

# Observations on pelagic birds in the South Atlantic Ocean in the Austral Spring

Maurice A. E. Rumboll and Joseph R. Jehl, Jr.

**ABSTRACT.**—We studied seabird distribution beyond the continental shelf off eastern South America, between Tierra del Fuego (53°S) and southern Brazil (29°S) in the austral spring of 1975. Bird populations seemed low in this little studied area, but data from other seasons are too few to permit comparisons. Maximum numbers and diversity occurred in the immediate vicinity of the Subtropical Convergence. The distribution of several species was largely restricted to zones of surface water (Subantarctic, Subtropical) on each side of the convergence. The occurrence of three immature Emperor Penguins (*Aptenodytes forsteri*) at 40°30'S, 54°34'W establishes the northernmost record for this Antarctic species.

Basic information on seabird distribution in the South Atlantic is surprisingly scanty. Most recent studies (e.g., Tickell and Woods, 1972; Cooke and Mills, 1972; Jehl, 1974; see also Watson et al., 1971 and references therein) have dealt largely with populations over the continental shelf or along the continental slope. This is not surprising as pelagic bird studies must usually be carried out incidental to other oceanographic or commercial activities. As a result, our knowledge is strongly biased in favor of those species that frequent near-shore waters or commercial shipping lanes.

An opportunity to obtain ornithological data from the little-studied area beyond the continental shelf of eastern South America was realized in the austral spring of 1975, when the R/V Hero was assigned to support studies on marine vertebrates in the South Atlantic (Cruise 75-5). This paper reports on the ornithological results of that cruise.

## ITINERARY AND METHODS

Hero departed Ushuaia, Argentina, on 10 September, passing eastward through the Beagle Channel, and then northeastward through the Strait of Le Maire along a course parallel to but slightly beyond the edge of the continental shelf. On the morning of 16 September, Hero left the cold Subantarctic Zone of surface waters, passed through the Subtropical Convergence, and entered the warmer, less productive waters of the Subtropical Zone. At noon on 20 September Hero reached its northernmost station (28° 44'S) off southern Brazil and headed ESE to the Bromley Plateau (31° 30'S, 33° 30'W), arriving on 23 September. The route then turned southward and southwestward, and between 24-28 September generally followed or paralleled the edge of the Subtropical Convergence. On 29 September, Hero reentered subantarctic waters and continued southwestward, passing the Falkland Islands on 3 October and arriving in Ushuaia on 6 October (Fig. 1).

Shipboard observations and censuses were made by Rumboll with the assistance of R. L. Brownell, Jr. and other members of the scientific party and ship's crew. Censuses were made for a ten minute period during each two hour interval throughout the day. All birds seen were counted and the number of ship-following species was estimated (Table 1). Other observations and counts were made as often as possible, as work schedule and weather permitted. Censuses were not taken when the ship was stopped for studies of marine mammals. Surface water temperatures were taken at 0800, 1200 and 1800 hours. Distribution and densities of the commoner species are shown in Figures 2 - 11.



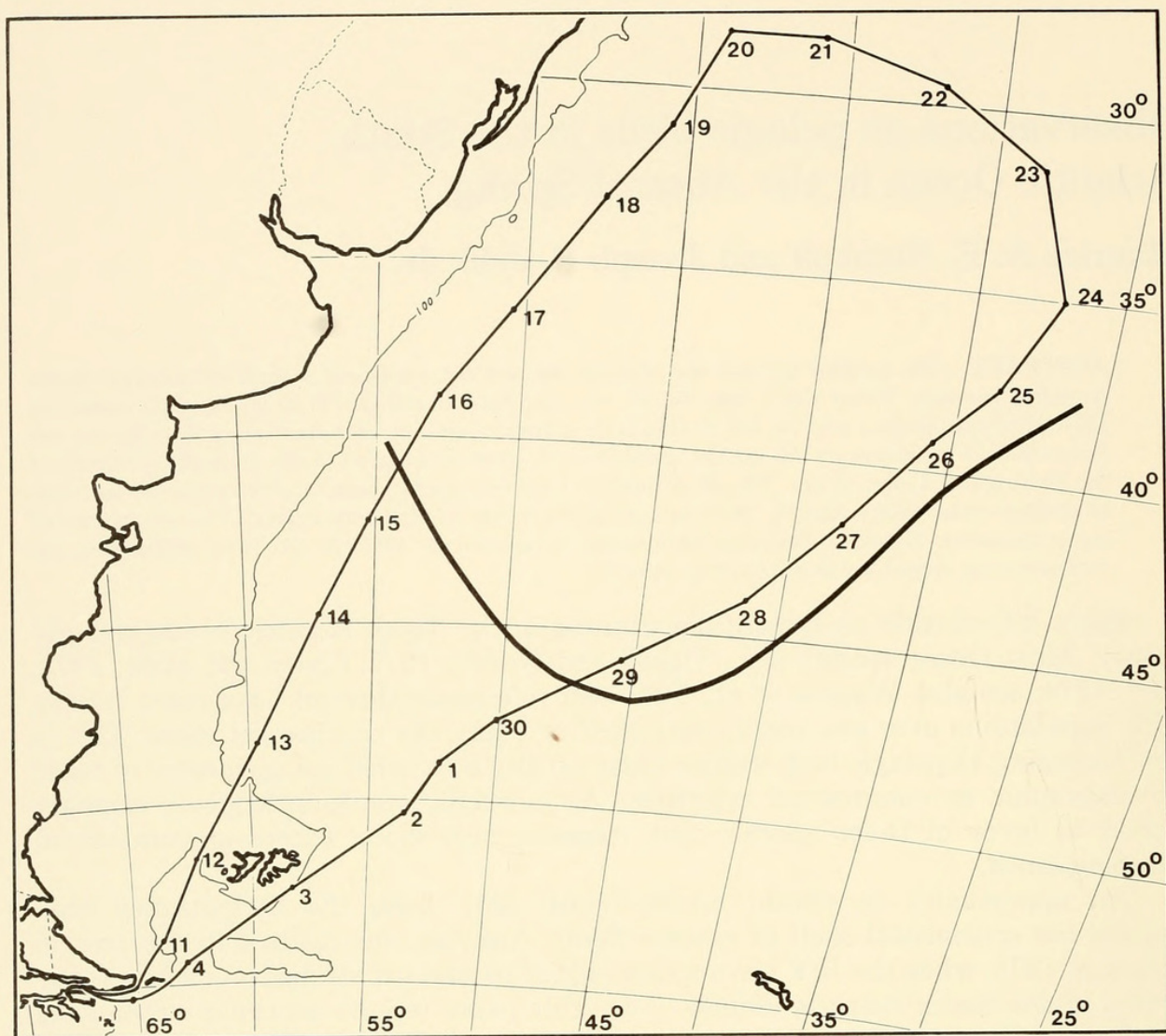


Figure 1. Cruise route of the R/V Hero (Cruise 75-5) in the South Atlantic Ocean, 11 September to 4 October 1975. Numbers indicate ship's noon position on each date from 11 September to 4 October. Heavy dark line marks the approximate location of the Subtropical Convergence. The light line marks the boundary of the continental shelf.

Weather conditions varied considerably but were, in general, suboptimal. Rough seas prevailed on many days, which seriously hampered observations, precluded collecting, and made sightings of birds flying close to or sitting on the water nearly impossible. A dense fog on 29 September virtually eliminated observations.

Collecting was done as opportunity presented. Specimens are deposited in the Natural History Museum, San Diego. Plankton samples were obtained daily; they have been deposited in the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia," Buenos Aires. Mallophaga were deposited at the University of Canterbury, Christchurch, New Zealand.

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## ANNOTATED LIST OF SPECIES

**Emperor Penguin** (*Aptenodytes forsteri*).—The sighting of this species constitutes the most remarkable distributional record of the cruise. On 15 September, Rumboll saw two birds 100 m ahead of the Hero and watched them carefully until they dove when the ship was only 20 m distant; one hour later he saw a single bird. He noted that the color of the ear patch was washed out, which indicates that the birds were juveniles. Rumboll has had extensive experience with King Penguins (*A. patagonica*) on the Falkland Islands and is confident of his identification. The sightings were made at 40° 30'S, 54° 34'W, some 40 miles S of the Subtropical Convergence and over 400 miles off southern Buenos Aires Province, Argentina. This is by far the most northern record for either species of *Aptenodytes* (cf. Watson et al., 1971). The sighting of three birds in this ornithologically unexplored area—and hundreds of miles north of the pack ice—suggests that the winter range of juvenile or non-breeding Emperors may be far more extensive than is currently realized.

