

Penguins of the Magellan region*

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SUMMARY: The Magellan region, including the Falkland Islands, is one of the world's most important areas for seabirds, and especially penguins. World-wide there are 17 species of penguin; 7 of these regularly breed around the coastal waters of South America, and 5 within the Magellan region. These are the King Penguin (*Aptenodytes patagonicus*), Gentoo Penguin (*Pygoscelis papua*), Rockhopper Penguin (*Eudyptes c. chrysocome*), Macaroni Penguin (*Eudyptes chrysolophus*) and Magellanic Penguin (*Spheniscus magellanicus*). During the last five years, a review of the breeding populations of penguins within the Magellan region was conducted. This work included population censuses of all the surface breeding species throughout the Falkland Islands and southern South America. The results of this work are presented, along with other cited information, to provide a summary of the current knowledge of penguin populations within the Magellan region.

Key words: Penguin, Magellan, Falkland, Chile, Argentina.

RESUMEN: LOS PINGÜINOS DE LA REGIÓN DE MAGALLANES. – La región de Magallanes, incluyendo las Islas Falkland, es un área muy importante para las aves marinas del mundo. Hay 17 especies de pingüinos; 7 crían en América del Sur y 5 crían en la región de Magallanes. Se trata de los Pingüino Rey (*Aptenodytes patagonicus*), Pingüino Papúa (*Pygoscelis papua*), Pingüino de Penacho Amarillo (*Eudyptes c. chrysocome*), Pingüino Macaroni (*Eudyptes chrysolophus*) y Pingüino de Magallanes (*Spheniscus magellanicus*). Durante los últimos 5 años investigamos las poblaciones de los pingüinos en la región de Magallanes. Esta investigación incluyó registros de todas las especies que crían sobre la tierra en las Islas Falkland y en el extremo meridional de América del Sur. Presentamos nuestros resultados con información de otra literatura citada para proporcionar un resumen del conocimiento sobre las poblaciones de los pingüinos en la región de Magallanes.

Palabras clave: Pingüino, región de Magallanes, Islas Falkland, Chile, Argentina.

INTRODUCTION

During 1995/96, a population census of all penguin species (except the Magellanic Penguin) was conducted around the Falkland Islands (Bingham, 1998b). Every breeding colony was visited, and population totals for each species obtained. Comparing these data with previous studies revealed that the Southern Rockhopper population had crashed to a fraction of its former size (Bennett, 1933; Bing-

ham 1994c, 1995a, 1998b). With no obvious reason for this dramatic decline, apart from speculation about commercial fishing, it became a priority to census the remainder of the world population located in South America, to determine how wide-spread the decline had been.

It had been shown during the 1995/96 census of the Falkland Islands, that it requires little extra effort to census all penguin species during the course of such a census. The only exception to this was the Magellanic Penguin, which because of its wide-spread, low-density distribution in burrows, made it

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impossible to census with methods employed for surface nesting species (Bingham, 1998b). For this reason the Magellanic Penguin had been excluded from the Falkland Islands census. On that basis it was decided that a census would be conducted of all South American penguins during the 1996/97 breeding season, except for those of the Genus *Spheniscus*.

During the 1995/96 Falkland Islands census it had been possible to conduct ground counts of incubating pairs at each of the breeding colonies, because most colonies were relatively accessible (Bingham, 1998b). By contrast, many of the South American colonies are remote and inaccessible, and any attempt to conduct ground counts of each and every colony would have been doomed to failure. It was therefore decided from the outset that the census would be conducted by light aircraft, thereby negating the need to get ashore at difficult and remote sites.

The location of all the Falkland Islands breeding sites had been known prior to the commencement of the 1995/96 census (Bingham, 1998b), but this was certainly not the case for South America. Although data did exist for a number of known breeding sites around South America (Frere *et al.*, 1993; Venegas 1984, 1991; Woehler, 1993), it was likely that other sites existed which had not been recorded. This was another reason for favouring an aerial census, since it

provided the opportunity to cover large areas of suitable coastline in search of previously unrecorded colonies. This reduced the margin of error that would otherwise arise from new sites being overlooked, however the margin of error for aerial counts was likely to be higher than for ground counts.

