THE FIELD IDENTIFICATION AND DISTRIBUTION OF THE THIN-BILLED PRION (Pachyptila belcheri) AND THE ANTARCTIC PRION (Pachyptila desolata)

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ABSTRACT

The field characters of both the Thin-billed Prion (*Pachyptila belcheri* (Mathews, 1912)) and the Antarctic Prion (*P. desolata banksi* (Smith, 1840) and *P.d. alter* (Mathews, 1912)) are described and a discussion of the differing feeding habits and food is given. The food of *Pachyptila belcheri* chiefly consists of the amphipod *Parathemisto gaudichaudii* which is taken nocturnally, while the " krill " *Euphausia superba* is the primary food source of *P. desolata* and is mainly captured by day.

The Thin-billed Prion ranges far from its known breeding grounds at the Falkland Islands and Kerguelen, and is the most frequently encountered *Pachyptila* in the southernmost waters of the central Pacific. Birds of the year reach the Bellingshausen Sea from the Falkland Islands by mid-April, and disperse over much of the South Pacific during May. In early November, sub-mature birds gather in substantial numbers south of the Antarctic Convergence to take advantage of a rich food supply and undergo an early moult in December and January. The adults apparently begin the moult cycle in early February and are through by May.

The distribution of both species of prion is discussed on the basis of field work and specimen records, and an attempt has been made to correlate this data with published information. A tentative distributional pattern for both species is presented.

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INTRODUCTION

Although we have progressed greatly since Green (1887) wrote, " All the Prions are remarkable for their broad bills, which is especially noticeable in the males," the field identification of the genus *Pachyptila* is still primarily based upon supposition. Holgersen (1957), perhaps, best sums up the longstanding difficulty in identifying prion species at sea by reporting, " Although Whalebirds were seen throughout most of our cruise south of the La Plata Sea I have not a single specific identification for these birds."

Published data on the pelagic distribution of prions are consequently very meagre, but largely through the efforts of Murphy (1936), Falla (1940) and Fleming (1941), a useful summary of the recorded breeding range for each of the five species of prions has been postulated. This information was arbitrarily based upon the location of the breeding stations of each species in relation to the corresponding hydrographic zones of surface water. Both Falla and Fleming noted that some of the southern species disperse widely from their islands after breeding, and that their winter feeding ranges are not accurately known. As Bierman & Voous (1950) have succinctly remarked, " the zonal arrangement of pelagically living Whalebirds must be complicated and cannot be firmly fixed."

Very few specimens of *Pachyptila* have been taken at sea but beach-patrolling activities have resulted in " storm wrecked " prions being retrieved from the southern coasts of South America, South Africa, Australia and the exposed western shoreline of New Zealand.

These mainly winter records clearly demonstrate that at least three species of *Pachyptila* engage in some form of post-nuptial, trans-oceanic migration. However, in spite of the great abundance of prions inhabiting the Southern Ocean, collections generally from many scattered localities contain relatively few specimens, an indication of wide dispersal.

Some morphological and plumage differences in *Pachyptila* have been observed at sea; Wilson (1907) and Bierman & Voous (1950) recorded differences in bill structure among pelagic prions; Falla (1937) mentioned the small head of *Pachyptila turtur* as being a good field character; and Holgersen (1957) commented on dissimilarities of plumage patterns of birds seen by him in the South Pacific.

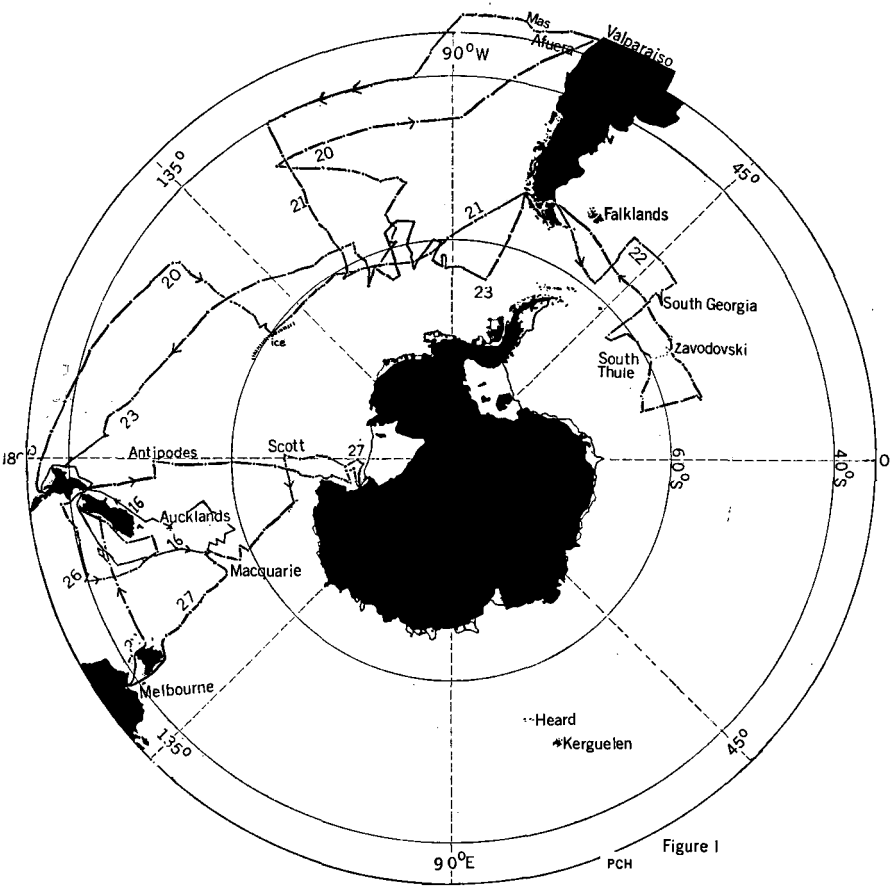

FIGURE 1 — Tracks of USNS *Eltanin*, 1965-67.

Culminating several years investigating the prion group, I was privileged to carry out field research on the genus *Pachyptila* on board the National Science Foundation's Antarctic Research ship *Eltanin,* and I present this first paper dealing with two of the six prion species in the hope of renewing interest in this difficult group of petrels.

METHODS

From January 1965 to May 1967, I spent eight cruises aboard the USNS *Eltanin* as a representative of the Dominion Museum, Wellington, New Zealand. As shown in Fig. 1, three cruises were spent in the New Zealand Subantarctic - Tasman Sea zone; three probing the South Pacific from approximately 45° S to the vicinity of the pack ice (about 60° S); one into the Ross Sea, and a summer cruise into the South Atlantic by way of the Magellan Straits. Ten Subantarctic and Antarctic islands were visited, from Macquarie Island in the east to the South Sandwich Islands in the west.