**Gentoo Penguin** (*Pygoscelis papua*).—One, 30 mi. SE Falkland Islands, 3 November.

**Rockhopper Penguin** (*Eudyptes crestatus*).—Small penguins, almost certainly of this species, were encountered, very uncommonly, in cold waters from west of the Falklands north to the latitude of the Valdes Peninsula (12-15 September), and on several days between 30 September and 5 October, as the ship approached and passed by the eastern edge of the Falklands. The largest flock was 7; most flocks comprised two or three individuals. This species probably winters fairly commonly in deep water beyond the continental shelf as far north as Uruguay (Jehl, 1974).

**Magellanic Penguin** (*Spheniscus magellanicus*).—This species is common over the continental shelf but rare over deeper waters (Jehl, 1974). The only sightings during this cruise were groups of 4 and 5 in the Beagle Channel on 10 September, 3 birds north of the Falklands on 13 September, and groups of 2, 2, and 3 far east of the Valdes Peninsula on 15 September.

**Wandering Albatross** (*Diomedea exulans*).—Widely distributed, though mostly uncommon, over entire route, with maximum numbers (18 on 25 September) in the vicinity of the Subtropical Convergence. No first-year birds were observed. Rumboll noted that most of the birds north of 35°S trailed their feet, whereas those farther south folded them forward into their belly feathers. This behavior may be related to thermoregulation and requires further substantiation. Rumboll did not identify any examples of *D. epomophora*, which seems to prefer shallower shelf waters (Jehl, 1974; Watson et al., 1971).

**Black-browed Albatross** (*Diomedea melanophris*).—Seen along the entire cruise route, though very uncommon in warm waters north of and remote from the Subtropical Convergence. The largest numbers (100-400 individuals) were encountered in the vicinity of the Falkland Islands, where the species nests. Rumboll noted the virtual absence of immatures, no more than 10 being recorded on the entire cruise. A concentration of 300 on 3 October near the Falklands was associated with a herd of Pilot Whales (*Globicephala melaena*) and Dusky Dolphins (*Lagenorhynchus australis*).

**Yellow-nosed Albatross** (*Diomedea chlororhynchos*), **Gray-headed Albatross** (*D. chrysostoma*).—On 23-25, and 27 September Rumboll saw small numbers of immature Yellow-nosed Albatrosses in warm waters north of the Subtropical Convergence. Gray-headed Albatrosses were recorded definitely on 26 September (1 bird) in the vicinity of the Convergence and were seen regularly but uncommonly thereafter to the vicinity of Staten Island (maximum 7 on 30 September). Fifteen "gray-headed" albatrosses were seen under poor conditions on 24 September. Rumboll felt that more than one species was present, but in view of the relatively high water temperatures (15.5°C) it seems likely that most were *chlororhynchos*.



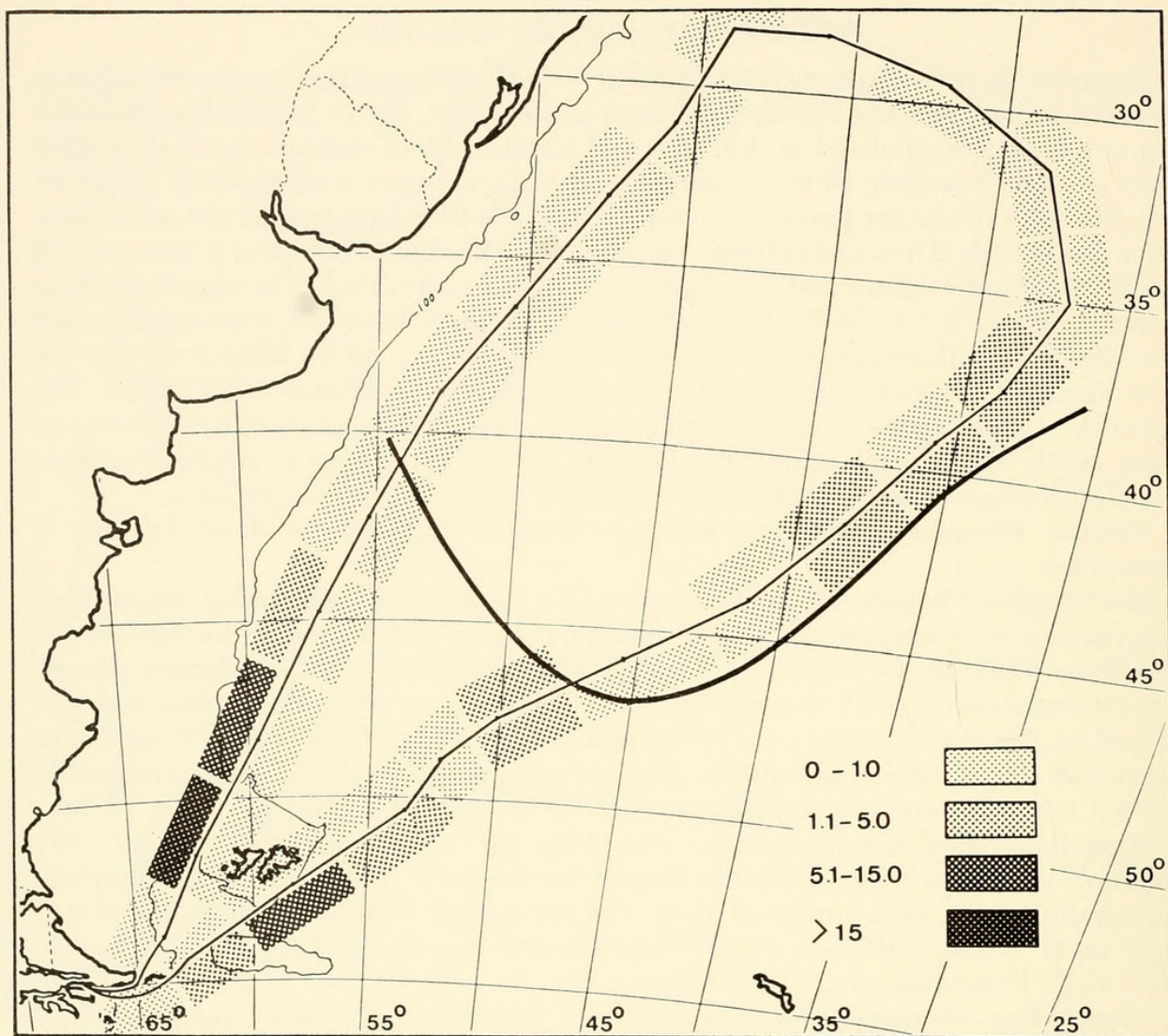


Figure 2. Distribution of *Diomedea melanophris* (outside of cruise track), and *Diomedea exulans* (inside of cruise track). Key to densities pertains to Figures 2-11.

The predilection of *chrysostoma* for colder waters is well known. An adult *chrysostoma* weighed 3700 g.

**Sooty Albatrosses** (*Phoebastria fusca*, *P. palpebrata*).—Both of these species were observed, *fusca* much more commonly (21 vs. 6 sightings). Records of *palpebrata* were made along or south of the Subtropical Convergence, whereas *fusca* preferred warmer waters.

**Giant Petrel** (*Macronectes giganteus*).—Giant Petrels (all presumably *M. giganteus*) were common in Subantarctic waters, uncommon along the Subtropical Convergence, and almost unrecorded in the Subtropical zone. With the exception of a white-phased bird near Staten Island on 4 October, all sightings were of dark-plumaged individuals.

**Southern Fulmar** (*Fulmarus glacialisoides*).—Regular and fairly common south of the Subtropical Convergence, but most abundant in the vicinity of land (Tierra del Fuego, Falklands). Only two individuals were sighted north of the Convergence.

**Cape Pigeon** (*Daption capensis*).—This was the species encountered most commonly. It occurred throughout the entire cruise area, though it was much less common north of the Subtropical Convergence. Cape Pigeons are well known scavengers and immediately investigate floating scientific specimens or garbage. Rumboll saw several using their wings to dive after jellyfish. On 17 September, he saw two birds with bright pink patches on the belly, perhaps marked by other researchers.



