

SOUTH POLAR SKUA BREEDING COLONIES IN THE ROSS SEA REGION, ANTARCTICA

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ABSTRACT

Using ground and aerial surveys between 1980 and 1983, we increased the number of known breeding sites of the South Polar Skua in the Ross Sea region from 21 to 55. Some 20 more sites may occur along parts of the coast which we did not survey, especially between Cape Adare and Cape Jones. We estimate that the Ross Sea region has about 15 000 skuas. Up to 20% of breeders do not nest in association with penguins.

Since the late 1950s, several colonies have increased, while others have decreased. Some colony changes have apparently been due to human activity. Information on banded birds indicates a low rate of exchange between colonies; some movement may be related to more food being available at refuse dumps at scientific bases.

INTRODUCTION

Efforts have recently been directed toward assessing the numbers of penguins breeding in different regions of the Antarctic (e.g. Croxall & Prince 1979, Wilson 1983), the aim being to use trends in penguin numbers to assess changes in the Antarctic marine ecosystem. Little attention has been directed toward other birds because most are much harder to census. One species easy to census but ignored is the South Polar or Antarctic Skua (*Catharacta maccormicki*). Skuas nest in the open in discrete colonies, and they return year after year to the same breeding territory. Thus we do not expect to find erratic year-to-year fluctuations in numbers.

While looking for emigrants from Cape Crozier, we visited a large number of colonies in the Ross Sea region during the austral summers of 1980-81 to 1983-84. Most sites are in ice- and snow-free areas on the coast of Victoria Land and its offshore islands (Fig. 1 and 2).

METHODS

We made ground counts at various colonies. Except as noted below, the following observations were made by parties of three or four experienced field biologists: December 1980-1983, at least 2 weeks each year at Cape Crozier, Ross Island; December 1981 and 1982, 1-3 days at other colonies on Ross Island as well as on nearby islands and the adjacent Victoria Land coast bordering on McMurdo Sound (Table 1: all sites listed below Cape Bernacchi); December 1982 and 1983, 1-2 hours at each of four sites farther north on the Victoria Land coast (sites Depot Island to Cape Bernacchi in Table 1); January 1982, 2-6 hours at each of eight sites northward along the remainder of the Victoria Land coast, including several islands (Table 1); December 1983, 2 hours at Gregory Island on the Victoria Land coast.

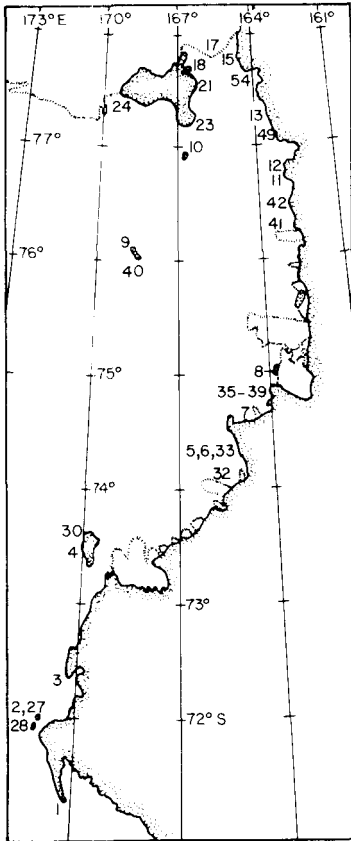


FIGURE 1 —
The Victoria Land coast and adjacent islands; the locations of colonies are indicated by numbers which refer to those in Tables 1 and 2

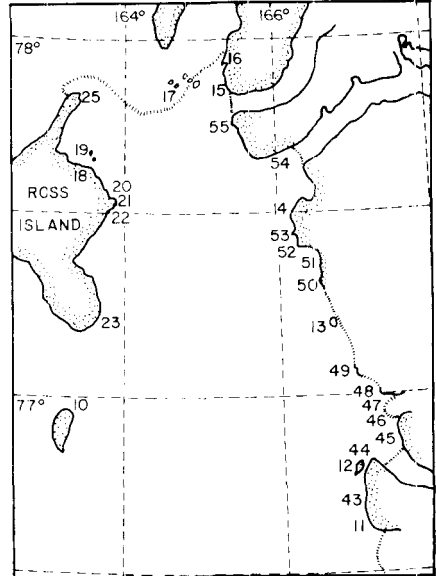


Figure 2 — The McMurdo Sound and southern Victoria Land Coast region; numbers as in Fig. 1

During ground surveys, we counted nests (with eggs or chicks) and/or defended territories. Thus, our estimates of breeding pairs reflect the number of defended territories that we encountered.

