300000 (A5)			
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D. E. Rounsevell, pers.
comm.

19	Bishop & Clerk Is		2	20 (C3)	1976	(69)	
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ROCKHOPPER PENGUINS ON CAMPBELL ISLAND (MAP 14)

20	Campbell I			51500 (A2)	1986	(72)	
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P. J. Moors, pers. comm.
Population decreased since
1940s by 94%.

ROCKHOPPER PENGUINS ON THE AUCKLAND ISLANDS (MAP 14)

21	Auckland Is		12	5000			
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				-10000 (A5)	1972	(9)	
--	--	--	--	-------------	------	-----	--

ROCKHOPPER PENGUINS ON THE ANTIPODES ISLANDS (MAP 14)

22	Antipodes Is		86	50000 (A4)	1978	(125)	
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ROCKHOPPER PENGUINS ON ELEPHANT AND CLARENCE ISLANDS (MAP 14)

23	Clarence I						
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	61°10'S	53°00'W	1	1 (A1)	1976/7	(23)	
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ROCKHOPPER PENGUINS ON SOUTH GEORGIA (MAP 14)

24	South Georgia		2	2 (N1)		(25)	
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Sporadic breeder
(J. P. Croxall, pers. comm.).

ROCKHOPPER PENGUINS ON THE FALKLAND ISLANDS (MAP 14)

Locality	Latitude	Longitude	No Cols	Total Population (pairs)	Date	Refs	Remarks
25	Beauchêne I						
	52°45'S	59°09'W		300000 (N4)	1980	(99)	
26	Jason Is						
	51°05'S	61°10'W		<1500000 (A5)		(24)	
27	Steeple Jason I						
	51°02'S	61°14'W		190000		(111)	
28	Falkland Is		86	2500000 (A4)		(24)	
				540000			
				-700000		(110)	

ROCKHOPPER PENGUINS IN SOUTH AMERICA (MAP 14)

29	Staten I						
	54°40'S	64°30'W		100-1000 (N4)	1988		H. Le Goff, pers. comm. to S. & J. Poncet
30	Diego Ramirez Is						
	56°30'S	68°52'W		60000 (A5)			
				56369 (A2)	1980/1		R. P. Schlatter and G. M. Riveros, unpubl. report
31	Isla Hornos						
	55°50'S	67°15'W		600 (A3)	1984		G. S. Clark, pers. comm..
32	Barnevelt I						
	55°49'ß	66°46'W		10800 (A5)	1984		G. S. Clark, pers. comm.
33	Terhalten I			3000 (A5)	1984		G. S. Clark, pers. comm.
34	Cathedral Rocks			B			G. S. Clark, pers. comm.
35	Ildefonso Group						
	55°50'S	69°15'W		100000 (A5)	1984		G. S. Clark, pers. comm
36	Hall I			500 (A3)	1984		G. S. Clark, pers. comm.
37	Isla Buenaventura						
	50°45'S	75°09'W		500 (A4)	1984	(15)	
38	Isla Solitario						
	47°42'S	75°42'W		6 (C1)	1984	(15)	
	Chile region (total)			75000 (A5)		(56,94, 95,115)	
				175000 (A5)	1984		G.S. Clark, pers. comm.

Conclusions

Current Applications

Our knowledge of the distribution and abundance of the eight species of penguins treated in this update is now greatly improved and more detailed than the original synthesis, due to major improvements in both the coverage and accuracy of surveys. Census data have been collected from regions not previously visited and from colonies not previously reported, supplementing the increasing body of data from the more frequented areas of the Antarctic and Subantarctic.

We can, therefore, present new estimates of minimum breeding populations (Table 1), which are considerably more accurate and comprehensive than those in the earlier synthesis and a major advance on estimates of only 10 or so years ago (Laws 1977, Croxall 1984). The estimates in Table 1 are of both total world breeding populations and total breeding populations within the CCAMLR area (that is, the Southern Ocean north to the Antarctic Polar Front), the principal management unit in the region. Of the estimated 272 515 tonnes of total penguin biomass, (Table 1), approximately 90%, or some 245 902 tonnes are found within the CCAMLR area. All Emperor, Adélie and Chinstrap Penguins, and virtually all Macaroni Penguins breed within the area. Approximately 95% of King Penguins, 75% of Gentoo Penguins and 20% of Rockhopper Penguins, but no Royal Penguins, breed within the CCAMLR area.