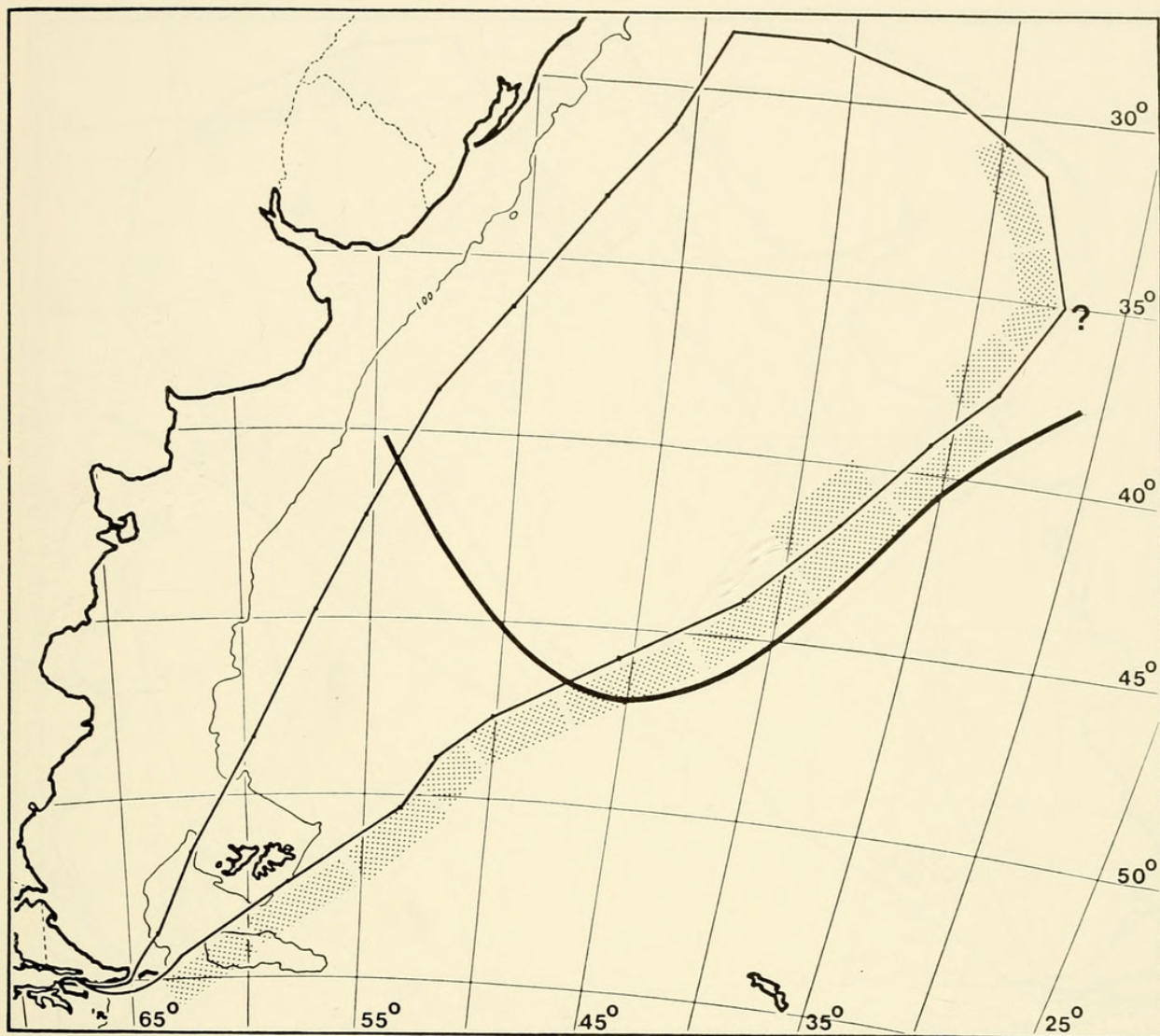


Figure 3. Distribution of *Diomedea chrysostoma* (outside) and *Diomedea chlororhynchos* (inside).

**Prions** (*Pachyptila* spp.).—Packs of prions were fairly common over the southern half of the cruise route, except in the vicinity of land, and were particularly common along the Subtropical Convergence. One possible *P. belcheri* was identified among many prions seen on 16 September. On 27 September, along the Subtropical Convergence, Rumboll collected 3 prions and on 30 September, south of the Convergence, 4 more. Although these show considerable variation in bill shape, all seem referable to *salvini*, and are presumed to have originated on Tristan da Cunha (G. E. Watson, pers. comm.). These records considerably extend the western range of *salvini* (cf. Watson et al., 1971).

**Blue Petrel** (*Halobaena caerulea*).—A single bird NE of the Falklands on 2 October, and three birds probably of this species on 16-17 September. The latter records, if correct, seem far north for this predominantly cold-water species.

**Atlantic Petrel** (*Pterodroma incerta*).—This was the commonest and most easily identified species of *Pterodroma*. Although it was regular along the northern part of the route, it was most abundant in the immediate vicinity of the Subtropical Convergence. A male weighed 650 g.

**Soft-plumaged Petrel** (*Pterodroma mollis*).—Encountered daily between 17 and 26 September, in Subtropical waters. Only a few were seen each day; the highest count, 21, was made on 20 September.

*Pterodroma* spp.—Between 21 and 25 September, north of the Convergence, Rumboll observed a few individuals of two or more species of *Pterodroma*. His descriptions suggest *Pt. arminjoniana* (mainly) and *Pt. lessoni* (one record).



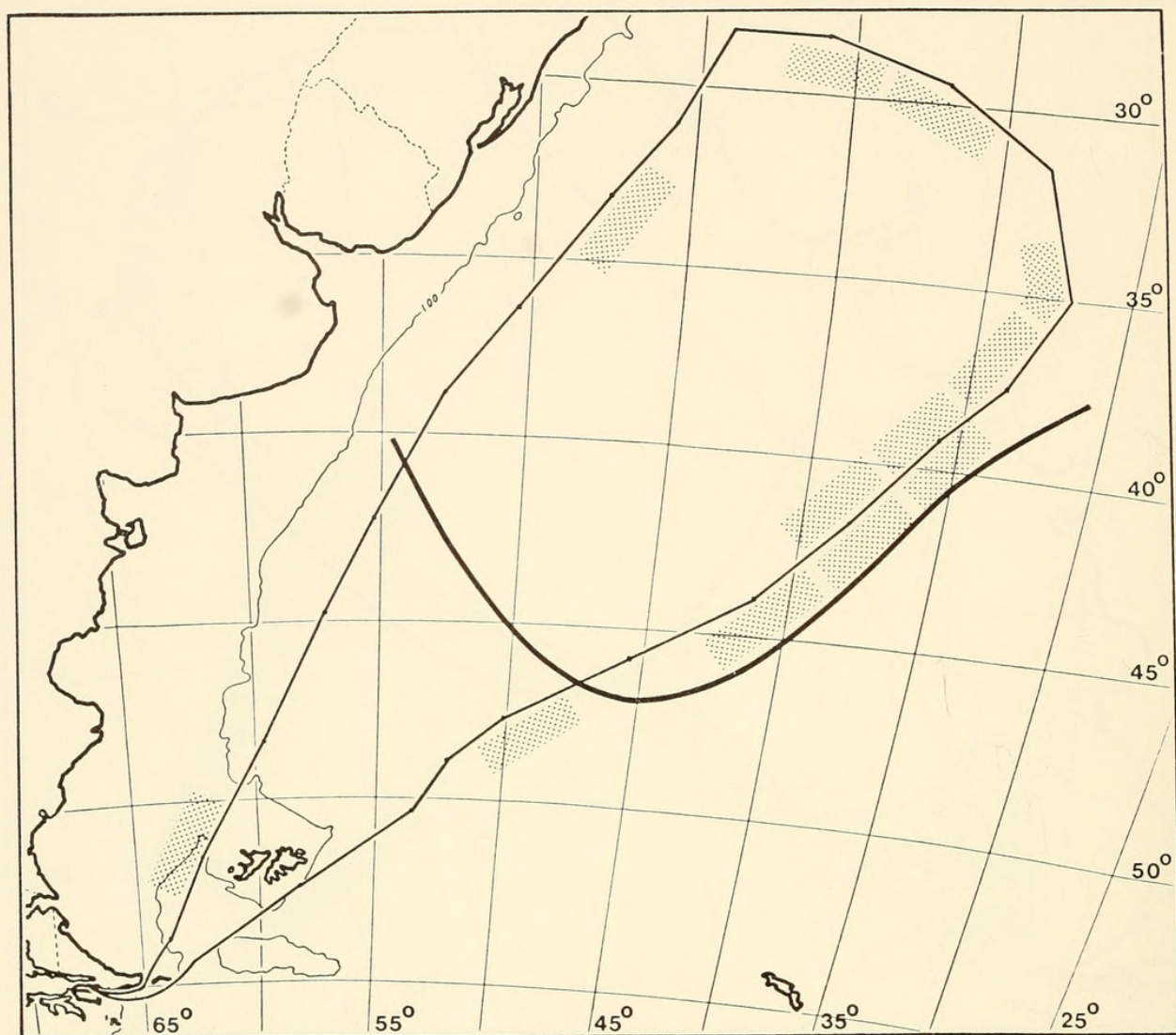


Figure 4. Distribution of *Phoebetria palpebrata* (outside) and *Phoebetria fusca* (inside).

**Shoemaker** (*Procellaria aequinoctialis*).—This species, which prefers deep, offshore waters (Jehl, 1973, 1974) was sighted throughout the entire cruise, but was rare in the Subtropical zone. No significant concentrations were observed. Two individuals of *P. a. conspicillata* were seen along the Convergence on 24-25 September. A specimen of *P. a. aequinoctialis* weighed 1100 g.