In addition to these ground counts, we overflew all the exposed coastal terrain of Victoria Land, between 74°00' and 75°00' and between 76°00' and 78°00', during January and December 1982 (Table 2). Little exposed coastal ground exists between 75°00' and 76°00'. We flew by helicopter at altitudes of about 100 m, being careful not to fly over nesting penguins which, unlike skuas, are very sensitive to low-flying aircraft. At five sites we made both aerial and ground counts to estimate a factor by which to correct aerial counts (Table 3).

TABLE 1 — The number of breeding pairs of skuas at sites where ground censuses were conducted

Site	Date	Number of Breeding Pairs
1. Cape Adare	26 Jan 1982 ^a	306
2. Possession Island	9 Jan 1982	474
3. Cape Hallett	17 Jan 1983 ^b	84
4. Coulman Island, Middle	11 Jan 1982	55
5. Edmonson Pt, N ^c	13 Jan 1982	56
6. Edmonson Pt, S	13 Jan 1982	5
7. Markham Island	13 Jan 1982	21
8. Inexpressible Island	12 Jan 1982	60
9. Franklin Island, south end	14 Jan 1982	184
10. Beaufort Island	15 Jan 1982	209
11. Depot Point	29 Dec 1982	72
12. Gregory Island	28 Dec 1983	119
13. Dunlop Island	29 Dec 1982	88
14. Cape Bernacchi	29 Dec 1982	31
15. Blue Glacier	9 Dec 1981	226
16. Cape Chocolate	24 Dec 1981	35
17. Dailey Islands	8-9 Dec 1981	77
18. Cape Evans	7 Dec 1981	88
19. Delbridge Islands	5 Dec 1981	49
20. Cape Barne	23 Dec 1981	41
21. Cape Royds	24 Dec 1981	76
22. Rocky Point	24 Dec 1981	66
23. Cape Bird	16-18 Dec 1981	399
24. Cape Crozier	Dec 1980	1000
25. Cape Armitage (Obs. Hill)	25 Dec 1982	1
Total pairs		3822

a

A survey in January 1982 revealed that the skuary occupied the same area as in 1961 (G. J. Wilson, pers. obs.)

b

Data from Pascoe, 1984.

c

Edmondson Point, N and S refer to small unnamed points immediately north and south of Edmondson Point

During January 1982, G. J. Wilson (pers. comm.) spent several weeks at Cape Adare but was only able to compare the extent of the colony relative to a complete census and mapping done by Reid (1962). Another New Zealand Antarctic Research Programme party surveyed the colony at Cape Hallett in January 1983 (Pascoe 1984).

In the following discussion, where possible we have defined colony sites according to maps or descriptions published by previous workers; diversions from these descriptions are noted.