The leisurely speed of 9 knots which the ship maintained between oceanographic stations was most helpful to the ornithological programme, in allowing good opportunities to identify, photograph and examine prions on the wing. Observations were made continuously throughout the day from various locations about the ship from the bow or stern platform during fair weather, and from the bridge or helicopter deck during inclement periods. A pair of 7 x 50 binoculars aided identification.

Eltanin spent as many as 30 or more days of its usual 60-day cruise time on station. Much information on prions was gained during these prolonged halts, and when sea and schedule allowed, the ship's 22-ft powered dory was lowered overside to make prion-collecting forays.

A 12-gauge shotgun using No. 8 shot was used in obtaining specimens. Fourteen prions, attracted aboard at night with a pair of 1500 watt bridge signaling lights, were also collected.

All specimens were examined and measured in the flesh.

An important part of the programme was photographing and sketching prions whenever possible. Using a Carl Zeiss " Contarex " camera equipped with telephoto lenses up to 500mm, 613 identifiable prion photographs were taken at 51 places. Most were colour transparencies which were used for examination of dorsal colour gradations and distinguishing patterns, often difficult to reliably ascertain in monochrome prints. I processed all the films in *Eltanin's* photographic laboratory.

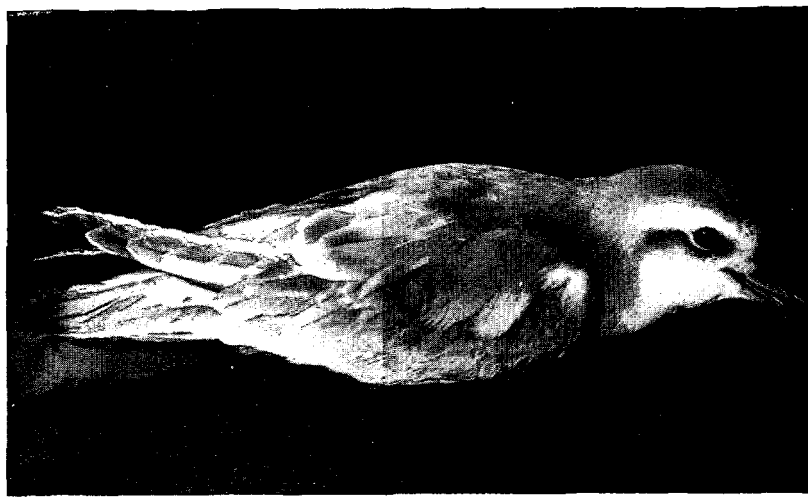

FIGURE 2 — A Thin-billed Prion *(Pachyptila belcheri)* collected alive in the South Pacific, Cruise 23. Note the distinctive facial pattern.

FIELD IDENTIFICATION

(a) *Descriptive*

(i) The Thin-billed Prion (*Pachyptila belcheri* (Mathew, 1912)).

At sea, the Thin-billed Prion [=Narrow-billed Prion of OSNZ Annotated Checklist 1970] can be distinguished as a slim, very pale prion with a large amount of white on the face. This latter aspect is due to the expansive white lores (area in front of the eye) and the band of unbroken white feathering forming the supercilliary stripe above the eye. These white areas are important field characters in identifying *P. belcheri* at sea, and should be looked for in pelagic prions south of about 50° S. The lores are not mottled with dark feathers as in *P. desolata,* and the white superciliary stripe is broader and more extensive than that displayed by any of the remaining species of the genus (see Fig. 2).

The peculiar dark open "M" marking extending across the wings is narrow and ill-defined in *P. belcheri,* being most obvious as a dusky black on the outer webs of the distal primaries and the subterminal portion of the scapulars; the white fringing frequently noted on these feathers is conspicuous only in freshly plumaged birds, and is a feature of all species of *Pachyptila.* Wear to the contour feathering tends to alter the appearance of the bird's upper surface from a pastel blue to a smoky grey. The dark wing band fades to a dull brown and is often reduced to the more strongly pigmented areas of the wing (cf. Figs. 3 and 4).

