

ORNITHOLOGICAL OBSERVATIONS AT SEA IN THE SOUTH ATLANTIC OCEAN, 1954-64

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ABSTRACT. Observations of sea birds made during 19 voyages in the South Atlantic Ocean are tabulated to give frequencies and positions. The voyages are divided into 11 transects and for some of them comparative data are available for several months from spring to autumn.

SINCE 1947 ships establishing and re-supplying stations of the British Antarctic Survey have sailed regularly between the United Kingdom and the South Atlantic sector of the Antarctic. From 1954 to 1964, W.L.N.T. made seven voyages with these vessels and one with a whaling tanker, while R.W.W. sailed four times between Montevideo and the Falkland Islands on board Royal Mail ships. This paper presents the results of sea-bird watches kept during these voyages as well as those from seven other voyages made by H. Dollman and G. Edwards. Altogether, data are available from 19 voyages amounting to 195 days at sea between the Equator and lat. 63°S. (Table I).

TABLE I. SHIPS AND VOYAGES ON WHICH SEA-BIRD OBSERVATIONS WERE RECORDED

1. R.R.S. <i>John Biscoe</i>	Southampton (4 October 1954)–Cape Verde Islands–Montevideo–Falkland Islands–South Shetland Islands–South Orkney Islands (27 November 1954)	W.L.N.T.
2. R.M.S. <i>Fitzroy</i>	Montevideo (18 December 1956)–Falkland Islands (22 December 1956)	R.W.W.
3. R.R.S. <i>John Biscoe</i>	South Orkney Islands (30 March 1957)–South Georgia–Falkland Islands–South Georgia–Tristan da Cunha–St. Helena–Southampton (7 June 1957)	W.L.N.T.
4. S.S. <i>Southern Opal</i>	Newcastle upon Tyne (16 August 1958)–Venezuela–South Georgia (24 September 1958)	W.L.N.T., P.A.C.
5. R.R.S. <i>Shackleton</i>	South Georgia (5 May 1959)–Falkland Islands–Montevideo–Tristan da Cunha–St. Helena–Dakar–Southampton (25 June 1959)	W.L.N.T., P.A.C., H.D.
6. M.V. <i>Kista Dan</i>	Montevideo (14 January 1960)–Falkland Islands (18 January 1960)	G.E.
7. R.M.S. <i>Darwin</i>	Falkland Islands (22 January 1960)–Montevideo (26 January 1960)	R.W.W.
8. R.M.S. <i>Darwin</i>	Montevideo (22 April 1960)–Falkland Islands (26 April 1960)	R.W.W.
9. R.R.S. <i>John Biscoe</i>	Falkland Islands (23 April 1960)–Montevideo (27 April 1960)	G.E.
10. R.R.S. <i>John Biscoe</i>	Montevideo (27 April 1960)–Falkland Islands (2 May 1960)	G.E.
11. R.R.S. <i>John Biscoe</i>	Falkland Islands (12 May 1960)–Montevideo (16 May 1960)	G.E.
12. R.R.S. <i>Shackleton</i>	Montevideo (26 November 1960)–Falkland Islands (30 November 1960)	G.E.
13. M.V. <i>Kista Dan</i>	Montevideo (29 December 1960)–Falkland Islands–South Shetland Islands–South Orkney Islands–South Georgia (16 January 1961)	H.D., W.L.N.T.
14. R.R.S. <i>John Biscoe</i>	South Georgia (10 April 1961)–South Orkney Islands–Falkland Islands–Montevideo–Southampton (28 May 1961)	W.L.N.T., P.W.M., H.D.
15. M.V. <i>Kista Dan</i>	Southampton (December 1961)–Montevideo–Falkland Islands–South Georgia (January 1962)	C.F.F., H.D.
16. R.R.S. <i>Shackleton</i>	South Georgia (March 1962)–South Orkney Islands–South Shetland Islands–Falkland Islands–Montevideo–Southampton (May 1962)	C.F.F., H.D.
17. R.R.S. <i>Shackleton</i>	Southampton (October 1962)–Montevideo–Falkland Islands–South Georgia (November 1962)	W.L.N.T., R.P.
18. R.M.S. <i>Darwin</i>	Falkland Islands (15 April 1963)–Montevideo (19 April 1963)	R.W.W.
19. R.R.S. <i>Shackleton</i>	South Georgia (4 April 1964)–Falkland Islands–Montevideo (20 April 1964)	W.L.N.T., R.P.

Observers: P. A. Cordall (P.A.C.), H. Dollman (H.D.), G. Edwards (G.E.), C. F. Le Feuvre (C.F.F.), P. W. Mander (P.W.M.), R. Pinder (R.P.), W. L. N. Tickell (W.L.N.T.) and R. W. Woods (R.W.W.).

As we are concerned principally with birds of the Antarctic and southern cold temperate zones, the northern boundary for our analysis should be in the region of the Sub-tropical Convergence, whose most northerly extension in the South Atlantic is about lat. 37°S. (Murphy, 1936). However, Deacon (1960) has pointed out that much less is known about the Sub-tropical than the Antarctic Convergence and, in view of the mobility of birds, we have arbitrarily taken lat. 20°S. as the northern boundary for our tabulated data (Appendix); but where appropriate we have commented in the text upon observations made farther north and into the Northern Hemisphere.

METHODS

Observations were made daily at any convenient time during daylight hours. Binoculars were used (7×50–10×40) and at each observation the date, time and length of observation were recorded together with conditions of weather and sea. Even in the worst storms most observers managed to spend some time on the bridge or deck, but inevitably more hours were spent watching during finer days. The ship's noon position and time zone were recorded daily.

Large birds were usually counted individually, but the abundance of most species was represented by the following numerical classes:

- I = 1 or 2,
- II = 3–10,
- III = 11–100,
- IV = 101–1,000,
- V = over 1,000.

The voyages cross all climatic and oceanographic zones from the tropics to the polar seas (Fig. 1), and for this reason as well as convenience it is useful to divide them into different transects (T.1–T.11). Transects 1 and 2 are confined to the tropics and sub-tropics. The Sub-tropical Convergence of surface waters passes close to the south of the Tristan da Cunha group, while the ocean between the River Plate and the Falkland Islands is within the southern cold temperate zone (T.3). South and east of the Falkland Islands (T.6, T.7 and T.10), all voyages cross the Antarctic Convergence, while transects 8 and 9 lie entirely within the Antarctic zone of surface water. Transect 5 crosses all zones from the tropics to the Antarctic, and provides a useful comparison between mid-ocean (T.2) and coastal South America (T.1), where the presence of nearby land accounts for some of the species seen there. Between the River Plate and Tristan da Cunha the Sub-tropical Convergence was crossed close to the South American coast (T.11).

The data are presented in a number of transect tables (Appendix) but to save space species seen rarely, or only near land, have been excluded from all tables.

For most of the analyses the ships' noon positions are given to the nearest whole degree of latitude and longitude. The hours of daylight and therefore the number of nautical miles over which it is possible to make observations will differ according to the latitude and season of the year, and in the analysis of great shearwaters (*Puffinus gravis*) seen between Montevideo and the Falkland Islands (T.3) we have indicated the proportion of the total voyage available for observation (Fig. 2). This was not done for the other transects and species.

RESULTS

Transects

Transect 1. lat. 20°S., long. 39°–40°W. to River Plate (October—2 runs; May—2 runs).