TABLE 2 -- The number of breeding skuas at site censused from the air^a

Site	Date	Number Counted	Adjusted No. Breeding Birds
26. Cape McCormick	9 Jan 1985	none	--
27. Sven Foyn Island	9 Jan 1985	135	397
28. Bull Island	9 Jan 1985	2	6
29. Heftyes' Island	9 Jan 1985	none	--
30. Coulman Island, near North Adélie colony	11 Jan 1982	1	3
South Adélie colony	11 Jan 1982	?	--
31. Wood Bay coast (3 sites)	13 Jan 1982	20	59
32. Edmonson Point	13 Jan 1982	50	147
33. Tinker Glacier	13 Jan 1982	9	26
34. Cape Washington	13 Jan 1982	none	--
35. Oscar Point	13 Jan 1982	20	59
36. Northern Foothills coast	13 Jan 1982	31	91
37. Gerlache Inlet coast	13 Jan 1982	21	62
38. Cape Russell	13 Jan 1982	10	29
39. Franklin Island, north end	14 Jan 1982	50	147
40. Cape Day	29 Dec 1982	7	21
41. Tripp Island	29 Dec 1982	3	9
42. Cape Ross	29 Dec 1982	48	141
43. Cape Archer	29 Dec 1982	2	6
44. Lion Island	29 Dec 1982	1	3
45. Point Retreat	29 Dec 1982	15	44
46. Cuff Cape	29 Dec 1982	1	3
47. Discovery Bluff	29 Dec 1982	42	124
48. Cape Roberts	29 Dec 1982	37	109
49. Spike Cape	29 Dec 1982	21	62
50. Bay of Sails	29 Dec 1982	7	21
51. Gnelss Point	29 Dec 1982	10	29
52. Marble Point	29 Dec 1982	23	68
53. New Harbor coast	29 Dec 1982	45	132
54. Strand Moraines	29 Dec 1982	52	153
Total breeders			1951

a Aerial counts adjusted based on data in Table 3: air counts \div 0.34

RESULTS AND DISCUSSION

Population size

Watson *et al.* (1971) summarised the literature and plotted 21 breeding sites of South Polar Skuas in the Ross Sea region. Skua colonies mainly exist along the Victoria Land coast and its offshore islands from 78° to 71° S. We directly surveyed almost all exposed ground along the Victoria Land coast from 78°00' to 73°10' S (except for three small moraines between 76° and 75°), including nearshore islands; we also surveyed all islets in McMurdo Sound, and all large offshore islands of the region, including Ross, Beaufort, Franklin, Coulman, Possession, Sven Foyn, Bull and Heftyes'. During our surveys we discovered 34 more breeding sites. Only 16 of the total 55 sites were associated

TABLE 3 -- Comparison of ground and aerial counts

Site	No. Birds Counted From The Air	No. of Actual Territories ^a	Actual Colony Size ^b	Ratio- Air: Ground ^c
Depot Point	46	72	144	0.32
Gregory Island	90	119	238	0.38
Dunlop Island	47	88	176	0.27
Cape Bernacchi	22	31	62	0.35
Cape Chocolate	29	35	70	0.41
Total	234	345	690	0.34

a Counted on the ground

b Number territories x 2

c Air counts $\frac{1}{2}$ figures in third column

with Adélie Penguin (*Pygoscelis adeliae*) rookeries. Most breeding areas not associated with penguin rookeries were small, but together they contributed 20.6% of the estimated 4798 breeding pairs among the sites we surveyed. The occurrence of so many skuas elsewhere than at penguin rookeries supports the observation of Young (1963b, 1970) that South Polar Skuas do not depend on penguins for food. The fact that many skuas nest at penguin sites may only mean that both species are using the few available ice- and snow-free localities which are also near abundant marine food.

Undoubtedly, many skuas nest on that part of the Victoria Land coast which we did not census, as well as on the coast of King Edward VII Peninsula (Marie Byrd Land) in the eastern Ross Sea. There are also inland colonies (not listed in the tables) such as Crater Cirque in Victoria Land and the Rockefeller Mountains in Marie Byrd Land (Ricker 1964, Watson *et al.* 1971), where skuas have not been counted. At this point, we estimate that scientists have now visited about 70% of the skua colonies in the Ross Sea region. The Victoria Land coast between 75° and 76° is largely glacial, and probably no more than three colony sites exist in that stretch. The coast is covered by glaciers between 73°10' and 74°, as well. North of 73°10', however, much of the coast is exposed and could support as many as 20 breeding sites (i.e. between Cape Jones and Cape Adare). At least nine Adélie Penguin rookeries are along this stretch (Wilson 1983), but details of nesting skuas are known for only four of them. The majority of unsurveyed skua sites, however, are probably not associated with penguins.