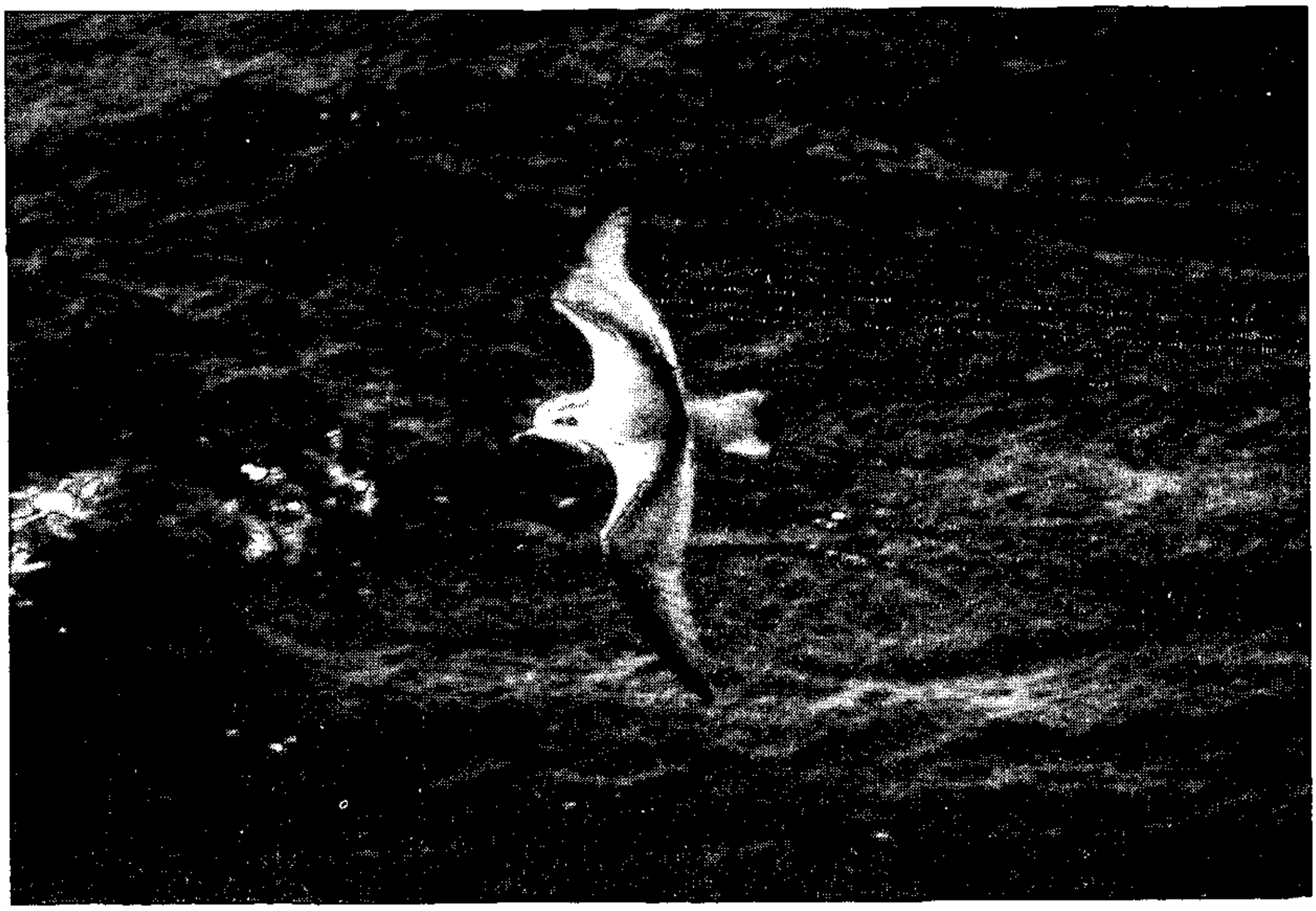

FIGURE 3 — An adult Thin-billed Prion in sub-zero waters, South Pacific, 6 October 1965, Cruise 20.

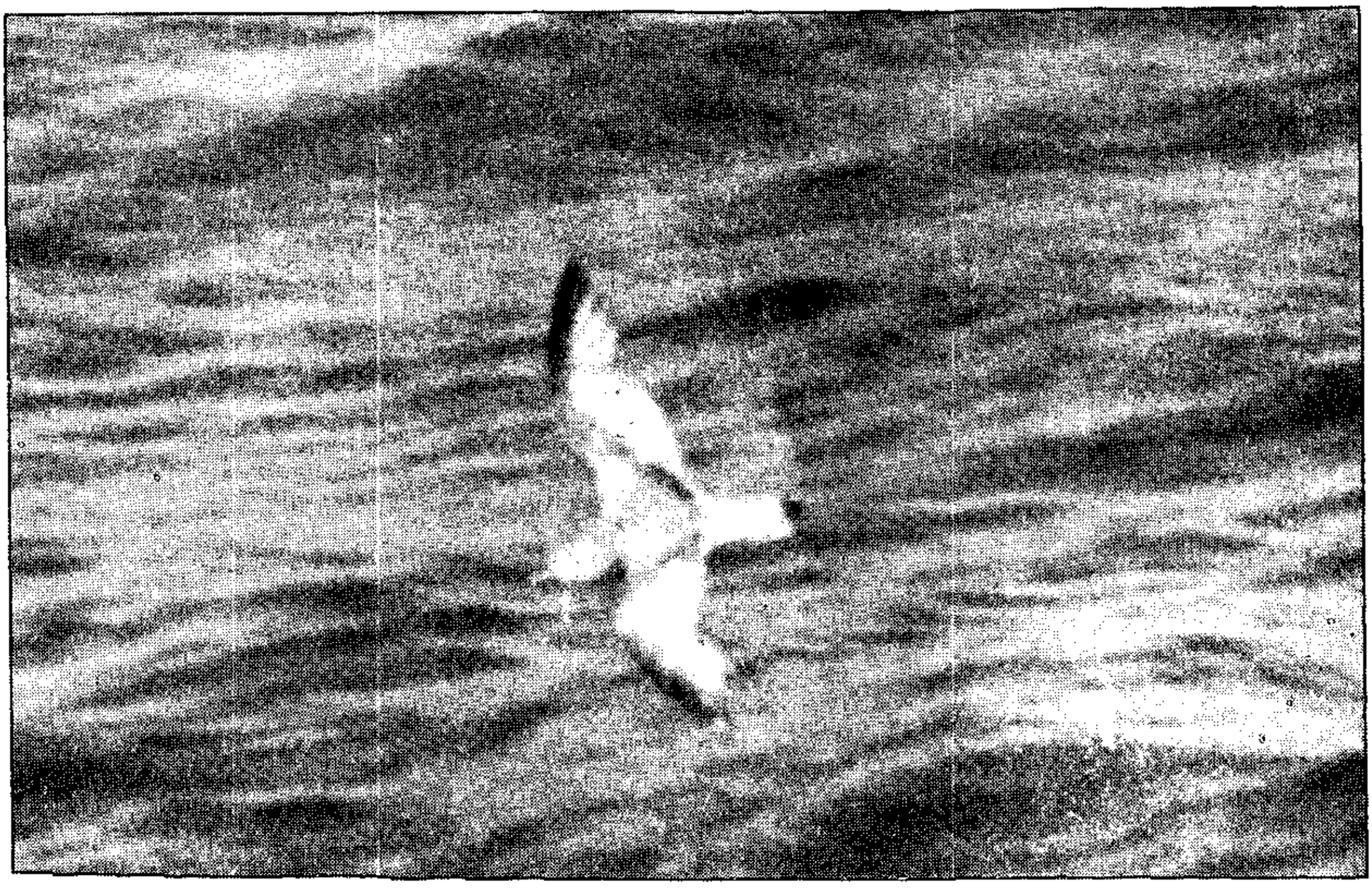

FIGURE 4 — *Pachyptila belcheri* in moult, South Atlantic, 25 January 1966, Cruise 22. Note partial absence of open "M" marking resulting from wear to the plumage. This phenomenon does not occur with the more darkly pigmented Antarctic Prion.

FIGURE 5 — The Antarctic Prion at sea: a typical example of the Scotia Sea subspecies, *P. desolata banksi*, Cruise 22. Note dark "collar."