Ships on this route vary in their distance from land. At times some vessels were within a few miles of the coast while at others they were up to 250 nautical miles to the east, probably away from the continental shelf. More species in larger numbers were seen in October than in May. Great albatrosses were seen every day (except one) in October but were absent altogether in May. Wilson's petrels (*Oceanites oceanicus*) were very common on both October runs, being seen every day from lat. 3°S. almost to the River Plate. On the other hand, notable differences were apparent between the two May runs. In 1962, Wilson's petrels were seen north of the River Plate on only one day while in 1961 they were present every day from lat. 25°S. to 6°S.,

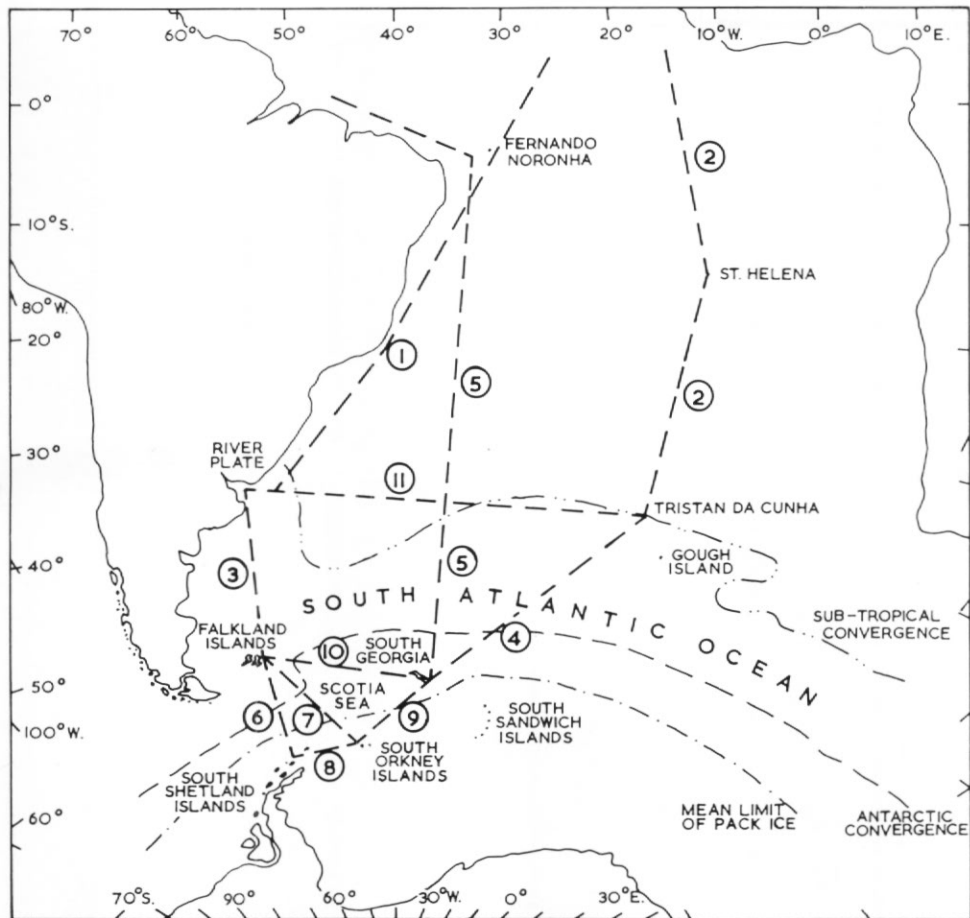


Fig. 1. Map of the South Atlantic Ocean showing the routes followed on all voyages and their division into 11 numbered transects.

and again north of the Equator for 2 days between lat. 39°N ., long. 13°W . to lat. 43°N ., long. 10°W . when they were moulting.

Transect 2. Tristan da Cunha—St. Helena (May—1 run; June—1 run).

North of Tristan da Cunha, cold temperate pelagic sea birds become rapidly less numerous and small numbers of tropical species (e.g. black noddies (*Anous tenuirostris*), white terns (*Gygis alba*), tropic birds (*Phaethon* spp.) and boobies (*Sula* spp.)) appear nearer St. Helena. Of the two runs on this transect, that of 1959 was 17 days later than that of 1957. Apart from great albatrosses which were seen every day in both months the only other birds seen in May were a few great shearwaters on one day. Many more birds were about in June, soft-plumaged petrels (*Pterodroma mollis*) being seen in small numbers each day, and giant petrels (*Macronectes* spp.) were still present one day north of Tristan da Cunha. In both years, however, Wilson's petrels were notably absent, but were met farther north. On 25 May 1957, about 50 were seen at lat. 10°N ., long. 17°W . and in 1959, while north of St. Helena (11–12 June) three followed the ship between lat. 7°S . and 2°S . and from lat. 11°N ., long. 17°W . to Dakar; these last birds were showing moulting primaries.

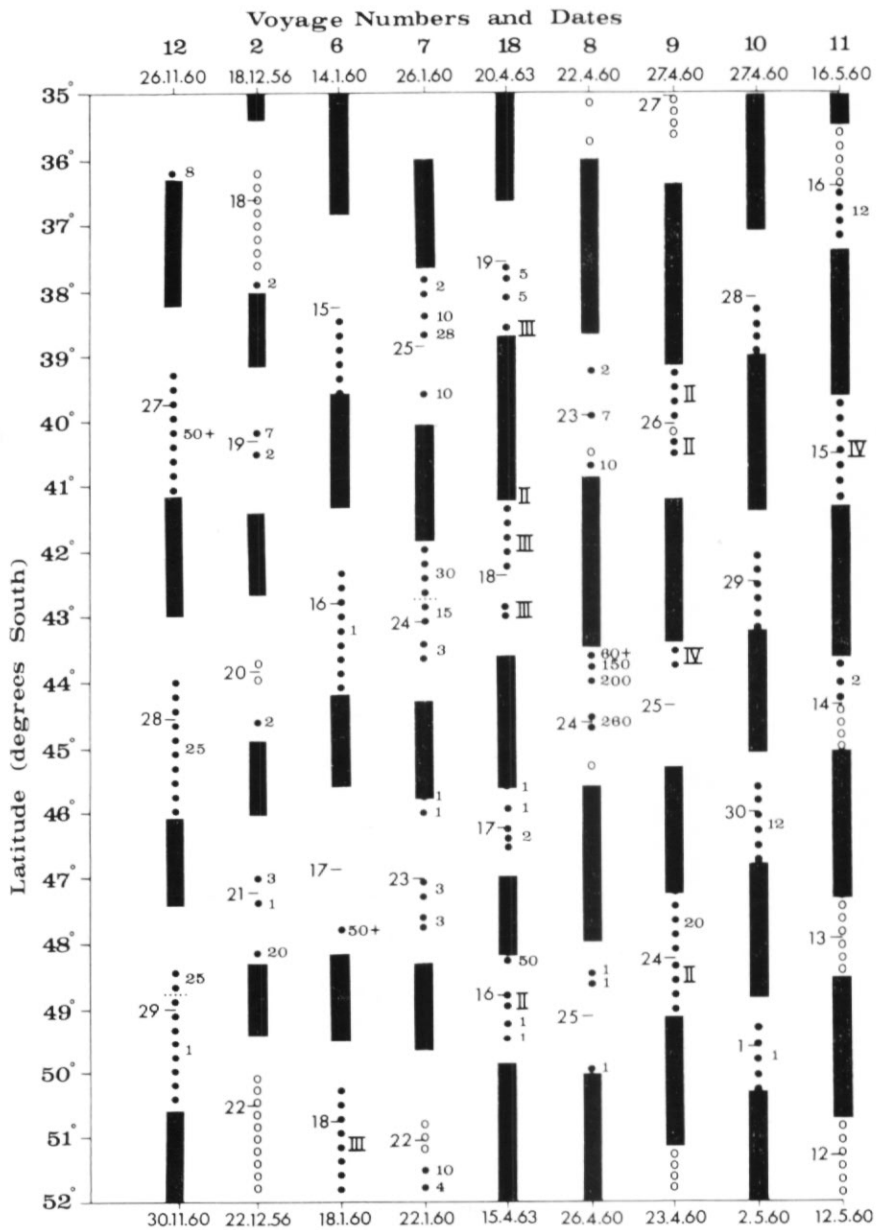


Fig. 2. Records of great shearwaters (*Puffinus gravis*) seen during nine voyages between the River Plate (lat. 35° S.) and the Falkland Islands (lat. 52° S.). The solid columns represent those sections of voyages when darkness prevented observation. Figures on the left of each column point to the noon position on the date given. Solid circles (●) indicate the presence of great shearwaters, while the Arabic figures and Roman numerals on the right of each column give their abundance. Open circles (○) indicate the confirmed absence of shearwaters. Cross lines of small dots (.....) separate different observations.