In order to quantify the margin of error likely to be expected from aerial counts, a number of aerial censuses were made of Rockhopper colonies in the Falkland Islands for which the number of breeding pairs was also determined by ground counts. These aerial counts differed by a maximum of 14% from ground counts made of the same colony, suggesting a total margin of error of $\pm 20\%$ for aerial census data (Bingham 1998a,b).

The 1996/97 aerial census was conducted throughout the known *Eudyptes* breeding ranges of Chile and Tierra del Fuego (Woehler, 1993). The Atlantic coast of mainland Argentina was excluded from the census, since this coastline has been well studied, and does not hold any breeding sites for species covered by the census, other than a very small Rockhopper colony on Isla Pinguino, near Puerto Deseado (47°45'S 65°54'W) (Frere *et al.*, 1993, Gandini *et al.*, in press). This colony is regularly monitored as part of an ongoing research programme, and population data from that research was used in favour of duplicating results (Frere *et al.*, 1993).

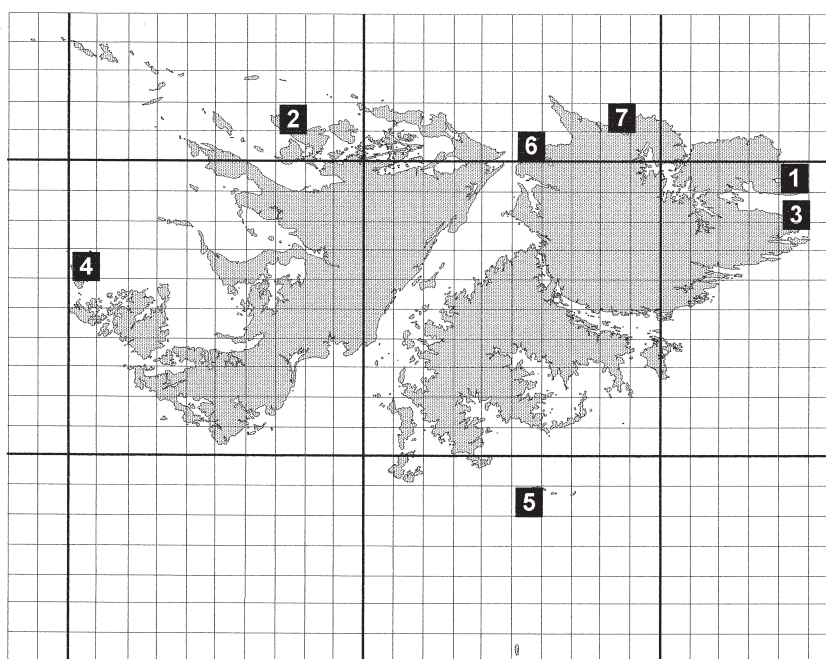


FIG. 1. – Map of Falkland Islands King Penguin breeding sites (numbers refer to Table 1).

TABLE 1. – Falkland Islands King Penguin counts 1995/96 (site numbers refer to Figure 1).

	SITE	CHICKS
1	Volunteer Point	330
2	Saunders Island	3
3	Kidney Cove	2
4	New island	1
5	Sea Lion Island	1
6	Paloma Beach	1
7	Concordia Beach	1
	TOTAL	339

RESULTS

King Penguin

King Penguins do not make nests, but instead hold eggs and chicks on their feet, making nest

counts impossible. For this reason counts are made of chicks and a conversion factor used (Lewis Smith and Tallowin, 1979). The Falkland Islands population census recorded 339 chicks, which equals a total breeding population of approximately 400 breeding pairs (Bingham, 1998b) (Figure 1; Table 1).

King Penguins have not bred in South America since the colony on Islas de los Estados (54°50'S 64°00'W) was wiped out by sealers during the last century (Prosser Goodall, 1979). No King Penguins were recorded anywhere in South America during 1996/97.

Gentoo Penguin

The Falkland Islands hold around 20% of the world population of Gentoo Penguin, with a total population of 65,000 breeding pairs at 81 sites being

TABLE 2. – Falkland Islands Gentoo counts 1995/96 (numbers refer to Figure 2).