**Pediunker** (*Procellaria cinerea*).—The Pediunker, or Gray Petrel, was widely distributed over deep waters, most records being made near the Subtropical Convergence. On most days no more than one bird was reported. The largest concentration, 13 in an afternoon, was found in the vicinity of a herd of Pilot Whales well off Golfo San Jorge on 14 September. A male collected on 28 September weighed 1050 g. Distribution maps in Watson et al., (1971) suggest that the Pediunker and Shoemaker are commoner over the Continental Shelf than farther offshore. This is an artifact, resulting from the fact that most seabird observations in the South Atlantic have been made near the coast. Actually, both species prefer deep waters, and the Pediunker is extremely rare over the shelf (Jehl, 1974, Cooke and Mills, 1972).

**Cory's Shearwater** (*Calonectris diomedea*).—An unidentified shearwater at the Bromley Plateau on 23 September was probably this species, which has recently been reported wintering in fair numbers off the coast of northern Argentina (Cooke and Mills, 1972).



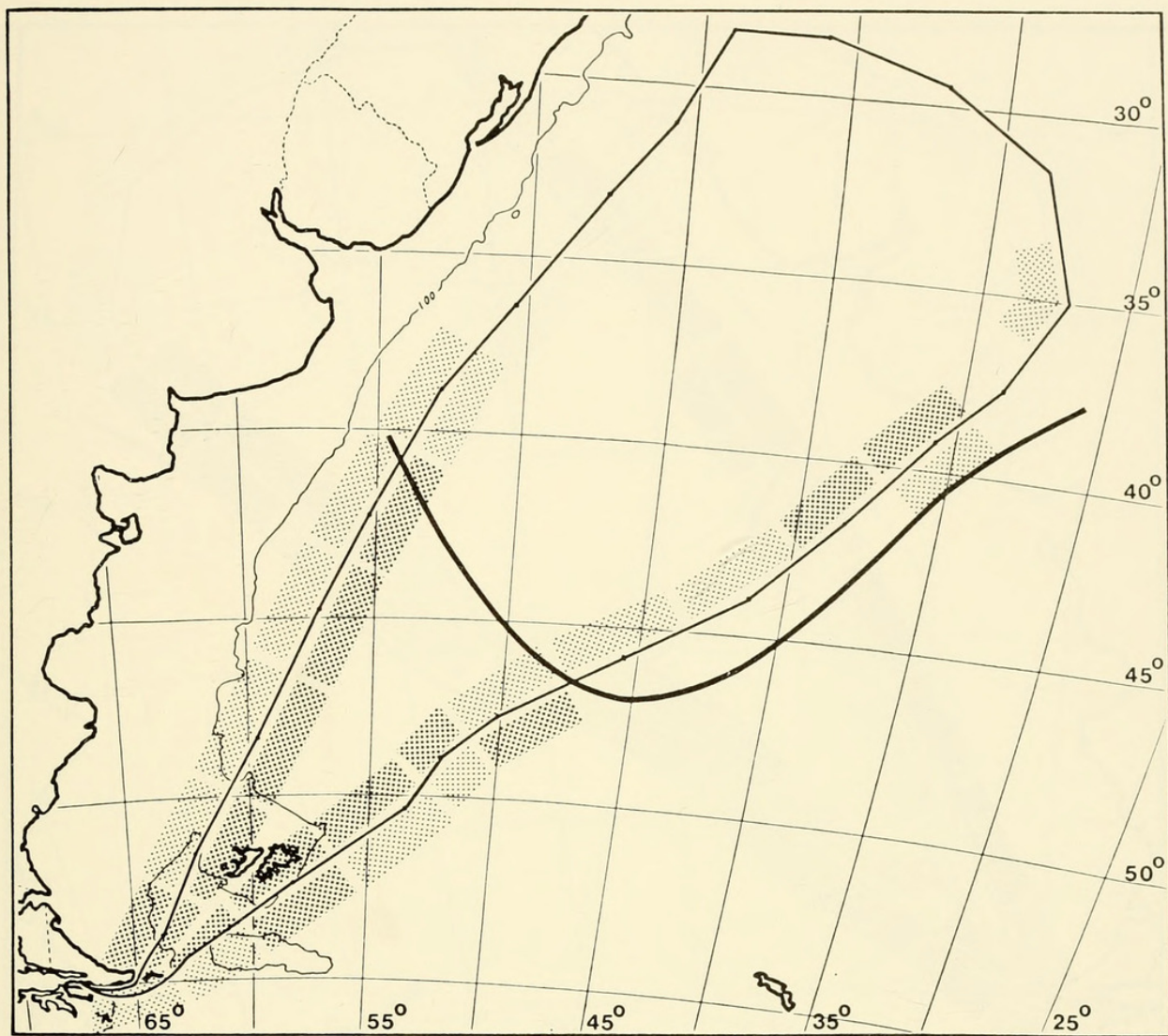


Figure 5. Distribution of *Fulmarus glacialis* (outside) and *Macronectes giganteus* (inside).

**Sooty Shearwater** (*Puffinus griseus*).—Seen along most of the cruise route, but common only in cool waters; very rare or absent in warm waters. Areas of local abundance, principally near Staten Island and in the Strait of Le Maire, are near presumed nesting localities. A flock of 3000 along the south shore of Staten Island in the early evening of 4 October may have been flying toward a staging area.

**Greater Shearwater** (*Puffinus gravis*).—Watson (1975) considers this a species of “cool waters near the Subtropical Convergence.” During this cruise it was found almost exclusively in warm waters north of the Convergence, where it was fairly common. Its distribution paralleled that of *Pterodroma mollis* and largely complemented that of *Puffinus griseus*, which occurred mainly in cooler waters.

**Manx Shearwater** (*Puffinus puffinus*).—Three individuals near 37° 30'S, 34°W were the only sighting of this species, which winters commonly off the South American coast between Brazil and northern Argentina.

**Small shearwaters** (*Puffinus* spp.).—On 26 September, near 39°S, 35°S 33'W, Rumboll saw a single small shearwater with an extremely fast and shallow wing beat, a brownish back, and with the white of the undertail coverts extending upward onto the sides of the rump. These characters suggest the Fluttering Shearwater (*P. gavia*), which is only known to occur in the New Zealand region. On 20 September he saw another small shearwater, but with a pale grayish back. This observation may refer to the Allied Shearwater (*P. assimilis*), which has been reported from the general area.