Transect 3. River Plate–Falkland Islands (November—3 runs; December—2 runs; January—2 runs; April—7 runs; May—2 runs).

We have more observations for this transect than any other, sufficient to indicate clearly differences in abundance or movements of some species from early summer to autumn. Species like the black-browed albatross (*Diomedea melanophris*) which breeds in huge numbers in the Falkland Islands are common in all the records, being logged on 64–88 per cent of days at sea. On 21 out of 67 days over 100 were seen, and on 2 days over 1,000. No significant differences are apparent in the numbers seen each month. Antarctic breeding species such as the cape pigeon (*Daption capensis*) and silver-grey fulmar (*Fulmarus glacialisoides*), although not seen at all during the height of the summer, are still moving south in November and are becoming more numerous again in April and May.

The occurrence of great shearwaters in these latitudes is interesting, and will be dealt with in detail below.

Transect 4. South Georgia–Tristan da Cunha (May—1 run).

In general, the pelagic species were much more numerous in mid-ocean. On 4 out of 6 days over 100 cape pigeons were seen but not as far north as nearer the South American coast (T.1 and T.3). Considering the large numbers of black-browed albatrosses that nest at South Georgia and the evidence for their movements to South Africa (Tickell, 1967), their absence on this run indicates a rapid and complete exodus not only from the breeding grounds but from the surrounding seas where they feed during the breeding season. Sooty (*Phoebastria fusca*) and light-mantled sooty (*P. palpebrata*) albatrosses were seen on the same day only in the vicinity of Tristan da Cunha. The absence of great shearwaters is also notable.

Transect 5. lat. 20°S., long. 35°W.—South Georgia (September—1 run).

Because only one transect was made during September, the observations are not strictly comparable with those of any other transect; however, it is important as it traverses latitudes between transects 1/3 and 2/4. Cape pigeons occurred no farther north (lat. 28°S.) on this oceanic transect than they did near the coast (lat. 29°S.) in October (T.1) but they were more numerous farther south than they were on transect 3. In both October runs of transect 1, one Schlegel's petrel (*Pterodroma incerta*) was seen (lat. 29°S.) farther north than in transect 5.

Although strong southerly passages of Wilson's petrels were evident near the coast during October, only one individual was seen at lat. 15°S. and two at lat. 28°S. on this transect.

Transect 6. Falkland Islands–South Shetland Islands (November—1 run; January—1 run; March/April—1 run).

Transect 7. South Orkney Islands–Falkland Islands (April—1 run).

Both of these transects cross the Antarctic Convergence and Antarctic species such as cape pigeons and silver-grey fulmars were present only near their breeding grounds at the height of the summer (January). Cold temperate species, on the other hand, were not seen south of the Convergence.

It is possible that some at least of the species seen on these transects were birds on circum-polar passage through Drake Passage from the South Pacific to the South Atlantic or vice versa. Great albatrosses could well be amongst these as colour-dyed wandering albatrosses (*Diomedea exulans*) from Bird Island, South Georgia, have been reported near Cape Horn (Tickell, 1968).

Transect 8. South Shetland Islands–South Orkney Islands (January—1 run; March—1 run).

Transect 9. South Orkney Islands–South Georgia (January—1 run; March—1 run; April—1 run).

Both of these transects lie within the Antarctic zone of surface water. Characteristically, snow petrels (*Pagodroma nivea*) and Antarctic petrels (*Thalassoica antarctica*) were seen, but

cold temperate species were also occasionally found, for instance a sooty shearwater (*Puffinus griseus*) was recorded at lat. 58°S. Wilson's petrels were common at all times and sub-Antarctic species such as albatrosses were frequent.

Transect 10. Falkland Islands–South Georgia (May—2 runs; November—1 run).

Although there is little difference in latitude between the Falkland Islands and South Georgia, the Antarctic Convergence passes between them (Fig. 1). Some species breed on both islands, for example, giant petrel and shoemaker (*Procellaria aequinoctialis*), while others such as wandering albatross (South Georgia) and sooty shearwater (Falkland Islands) nest only on one. Grey-headed albatrosses (*Diomedea chrysostoma*) and diving petrels (*Pelecanoides* spp.) are commonest near South Georgia, but such differences are not widely reflected in our observations; Wilson's petrels, abundant in November, were almost absent in May.

Transect 11. River Plate–Tristan da Cunha (May—1 run).

This transect runs approximately along the line of the Sub-tropical Convergence. Large numbers of sea birds were seen throughout the voyage. Wilson's petrels were only present near the coast of South America, and white-bellied storm petrels (*Fregetta grallaria*) only near Tristan da Cunha. Similarly, great shearwaters were present only within 350–400 nautical miles and giant petrels within 150–200 nautical miles of the coast of Argentina. Although large numbers of prions (*Pachyptila* spp.) were seen, they were not accompanied by blue petrels (*Halobaena caerulea*) as often found farther south.

Species

Those species marked with an asterisk (*) are not included in the appendix tables.

Penguins.* Several species of penguin can usually be seen in large numbers off the coasts of the Falkland Islands, South Shetland Islands, South Orkney Islands and South Georgia. All such observations, within about 50 nautical miles of the breeding grounds, have been excluded from this paper.

The probability of seeing penguins at sea must be substantially less than that for flying birds. In calm conditions surfacing penguins can be seen well away from a vessel, but in rough seas they are easily missed even when close. Negative records are therefore no indication that a species is absent.

Penguins were seen away from land only between the River Plate and Falkland Islands (T.3). Most of them were magellanic penguins (*Spheniscus magellanicus*), but gentoo penguins (*Pygoscelis papua*) were seen twice at lat. 48°S., long. 57°W. on 24 April 1960 and at lat. 49°S., long. 57°W. on 29 November 1960. Rockhopper penguins (*Eudyptes crestatus*) were seen only once, on 14 November 1962 at lat. 39°S., long. 57°W.

Great albatrosses. Like many previous observers, we found that we often logged wandering albatrosses (*Diomedea exulans*) without being certain we were not seeing royal albatrosses (*Diomedea epomophora*). In some voyages sub-adult plumage descriptions have confirmed identifications, but Tickell (1968) has shown that half of the male wandering albatrosses breeding at Bird Island have "chionopectera" plumage and probably appear identical to royal albatrosses at sea. Since these observations were made, Westerskov (1960) has published field characters for distinguishing the two species based upon the attitude of the wings in flight.

Wandering albatrosses nest at a number of islands in the South Atlantic, while royal albatrosses breed only around New Zealand. Johnson (1965) suggested, on the grounds that a large number of royal albatrosses have been identified on the west coast of South America, that they might breed on some of the islands around Tierra del Fuego. Throughout the world they are about half as numerous as wandering albatrosses (Tickell, 1968). Nevertheless, royal albatrosses banded on Campbell Island have been recovered on the fishing grounds off the estuary of the River Plate (Kinsky, 1963; personal communication) and as transects 3 and 6 are parallel to the route from Cape Horn to the River Plate there is no reason why some of our

identifications might not be of royals. We have therefore thought it prudent to record all sightings as great albatrosses, indicating those which were confirmed as wandering albatrosses. Our most northerly sightings were confirmed as wandering albatrosses by their sub-adult plumage. The presence of great albatrosses near the coast (T.1) at lat. 23°S. in October, a month before the arrival of the species at South Georgia, is interesting compared with May when the most northerly sighting was lat. 37°S. In mid-ocean (T.2) the most northerly wandering albatrosses in May were at lat. 24°S., while in September (T.5) they were at lat. 28°S. all of which agree well with the observations of Dixon (1933), who likewise did not distinguish between the two species.