	SITE	NESTS		SITE.	NESTS.
1	New Island	5100	42	Great Island	490
2	Steeple Jason Island	3923	43	Lively Island	490
3	Saunders Island	3510	44	Beauchene Island	444
4	Albemarle	2626	45	Town Point	416
5	Bull Point	2230	46	Gladstone Valley	410
6	Speedwell Island	2229	47	New Haven	400
7	Grand Jason Island	2196	48	North Pond	379
8	Carcass Bay	2039	49	Fox Point	378
9	Shallow Bluff	1737	50	Little Mountain	375
10	Kidney Cove	1730	51	Brazo del Mar	357
11	Sea Lion Island	1484	52	Ten Shilling Bay	342
12	Lucas Hill	1457	53	Bluff Head	330
13	Grave Cove	1434	54	The Sandhills	330
14	Port Edgar	1408	55	Barren Island	326
15	Weddell Island	1220	56	Cape Orford	311
16	Cape Dolphin	1148	57	Berthas Beach	310
17	Stevelly Bay	1071	58	Little Creek	304
18	Whaler Bay	1000	59	4th Passage Island	300
17	Volunteer Point	970	60	Rookery Point	300
20	Stephens Peak	894	61	Sparrow Cove	300
21	Beaver Island	892	62	Leopard Bay	270
22	Bleaker Island	875	63	Rookery Sands	249
23	Seal Bay	875	64	Port King	208
24	West Head	855	65	Carcass Island	180
25	Bluff Cove	850	66	Strike off Point	176
26	Queen Point	832	67	Fanning Harbour	160
27	Lake Hammond	830	68	Murdos Cave	137
28	Motley Point	800	69	Moffit Harbour	130
29	Pebble Island	754	70	Pleasant Road	123
30	Fox Point	751	71	Rodeo Point	120
31	Isthmus Cove	738	72	Cow Bay	117
32	Blue Mountain	728	73	Salt house	110
33	Big Seal Rook	716	74	North Beach	103
34	Port North	705	75	Hoste Inlet	66
35	Concordia Beach	701	76	Limpet Creek E.	54
36	Hope Point	654	77	Long Point	52
37	Paloma Beach	601	78	Colorado Bay	44
38	Bull Roads	564	79	Shag Harbour	16
39	Keppel Island	560	80	Ajax Bay	14
40	Bottomless Pond	534	81	Egg Harbour	7
41	Limpet Creek W.	531		TOTAL	65,000

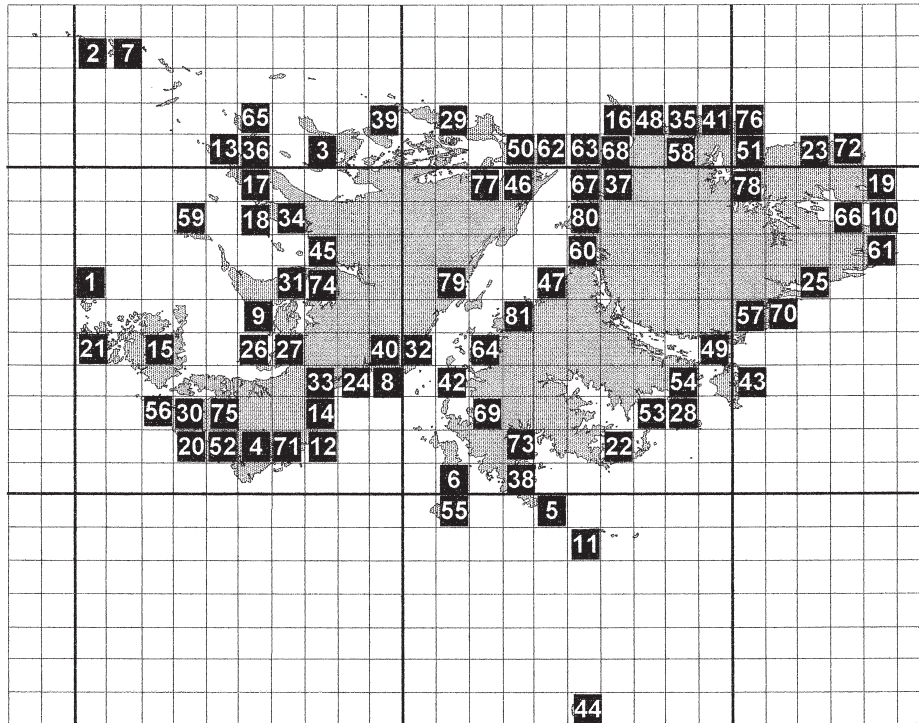


FIG. 2. – Map of Falkland Islands Gentoo breeding sites (numbers refer to Table 2).

recorded during 1995/96 (Bingham, 1998b) (Figure 2; Table 2). Somewhat surprisingly, a very small Gentoo breeding colony was discovered on Islas de los Estados (54°50'S 64°00'W), containing almost 100 breeding pairs. This was the only breeding colony of Gentoo Penguin recorded in South America.