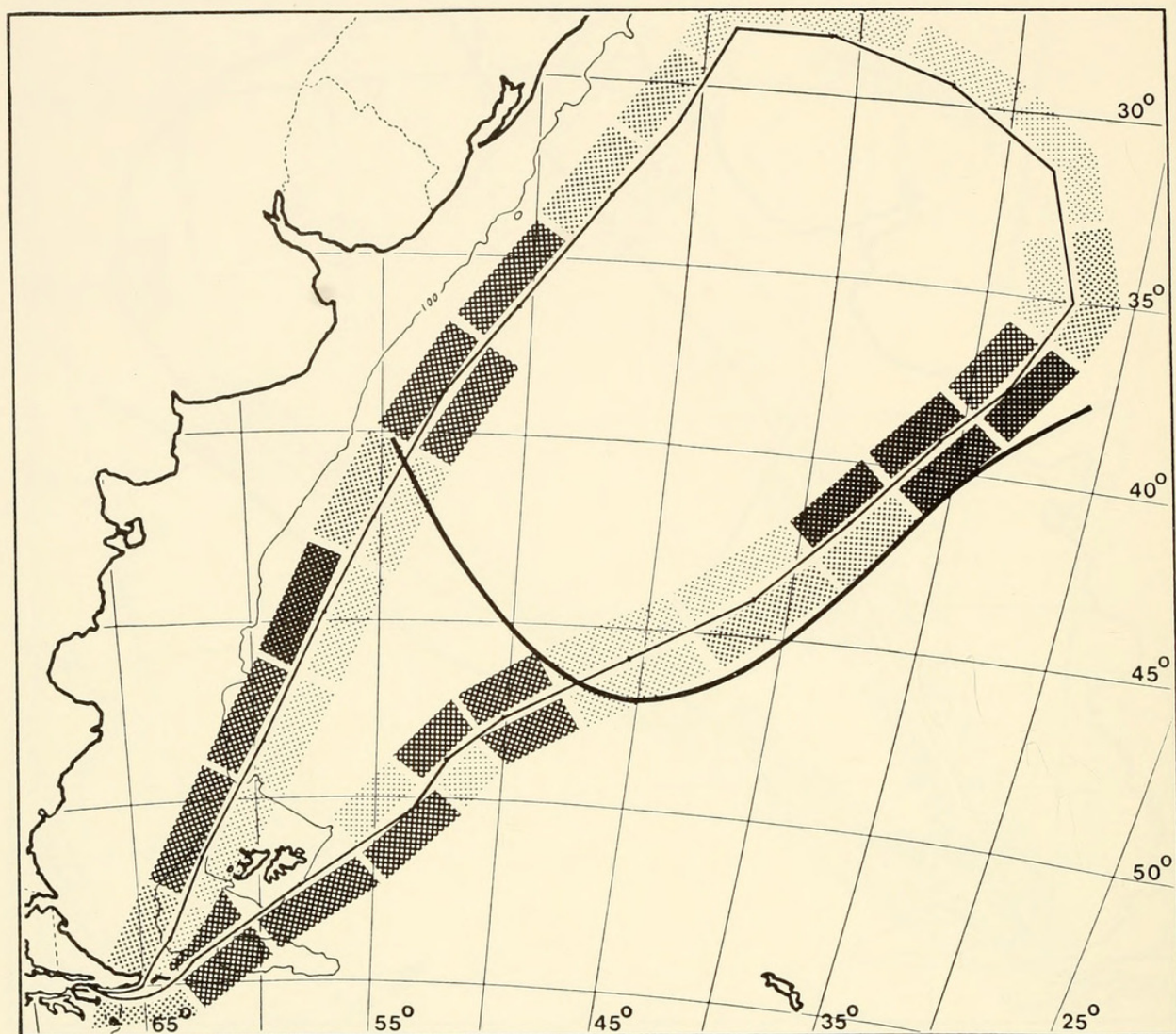


Figure 6. Distribution of *Daption capensis* (outside) and *Pachyptila* sp. (inside).

**Wilson's Storm-Petrel** (*Oceanites oceanicus*).—Uncommon though scattered along the entire route; seemingly commonest near the Subtropical Convergence and rarest in waters warmer than  $17^{\circ}\text{C}$ . Rumboll noted that it was most frequently seen near patches of floating kelp. A specimen taken  $46^{\circ} 24'\text{S}$ ,  $56^{\circ} 55'\text{W}$  is referable to *O. o. oceanicus*.

**Gray-backed Storm-Petrel** (*Garrodia nereis*).—Rare, a total of 11 birds seen on 6 dates. All observations were made south of the Subtropical Convergence and beyond the continental shelf.

**Black-bellied Storm-Petrel** (*Fregetta grallaria*).—Rare, a total of 13 birds observed on 10 dates. Except for a tendency to remain far offshore, the species exhibited no obvious distributional pattern, occurring in very cold as well as in very warm waters. Many observations were made north of the range shown by Watson et al., (1971).

**Diving-Petrels** (*Pelecanoides* spp.).—Diving petrels were fairly common in the vicinity of the Beagle Channel and Strait of Le Maire (10-11 September, maximum 150) and in the vicinity of the Falklands and Staten Island (3-5 October). Two specimens of *P. urinatrix* were taken aboard ship on 4, 5, October; presumably all records pertain to that species. Several diving-petrels were seen beyond the continental shelf off Buenos Aires Province on 26-27 September (maximum, 14 on the 27th); from previous records (Jehl, 1974) it seems probable that these were *urinatrix*.



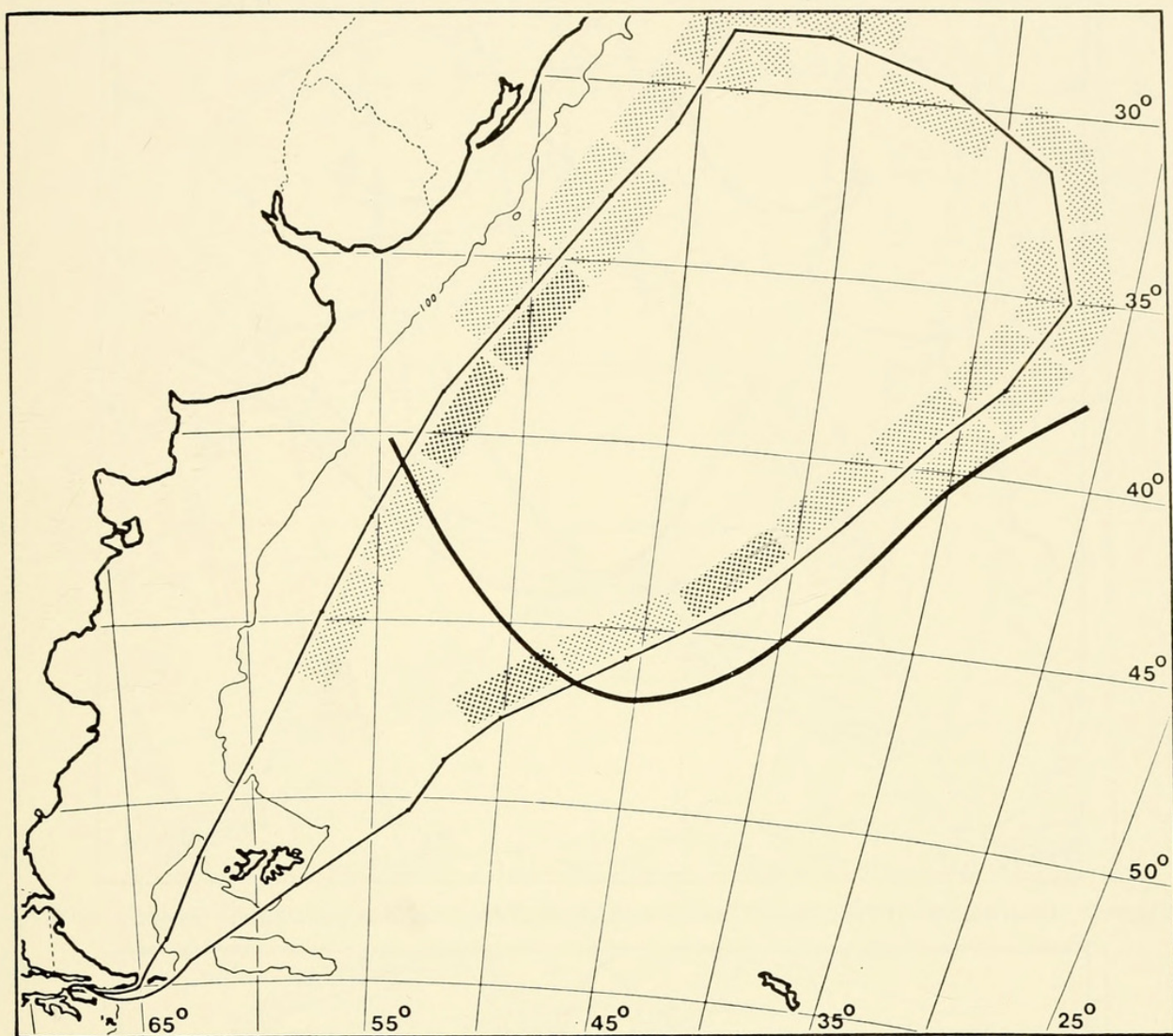


Figure 7. Distribution of *Pterodroma mollis* (outside) and *Pterodroma incerta* (inside).

**Skuas** (*Catharacta* spp.).—Skuas were seen occasionally, though rarely more than one per day, with most records from north of 47°S. The birds rarely approached the ship and Rumboll made no attempt to determine which form(s) was present.

**Jaegers** (*Stercorarius* spp.).—Three unidentified jaegers were seen off the coast of Brazil on 19-20 September.

**Kelp Gull** (*Larus dominicanus*).—Uncommon but regular south of 48°S. All observations were made within 300 miles of land.

**Terns** (*Sterna* spp.).—Scattered terns, usually individuals but occasionally small flocks, were seen between 48°S and 29°S. There was no obvious pattern; maximum concentrations (14, 9 birds) were observed near the Subtropical Convergence on 16 and 29 September, respectively. Terns rarely approached the ship and specific identification was impossible, although most observations presumably refer to *S. hirundinacea*.