Black-browed albatross (*Diomedea melanophris*). This is the commonest albatross of the South Atlantic, breeding at Tierra del Fuego, the Falkland Islands and South Georgia. Recoveries of banded birds have shown that most fledglings from the Falkland Islands move up the coasts of Argentina and Brazil, while those from South Georgia go to South African waters (Tickell, 1967).

It is not surprising therefore that the species was always common between the estuary of the River Plate and the Falkland Islands (T.3). When most abundant (April) they were sighted on 23 out of 25 (92 per cent) days at sea.

Farther north the species was present in May up to lat. 22°S. (T.1) but in October the most northerly birds were at lat. 38°S. (T.3). In May they were seen every day between the River Plate and Tristan da Cunha (T.11), but none occurred to the north of Tristan da Cunha. Between the South American coast and mid-ocean in September (T.5) the most northerly record was lat. 35°S. but very few individuals were recorded between there and South Georgia.

Black-browed albatrosses leave South Georgia towards the end of April, the last fledglings going to sea at the end of the first week of May (Tickell, 1967). The population obviously disperses very rapidly because on the single run of transect 4, from South Georgia to Tristan da Cunha between 7 and 12 May 1957 not a single one was seen. Between the Falkland Islands and South Georgia (T.10), black-browed albatrosses were more numerous in November than May. South of the Falkland Islands (T.6) the birds appear to be less frequent in Drake Passage, and none was seen on transects 7 and 8. They were not seen near the South Orkney Islands, but appeared in January, March and April about half-way between that group and South Georgia.

Grey-headed albatross (*Diomedea chrysostoma*). This species was seen rarely and in very small numbers, except in the vicinity of South Georgia.

Yellow-nosed albatross (*Diomedea chlororhynchos*). This species was seen only in mid-Atlantic waters near Tristan da Cunha.

Sooty albatrosses. Neither the sooty albatross (*Phoebastria fusca*) nor the light-mantled sooty albatross (*Phoebastria palpebrata*) ever occurred in large numbers and they were both absent from the South American coast north of the River Plate (T.1). *P. fusca* was seen north of Tristan da Cunha (T.2) to lat. 25°S. in early June 1959, but it was not recorded on a previous run (in 1957) 17 days earlier. Between the River Plate estuary and Tristan da Cunha (T.11) at this time in 1959 *P. fusca* was seen on 4 and *P. palpebrata* on 2 out of 8 days, the latter being the most northerly (lat. 38°S.) report of *P. palpebrata*. The most southerly *P. fusca* were encountered at lat. 41°S. in May 1957 south of Tristan da Cunha (T.4), and between lat. 38° and 41°S. near Tristan da Cunha both species were seen on the same days (T.4 and T.11). *P. palpebrata* was common on transect 4 but along transect 5 in September no *P. fusca* and only one *P. palpebrata* were seen between the Equator and South Georgia.

A few *P. palpebrata* were seen between the Falkland Islands and River Plate (T.3) in December, April and May, and the species was also recorded on all the remaining transects (T.6–T.10).

Giant petrels. We have made no attempt to distinguish *Macronectes halli* and *M. giganteus* (Bourne and Warham, 1966).

No pattern emerges in these observations of their oceanic distribution, but they are commonly

seen on most voyages about the Scotia arc (T.6–T.10) and may be abundant at times, for example, in November between the Falkland Islands and South Georgia (T.10).

Their frequency north of the Falkland Islands (T.3) varies from 73 and 76 per cent of days in November and April to 29 per cent of days in December. Between South Georgia and Tristan da Cunha (T.4), giant petrels were present on 5 out of 6 days but in September only single individuals were met on 2 days between the Equator and South Georgia; one of these was at lat. 35°S., our most northerly observation of the species.

On transect 11, in May, giant petrels were abundant near the River Plate but rarely seen afterwards. None was seen near the coast north of the River Plate (T.1) nor in mid-ocean north of Tristan da Cunha (T.2).

Silver-grey fulmar (*Fulmarus glacialisoides*). Although common in the Scotia Sea where large breeding colonies are found on Trinity Peninsula (personal communication from P. Mitchell), the South Orkney and South Sandwich Islands, this bird does not appear to winter as far north as the cape pigeon. Approaching South Georgia from the north (T.5), it was not encountered until lat. 45°S.; in May none was seen between South Georgia and Tristan da Cunha, nor from the River Plate to Tristan da Cunha where cape pigeons were common.

The most northerly sighting was of a single bird in lat. 29°S. just off South America, but no other fulmars were seen in four runs of transect 1. From the River Plate to the Falkland Islands a few were present towards the north in November, but none was seen in December or January, although in April and May they became more frequent nearer the Falkland Islands.

Antarctic petrel (*Thalassoica antarctica*). This truly Antarctic species breeds only on the Antarctic continent, and the nearest known nests are in the Theron Mountains (lat. 79°S., long. 28°W.) (Brook and Beck, 1972) and in Dronning Maud Land (Kononov and Shulyatin, 1964). It was seen on two occasions near the South Shetland Islands, and a freshly dead specimen was found near Port Stanley in the Falkland Islands on 23 September 1959.

Cape pigeon (*Daption capensis*). Cape pigeons breed in large numbers at the South Orkney, South Shetland and South Sandwich Islands, and they are often abundant in the Scotia Sea (T.6–9). Fewer nest at South Georgia, but a great many are often present perhaps attracted by whaling and sealing operations.

They are common throughout the South Atlantic, but perhaps less so near the South American coast. From the River Plate to Tristan da Cunha (T.11), in May, they were numerous each day, but none occurred in the immediate vicinity of Tristan da Cunha nor to the north of it (T.2).

Near the South American coast (T.1) none was seen north of the River Plate in May, but in 2 years a few were as far north as lat. 29°–30°S., and on transect 5 in September they were met at lat. 28°S. and seen almost all the way to South Georgia.

Between the River Plate and Falkland Islands none was recorded at all in December and January, but variable numbers occurred in November, April and May. Only in May were cape pigeons far more frequent along transect 4 than transect 3.

Snow petrel (*Pagodroma nivea*). This characteristic bird of polar seas was seen only in the vicinity of the South Shetland Islands, South Orkney Islands and South Georgia where it nests.

Great-winged petrel (*Pterodroma macroptera*)* Great-winged petrels were seen twice, on 23 January 1960 at lat. 47°S., long. 57°W. and on 23 April 1960 at lat. 40°S., long. 57°W. We suspect that they may have been more frequent than these records indicate, but they were rarely close enough to be identified with certainty.

White-headed petrel (*Pterodroma lessoni*)* We have five reports of white-headed petrels between lat. 42°S. and 53°S., but all are tentative identifications. The implication is that the species is very uncommon in the South Atlantic.

Schlegel's petrel (*Pterodroma incerta*). This bird occurred between lat. 21°S. and 55°S. (T.6, November 1954). It does not cross the Antarctic Convergence and was not seen at all on T.6–9.

It was commonest between lat. 35°S. and 50°S. Between the River Plate and the Falkland Islands it was commonest in April, being present on 68 per cent of days.