Southern Rockhopper

The Falkland Islands and South America are home to two species of the genus *Eudyptes*; the Southern Rockhopper and the Macaroni (Bingham, 1998a). The Southern Rockhopper is a subspecies

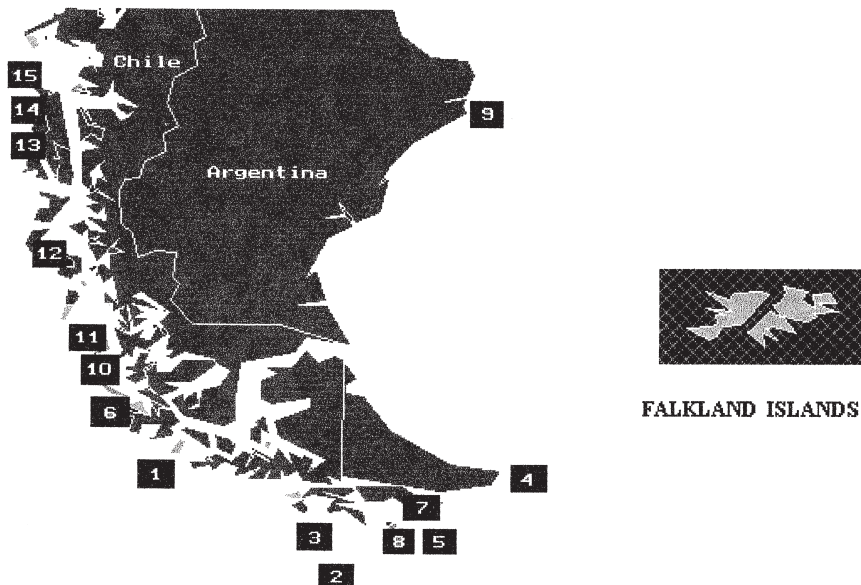


FIG. 3. – Map of South American Rockhopper breeding sites (numbers refer to Table 3).

TABLE 3. – South American Rockhopper counts 1996/97 (numbers refer to Figure 3).

SITE	NESTS	GRID REFERENCE	
1	Isla Noir	70,000	54°30'S 73°00'W
2	Islas Diego Ramirez	60,000	56°31'S 68°43'W / 56°27'S 68°44'W
3	Islas Ildefonso	10,000	55°43'S 69°20'W
4	Isla de los Estados	10,000	54°52'S 64°40'W / 54°44'S 63°50'W
5	Islas Barnevelt	7,000	55°49'S 66°47'W
6	Isla Recalada	5,500	53°20'S 74°10'W
7	Islas Terhalten	4,500	55°27'S 67°04'W
8	Grupo Cabo de Hornos	2,600	55°56'S 67°21'W / 55°53'S 67°25'W
9	Isla Pingüino	200	47°45'S 65°54'W
10	Isla Desolación	700	52°45'S 74°44'W
11	Islas Reina Adelaida	400	52°26'S 74°40'W
12	Isla Buenaventura	800	50°45'S 75°10'W
13	Golfo Ladrillero	300	49°22'S 75°42'W
14	Bahía Dineley	500	48°52'S 75°40'W
15	Isla Solitario	200	47°44'S 75°24'W
S. AMERICA TOTAL		175,000	

that is restricted to the Falkland Islands and South America (Bingham, 1998b).

The 1996/97 census showed that South America holds a breeding population of about 175,000 pairs of Southern Rockhoppers, at a total of 15 breeding sites (Figure 3; Table 3). Apart from the very small colony on Isla Pingüino (Frere *et al.*, 1993), these breeding sites are restricted to the islands off Tierra del Fuego and Chile. Combined with the Falkland Islands census total of 300,000 pairs at 36 sites (Bingham, 1998b) (Figure 4; Table 4), this gives a

world population of 475,000 breeding pairs at 51 sites for the subspecies *Eudyptes c. chrysocome*. (South Georgia has been known to hold a few breeding pairs, but no more than 10 pairs have been recorded).