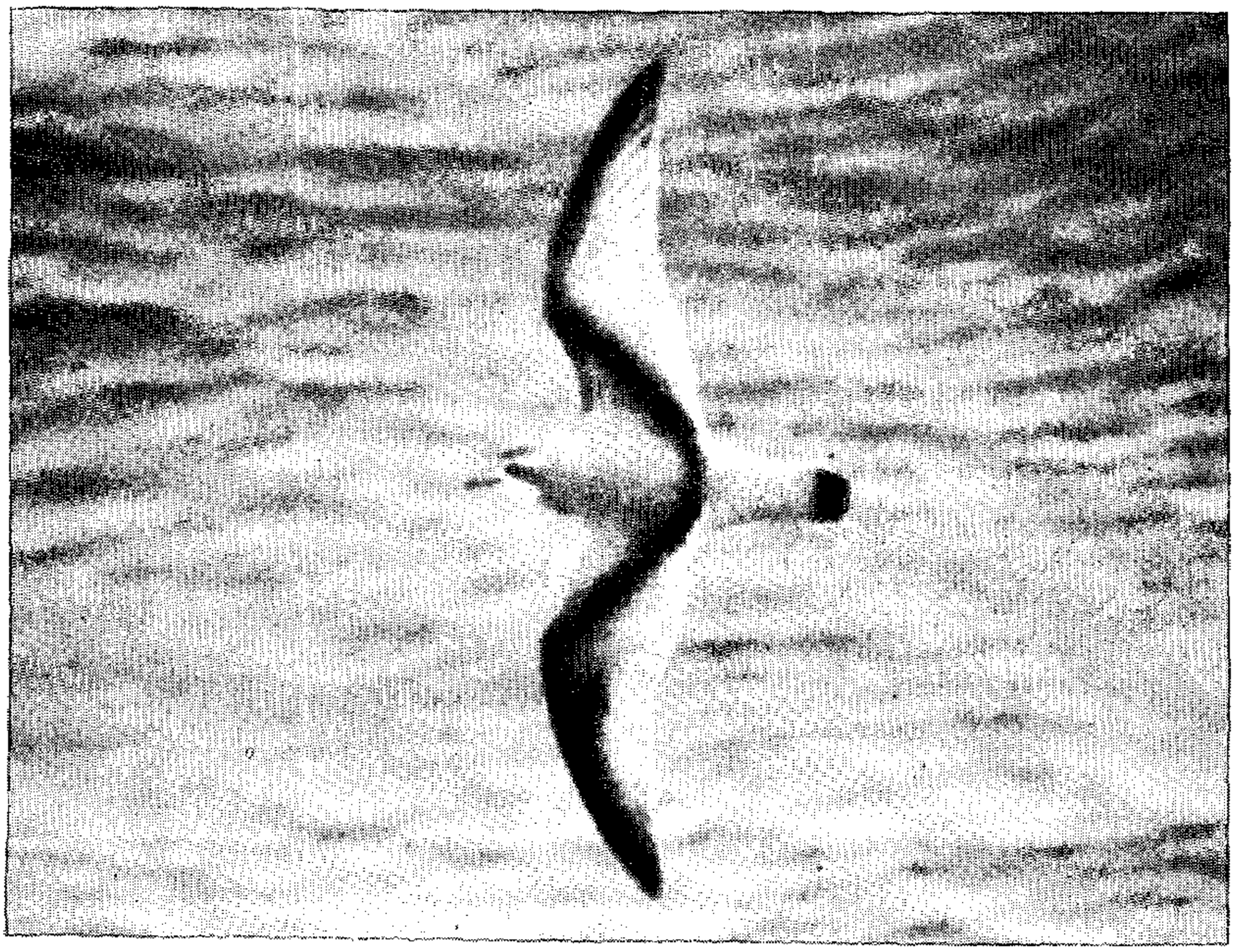

FIGURE 6 — *Pachyptila desolata alter* off Macquarie Island: a bird in fresh plumage, Cruise 27.

(ii) The Antarctic Prion (*Pachyptila desolata* (Gmelin, 1789)

The taxonomic status of several described subspecies of *P. desolata* is currently under review for publication elsewhere. In the area covered in this paper only the high-latitude subspecies *P. d. banksi* (Smith, 1840) and the slightly paler Neozelanic breeding birds centred on Auckland and Macquarie Islands, here called *P. d. alter* (Mathews, 1912) are considered to be involved.

At sea, the Antarctic Prion has a dorsal plumage appreciably darker in tone than the preceding species. The darkly pigmented crown and the rich dark blue collar extending over the neck should be looked for (see Fig. 5). The lores are often freckled with sooty black feathers, and the well marked suborbital black patch underscoring the eye give this species a facial pattern more sombre than *P. belcheri.* The white superciliary stripe, although quite apparent in freshly moulted and young *P. desolata,* lacks the dimensions of that shown in *P. belcheri* and is frequently interupted with scattered dark feathering (see Fig. 7).

The open "M" marking across the wings is black, well defined and moderately broad. Despite abrasion it remains distinct in this prion, turning noticeably brownish only in cases of extreme wear.

The black terminal barring of the central rectrices tends to be more dominant in this species than *P. belcheri,* but care should be exercised when comparing this feature with worn plumaged *P. desolata* and freshly moulted *P. belcheri.*

Examples of adult Antarctic Prions examined and collected in February and March showed substantial wear to the plumage, especially to the crown and flight feathers. This brings about a further darkening of the head through the loss of the pale extremities of the crown feathers, and the superciliary stripe is considerably shortened, so much so that it can be difficult to see when the bird is on the wing. In this condition, the dark mottled facial features give *P. desolata* a decidedly " scowling " appearance, totally unlike the small, largely white face of *P. belcheri.*

Although wear to the contour feathering of *P. desolata* does cause plumage fading, it does not occur to the same extent as *P. belcheri* and the darker head and collar still remain conspicuous.

(b) *Silhouette and Flight Patterns*

In flight, the Antarctic Prion usually carries its head tucked in close to the body, this making the neck appear more thickset, shorter, and more richly coloured than it actually is. This effect is further accentuated by the wings being held well forward in a position which enhances the length of the tail. Thus, *P. desolata* assumes a hawk-like profile which is most apparent when the bird is viewed laterally or from below (see Fig. 5). The Thin-billed Prion does not convey such an impression. It is a slender bird with a small head and slim neck, which are clearly silhouetted against the sky as the prion rises from the sea.

FIGURE 7 — An adult Antarctic Prion *(P. desolata banksi)* collected in the Scotia Sea. Note dark facial and reduced superciliary stripe; compare with Fig. 2.

The flight pattern of both species is similar although the heavier bird, *P. desolata,* has a slightly slower, more deliberate wing action. This is most apparent during calm weather when the birds use a peculiar laboured, flopping mode of flight. Despite this seeming discomfort, *P. desolata* rarely alights upon the water except to feed.

Pachyptila belcheri is, by contrast, a dainty and buoyant flier, often given to extraordinary aerobatics only paralleled by the Fulmar Prion *(Pachyptila crassirostris)*. The Thin-billed Prion remains highly manoeuverable when there is little or no wind, and was seen to outpace and outperform *P. desolata* on several occasions under these conditions.