Non-breeding skuas occur at most breeding sites. Reid (1962) for Cape Adare and Wood (1971) for Cape Crozier estimated that the ratio of breeding pairs to non-breeding skuas is 1.0:0.4. The ratio of 1.0 (0.98) non-breeders per breeding pair at Cape Hallett during late January 1983 (Pascoe 1984) is quite a different figure, and the difference could be due to many factors. Using the more conservative 1.0:0.4 ratio, and given a total of 4798 breeding pairs, we estimate a minimum of 11 515 skuas at known colonies in the Ross Sea in summer. Additional breeding birds would be associated with the uncensused

sites of Victoria Land and Marie Byrd Land. Skuas rarely visit colonies when under 3 years old, and many not until 4-5 years old (Ainley, Wood and Ribic, unpubl. data). Therefore, many young non-breeders probably also occur in the region during summer but remain at sea. Estimating their numbers during summer would be difficult. Considering approximately 25 sites not yet censused, plus the unknown number of non-breeders that do not visit colonies, we guess that an additional 3500 skuas could occur in the Ross Sea region during summer, or about 15 000 birds total. Ainley *et al.* (1984), extrapolating from at-sea densities, estimated a total population of 13 500 skuas in the Ross Sea region during summer.

Population trends

We compared our census results with those of previous censuses (Table 4). The comparison gives some insight into changes of numbers at some sites. At Cape Hallett and the northern rookery at Cape Bird (based on colony map supplied by G. J. Wilson), numbers declined appreciably. The 1967 Cape Bird figure, however, may have been only a rough estimate, but near to Cape Bird, numbers at Horseshoe Lake and Rocky Point, after an earlier increase, seem also to have declined slightly after 1963. At Cape Royds numbers increased between 1960 and 1963, declined slightly, but have since remained fairly stable. Thus, numbers at all sites on the eastern shore of northern McMurdo Sound show a consistent downward trend or no growth after the early 1960s. Numbers

TABLE 4 -- A comparison of census results (breeding pairs) during different austral summers^a

Site	1955	'57	'60	'63	'64	'65	'66	'67	'68	'71	'81-'83
C. Hallett ^b	>150			162		147	113	105	98	98	84
C. Crozier ^c								1000			1000
C. Bird, N ^d								250			167
Rocky Pt ^e						68					66
Horseshoe Lk ^f			18			23					17
C. Royds ^g			50	62	57	57					59
C. Barne ^f			21			30					41
Delbridge Is ^g						0?					49
C. Evans ^e		52		54	55						188
C. Armitage ^e				1	1	1					1
Dailey Is ^e						16					77
Gneiss Pt ^e						0					15
Marble Pt ^e						20					34
Blue Glacier ^e						20					226
C. Chocolate ^e						25					35

a Austral summers identified by the initial year of each summer, even though some counts are from January of the next calendar year, e.g. January 1965 of the 1964-65 summer='64

b Eklund 1961, Johnston 1971, Trillmich 1978, Pascoe 1984

c Wood 1971

d Young 1970

e Spellerberg 1967

f Young 1963, Spellerberg 1971

g Young 1967, Spellerberg 1967

also declined at Cape Hallett. Although Johnston (1971) attributed the decline at Hallett to the disturbance from a scientific station, the colony apparently continued to decline, or at least did not recover, after the station was closed in 1971 (Pascoe 1984). Thus, factors other than human disturbance may have contributed to the decline of skua numbers at sites in the Ross Sea. The seemingly high ratio of non-breeders to breeders at Cape Hallett in 1983 (see above) may indicate that breeding numbers will increase there soon.