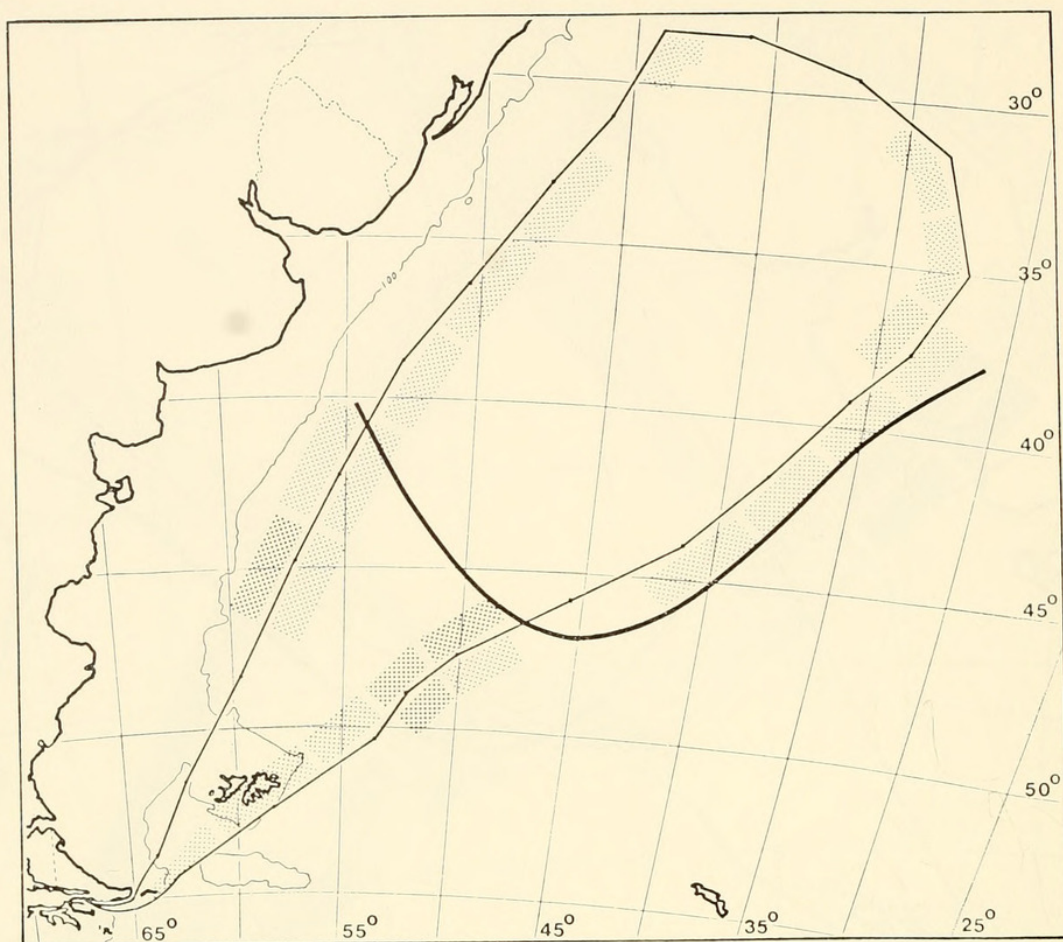


Figure 8. Distribution of *Procellaria cinerea* (outside) and *Procellaria aequinoctialis* (inside).

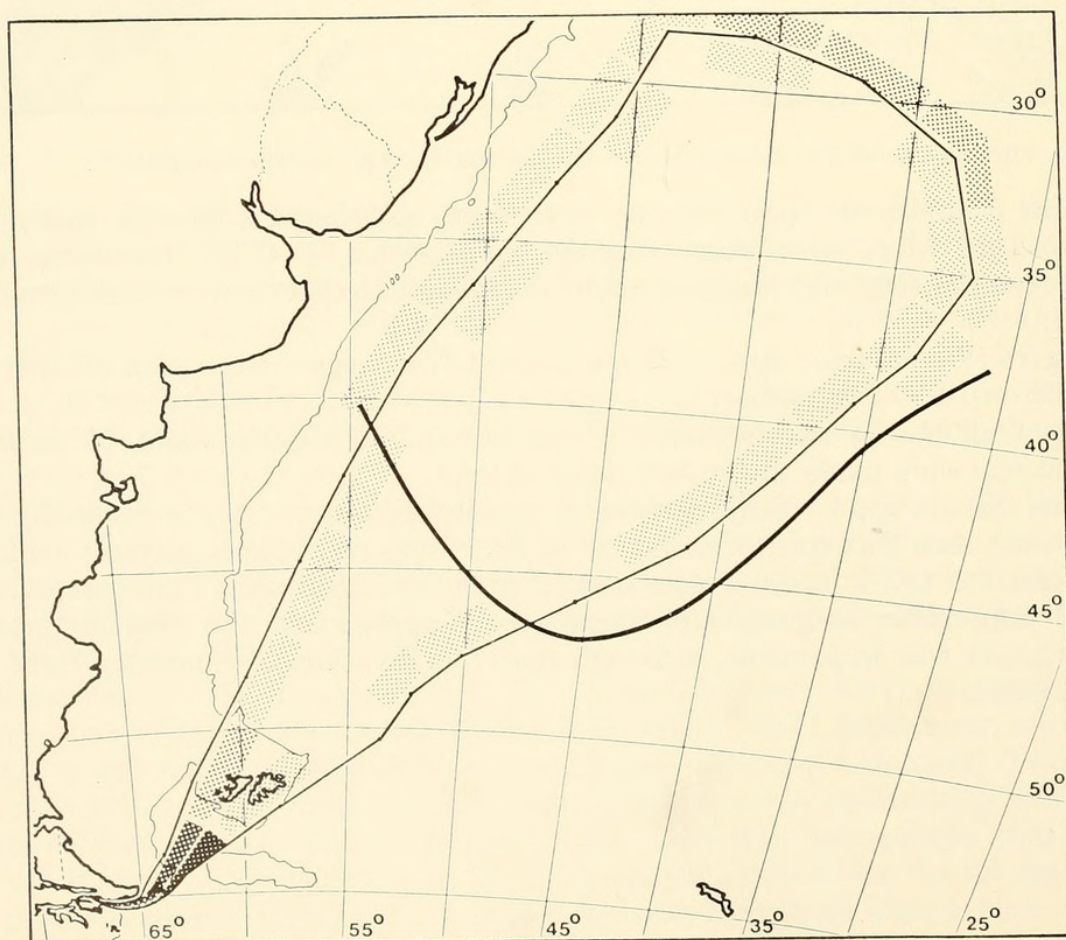


Figure 9. Distribution of *Puffinus gravis* (outside) and *Puffinus griseus* (inside).



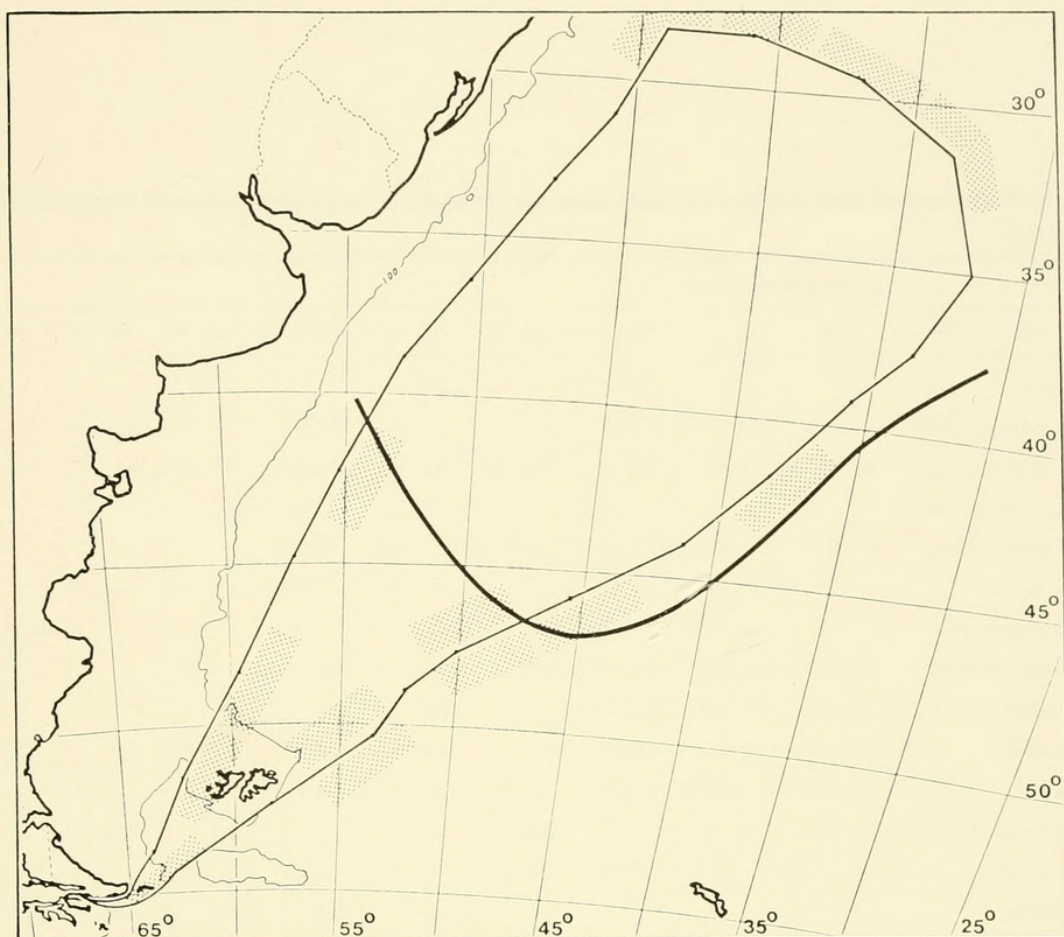


Figure 10. Distribution of *Fregetta tropica* (outside) and *Garrodia nereis* (inside).