(c) *Feeding Habits*

Perhaps the most interesting comparative differences between these two prion species is the way in which they feed. *Pachyptila desolata,* with its wider, more robust bill, equipped with palatal lamellae for sifting, feeds in a scooping fashion ably described by Murphy (1936): "The birds worked along with an odd creeping motion, resting their bodies lightly upon the surface but holding the wings just above it, the feet apparently furnishing all of the motive power. Then, as they scurried forward quite rapidly, their heads would be thrust under water and the laminated [sic] bills

would scoop for food." I have frequently observed *P. desolata* in the South Atlantic and Australasian seas foraging in this manner; this species is also adept at seizing large euphausids from the surface of the sea, and taking to the air with the crustacean held crosswise between the mandibles. Since Wilkins (1923) observed thousands of *P. desolata* feeding upon myriads of crustaceans off the southern end of South Georgia in 1922, there have been numerous accounts of this species of prion foraging by day. Those birds we collected at sea from a variety of places often contained recently captured euphausids, occasionally still held in the birds' mouth.

Unlike its congener, *Pachyptila belcheri* feeds chiefly at night; I have only very rarely seen this species foraging by day despite numerous observations. While on station in the Pacific, with the bright deck lights illuminating the surrounding sea, small groups of *P. belcheri* were seen dashing helter-skelter over the water feeding voraciously on surface plankton like storm petrels (Hydrobatiidae). The Thin-billed Prion glides bouyantly over the sea on stiffly outstretched wings, occasionally patting the water with the feet to obtain extra momentum and lift. The head is quickly lowered and the zooplankton is deftly picked from the sea with such speed as to frequently deceive the observer's eye. Often, particularly in calm weather, the wings are vibrated in short arcs with great rapidity, this enabling the bird to remain poised in the air for several moments before darting off in further quest for food. Where there are large concentrations of surface plankton *P. belcheri* will alight upon the sea to gather food by 'picking' like the Cape Pigeon *(Daption capensis)*, but with considerably more speed and dexterity.

I have no records of *P. belcheri* sifting for food as does *P. desolata,* but this is not surprising in view of the variance of bill structure and the lack of functional palatal lamellae in the maxilla of the smaller bird.

(d) *Bill Structure*

In the hand, the two species can be easily distinguished by the marked differences in the bill proportions, but at sea, unless the birds are seen at short range, this feature cannot be relied upon: only once could I identify them by bill characters when, during an *Eltanin* station, the whalebirds clustered about the ship in large groups of apparently curious individuals. Sometimes the prions would flit so closely that one could see droplets of water hanging from their bills.

DISTRIBUTION

The following distributional data obtained during eight cruises of *Eltanin* is given in numerical and chronological sequence (Table 1). Each shows the ship's noon position and surface temperature, and the number of prions seen for the day. Where necessary, explanatory notes have been added.

(a) CRUISE 16: NEW ZEALAND SUBANTARCTIC (Table 1)

TABLE 1 Cruise 16 : New Zealand subantarctic
28 January - 26 February 1965

Pachyptila desolata alter (Mathews, 1912)

Date	Latitude (° 'S)	Longitude (° 'E)	No. seen *	Temp.	Notes
8 Feb	49 18	162 01]			
		]	11	10.05	
"	52 01	162 02]			
10	54 24	159 00	∞	6.80	(1)
11	55 30	160 00	∞	6.50	
12	56 19	158 27	∞	4.90	
13	58 36	161 50	few	5.3	
14	58 29	163 10	1	5.7	(2)
16	55 23	169 34	2	-	
17	54 39	168 19	3	-	
18	52 26	166 42	few	9.9	
19	50 43	166 18	∞	-	(3)
20	52 02	166 42	few	9.7	
21	49 29	171 18	1	10.9	
24	44 05	175 55	1	-	(4)

* In this and other tables, ∞ indicates birds too numerous to count.

TABLE 1, Notes.

(1) 10-11 February. While off the northern and east coasts of Macquarie Island, large flocks of Antarctic Prions were observed near *Eltanin*. Many birds showed the white edging of both secondary and scapular feathers, indicative of fresh plumage. Scattered throughout these presumably non-breeding birds were adult breeders, their nest-frayed feathers forming a marked contrast to the more richly pigmented birds.

(2) 15 February. No birds seen owing to poor visibility and rough seas.

(3) Between Macquarie and the Auckland Islands where we made landfall on 19 February, Antarctic Prions were irregularly observed. Off these latter islands, however, thousands were seen milling about some 4 to 10 miles from shore. Four specimens were collected 3 miles east of Norman Inlet on 19 February.

(4) 24 February. One stray *P. desolata* was observed in company with two Fulmar Prions *(Pachyptila crassirostris)* off the east coast of the South Island of New Zealand.

TABLE 2 Cruise 20 : Trans-Pacific
14 September - 12 November 1965

Pachyptila belcheri (Mathews, 1912)

Date	Latitude (° 'S)	Longitude (° 'W)	No. seen	Temp.	Notes
19 Sept	41 59	159 40	frequent	10.1	(1)
20	42 55	155 16	"	9.3	
23	45 18	144 51	scattered	8.7	
24	47 03	144 56	"	7.8	
26	51 01	144 58	"	7.7	
28	55 17	144 36	"	5.1	(2)
30	57 19	145 08	"	-0.4	
1 Oct	58 40	144 55	"	-0.2	(3)
6	60 20	137 50	∞	-0.5	
8	60 02	127 22	scattered	-0.1	
9	60 15	126 30	"	1.0	
14	59 20	105 26	"	2.6	
15	59 02	105 32	"	3.9	
17	57 14	104 18	"	3.9	
18	57 02	104 34	"	4.9	
19	56 05	104 20	"	5.2	
22	52 00	99 54	"	5.9	
23	51 28	102 27	"	6.9	
24	51 24	102 50	"	6.6	
25	50 51	104 57	"	6.6	
29	45 45	118 18	"	8.2	
8 Nov	42 07	85 20	"	11.6	
9	39 33	81 36	3	12.0	

Pachyptila desolata

19 Sept	41 59	159 40	frequent	10.1	(1)
20	42 55	155 16	"	9.3	
21	43 48	150 21	5	8.8	
22	44 51	145 19	scattered	8.9	
11 Oct	61 09	117 25	"	2.1	
15	58 57	105 25	few	3.9	
16	58 23	105 35	"	4.2	
17	57 04	104 38	"	3.4	
19	56 07	104 17	"	5.0	
1 Nov	44 35	111 19	1	9.7	
6	44 57	92 03	4	9.1	

TABLE 2, Notes.

(1) 19-20 September. Both prion species were observed together in considerable numbers. The Antarctic Prions were in crisp new plumage, and were readily distinguished from the majority of the *P. belcheri* which were in severe wing moult and worn body feathering. Flocks of 50 to 60 individuals briefly followed *Eltanin,* gliding above the decks like small grey gulls.