Macaroni Penguin

The Falkland Islands population of Macaroni Penguins is very small, with no individual colonies and only individual pairs found breeding amongst

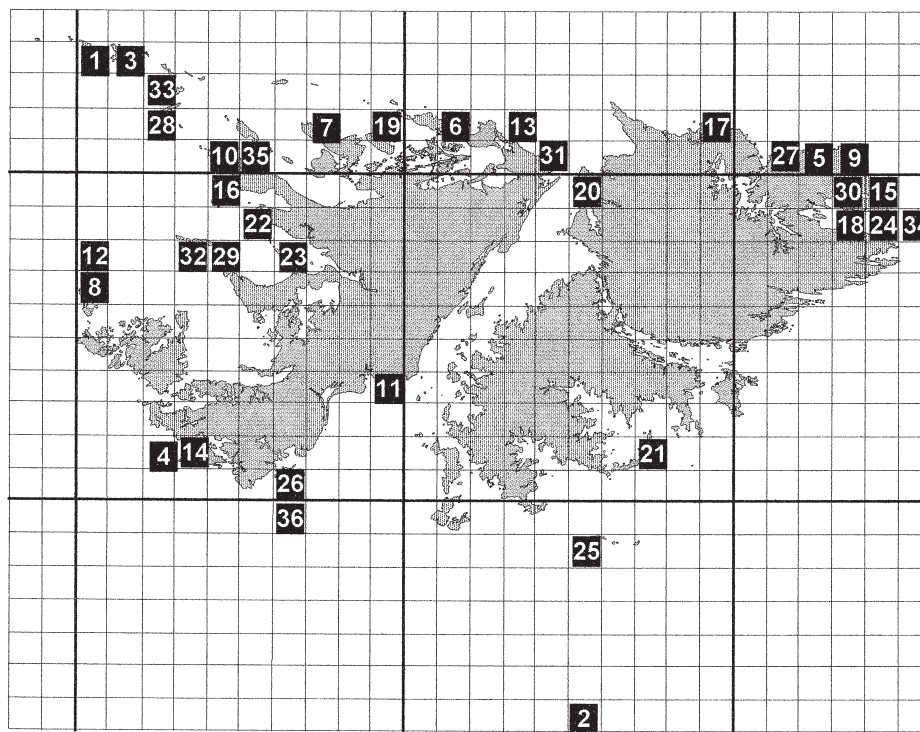


FIG. 4. – Map of Falkland Islands Rockhopper breeding sites (numbers refer to Table 4).

TABLE 4. – Falkland Islands Rockhopper counts 1995/96 (numbers refer to Figure 4).

SITE	NESTS	SITE	NESTS.
1 Steeple Jason Island	115000	20 Fanning Head	1071
2 Beauchene Island	74300	21 Bleaker Island	700
3 Grand Jason Island	34000	22 Rabbit Island	600
4 Bird Island	10600	23 Hummock Island	540
5 Rabbit Rincon	8487	24 Cochon Island	515
6 Pebble Island	6702	25 Sea Lion Island	504
7 Saunders Island	5781	26 Arch East Island	411
8 New Island	5500	27 Campa Menta	380
9 Macbride Head	4146	28 South Jason Island	300
10 West Point Island	4042	29 1st Passage Island	267
11 Carcass Bay	3783	30 Diamond Cove	155
12 North Island	3472	31 White Rock	150
13 Tamar Point	2566	32 2nd Passage Island	125
14 Stephens Peak	2504	33 Elephant Jason Islan	100
15 Rugged/Eagle Hill	2460	34 Kidney Island	100
16 Deaths Head	2243	35 Grave Cove	93
17 Cape Bougainville	1943	36 Clump Island	83
18 Mount Low	1910		
19 Keppel Island	1168	Falklands TOTAL	297,000

Rockhoppers colonies. The total Falklands population stands at less than 50 pairs (Bingham,1998a).

The 1996/97 census showed that South America holds a breeding population of about 12,000 pairs of Macaroni, at a total of nine sites (Figure 5; Table 5). These sites are all restricted to the islands off Tierra del Fuego and Chile. Only the islands of Diego Ramirez, Ildefonso and Noir hold more than a thousand breeding pairs.

TABLE 5. – Macaroni Penguin counts 1996/97 (numbers refer to Figure 5).