It is important, however, to understand the limitations of the present data. On one hand, the estimates of world and CCAMLR populations of Emperor, King, Adélie and Royal Penguins are unlikely to be changed much by discoveries of new populations or better counts of existing populations. On the other hand, Chinstrap and Macaroni Penguin estimates may be significantly modified when reliable data are available for the South Sandwich Islands. Better data for South Georgia may significantly change estimates for Macaroni Penguins. Improved information from outside the CCAMLR area (especially from South America, the Falkland Islands and the Tristan da Cunha group) may materially affect estimates for Gentoo and Rockhopper Penguins.

Notwithstanding these problems, the present data are by far the best source available for estimates of Antarctic-wide, or regional, penguin numbers and biomass. In conjunction with data on diet, bio-energetics and foraging areas, the population data also have an important use in contributing to models, on various spatial scales, of predator-prey interactions. In particular, these models include relationships involving commercial resources, such as Antarctic Krill.

While this compilation should also be of great use as a source for locating more detailed information on penguin breeding sites and numbers, it is unlikely at present to provide adequate documentation of population changes, except in a few cases. Too many of the counts are either of unknown (or low) accuracy, or made at different times of the breeding season (for example, in relation to egg-laying) to be suitable for direct comparisons. Such comparisons, and interpretations based on them, should be undertaken with great caution.

Future Requirements

There are still many areas and localities for each species for which no data, no recent data or no accurate data exist. The main requirements, discussed in the introductory texts of each species, are summarised in Table 2. Some localities and sites have not been surveyed for several decades, and in some areas, stretches of the Antarctic coastline have never been examined. Localities for which there are no recent data include areas protected under the

Antarctic Treaty, and the need for current population data from these areas was indicated by Croxall (1987), who highlighted protected areas for which no quantitative data were available.

In the Antarctic, surveys are needed for Enderby Land, George V Land, Marie Byrd Land and parts of the Antarctic Peninsula and the associated islands. In the Subantarctic, the following islands/localities have not been recently surveyed, and should, at the earliest opportunity, be re-surveyed: Prince Edward Island, some of the smaller islands in the Iles Crozet, the Tristan da Cunha group, the Balleny Islands, some of the Subantarctic islands of the New Zealand region and the South Sandwich Islands (Table 2).

In future, the population data should be collected as soon as possible after egg laying has finished. Helpful data on counting and timing of laying for Adélie, Chinstrap and Macaroni Penguins are provided in SC-CAMLR (1991).

This publication has drawn together a very substantial amount of information to permit a realistic assessment of the current status of penguin stocks. It has also indicated the main gaps to be filled to complete this task. The complementary, and arguably more important task in view of the potential sensitivity of penguins to environmental perturbation (whether due to fishing, pollution or habitat modification), is to monitor the status of selected indicator populations of each species of Antarctic penguin. This synthesis makes accessible a considerable wealth of potential baseline data (though of varying levels of accuracy) but the fundamental need is for a regular long term commitment of resources at identified sites covering a broad geographical range.

The CCAMLR Ecosystem Monitoring Program (CEMP) has made very successful steps in this direction since the inauguration of its field programme in 1988, but so far only Adélie, Chinstrap and Macaroni Penguins are included. Some monitoring of population trends in the other five species is underway (Appendix 2), but this is less frequent and comprehensive than desirable. National programmes should review their existing activities to identify sites where accurate annual counts could readily be made.

Table 1. Minimum breeding populations (pairs) and biomass (kg) for the species covered in this update.