(2) 29 September. Passed through clearly delineated Antarctic Convergence at 56° S 144° 30′ W. Dense fog prohibited observations.

(3) 3 October. First brash ice encountered at 60° 10′ S, 145° W. Prions were absent while the ship was actually in or near the ice (3-5 Oct.). On leaving the icefield, *Eltanin* crossed eastward through waters ranging from −2° Centigrade to 3.6°C. Thin-billed Prions were regularly recorded in these open waters, and a large gathering of many hundreds of this species seen on 6 October, while the ship lay on Station 13, exceeded the numbers of all other petrels.

(b) CRUISE 20: TRANS-PACIFIC. 14 SEPT. - 12 NOV. 1965
(Table 2)

This 8,574 mile cruise was the first on which the Thin-billed Prion was observed. This species proved to be the dominant *Pachyptila* frequenting the South Pacific during the spring months, and was the most abundant south of the Antarctic Convergence. Here in frigid waters, *P. belcheri* was often seen in company with Antarctic Petrels *(Thalassoica antarctica),* Antarctic Fulmars *(Fulmarus glacialoides)* and Cape Pigeons *(Daption capensis).* The Antarctic Prion was notable for its rarity over much of the region traversed.

(c) CRUISE 21: EASTERN PACIFIC, 23 NOV. 1965 - 9 JAN. 1966
(Table 3)

This 47-day summer cruise was interesting because of the remarkable change in bird distribution which took place between this cruise and its predecessor, Cruise 20. In the Central Pacific at 120° Longitude, the Antarctic Convergence had moved south 183 miles to 60° 03′ S; (average latitude is about 57° S) all antarctic species of petrel had vanished and two, hitherto unrecorded subtropical petrels — the Juan Fernandez Petrel *(Pterodroma e. externa)* and Stejneger's Petrel *(Pterodroma longirostris)* were recorded as far south as 50° S, 120° W.

Despite spending a month at sea in mostly subantarctic waters where a month previously *P. belcheri* had been widespread, no prions were seen north of the Antarctic Convergence. However, on 25 December, when *Eltanin* crossed into Antarctic waters, Thin-billed Prions suddenly reappeared. From this date until we entered the Straits of Magellan fifteen days later, *P. belcheri* were frequently observed, occasionally in flocks of several hundred. Many of these

TABLE 3 Cruise 21 : Eastern Pacific
23 November - 9 January 1966

Pachyptila belcheri

Date	Latitude (° 'S)	Longitude (° 'W)	No. Seen	Temp.	Notes
25 Dec	59 44	120 06	2	5.0	
27	61 12	120 20	2	3.8	
28	61 23	117 08	several	3.8	
29	62 03	109 40	∞	3.4	
30	62 30	102 00	frequent	3.3	
31	61 33	97 03	few	4.4	
1 Jan	59 28	91 25	1	4.8	
2	57 22	85 46	3	6.3	
3	56 31	83 46	2	6.4	
4	55 02	80 26	several	6.4	
5	53 01	75 43	frequent	7.3	
6	52 52	75 16	"	9.2	

birds were completing the moult and showed numerous gaps in the new flight feathers. No *Pachyptila* were seen inside the Magellan Straits.

The Antarctic Prion was very scarce during Cruise 21, being seen on only two occasions. Odd birds were found scattered throughout *P. belcheri* and Blue Petrel *(Halobaena caerulea)* flocks on 29 December (62° 03′ S, 109° 40′ W; 3.4°C.) and two were recorded on 31 December (61° 33′ S, 97° 38′ W; 4.4°C.)

(d) CRUISE 22: SCOTIA, 19 JAN. - 17 MAR. 1966
(Tables 4 - 5)

As shown in Table 4, Antarctic Prions were numerous during the 6,507 miles of Cruise 22. They outnumbered all other petrels seen. Eighteen pelagic specimens of *Pachyptila d. banksi* were collected from six locations in the Scotia Sea. A sizeable number of *P. belcheri* were seen off Staten Island, Tierra del Fuego on 20 January, but once having crossed the Antarctic Convergence, this species was recorded on only eight occasions (see Table 5). Three Antarctic islands were briefly visited during this cruise: South Georgia (7 February) and South Thule and Zavodovski Islands on 18 February and 6 March respectively.

TABLE 4 Cruise 22 : Scotia Sea
19 January - 17 March 1966
Pachyptila desolata banksi (Smith, 1840)

Date	Latitude (° 'S)	Longitude (° 'W)	No. Seen	Temp.	Notes
21 Jan	55 56	61 45	1	5.8	
22	57 04	60 01	3	6.2	
23	57 27	59 00	2	-	
24	57 02	57 50	2	4.2	1 collected
25	58 54	54 18	2	2.9	
26	59 01	52 44	several	2.5	
27	57 33	52 00	odd	3.4	
28	56 02	52 00	3	5.9	fog
29	55 49	51 29	nil	5.8	fog
30	54 35	51 38	1	6.2	
31 Jan to 3 Feb	53 36	52 16	nil	-	fog
5	51 31	39 59	6	5.1	
6	53 06	40 00	few	4.8	
7	53 49	38 10	∞	-	(1)
8	54 59	40 03	∞	-	
9	56 30	39 46	several		
10	59 00	40 00	few	1.6	1 collected
11	60 06	39 47	∞	1.6	
12	63 00	40 00	∞	0.3	8 collected
13	63 19	39 50	∞	-0.3	
14	62 04	37 58	1+	-	
15	60 20	36 14	odd	0.8	
16	60 01	33 05	odd	0.8	
17	60 10	30 00	"	1.0	(2)
18	59 28	27 16	nil	1.0	(3)
19	61 01	26 12	2	1.0	
20	61 54	21 55	frequent	1.2	(4)
21	62 29	19 03	few	0.7	
22	62 33	17 34	"	0.7	
23	63 04	14 59	frequent	0.1	
24	61 00	14 47	0cc.	0.5	
25	60 11	14 39	3	1.0	
4 Mar	55 59	22 35	8	1.8	
5	56 32	24 23	3	1.7	
6	56 24	26 46	4+	0.7	(5)
7	56 20	30 58	odd	1.7	
8	56 17	35 10	several	2.7	
9	56 09	38 39	"	2.0	
10	55 45	42 52	"	3.6	4 collected

TABLE 5 Cruise 22 : Scotia Sea
19 January - 17 March 1966

Pachyptila belcheri

Date	Latitude (° 'S)	Longitude (° 'W)	No. Seen	Temp.	Notes
20 Jan	54 45	63 22	∞	6.2	Off Staten I.
25	58 55	54 14	1	2.9	Bird in moult
27	57 33	52 00	1	3.4	
4 Feb	50 59	39 51	1+	4.7	
5	51 31	39 59	several	5.1	
9	56 29	39 56	"	2.3	
14 Mar	54 43	55 30	1	6.7	
16	52 52	66 03	1	8.3	

TABLES 4 - 5, Notes.