Soft-plumaged petrel (*Pterodroma mollis*). This species was most numerous between lat. 35°S. and 45°S. especially in the seas around Tristan da Cunha and north of the Falkland Islands. The most northerly records occurred on 4 days sailing from Tristan da Cunha, 1–4 May 1959. 2 years previously the same passage was crossed during 14–17 May and the most northerly individuals were within sight of Tristan da Cunha (lat. 37°S.).

Blue-petrel (*Halobaena caerulea*). These birds have been observed between lat. 45°S. and 58°S. They sometimes fly in company with *Pachyptila* spp. from which they are easily distinguishable. Markedly less numerous than prions, they occasionally occur in quite large numbers.

Prions. We did not distinguish the various species of prion at sea. In the South Atlantic, *Pachyptila desolata* nests in the South Orkney Islands and South Georgia, *P. belcheri* and *P. turtur* or *P. crassirostris* in the Falkland Islands (Strange, 1968; personal communication from W. R. P. Bourne), while *P. vittata* breeds at Gough Island and in the Tristan da Cunha group. Observations have been pooled, and serve at least to show that these birds are sometimes present in huge numbers.

Shoemaker (*Procellaria aequinoctialis*). Shoemakers breed at the Falkland Islands and South Georgia. They were frequently seen on transect 3 and in greatest numbers on the fishing grounds off the River Plate (lat. 37° and 39°S.). The most northerly bird was seen at lat. 29°S. in May (T.1) and the most southerly at lat. 58°S. in April near the South Orkney Islands (T.9).

Pediunker (*Procellaria (Adamastor) cinereus*). Pediunkers were observed between lat. 35°S. and 49°S. They were never as numerous as might be expected from Murphy's (1936) account. Altogether out of 90 days spent between lat. 30°S. and 50°S. the species was seen on only 10 days.

Great shearwater (*Puffinus gravis*). Until the recent discovery of great shearwater nests in the Falkland Islands (Woods, 1970), the only known breeding station was at Tristan da Cunha. At sea the birds are very common between the River Plate and Falkland Islands (T.3) (Fig. 2). They were seen on 62–91 per cent of days during the months of observation and frequently over 100 were recorded in a single day. The most northerly sightings were at lat. 9°S. off Brazil and lat. 4°S. in mid-ocean. The only record south of the Falkland Islands between 1954 and 1964 was a "large flock" between East Falkland and Beauchene Island (60 nautical miles south of East Falkland) in late December 1959 (Woods, 1970). None was seen between the Falkland Islands and South Georgia, and in May the species was also absent from the seas between Tristan da Cunha and South Georgia (T.4).

Data from the 16 voyages on transect 3 have been examined by grouping summer records (November–January; 7 voyages) and autumn records (April–May; 9 voyages). The mean duration of each voyage of 1,100 nautical miles was just over 4 days and the ships concerned were moving too fast for an adequate number of observations to be obtained. Only tentative deductions regarding changes in distribution are possible.

Although the species was common on all voyages between lat. 35°S. and 48°S., larger numbers were seen between lat. 41°S. and 47°S. in late April than in the November–January period. It is probable that many birds in this part of the South Atlantic, which is about 2,500 nautical miles west-south-west of Tristan da Cunha, are non-breeders. A round feeding-flight of 5,000 nautical miles appears too long for birds breeding at Tristan da Cunha, and Watson (1971) reported moulting birds among great shearwaters seen off Tierra del Fuego.

Three voyages in 1960 covered overlapping periods between 22 April and 2 May, while a fourth covered the period 12–16 May, giving some evidence of movements of the larger flocks. Using only those six counts or estimates of 75 or more birds seen in one day, a Spearman rank correlation coefficient on dates and latitudes of these observations was computed. The coefficient

yielded ($r_s = +0.5$) shows moderate positive correlation, though not significant at the 0.05 level, between passage of time in days after 22 April and movement northward measured by decreasing latitude south of the Equator.

Taking all available observations into account, it seems that fewer birds were present south of lat. 48°S. in late April and May than in the November–January period. The small Falkland Islands population appears to move north from about the end of the third week in April.

Sooty shearwater (*Puffinus griseus*). Sooty shearwaters breed in the Falkland Islands and one bird caught and ringed in Stanley on 4 May 1962 was recovered on 1 June of the same year off St. Philip, Barbados (Sladen and others, 1968). No pattern is apparent from seaborne observations but, comparing transects 3, 4, 5 and 11 with transects 9 and 10, it seems that the species occurs farther south and east of the Falkland Islands than the great shearwater and it is also much less numerous on transect 3. On transect 5 the most northerly birds were encountered at lat. 35°S. and continued to be seen each day until lat. 49°S. The most southerly record was at lat. 58°S., long. 41°W. but the species is not often encountered far south of the Falkland Islands.

Other shearwaters.* Small shearwaters have been seen from time to time off the coast of Argentina (T.3) and on two occasions fairly large numbers were encountered. Manx shearwaters (*Puffinus puffinus*) have been identified. The only other report is of a single bird near Tristan da Cunha (T.11).

Wilson's petrel (*Oceanites oceanicus*). Trans-equatorial migration by this species was suggested by Roberts (1940) and our observations are consistent with his hypothesis. Close to the South American coast (T.1) in October the species was twice encountered just south of the Equator (lat. 3°S. and 7°S.), after which birds were seen all the way to the River Plate. A month earlier in 1958 only three Wilson's petrels were seen between the Equator and South Georgia on transect 5 (between lat. 5°S. and 10°S.; T.5 was within 2° longitude of T.1). September may be early for this stage in the passage or the migrants may tend to travel nearer the coast as observed in October. Between the River Plate and the Falkland Islands, birds were seen in small numbers during November, December, January, April and May. In the seas around the South Shetland and South Orkney Islands where they breed, large numbers were observed in mid and late summer.

A northward passage was apparent in May 1961 up the South American coast and north of the Equator; about 20 birds with very worn and moulting plumage accompanied the ship on 25–26 May between lat. 39°N., long. 13°W. and lat. 43°N., long. 10°W. It is notable that between the River Plate and Tristan da Cunha (T.11) during the same month Wilson's petrels were seen only near the coast of South America. In mid-Atlantic none was seen between South Georgia and lat. 7°S. (T.4 and T.2) in May 1957, but on 25 May about 50 were seen north of the Equator at lat. 10°N., long. 17°W. In another year (15–16 June 1959) about 30 birds with moulting quills followed the ship between lat. 11°N., long. 17°W. and Dakar.

Other storm petrels. Black-bellied (*Fregetta tropica*) and white-bellied storm petrels (*F. grallaria*) were recorded as separate species but, in view of the numbers of observers involved (Table I) and the possibility of misidentification, we wish to be cautious about these data. The ranges of the two species appear to overlap. *F. tropica* was recorded on 11 days between lat. 40°S. and 60°S. and *F. grallaria* on 12 days between lat. 2°S. and 52°S.; *F. grallaria* was numerous near Tristan da Cunha. Grey-backed storm petrels (*Garrodia nereis*) were recorded only between the River Plate and the Falkland Islands from lat. 42°S. to 49°S. During 68 days at sea they were seen on ten different occasions.

Diving petrels.* With the exception of two reports north of the Falkland Islands at lat. 49°S., long. 58°W. on 25 April 1960 and 16 April 1963, diving petrels have been seen only near South Georgia. Two species, *Pelecanoides (urinatrix) exsul* and *P. georgicus*, have been listed for South Georgia (Bourne, 1968) but we have not distinguished species at sea.

Boobies.* Three species of booby, the red-footed (*Sula sula*), blue-faced (*S. dactylatra*) and the brown (*S. leucogaster*), were seen south of the Equator near St. Helena and the South American coast, but only brown boobies were recorded south of lat. 20°S. On 5 and 6 May 1962, small parties were seen between lat. 22°S. and 25°S. and on 9 May 1961 larger numbers were encountered at lat. 22°S., off the Brazilian coast (T.1).