Species	Minimum breeding population (pairs)	Minimum estimated total biomass (kg)*	Estimated biomass in CCAMLR area **
Emperor Penguin	195 400	12 720 540	12 720 540
King Penguin	1 070 800	32 445 240	30 743 900
Adélie Penguin	2 465 800	21 700 800	21 700 800
Chinstrap Penguin	7 490 200	62 168 970	62 168 970
Gentoo Penguin	314 000	3 705 200	2 818 100
Macaroni Penguin	11 841 600	111 311 000	111 105 000
Royal Penguin	850 000	# 8 408 800	Nil
Rockhopper Penguin	3 687 600	19 175 500	3 765 850
Totals		272 514 900	245 902 010
*Mass data taken from Croxall (1984) except # from E. J. Woehler (unpublished data).			
**CCAMLR area excludes Iles Amsterdam and Saint-Paul, Macquarie Island and offshore islets, Auckland, Antipodes and the Snares Islands, all South American localities and the Falkland Islands.			

Table 2. Breeding localities identified as requiring current population census data.

Species	Breeding Localities
Emperor Penguin	Areas with no data (*) or no recent data: Lazarev Sea area*, Ongul Island*, Casey Bay*, Amundsen Bay*, Sandefjord Bay (1968), Karelin Bay (1958), Gaussberg (1960), Bowman Island (1960), Ninnis Glacier*, Wilson Hills (1959). Areas known to have large but poorly known populations: Gould Bay, Riiser-Larsen Peninsula, Cape Darnley, Penguin Island, Haswell Islands (SSSI 7) and the Shackleton Ice Shelf. Areas with small (little known) populations: Dion Islands SPA 8 (1978) and Inaccessible Island.
King Penguin	Areas with no data (*) or no recent data: Prince Edward Islands (1974 to 1977) and South Georgia (1985/86). Areas known to have large but poorly known populations: Some of the colonies on the Iles Crozet.
Adélie Penguin	Areas with no data (*) or no recent data: Novolazarevskaya Base area*, Prince Olav coast (1981), Alasheev Bight (1972), Casey Bay*, Gaussberg (1957), Haswell Islands SSSI 7 (1979), Davis Island (1960), Balaena Islands*, Chick Island (1960), Lewis Island (1960), Commonwealth Bay (1980-82), Cruzen Island (1977), Shepard Island (1977), Charcot Island (1977), Danger Island (1978), Beagle Island*, Darwin Island*, Nelson Island (1957/58), Gibbs Island (1971), Clarence Island (1976) and the South Sandwich Islands. Areas known to have large but poorly known populations: Jonassen Island and Joinville Island.
Chinstrap Penguin	Areas with no data (*) or no recent data: The Balleny Islands (1973), the Wideopen Islands (1978), a few colonies in the South Orkney Islands (1903 to 1983), parts of the South Shetland Islands (1971) and South Georgia (1972). Areas known to have large but poorly known populations: The South Sandwich Islands. Areas with small (little known) populations: Bouvetøya and parts of the Elephant Island Group.

Table 2. Breeding localities identified as requiring current population census data, continued.

Species	Breeding Localities
Gentoo Penguin	Areas with no data (*) or no recent data: Deception Island*, Elephant and Clarence Islands (1971), some colonies in the South Orkney (1903 to 1978) and South Shetland islands (1952 to 1979), and the South Sandwich Islands*. Areas known to have large but poorly known populations: Falkland Islands. Areas with small (little known) populations: Trinity Peninsula and Joinville Island.
Macaroni Penguin	Areas with no data (*) or no recent data: Prince Edward Island (1974 to 1977), South American localities* and most of the South Shetland Islands (1909 to 1977). Areas known to have large but poorly known populations: Bouvetøya, Heard Island and the McDonald Islands and South Georgia. Areas with small (little known) populations: The Falkland Islands, islands in the Elephant Island group, islands in the South Orkney Islands and the South Sandwich Islands.
Rockhopper Penguin	Areas with no data (*) or no recent data: Tristan da Cunha group (1973), Prince Edward Island (1974 to 1977), Iles Amsterdam and Saint-Paul (1982), Heard Island*, the Auckland Islands (1972) and the Antipodes Islands (1978). Areas known to have large but poorly known populations: Iles Crozet, Macquarie Island and the Falkland Islands. Areas with small (little known) populations: McDonald Islands.

Acknowledgements

D. G. Ainley, V. Bakken, K. J. Barton, J. L. Bengtson, G. S. Clark, J. Cooper, J. P. Croxall, L. Greenfield, P. Jouventin, G. L. Kooyman, F. Mehlum, P. J. Moors, A. Myrcha, G. G. Robertson, D. E. Rounsevell, M. L. Tasker, R. H. Taylor, B. W. Thomas, J. Valencia, M. D. Whitehead, K. J. Wilson and P. R. Wilson provided me with their unpublished, in press or published data. S. and J. Poncet greatly improved the presentation of the data from the Antarctic Peninsula with their valuable assistance.