(1) 7 February. At 7 a.m., as *Eltanin* steamed along the north-western coast of South Georgia, myriads of Antarctic Prions were seen streaming out to sea from the mist-shrouded valleys. It was surprising that none flew onboard or collided with the ship, so dense were their numbers. None were observed ashore during our short stay in the Bay of Isles.

(2) 17 February. During a brief snowstorm, three birds flew onboard at 2.10 a.m. while the brightly lit *Eltanin* lay on Station 29 60° 02′ S, 29° 59′ W; 1.0°C.).

(3) 18 February. Landed at South Thule Island. No *Pachyptila* were observed in the vicinity of this ice-capped island, and none were seen ashore.

(4) 20 February. Many varieties of far ranging petrels including groups of Antarctic Prions were seen over the plankton-rich sea this date. Buckets of krill *(Euphausia superba)* were being regularly extracted from the ship's three foot square sea water intake.

(5) 6 March. Occasional Antarctic Prions were recorded near Zavodovski Island this date, with one specimen being collected from close inshore. It is doubtful whether any prion could survive for any length of time in the sulphurous fumes that are issuing from the numerous cracks and fumaroles of this volcanic island, although an extensive rookery of mostly Chinstrap Penguins *(Pygoscelis antarctica)*, over a million birds, seem to prosper under these very unusual circumstances.

(e) CRUISE 23: TRANS-PACIFIC, 31 MAR. - 30 MAY 1966 (Tables 6 - 7)

During this cruise, the westward migration of Falkland Island Thin-billed Prions was seen, and eleven birds were attracted aboard *Eltanin* by two powerful signalling lights. Winter weather prevented additional collecting in the ship's dory. *Pachyptila belcheri* paced us well across the Pacific and were constantly seen as scattered birds winging west by day, and numerous white shapes at night. A definite preference for waters south of the Antarctic Convergence, particularly in the eastern sector of the Pacific, was again noted during this cruise. The Antarctic Prion was seen sparingly about the periphery of the Pacific.

TABLE 6 Cruise 23 : Trans-Pacific
31 March - 30 May 1966

Pachyptila belcheri

Date	Latitude (° 'S)	Longitude (° 'W)	No. Seen	Temp.	Notes
2 Apr	54 48	75 42	frequent	7.4	
4	61 33	78 14	several	3.9	
5	64 51	80 52	6	0.6	
7	63 29	93 38	frequent	2.4	
8	63 27	94 07	1	2.0	
15	63 49	101 55	several	2.1	3 collected
20	58 48	100 42	frequent	-	
21	58 06	103 55	several	6.2	
22	58 03	107 36	2+	7.0	
25	61 23	108 20	3	4.9	
26	62 00	108 50	6	4.7	
28	63 51	108 56	several	2.2	8 collected
29	63 10	110 52	1	3.2	
1 May	63 36	115 58	scattered	3.1	
4	58 55	115 02	1+	5.2	
5	58 35	115 30	1	5.1	
6	57 38	115 11	2+	5.2	
7	57 33	118 58	frequent	5.1	
8	57 25	123 35	"	4.6	
9	57 41	126 55	"	4.0	
10	56 59	128 37	"	5.6	
11	56 42	131 18	"	3.9	
12	56 02	132 09	"	4.0	
13	54 29	138 03	"	5.0	
15	52 03	149 52	1	5.9	
17	48 59	162 04	1?	9.7	
18	47 34	167 32	1	10.7	

TABLE 7 Cruise 23 : Trans-Pacific
31 March - 30 May 1966

Pachyptila desolata

Date	Latitude (° 'S)	Longitude (° 'W)	No. Seen	Temp.	Notes
2 Apr	54 48	75 42	few	7.4	
3	58 03	77 20	1	6.3	
5	64 51	80 52	4	0.6	
8	63 27	94 07	2	2.0	
18 May	47 34	167 32	3	10.8	
20	46 20	170 09	3	12.4	
21	44 40	173 00	1	12.3	
22	43 52	174 27	200+	12.6	
23	42 55	176 05	1	14.0	
24	Off Chatham Islands		1+	-	

(f) CRUISE 26: TASMAN SEA, 29 NOV.-20 DEC. 1966

For this 21-day cruise, the Thin-billed and Antarctic Prions were seen on only one occasion. This was on 11 December, in the position 45° 38′ S, 160° 08′ E; surface temp. 10.9°C. Several freshly plumaged *P. desolata* were sighted in company with Thin-billed Prions hovering over three New Zealand Fur Seals *(Arctocephalus forsteri)* investigating our ship on Station 4.

(g) CRUISE 27: ROSS SEA, 31 DEC.-1 MAR. 1967
(Table 8)

This cruise into the Ross Sea started from Wellington, New Zealand, and finished at Melbourne, Australia. While on passage to McMurdo Sound, where we arrived on 22 January, a short stop-over at the Antipodes Islands was made on 3 January. Several Subantarctic Fairy Prions (*Pachyptila turtur* subspp.) were recorded from the dory on route to and from the beach, and later, during our approaches on Macquarie Island. Scott Island (Fig. 8) was investigated on 2 February, and Macquarie was again visited on 15 February. The Antarctic Prion proved to be the most frequently recorded prion, but its numbers were erratic, with the largest gatherings being seen near the breeding stations. Essentially restricted to a belt on water between 56° and 67° South, *P. desolata* was not observed at all in the

TABLE 8 Cruise 27 : Ross Sea
31 December 1966 - 1 March 1967

Pachyptila desolata

Date	Latitude (° 'S)	Longitude (° ')	No. Seen	Temp.	Notes
2 Jan	48 32	175 32E	several	10.4	
4	52 35	178 50E	1	9.2	(1)
5	56 30	178 29E	20	6.3	
6	61 15	177 58E	frequent	3.7	(2)
7	63 00	177 42E	few	3.2	(3)
8	63 26	177 54E	occ.	2.7	
2 Feb	67 24	179 53W	200+	0.2	(4)
5	67 03	163 22E	few	0.5	(5)
6	65 00	160 55E	2	0.9	fresh plum.
7	65 18	160 46E	odd	1.2	
8	62 40	158 06E	4	1.7	
9	61 13	156 36E	several	2.8	fresh plum.
10	59 35	155 19E	2	2.8	
11	59 00	157 00E	3	3.0	
12	57 56	153 53E	few	4.2	(6)
13	58 06	154 29E	1	4.5	fresh plum.
14	56 23	156 18E	∞	5.9	(7)
15	54 30	158 58E	few	5.9	(8)
16	55 04	156 46E	-	6.5	(9)
17	56 00	152 39E	few	5.2	
18	56 11	152 11E	several	5.6	worn plum.