Numbers may have increased at eight other sites, all in the southern McMurdo Sound area. Though the trends may be real, we cannot validly assess the amount of increase by the available data. For instance, at the Delbridge Islands, Spellerberg (1967) noted no nesting skuas, but Young (1967) stated that an unspecified number did nest there. At Cape Evans, many of the nests we located were well inland (up to 1 km), and we do not know how thoroughly this inland area was checked in previous years. Thus, the increase may have been less than it seems. The same is true for the large colony at Blue Glacier, where most birds were up to 2 km inland in the recent survey. At this and other sites with apparent increases, Spellerberg (1967) could spend only about an hour at each (and some he may have just flown over), whereas we could have three or four biologists spending 1-3 days at each. There is also a seeming discrepancy at Cape Bird. Knox & Wilson (1979) reported 279 pairs in the entire area in 1978-79, but we found 399 pairs in December 1981, including many skuas breeding 1-2 km south of any penguin colonies.

A likely cause of the apparent increase in skua numbers at southern McMurdo Sound sites, especially in the late 1950s and early 1960s, was the human refuse at McMurdo Station dump. At all skua sites in southern McMurdo Sound the bones of chicken, lamb, and beef were common, brought by skuas from the dump. Jouventin & Guillotin (1979) proposed a similar cause for the doubling of the small skua breeding population at Pointe Géologie, Terre Adélie. The same may be true in the Antarctic Peninsula region, where South Polar Skua numbers are increasing at several sites as well as on the nearby South Orkneys (Hemmings 1984; W. Z. Trivelpiece, pers. comm.). These increases could well be the result of refuse from the increasing number of scientific bases in the region.

The stability of skua numbers at Cape Crozier is indicated by the little change apparent in the occupied breeding area. Nesting density has not changed either. Comparisons between 1967 and 1980 were done by RCW. The few Crozier skuas that visit McMurdo and Scott bases do so only during the pre- and post-breeding seasons.

Among all the sites listed in Table 4, the best comparisons are for Cape Hallett, Rocky Points, Horseshoe Lake, Cape Royds, Cape Barne, and perhaps Cape Crozier. On the one hand, the changes in various South Polar Skua colonies, including those outside the Ross Sea region, and the direct link between changes and human activities, make skuas less useful than penguins for monitoring marine ecosystems. On the other hand, trends in the Cape Bird and Cape Hallett skua colonies indicate that changes in environmental factors other than human activity may have been at play. Thus, there is some utility in monitoring skua numbers.

Interchange among populations

Few South Polar Skuas breed away from their natal rookeries. The emigration rate in the Cape Crozier population is only about 0.3% (Ainley, Wood and Ribic, unpubl. data). What little interchange exists does not occur at the same rate at all sites, and rates and the direction of movement could be tied to population trends (Table 5). Cape Evans, where numbers may have increased substantially, received far more immigrants (six) than any other colony relative to its size (few chicks were banded at Cape Evans, and thus we know nothing of emigration there). The small but increasing colony at Pointe Géologie also contributed an immigrant to the Ross Sea region. Cape Crozier, where the breeding numbers remained stable, received six immigrants but sent forth five emigrants for only a slightly positive trade balance. Cape Bird, where the colony possibly declined, received no immigrants but sent forth seven emigrants. These data, and others in Table 5, indicate that sites in southern McMurdo Sound, i.e. Cape Evans and the Dailey Islands, as well as Cape Crozier, were localities of choice for emigrating skuas. In fact, four of the five Crozier emigrants moved to sites in the southern Sound. As with population trends discussed above, many of these shifts could be related to the availability of food, i.e. the garbage dump at McMurdo, with Cape Evans and Dailey Islands being the closest sites (except Cape Armitage). Cape Crozier could be attractive because of the extensive open water nearby early in summer.

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TABLE 5 — Numbers of skuas, banded as chicks, which emigrated to breed away from natal colonies

Breeding Site	Natal Site Where Banded ^a				
	Pointe Géologie	Cape Hallett	Cape Crozier	Cape Bird	Cape Royds
Possession Is	1				
C. Hallett		--	1		
C. Crozier		2	--	3	
C. Bird				--	
C. Barne					1
C. Evans			3	3	
Dailey Is			2		

^a A ranking of sites by the number of chicks banded: C. Crozier, C. Hallett, C. Bird, Pt. Géologie, C. Royds

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