D. G. Ainley, J. Cooper, J. P. Croxall, A. Myrcha, R. H. Taylor and H. Weimerskirch commented on earlier drafts. J. P. Croxall supervised the production of this update and the Australian Antarctic Division provided the facilities required to produce it. M. Jackson and J. Cox prepared the initial artwork, which was completed by R. Missing and A. Sylvester.

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Appendix 1

Geographical coordinates of some locations mentioned in the text.

Location	Latitude	Longitude
Ile Amsterdam & Ile Saint-Paul	37°50'S	77°31'E
Antipodes Is	49°41'S	178°48'E
Auckland Is	50°40'S	166°10'E
Balleny Is	67°00'S	163°15'E
Bishop & Clerk Islets	55°06'S	158°43'E
Bounty Is	47°41'S	179°03'E
Bouvetøya	54°25'S	03°22'E
Campbell I	52°33'S	169°05'E
Iles Crozet	46°25'S	51°50'E
Falkland Is	52°00'S	60°00'W
Gough I	43°00'S	10°00'W
Heard I	53°05'S	73°30'E
Iles Kerguelen	49°00'S	65°00'E
Macquarie I	54°40'S	158°55'E
McDonald Is	53°03'S	72°36'E
Peter 1 Øy	68°45'S	90°40'E
Prince Edward Is	46°50'S	37°45'E
Snares Is	48°00'S	166°34'E
South Georgia	54°00'S	37°00'W
Tristan da Cunha (group)	37°10'S	12°20'W

Appendix 2

Current status of Antarctic and Subantarctic seabird monitoring studies.

Species	Site	Nation	Start	Frequency	Counts		Method		Breeding Success
					Incubation	Rearing	Colony	Sample	
Emperor Penguin	Kloa	Australia	1957	frequent	x	x		x	
	Fold I	Australia	1956	frequent	x	x		x	
	Taylor Glacier	Australia	1954	frequent	x	x		x	
	Auster	Australia	1957	frequent	x	x		x	
	Pointe Geologie	France	1952	annual		x	x		x
King Penguin	Heard I	Australia	1962	c.5y		x		x	
	Ile de la Possession	France	1980	5y	x			x(photo)	
	Baie du Marin	France	1980	annual	x			x	x
	Marion I	South Africa	c.1984	annual	x	x		x	x
	Prince Edward I	South Africa	c.1984	c.5y		x		x	
Adélie Penguin	Stranger Point	Argentina	1987	annual	x	x			x
	Mosman Peninsula	Argentina	1987	annual	x			x	x
	Commonwealth Bay	Australia	c.1982	c.5y	x		x		
	Davis	Australia	1960	annual	x			x	
	Casey	Australia	1961	c.5y	x		x		
	Ardley I	Chile	1981	annual	x		x		
	Pointe Geologie	France	1983	3y	x		x		
	Syowa	Japan	1970	annual	x		x		
	West Ross Sea	New Zealand	various	1-2y	x	x			
	Cape Bird	New Zealand	1968	annual	x		x		x
	Cape Royd	New Zealand	c.1970	annual	x		x		x
	Cape Crozier	New Zealand		1-2y	x		x		
	Signy I	UK	1978	annual	x		x		x
	Palmer area	USA	c.1974	annual	x		x		some
	Point Thomas	USA/Poland	1977	annual	x		x		x

Appendix 2

Current status of Antarctic and Subantarctic seabird monitoring studies, continued.