SITE	NESTS	GRID REFERENCE
1 Isla Diego Ramirez	4,500	56°31'S 68°43'W
2 Isla Noir	3,000	54°30'S 73°00'W
3 Isla Ildefonso	2,000	55°43'S 69°20'W
4 Isla Recalada	1,000	53°20'S 74°10'W
5 Isla Desolación	800	52°45'S 74°44'W
6 Isla de los Estados	~ 50	54°44'S 63°50'W
7 Islas Barnevelt	~ 50	55°49'S 66°47'W
8 Islas Terhalten	~ 50	55°27'S 67°04'W
9 Grupo Cabo de Hornos	~ 50	55°53'S 67°25'W
South America TOTAL	12,000	
Falkland Islands	<50	

Magellanic Penguin

Of the five species of penguin that regularly breed within the Magellan region, the Magellanic Penguin is the most numerous and widespread (Bingham, 1998a). It only breeds around the coasts of Chile and Argentina, and at the Falkland Islands.

DISCUSSION

The Falkland Islands population of around 400 breeding pairs of King Penguin has rapidly expand-

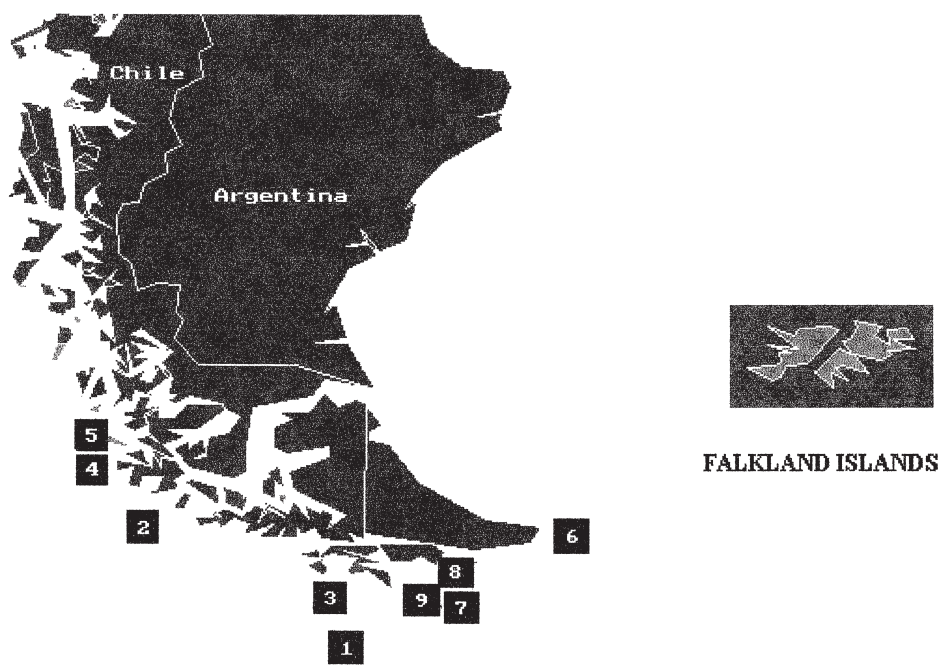


FIG. 5. – Map of Macaroni Penguin breeding sites (numbers refer to Table 5).

ed from a population of less than 100 pairs recorded during 1980/81 (Bingham, 1995a). With a world population of around 1,500,000 pairs (Woehler, 1993), the Falkland Islands population is of regional rather than global importance.

The Falkland Islands population of around 65,000 breeding pairs of Gentoo Penguin, recorded during the 1995/96 census (Bingham, 1998b), represents about 20% of the world population of 320,000 pairs (Bingham, 1998a; Woehler, 1993). The 1995/96 Falkland Islands census indicated a population decline of around 45% since a similar census conducted during 1932/33 (Bennett, 1933).

Annual counts of selected breeding sites around the Falkland Islands suggested that much of this decline had occurred during the late 1980s and early 1990s, with low breeding success also being observed during that period (Bingham, 1994a, d, 1995a). Continued monitoring of these sites since the census indicates that by 1997/98 the Falkland Islands population had risen to around 81,000 breeding pairs (Fig. 6), with high breeding success rates having been recorded from 1993/94 through to 1997/98 (Fig. 7). Gentoo populations are known to fluctuate greatly, and it is plausible that the decline observed previously was merely part of a natural cycle.