Cormorants.* King (*Phalacrocorax albiventer*), rock (*P. magellanicus*) and blue-eyed (*P. atriceps*) shags were seen in coastal waters. The only exception was on 12 May 1960 when large parties of king shags were still being seen on the water about 70 nautical miles north of the Falkland Islands.

Sheathbill (*Chionis alba*).* Jones (1963) has shown that these birds undertake journeys over considerable stretches of ocean. In April 1961, two sheathbills landed on R.R.S. *John Biscoe* when it was leaving the South Orkney Islands and stayed with the vessel all the way to the Falkland Islands. 2 weeks later when *John Biscoe* sailed north from the Falkland Islands a single sheathbill again joined the vessel and remained on board until it entered harbour at Montevideo. During these voyages the birds roosted on a sheltered part of the deck and periodically flew alongside and around the ship for a while, sometimes landing upon nearby icebergs before returning on board.

Great skua (*Catharacta skua*). We have not been able to distinguish the sub-species of great skuas seen at sea. Occasional birds are often seen in mid-ocean very far from land and twice we have come upon two birds flying in company. Although skuas sometimes pause to fly around a ship, generally they take no notice of it. The farthest north the species was seen was at about lat. 7°S., long. 33°W. on 19 October; the bird was flying south and, after inspecting the vessel and diving for meat thrown overboard, continued on its way.

Jaegers.* Pomarine skuas (*Stercorarius pomarinus*) were recorded five times between the River Plate and the Falkland Islands (T.3). The largest party comprised 12 individuals and the most southerly record was at lat. 47°S. Several arctic (*S. parasiticus*) and long-tailed (*S. longicaudus*) were seen in the same area.

In mid-ocean one juvenile arctic skua was encountered at lat. 2°S., long. 11°W. on 12 June 1959. North of the Equator, from 15–18 June 1959, a total of nine pomarine skuas were seen on the 17°W. meridian between lat. 11°N. and 21°N. 2 years later on 21 May 1961 a single pomarine skua was seen at lat. 23°N., long. 22°W. Farther north, on 3 May 1963, three flying north passed R.M.S. *Amazon* at lat. 25°N., long. 16°W.

Gulls.* All gulls were seen near to land. Dominican gulls (*Larus dominicanus*) were recorded from north of the River Plate (T.1) at lat. 33°S. near the River Plate, the Falkland Islands and South Shetland Islands (lat. 63°S.), while Patagonian black-headed (*L. maculipennis*) and grey-headed (*L. cirrocephalus*) gulls were encountered only near the mouth of the River Plate.

Terns.* Away from coastal regions terns were seen between the River Plate and the Falkland Islands (T.3), and amongst the islands of the Scotia Sea. Few of our identifications are certain enough for these observations to be useful.

DISCUSSION

Murphy (1936) summarized the reports of marine birds known at that time in the South Atlantic and discussed the physical characteristic of the ocean and climate which may have contributed to their distribution. Since World War II numerous ornithologists have made voyages in the South Atlantic; some have published their observations (Holgersen, 1945; 1957; Routh, 1949; Bierman and Voous, 1950; Van Oordt and Kruijt, 1954), while others have deposited their records in the files of the National Institute of Oceanography, Royal Navy Bird-watching Society, and similar organizations, where they are available for other workers (Bourne and Radford, 1961).

The recent publication of a map folio of Antarctic and sub-Antarctic birds (Watson and others, 1971) brings together observations from all available sources. These sources are very diverse and the maps are therefore, constructed from pooled data that are not always strictly comparable. Although it is a most useful reference for marine ornithologists, comparatively little interpretation is possible.

To obtain an adequate picture of the distribution of marine birds it would be desirable to run a series of north-south transects crossing the various climatic and oceanographic zones in different longitudes and seasons. This would be possible only with a vessel devoting at least part of its time primarily to marine ornithological research, and to date funds sufficient for such an enterprise have not been available. Bourne (1963) has already pointed out that the only feasible alternative is to try and make fuller use of whatever ships are at sea. In the North Atlantic, where shipping has long been more abundant, sea-bird logs have been numerous enough to permit calculation of species frequency over large areas of water (Jespersen, 1930; Wynne-Edwards, 1935). Within the cold-temperate, sub-Antarctic and Antarctic zones of the South Atlantic, ships are comparatively rare and marine ornithological research dependent upon them suffers from the disadvantage that their courses and the months in which voyages are undertaken are non-random and incomplete. Large expanses of ocean are never traversed and many months often pass when no vessels follow even the most frequented routes.

Bearing in mind these limitations, there are nevertheless ways of improving the traditional sea-bird log. The Pacific transect of Szijj (1967) is a good example. Cline and others (1969) have tackled the problem of defining transect width and expressing the abundance by area and biomass. The quadrant they employed for selecting transect edge was successful for penguins and other birds in pack ice in calm seas; but it is questionable whether it would be as reliable for flying birds seen from the deck of a rolling ship. In lower latitudes, where there are greater varieties of species, transect width must vary with the size of species and the ease with which they can be identified.

If it is impossible to study effectively large expanses of ocean, emphasis should be placed upon detecting the differences in sea-bird numbers and movements along those routes that are frequently traversed. Refinements in observation procedure and more rigorous analysis would allow much more confidence to be placed in those differences that are noticed. The key requirements appear to be:

- i. Well-defined routes regularly used by one or more vessels in as many months of the year as possible.
- ii. Continuity of observers on as many voyages as possible. This would be best achieved by the co-operation of watch-keeping deck officers and seamen.
- iii. Limitation of interest (at first) to conspicuous and easily recognized species.
- iv. Observation periods of fixed length ($\frac{1}{2}$ or 1 hr.) spaced so as to provide observations at intervals of approximately 1° of latitude.
- v. Negative and positive records; positive records indicating abundance by simple numerical classes.
- vi. Observations recorded upon check sheets or cards coded for immediate punching on to IBM cards.
- vii. Computer programme for routine sorting and print-out of data.

Few of these requirements were fully met in our work but the data are numerous enough to permit comparisons of our own observations in different places and at different times. We have been conscious of weaknesses in many of our sea notes, but where we have been unable to write usefully with caution about uncertain observations we have omitted them altogether. All but one of the observers who have co-operated with us (see Acknowledgements and Table I) have first worked with either one or both of us and this has given a degree of control and continuity to the series.

We have not sought to make syntheses or generalizations about the distributions of the birds we have seen; this we feel is a task for others at some future time when more comprehensive data are available. In the meantime there is great need for sea-bird studies that have been planned with limited objectives and adequate controls.

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APPENDIX

TABLES OF OBSERVATIONS ON TRANSECTS 1 TO 11

<i>Key:</i> Blank space	No birds seen
+	Birds present, numbers unspecified
1-20	Number of birds counted
I	Estimated numbers 1-2
II	Estimated numbers 3-10
III	Estimated numbers 11-100
IV	Estimated numbers 101-1,000
V	Estimated numbers over 1,000

TRANSECT I. EQUATOR-RIVER PLATE

	October 1954					October 1962				May 1961					May 1962				
	23	24	25	26	27	28	29	30	31	9	8	7	6	5	6	5	4	3	
Great albatrosses	1*	I	I	II		3	1	1	1										
<i>Diomedea melanophris</i>									1	?			?	II	15	15	1	4	
<i>Diomedea chlororhynchos</i>						1										III			
<i>Fulmarus glacialis</i>			I																
<i>Daption capensis</i>			II	II				1	1										
<i>Pterodroma incerta</i>			1														1	1	1
<i>Procellaria aequinoctialis</i>	1			I	I			1					5	3				II	III
<i>Oceanites oceanicus</i>	II	II	II			III	II	III	II	II	II					II			
<i>Catharacta skua</i>														1			1		
Lat. (°S.)	23	26	29	32	35	24	27	30	33	22	25	27	31	34	22	25	29	33	
Long. (°W.)	41	45	48	51	54	41	45	48	52	41	44	47	50	53	41	45	48	52	

 *Confirmed as *Diomedea exulans*.