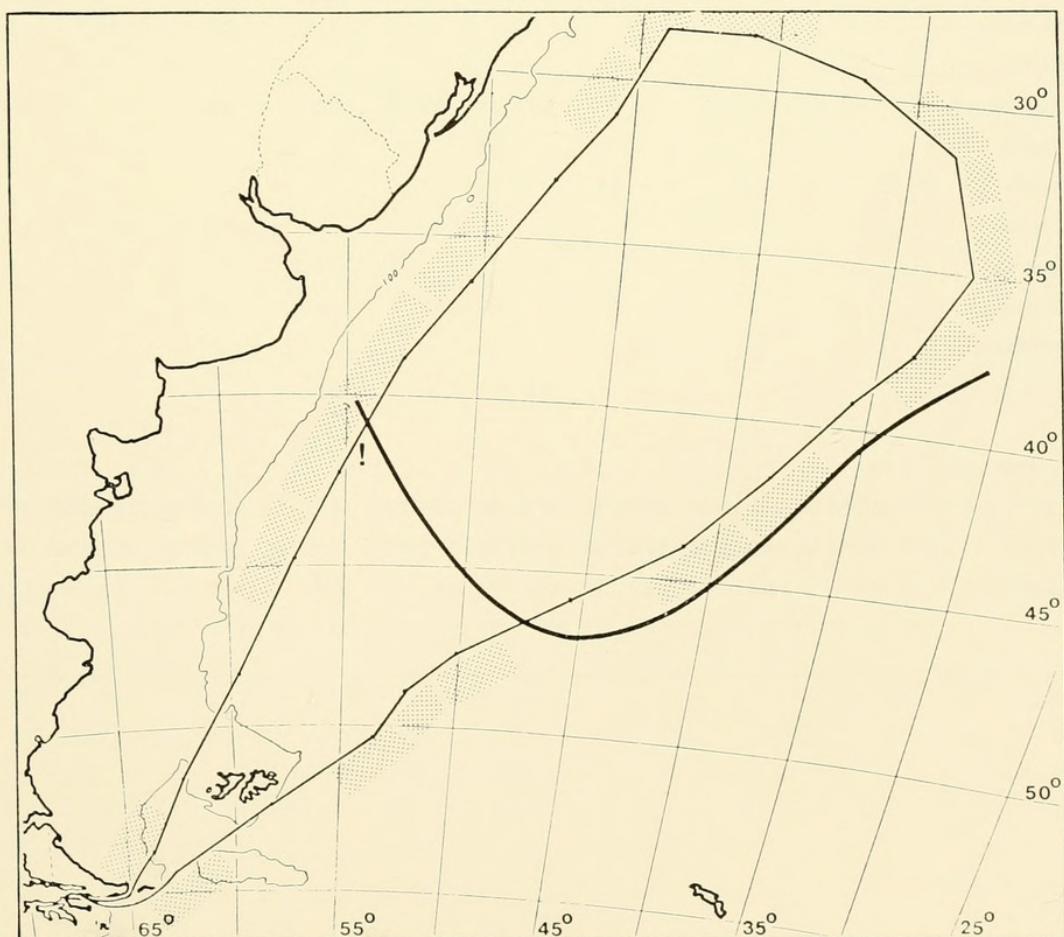


Figure 11. Distribution of *Oceanites oceanicus* (outside) and *Aptenodytes forsteri* (inside).



TABLE 1. Summary of daily censuses. Abundance indicated is average number of birds per ten minute census are omitted.

	September										
	11	12	13	14	15	16	17	18	19	20	21
<i>Eudyptes</i> sp.		+	+	+	0.2						
<i>Diomedea exulans</i>		0.7	0.3	+	+	0.6	0.7	0.2	0.3		
<i>Diomedea melanophris</i>	1.0	15.5	5.3	4.2	0.5	0.6	0.7	0.2		0.2	
<i>Diomedea chlororhynchos</i>											
<i>Diomedea chrysostoma</i>											
<i>Phoebastria fusca</i>								+			+
<i>Phoebastria palpebrata</i>		+									
<i>Macronectes giganteus</i>	4.0	4.0	3.8	4.3	1.3	0.2					
<i>Fulmarus glacialis</i>	2.2	0.2	0.5	+	0.8	0.2					
<i>Daption capensis</i>	3.5	9.2	11.0	15.7	2.8	8.4	5.7	2.8	2.6	0.2	0.4
<i>Pachyptila</i> sp.	0.5	+	1.0	+	+	7.4					
<i>Procellaria aequinoctialis</i>				0.2	+	+	0.3	0.2		0.2	
<i>Procellaria cinerea</i>				1.8	+						
<i>Puffinus gravis</i>						0.4	0.3	0.2	0.2	0.4	3.0
<i>Puffinus griseus</i>	10.5	1.5	0.2	0.2	+		+		0.3		0.2
<i>Pterodroma incerta</i>				0.5	0.3	4.4	2.0	0.2		0.2	
<i>Pterodroma mollis</i>							0.2	1.0	1.0	0.6	0.6
<i>Pterodroma</i> sp.											0.2
<i>Oceanites oceanicus</i>	0.2			0.7	0.7	0.6	0.8		0.3	+	0.2
<i>Fregetta tropica</i>										+	+
<i>Garrodia nereis</i>		0.2	+		0.7						
<i>Storm-petrel</i> sp.							1.2	0.8	0.3		
<i>Pelecanoides</i> sp.	3.0										
<i>Catharacta skua</i>					0.2	+	+		+	+	
<i>Larus dominicanus</i>	+	+	0.2								
<i>Sterna</i> sp.			+	0.2	+	0.8					
Periods of observation	4	6	6	6	6	5	6	5	6	5	5
Latitude °S	53°50'S	51°17'S	48°05'S	44°45'S	41°50'S	38°53'S	36°32'S	33°22'S	31°14'S	28°44'S	28°45'S
Longitude °W	64°10'W	62°19'W	59°42'W	57°11'W	54°50'W	52°52'W	50°23'W	47°41'W	45°51'W	44°05'W	41°02'W
Sea temperature °C	8.9	6.4	6.6	7.5	7.8	16.7	16.1	18.3	17.7	20.0	20.5
No. species	9	11	11	13	17	13	12	9	8	9	8



period. Birds seen during the day, but not in census period, are indicated by + . Species seen on fewer than four dates

									October				
22	23	24	25	26	27	28	29	30	1	2	3	4	5
								+			+		+
0.8	0.2	0.1	3.0	0.4	1.5	+		1.2	0.2	0.7	0.5	0.5	0.2
	0.2	0.2	3.0	2.0	2.0	1.0	0.2	3.3	0.8	1.7	13.5	3.5	0.4
	+	0.8	1.0		0.2								
		?		+	0.2	0.4	0.2	1.0	0.2	0.3	+	+	
+		+	0.6	0.6	0.2								
				0.2	+	+		0.2					
		+		1.6	2.0	0.2	+	0.3	1.8	5.0	1.2	3.5	1.0
				+				1.7	0.8	0.8	3.2	0.3	0.8
+	1.0	1.6	17.4	30.4	4.5	3.2	+	8.7	0.8	12.3	11.0	10.8	4.4
		+	11.4	40.8	37.5	0.6	1.0	14.0	10.8	0.3		8.3	
	0.2	+	1.0					1.2	1.2	0.2	0.2	0.3	
			+	+	+	+		0.2	1.2				
2.0	1.4	+	0.6										
	+	+	+	+	+	0.2		0.2	+		0.2	83.8	+
+		+	+	0.2	0.8	3.2	0.5	1.8					
	+	0.2	2.0	+									
0.2	0.4		+	0.4									
	+	1.0	1.0		+	+		1.0	+	+		+	
+	+				+		0.2	0.5		+			
								0.5		0.2		+	
			0.4										
					0.2						+	+	+
				+	+		0.2	+					
										+		0.3	+
+	+	+				+	+						
5	5	5	5	5	4	5	4	6	4	6	6	6	5
29°44'S	31°42'S	35°04'S	37°32'S	39°18'S	—	43°58'S	45°44'S	47°29'S	48°42'S	50°11'S	52°20'S	54°12'S	50°00'S
37°19'W	33°47'W	32°20'W	33°55'W	35°54'W	—	41°31'W	45°49'W	50°10'W	52°28'W	53°32'W	58°06'W	62°32'W	64°55'W
20.0	17.1	15.5	14.4	11.5	—	8.5	9.0	5.8	5.0	3.9	5.0	5.5	6.5
8	13	15	17	17	16	13	10	17	10	13	11	14	9



## DISCUSSION

The sparseness of seabirds over the open ocean was impressive. In the Subantarctic Zone birds were uncommon and diversity was moderate, 12-13 species being recorded on most days. In the Subtropical Zone birds were rare, only 8-9 species being seen each day. The greatest numbers and diversity (16-17 species daily) occurred near the Subtropical Convergence, where warm- and cold-water faunas intermingled. But even there numbers were low. Lacking quantitative data from other years or other seasons, we are unable to advance any firm interpretation for these data. (Data obtained by Tickell and Woods [1972, Table 5] during a cruise between the Equator and South Georgia are not strictly comparable.)