The world population of Southern Rockhopper Penguin now stands at around 475,000 breeding pairs, with 63% of the population in the Falkland Islands and 37% in South America. Comparison with previous census data (Bennett, 1933) indicates that the Falkland Islands population has crashed to just 10% of its former size, with much of this decline having occurred during the 1980s and early 1990s (Bingham, 1994c, 1995a, 1998b). Evidence of this dramatic decline can also be seen from the breeding sites themselves. The Falkland Islands breeding

sites feature old colonies which have destroyed the vegetation by years of occupancy, leaving only lichen covered rocks and stones around the nest-site. The huge breeding colonies that once produced these areas of barren ground, have now been reduced to small clusters of birds huddled in the centre of their stony territories.

The South American population shows no such evidence of decline, with breeding sites featuring a healthy mixture of new, middle-aged and old colonies, indicating a natural cycle of fluctuation and regeneration. Comparison with previous census data (Venegas, 1984, 1991; Woehler, 1993) also indicates that the South American population was stable throughout the 1980s and 1990s, during which the Falkland Islands population crashed (Bingham 1998b). The reason for such differing fortunes is unknown, although it is interesting to note that the waters around Tierra del Fuego and Chile are not heavily fished, whilst those around the Falkland Islands are (Falkland Islands Government, 1989). In the Falkland Islands, even internationally recognised sites, such as Beauchêne Island which is being considered for World Heritage status, have fleets of fishing boats operating just 3 miles from breeding Rockhoppers.

The Macaroni Penguin populations of South America (12,000 pairs) and the Falkland Islands (<50 pairs) must be looked at in the light of a world population of around 9 million breeding pairs (Bingham, 1998a; Woehler, 1993). These populations are therefore of regional rather than international importance. There were no obvious signs of decline amongst the South American population, and no evidence to suggest that the population has changed greatly over recent years. The Macaroni is the most numerous of all the world's penguins.

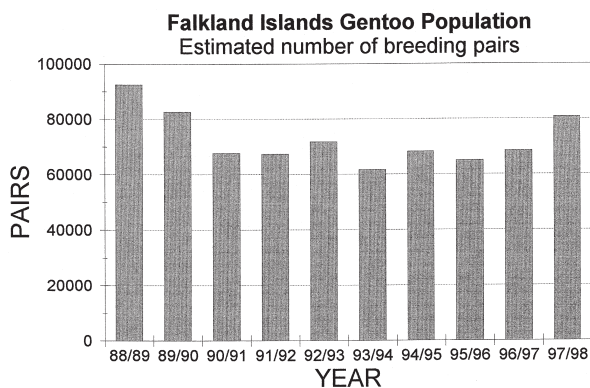


FIG. 6. – Falkland Islands Gentoo Penguin population trends.

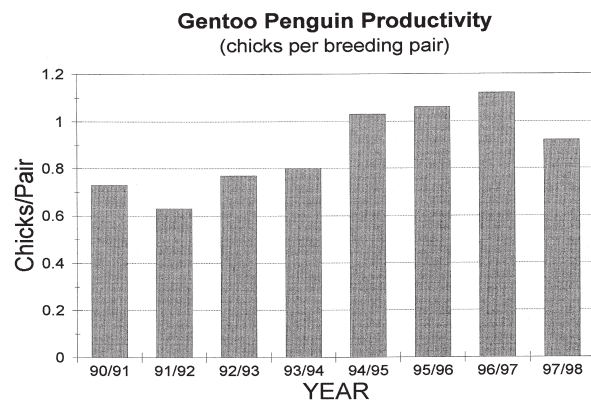


FIG. 7. – Falkland Islands Gentoo Penguin breeding success.

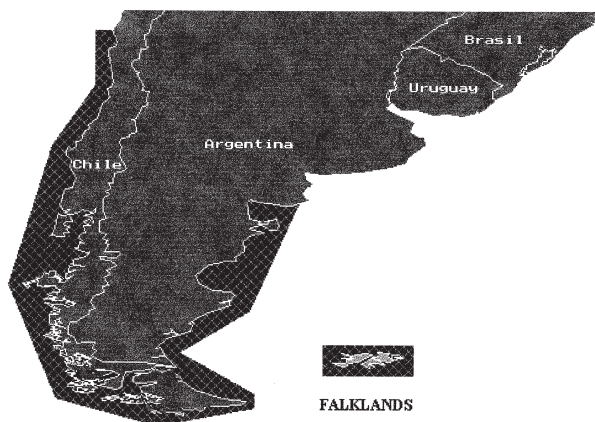


FIG. 8. – Map of Magellanic Penguin breeding range.