TRANSECT 2. TRISTAN DA CUNHA-ST. HELENA-EQUATOR

	May 1957			May/June 1959				
	14	15	16	31	1	2	3	4
Great albatrosses	5	6	2*	10	4	1*	1*	1
<i>Diomedea melanophris</i>				1				
<i>Phoebetria fusca</i>				1		1	1	
<i>Macronectes</i> spp.				II				
<i>Pterodroma mollis</i>				I	I	I	I	I
<i>Procellaria aequinoctialis</i>						1		
<i>Puffinus gravis</i>			II					
<i>Puffinus griseus</i>								1
<i>Fregetta</i> spp.				II			1	
Lat. (°S.)	33	29	24	37	32	29	25	21
Long. (°W.)	11	10	08	12	11	09	08	07

* Confirmed as *Diomedea exulans*.

TRANSECT 4. SOUTH GEORGIA-TRISTAN DA CUNHA

	May 1957					
	7	8	9	10	11	12
Great albatrosses		I	II	5*	25*	II
<i>Diomedea chlororhynchos</i>				2	II	
<i>Phoebetria fusca</i>					III	I
<i>Phoebetria palpebrata</i>		II	II	II	I	
<i>Macronectes</i> spp.	II	II		II	I	I
<i>Daption capensis</i>	III	III	III	III	I	
<i>Pterodroma incerta</i>			I	I	III	
<i>Pterodroma mollis</i>		I				IV
<i>Halobaena caerulea</i>		IV	I			
<i>Pachyptila</i> spp.		IV	IV	IV	II	IV
<i>Procellaria aequinoctialis</i>		I				
<i>Puffinus griseus</i>		I		I		
<i>Oceanites oceanicus</i>	I					
<i>Fregetta</i> spp.				I		III
<i>Catharacta skua</i>					4	
Lat. (°S.)	54	51	48	45	41	37
Long. (°W.)	36	31	26	22	17	13

* Confirmed as *Diomedea exulans*.

TRANSECT 3. RIVER PLATE-FALKLAND ISLANDS (OCTOBER-JANUARY)

	November/October 1954				November 1960				November 1962				December 1956					December/January 1961				January 1960				January 1960							
	3	2	1	31	29	28	27	26	17	16	15	14	22	21	20	19	18	2	1	31	30	18	17	16	15	22	23	24	25	26			
Great albatrosses		II*	I	II	2	5	12							1						I		+	+					2	1				
<i>Diomedea melanophris</i>		II	II	II	III	20	III		III			III	1	1	1	1	4		1	III	III	II				IV	2	2	2				
<i>Diomedea chrysostoma</i>				I						I																							
<i>Diomedea chlororhynchos</i>																									I								
<i>Phoebastria palpebrata</i>													1	3		4																	
<i>Macronectes</i> spp.		+	+	+	14	2			III	II	II	I		2				II		I	II					II	II						
<i>Fulmarus glacialis</i>			+	2			2					I																					
<i>Daption capensis</i>		+	+	15			2		I		II	I																					
<i>Pterodroma incerta</i>			+	1	III	12	12			I	I	I			2	3							+	20	1		II	III					
<i>Pterodroma mollis</i>													1	III													II	II					
<i>Pachyptila</i> spp.		+			IV					III			III																				
<i>Procellaria aequinoctialis</i>		+	+	+		3	III				I	III							I	III	+	+		III			2						
<i>Procellaria cinereus</i>																																	
<i>Puffinus gravis</i>		+	+		III	III	III	8			I	III		III	1	9		I	I	II	III	+	IV	2	IV	II	II	III	III				
<i>Puffinus griseus</i>			+				2															+	+		I	2	1	1					
<i>Oceanites oceanicus</i>		+	+		5	4	3				I	II			1	II			I	I		+	II	III	II								
<i>Fregetta</i> spp.							2							II					III		+	III	III						1				
<i>Garrodia nereis</i>					1																							6	1				
<i>Catharacta skua</i>					2	3					3	1	1					1		1		+	+	1	II		3	1					
Lat. (°S.)		46	42	38	49	45	40	34	52	47	43	39	50	47	44	41	37	49	45	41	37	51	47	43	38	51	47	43	39	35			
Long. (°W.)		57	57	57	57	57	57	58	58	57	57	57	57	57	57	57	56	57	57	56	56	58	57	57	56	58	57	57	57	57	58		

*Confirmed as *Diomedea exulans*.

TRANSECT 3. RIVER PLATE-FALKLAND ISLANDS (APRIL-MAY)

	April 1960					April 1960				April 1962				April 1963				April 1964			April-May 1960				April-May 1961				May 1959					May 1960				
	23	24	25	26	27	25	24	23	22	25	26	27	28	16	17	18	19	16	17	18	1	30	29	28	29	30	1	2	12	13	14	15	16	12	13	14	15	16
Great albatrosses		II	1	3		3	2	II		2	15	III		3		1	1	1	II		II	II		6		10			I			II				2	II	6
<i>Diomedea melanophris</i>	IV	III	III	III	1	6	4	III		III	8	2	III	1		13	III	II	II	II	II	III	III	1	1	II	1	1			1	III	III	1	12	III	4	
<i>Diomedea chrysostoma</i>	1					1					1			2															1									
<i>Diomedea chlororhynchos</i>						1	2																															
<i>Phoebastria palpebrata</i>		1						1			1			1										I		1			1	1						1		
<i>Macronectes</i> spp.	IV	II	II	II		16	1	1		III	3		1	3	1			III	II	II	4	4	II	2	I	1	1	1	II	II	1	I		2		1	10	
<i>Fulmarus glacialis</i>	IV	III				6				2											III								II	II	1						6	
<i>Daption capensis</i>	III	6		1							III			3							3	II	1		II			1				III					2	2
<i>Pterodroma incerta</i>		2	II			6	III				II	II	II	II	III	III		III	III			2	II		III		I		II	II					III	III		
<i>Pterodroma mollis</i>		III	III				III							III	III	II					1	III	1		II		III		II	II				III	III	II		
<i>Pachyptila</i> spp.		III	III	1		3	III				II	II		II	III						1		III	1	III	II	III	III	III	III	III				III	IV	3	
<i>Procellaria aequinoctialis</i>				III				III			2	1	3	1		3	6	1									1	I	II							III	II	
<i>Procellaria cinereus</i>						1																1			II		1			II						2		
<i>Puffinus gravis</i>		III	IV	III		4	IV	II		IV	II	III		III	4	IV	III		III		1	III	IV	III	II	II	1		II		1	I			2	IV	12	
<i>Puffinus griseus</i>				6				2					+		1		1							III			I		II								3	
<i>Oceanites oceanicus</i>				1		1								2		II			I				2	1		1			1							1		
<i>Fregetta</i> spp.										2					1	2																						
<i>Garrodia nereis</i>		6	1			1								1		3			1			2													1	1		
<i>Catharacta skua</i>	1		6	1	II	1	8		1	1	1		6	4	7						1	2	1				1	1	1	3					4	II		
Lat. (°S.)	51	48	44	40	35	49	45	40	35	52	47	43	38	49	46	42	38	48	44	40	50	46	43	38	48	45	41	36	52	47	43	38	35	51	48	44	41	36
Long. (°W.)	58	57	57	57	58	58	57	57	58	58	57	57	56	58	57	57	57	57	56	56	57	57	57	56	58	54	55	56	58	57	57	56	57	58	57	57	57	56