The low numbers of Southern Hemisphere residents encountered may be a seasonal phenomenon, adults having already retreated southward to the vicinity of nesting islands. The low numbers of trans-equatorial migrants (Sooty and Greater shearwater, Wilson's Petrels) may indicate that birds summering in the Northern Hemisphere had not yet returned. Similarly, we are unable to compare deep water vs. continental shelf avifaunas, as the only available quantitative data from the shelf pertain to winter (Jehl, 1974) or mid-summer (Cooke and Mills, 1972) transects, except to point out the absence or rarity of species that prefer nearshore waters (Magellanic Penguin, Royal Albatross, Sooty Shearwater, Magellanic Diving-Petrel).

Very few concentrations were encountered. Local pockets of diving-petrels and Sooty Shearwaters in the Strait of Le Maire on 11 September and larger flocks of sooties at Staten Island on 4 October seem attributable to the proximity of nesting colonies, as do concentrations of Black-browed Albatrosses near the Falklands. A local concentration, 17 species off the Valdes Peninsula on 15 September, may have been related to upwelling, as numbers of Pilot Whales were also feeding in the area. A small assemblage of 50 prions, 30 Cape Pigeons, 10 Black-browed Albatrosses and a scattering of other species near 47° 29'S, 50° 10'W on 30 September could not be attributed to any particular oceanographic conditions. Rumboll noted that storm-petrels were often found near masses of floating kelp and suggested that these mats may "filter" planktonic organisms and thus enrich local feeding conditions.

*Temperature preferences.*—It is well established that the distribution of many seabirds is related to sea surface temperatures. Temperature preferences are not always precise and may shift seasonally, be affected by the proximity of breeding colonies, or change in response to exceptional feeding opportunities, such as may occur in the vicinity of convergences. The temperature preferences of species observed in this cruise (Figure 12) are largely in accord with those found by previous workers (e.g., Murphy, 1936; Biermann and Voous, 1950; Jehl, 1973, 1974; Watson, 1975). Thus, many common species (e.g., *Daption capensis*, *Diomedea melanophris*) occurred over a broad range. *Eudiptes* sp., *Diomedea chrysostoma*, *Phoebetria palpebrata*, *Macronectes giganteus*, *Fulmarus glacialis*, *Pterodroma incerta*, *Procellaria cinerea*, *Puffinus griseus*, *Garrodia nereis*, and *Larus dominicanus*, were largely or entirely restricted to Subantarctic waters (< 15°C), whereas *Diomedea chlororhynchos*, *Phoebetria fusca*, *Pterodroma mollis*, and *Puffinus gravis*, occupied the Subtropical Zone (> 18°C). The occurrence of *Puffinus gravis* in the Subtropical Zone is somewhat surprising, as this species typically prefers colder waters. This species is absent from shelf waters in winter (Jehl, 1974); presumably birds seen on this cruise were migrants returning from the Northern Hemisphere that had not yet reached cooler waters near the breeding grounds. The apparent preference of *Larus dominicanus* for cold waters is an artifact due to the proximity of land in the more southern part of the cruise route; this species rarely wanders more than 50 miles to sea.



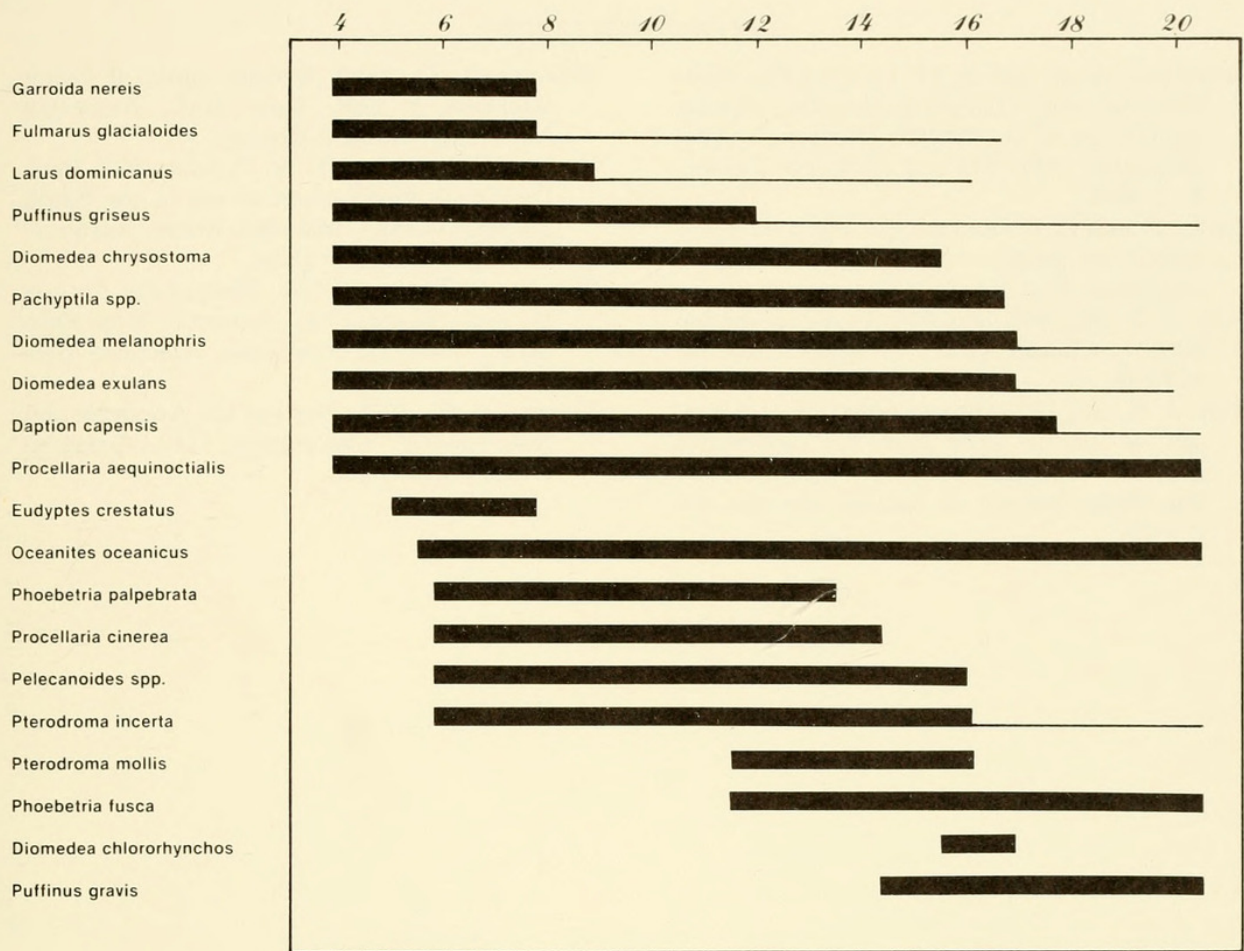


Figure 12. Temperature distribution of marine species encountered in this study. The major distribution is indicated by a solid bar, scattered records by a thin line.

*Oiling.*—Elsewhere Jehl (1974) has commented on the high frequency of oiling among procellariiform birds and penguins over the continental shelf of Argentina, particularly in the vicinity of major shipping lanes. Thus, it is interesting that over the open ocean, far from commercial traffic, Rumboll saw only one oiled bird, a Cape Pigeon 200 miles N of the Falklands.

*Seabirds and marine mammals.*—Seabirds have often been noted in the vicinity of marine mammals, particularly baleen whales, but the reports are usually anecdotal and provide little insight into the basis for the association. Opportunities to study such interactions are few and dwindling, as commercial harvesting continues to deplete whale populations.

We observed whales on 8 occasions: *Globicephala melaena* - 3 occasions; *Balaenoptera physalus* - 1; *Hyperoodon planifrons* -1; *Physeter catodon* -1 (2?), and unidentified - 1. In four cases, bird numbers increased in the vicinity of whales. In order not to disturb the whales we did not attempt to collect in the area. However, the species composition of these seabird flocks did not differ from those encountered elsewhere, suggesting that the birds and whales were responding independently to favorable feeding conditions.



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