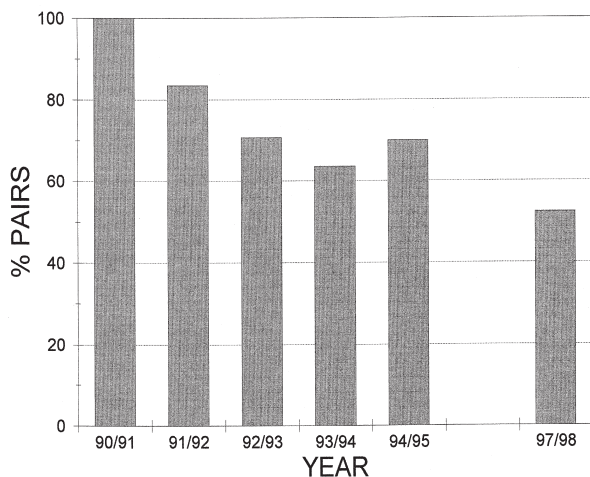


FIG. 9. – Falkland Islands Magellanic Penguin population trends (percentage of 1990/91 population which was ~300,000 pairs).

Although Magellanic Penguins were not included in the 1995/96 and 1996/97 censuses, that is not to say that no work has been done on this species. The current population along the coast of mainland Argentina is estimated to be 650,000 breeding pairs (Gandini *et al.*, in press). Observations of distribution around Tierra del Fuego and Chile during the 1996/97 census suggest that these regions hold a population at least as large as that of mainland Argentina, giving a South American population of at least 1,300,000 pairs. The Falkland Islands population is well in excess of 100,000 pairs (Bingham, 1998a), giving a minimum world population of around one and a half million breeding pairs (Fig. 8).

Annual monitoring of selected colonies (Bingham, 1994b, 1995a, b) shows that the Magellanic

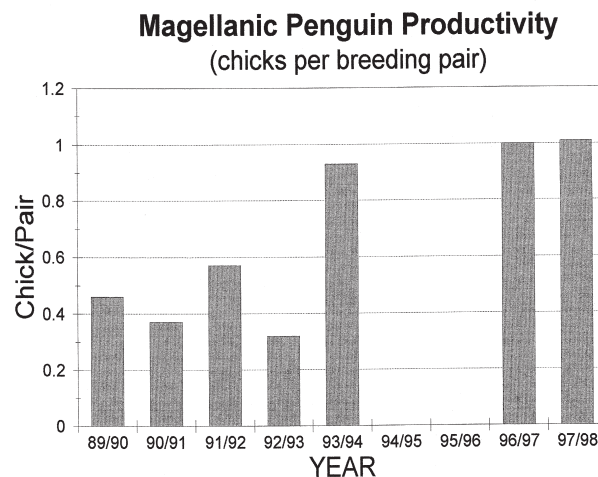


FIG. 10. – Falkland Islands Magellanic Penguin breeding success.

Penguin population of the Falkland Islands has declined to about half its 1980s level (Fig. 9). These declines coincided with observations of low breeding success up until 1993/94 (Fig. 10).

In addition to its Penguin Monitoring Programme in the Falkland Islands, the Environmental Research Unit now conducts similar studies at a number of Chilean breeding sites along the Straits of Magellan. These studies suggest that the Magellanic Penguin decline observed in the Falkland Islands has not been evident in the Magellan region of Chile, despite its close proximity and similar breeding habitat to the Falkland Islands (Bingham, 1998a).

Further evidence of the differing fortunes of the two regions can be seen from the breeding sites themselves. Magellanic Penguin colonies around the Falkland Islands generally feature a very high percentage (on average more than 70%) of unoccupied burrows. Similar breeding sites in the Straits of Magellan hold less than half the proportion of unoccupied burrows (< 35%), suggesting lower levels of adult mortality or higher levels of recruitment (Bingham, 1998a). There is no large-scale fishery in the Straits of Magellan.

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