Species	Site	Nation	Start	Frequency	Counts		Method		Breeding Success
					Incubation	Rearing	Colony	Sample	
Chinstrap Penguin									
	Elephant I	Brazil	1986	annual	x	x	x		?
	Ardley I	Chile	1981	annual	x		x		some
	Signy I	UK	1978	annual	x		x		x
	Point Thomas	USA/Poland	1977	annual	x		x		x
	Seal I	USA	1987	annual		x	x		some
Gentoo Penguin									
	Ardley I	Brazil	1986	annual	x	x	x		
	Ardley I	Chile	1981	annual	x		x		some
	Ile de la Possession	France	1978	annual	x		x		
	Signy I	UK	1978	annual	x		x		x
	Bird I	UK	1976	annual	x		x		x
	Point Thomas	USA/Poland	1977	annual	x		x		x
Macaroni Penguin									
	Elephant I	Brazil	1987	annual	x	x	x		x
	Isla Noir	Chile	1983	c.3y	x	x			
	Ile de la Possession	France	1980	5y	x		x(photo)		
	Marion I	South Africa	1980	annual	x	x	x		x
	Bird I	UK	1976	annual	x		x		x
Rockhopper Penguin									
	Ile de la Possession	France	1980	5y			x	x	
	Campbell I	New Zealand	1984	annual	x	x	x		x
	Gough I	South Africa	1982	annual	x		x		

Scientific Committee on Antarctic Research of the International Council of Scientific Unions.

SCAR, the Scientific Committee on Antarctic Research, is a committee of ICSU, the International Council of Scientific Unions, and it is charged with the initiation, promotion and co-ordination of scientific research in Antarctica.

SCAR is the single international, interdisciplinary, non-governmental organization which can draw on the experience and expertise of an international mix of scientists across the complete scientific spectrum. For over 30 years SCAR has provided such scientific advice to the Antarctic Treaty System and made numerous recommendations on a variety of matters, most of which have been incorporated into Antarctic Treaty instruments. Foremost amongst these have been the advice provided for the many international agreements which provide protection for the ecology and environment of Antarctica.

The membership of SCAR comprises the National Committees of those national scientific academies or research councils which are the adhering bodies to ICSU and which are, or plan to be, active in Antarctic research, together with the relevant scientific Unions of ICSU.

SCAR meets every two years to conduct its administrative business at the SCAR Delegates Meeting. At these meetings the members of SCAR, through their appointed Delegates, are responsible both for approving SCAR finances, and for formulating SCAR policy and strategy. The scientific business of SCAR is conducted by its Working Groups whose members are nationally appointed representatives. The Working Groups represent the scientific disciplines active in Antarctic research and they report to SCAR. The Working Group is the international forum for discussing national plans, progress and achievements in that particular discipline. Free and open discussions allow national scientific programmes to be internationally co-ordinated and may lead to proposals for international programmes to be developed.

Groups of Specialists are created by SCAR in response to specific scientific problems. Most Groups of Specialists have a limited life-span during which they will be expected to have completed their appointed task. A Group of Specialists may develop a programme of research which national members of SCAR, as appropriate, will put into effect, co-ordinated by the Group. Some Groups of Specialists, such as those on Antarctic Seals and on Environmental Affairs and Conservation, are created to monitor a particular aspect and to provide advice and make recommendations on a continuing basis. Such advice and recommendations will normally be passed through SCAR to the appropriate outside bodies, typically the Antarctic Treaty System including the Convention for the Conservation of Antarctic Seals (CCAS) and the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR).

Although funded only by small national contributions, SCAR activities provide the key framework for the very large expeditions and expenditure involved in the operation of national and multi-national research programmes. SCAR also sponsors major international symposia, conferences and workshops on Antarctic science which provide additional fora for the presentation of data and results, and for the discussion of Antarctic science among a wider audience.

SCAR will continue to initiate, promote and co-ordinate Antarctic scientific research and to provide scientific advice to the Antarctic Treaty System. It will also continue to provide input to relevant programmes of ICSU and other organizations, for example the World Climate Research Programme (WCRP), a joint programme between ICSU and the World Meteorological Organization (WMO). SCAR is currently planning a major new programme to address those aspects of global change where the Antarctic region is uniquely placed to provide fundamental data. Studies will include ozone depletion and the associated effects of increased ultra-violet radiation, atmosphere and ocean exchanges of greenhouse gases, changes in the Antarctic ice sheet and sea level, the history of climate change recorded in ice cores and ocean sediments.

SCAR is committed to the conservation of the ecosystems and environment of Antarctica, and to the freedom to continue to conduct scientific research in the south polar regions.

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