TRANSECT 5. EQUATOR-SOUTH GEORGIA

	September 1958										
	15	16	17	18	19	20	21	22	23	24	
Great albatrosses			1*	8*	6*	1	I	2*	1*		
<i>Diomedea melanophris</i>					1	1		1	1		
<i>Diomedea chlororhynchos</i>							2	1			
<i>Phoebastria palpebrata</i>							I				
<i>Macronectes</i> spp.					1	1					
<i>Fulmarus glacialisoides</i>								1	2		
<i>Daption capensis</i>			II	2	5	2	III	II	III		
<i>Pterodroma incerta</i>					I	2	1	2			
<i>Pterodroma mollis</i>					II						
<i>Halobaena caerulea</i>								1	1		
<i>Pachyptila</i> spp.					1	III	II	II	II		
<i>Procellaria aequinoctialis</i>						1		2	3		
<i>Procellaria cinereus</i>					2						
<i>Puffinus gravis</i>			1		1	1					
<i>Puffins griseus</i>					2	1	2	III	1		
<i>Oceanites oceanicus</i>			2								
<i>Catharacta skua</i>									2		
Lat. (°S.)	20	24	28	32	35	39	42	45	49	53	
Long. (°W.)	35	35	35	35	35	36	36	36	36	36	

* Confirmed as *Diomedea exulans*.

TRANSECT 6. FALKLAND ISLANDS-SOUTH SHETLAND ISLANDS

	7	January 1961			March-April 1962			
		8	9	10	3	2	1	31
Great albatrosses	II	I	2	1	1			
<i>Diomedea melanophris</i>	II	I		1	4	1	1	
<i>Diomedea chrysostoma</i>		1			1			
<i>Phoebastria palpebrata</i>		2					1	
<i>Macronectes</i> spp.	III	III	II	I	III		1	
<i>Fulmarus glacialisoides</i>				III		III	III	II
<i>Thalassoica antarctica</i>				I				
<i>Daption capensis</i>			1	IV	II	II	II	II
<i>Halobaena caerulea</i>	I		1					
<i>Pachyptila</i> spp.		II	II	I		II		
<i>Procellaria aequinoctialis</i>		I						
<i>Puffinus griseus</i>	IV	II						
<i>Oceanites oceanicus</i>	II	I	II	1	2	2		II
<i>Fregetta</i> spp.	II						1	
<i>Catharacta skua</i>	1		1					
Lat. (°S.)	52	56	59	63	52	56	59	63
Long. (°W.)	58	59	61	61	58	61	62	61

TRANSECT 7. FALKLAND ISLANDS-SOUTH ORKNEY ISLANDS

	April 1961		
	16	15	14
Great albatrosses	6	3	
<i>Diomedea chrysostoma</i>		1	
<i>Phoebastria palpebrata</i>	3		
<i>Macronectes</i> spp.		1	+
<i>Fulmarus glacialis</i>	II	II	+
<i>Daption capensis</i>	II	II	+
<i>Pagodroma nivea</i>			+
<i>Pachyptila</i> spp.	II	I	+
<i>Procellaria aequinoctialis</i>		1	
<i>Oceanites oceanicus</i>	II		+
<i>Fregetta</i> spp.		II	+
<i>Catharacta skua</i>			+
Lat. (°S.)	54	57	60
Long. (°W.)	55	51	45

TRANSECT 8. SOUTH ORKNEY ISLANDS-SOUTH SHETLAND ISLANDS

	January 1961		March 1962	
	13	12	28	29
Great albatrosses	I			
<i>Phoebastria palpebrata</i>	I		I	
<i>Macronectes</i> spp.	1	II	1	I
<i>Fulmarus glacialis</i>	II		IV	III
<i>Thalassoica antarctica</i>				2
<i>Daption capensis</i>	III	III	IV	III
<i>Pagodroma nivea</i>			3	
<i>Pachyptila</i> spp.	II			
<i>Oceanites oceanicus</i>	II	III	III	III
<i>Catharacta skua</i>		II		
Lat. (°S.)	62	62	62	62
Long. (°W.)	53	58	51	58

TRANSECT 9. SOUTH GEORGIA-SOUTH ORKNEY ISLANDS

	January 1961		April 1961		March 1962
	15	14	10	11	26
Great albatrosses	I	I	II		3
<i>Diomedea melanophris</i>	II		I		2
<i>Diomedea chrysostoma</i>				1	1
<i>Phoebastria palpebrata</i>	I	1		3	2
<i>Macronectes</i> spp.		1	II		1
<i>Fulmarus glacialisoides</i>		II		II	
<i>Daption capensis</i>	III	III	III	III	
<i>Halobaena caerulea</i>	II		II	II	
<i>Pachyptila</i> spp.	IV	II		II	III
<i>Procellaria aequinoctialis</i>	1			1	
<i>Puffinus griseus</i>				II	
<i>Oceanites oceanicus</i>	III	II	III	II	2
<i>Fregetta</i> spp.			I	II	
Lat. (°S.)	57	61	54	58	58
Long. (°W.)	39	46	36	41	41

TRANSECT 10. FALKLAND ISLANDS-SOUTH GEORGIA

	May 1957		8	May 1959			November 1962		
	5	6		7	6	5	22	23	24
Great albatrosses	2	II	1	1	II	II	1	II	III
<i>Diomedea melanophris</i>				2		1		II	II
<i>Diomedea chrysostoma</i>		II		1		1		I	II
<i>Phoebastria palpebrata</i>				1		1			I
<i>Macronectes</i> spp.	1	I	II	II	II	III	III	III	III
<i>Fulmarus glacialisoides</i>		II	1	1	2			1	
<i>Daption capensis</i>	1	IV	1			III	I	II	III
<i>Pterodroma incerta</i>	I			1					
<i>Halobaena caerulea</i>	II	1		1		2			I
<i>Pachyptila</i> spp.	II	IV		II	II	III		III	IV
<i>Procellaria aequinoctialis</i>					2				I
<i>Puffinus griseus</i>	III			1	2	1			
<i>Oceanites oceanicus</i>		I				1	III	III	III
<i>Fregetta</i> spp.								I	
Lat. (°S.)	53	54	52	53	53	54	52	53	53
Long. (°W.)	45	36	58	52	45	36	58	50	43

TRANSECT 11. RIVER PLATE-TRISTAN DA CUNHA

	21	22	23	May 1959		26	27	28
				24	25			
Great albatrosses	II*	II*	II*	II*	II	II*	II*	III
<i>Diomedea melanophris</i>	III	2	1	1	1	1	1	I
<i>Diomedea chrysostoma</i>				1				
<i>Diomedea chlororhynchus</i>						1	1	1
<i>Phoebetria fusca</i>				1	1	2	1	
<i>Phoebetria palpebrata</i>						1		1
<i>Macronectes</i> spp.	III				2			I
<i>Daption capensis</i>	III	II	III	III	II	III	III	I
<i>Pterodroma incerta</i>	1			II	II	I	II	I
<i>Pterodroma mollis</i>		1	1	II	I	III	III	III
<i>Pachyptila</i> spp.	1	IV	1	I	1	III	III*	IV
<i>Procellaria aequinoctialis</i>	I	1						I
<i>Procellaria cinereus</i>		I				II		I
<i>Puffinus gravis</i>	III	II						
<i>Puffinus griseus</i>	I					2		
<i>Oceanites oceanicus</i>	III	1						
<i>Fregatta</i> spp.								I
Lat. (°S.)	36	36	38	39	38	38	38	37
Long. (°W.)	52	47	41	35	30	24	19	13

* Confirmed as *Diomedea exulans*.