TABLE 8, Notes.

(1) 3 January. None observed about the Antipodes Islands where a landing was made on this date. A small race of Fairy Prion (*P. turtur* subspp.) which nests on this island was frequent in nearby waters.

(2) 6 January. Quite numerous on this date, especially towards evening. A few birds were in wing moult; the remainder were in new feathering.

(3) 8 January. First iceberg 63° 49.6′ S, 177° 54′ E. Frequent icebergs seen after this date. Passed through the Antarctic Convergence. *Eltanin* remained in the Ross Sea for 24 days during which time no prions were seen.

Australian coasts (Serventy & Whitell 1951; Condon 1944) and on western New Zealand beaches; most are immature birds. That these birds are from Kerguelen Island is supported by their being cast ashore with considerable numbers of Indian Ocean Lesser Broad-billed Prions *(Pachyptila salvini),* occasional Kerguelen Antarctic Prions *(Pachyptila desolata desolata)* and other petrels from that region (Bull & Boesen 1961: 63, 64, 65). Moulting birds, as seen regularly in the Pacific during Cruise 20 and 21 are exceedingly rare as beach derelicts, and in ten years of beach patrolling in New Zealand, I have not found any *P. belcheri* undergoing a full moult. Also, there are no records of this species being taken in waters immediately east of New Zealand. A severe tropical cyclone which scoured the seas just north and east of New Zealand in April 1968 accounted for a large loss of seabirds and the sinking of the inter-island ferry *Wahine.* Around Wellington, 588 birds were cast ashore, including 102 Fairy Prions *(Pachyptila turtur)* and 6 *P. desolata* (Kinsky 1968). Worthy of note is the fact that no Thin-billed Prions were victims of this storm.

From the available evidence, the western New Zealand coasts may represent the limit for immature stragglers of Kerguelen Thin-billed Prions.

Perhaps the most interesting and unexpected find of the current investigation was the large number of Thin-billed Prions frequenting the colder regions of the South Pacific. Although not seen in great aggregations as were the South Atlantic *P. desolata,* the Thin-billed Prion was nonetheless quite abundant as widely dispersed groups and individuals, which, when considered collectively, must account for many thousands of birds. The origin of this sizeable prion population is unknown, but in view of the observations and collections made during the Pacific cruises, I consider the Falkland Islands to be the breeding home of these birds.

Cawkell & Hamilton (1961) have shown that Falkland Island *P. belcheri* leave their breeding grounds, " any time after the beginning of March," and by early April, the forerunners of a general migration of birds are entering the Pacific by way of the Drake Passage. Cruise 23 coincided well with this migration. The first groups of *P. belcheri,* composed of young and adult birds, reached our position in the Pacific well south of the Antarctic Convergence on 15 April, when three birds flew onboard the ship (see Cruise 23, Table 6). An immature female has also been collected by G. E. Watson and I. P. Angle, of the U.S. National Museum, on 12 April 1965 at 58° 30′ S, 78° W, a position not far from ours of 15 April. During April and May, the Thin-billed Prion disperses westward into the hitherto sparsely populated South Pacific; most keep to the colder waters south of the Antarctic Convergence where food is particularly abundant.

For the winter months (June to imd-September), I have no records, but according to Szijj (1967) who crossed the South Pacific

from 29 July to 17 September 1964, his prion species " showed a curiously disjointed distribution, occurring in both the New Zealand and South American sectors in waters of 7°C or warmer, but twice they were encountered south of the Convergence as well." It is probable that like many Antarctic petrels, the majority of *P. belcheri* move north to more fruitful winter feeding grounds. Johnson (1965) reported *P. belcheri* as an irregular winter visitor straying as far north as 25° S along the Chilean coastline, while MacDonald & Lawford (1954) observed the species near the Kermadec Islands (29° S) in August 1951. They observed, " Large numbers were seen between Napier and Meyer Island during a short boat excursion from Raoul Island, Kermadecs, on August 31. It was not ascertained if the species was breeding in the Kermadecs, but the reason for the presence of a large number in August would have been worth investigating." A specimen was collected but unfortunately not kept. Sorensen (1964) collected a dead *P. belcheri* from Denham Bay at the Kermadecs in July 1944. Whether these birds are from Kerguelen, the Falkland Islands, or, indeed, from an unknown Pacific breeding site is a matter of conjecture, but it seems likely that they were part of the eastward drift of immature birds from the Indian Ocean.

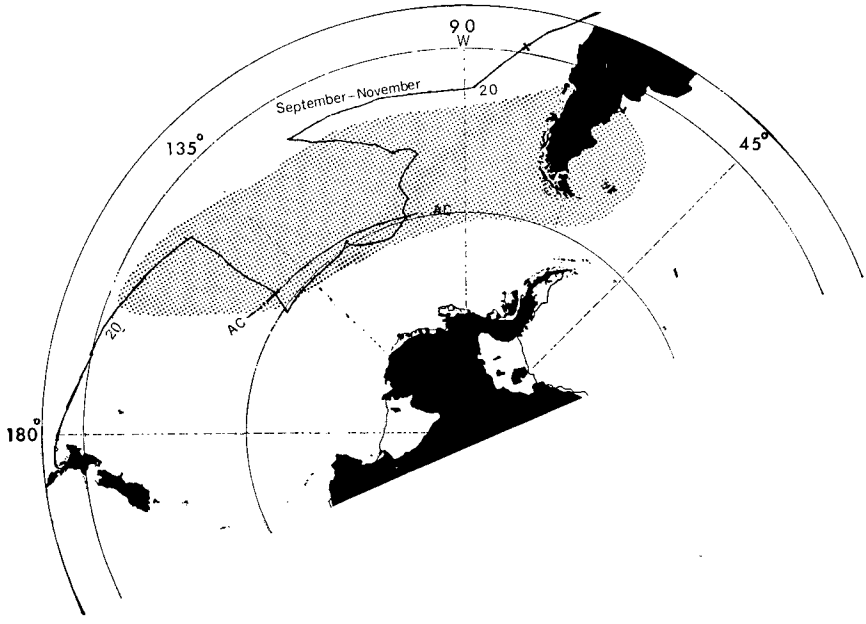

FIGURE 9 — Distribution of Thin-billed Prions during September to early November. The species is present about the South American coast all year.

By mid-September, most of the birds were returning or had returned south, since they were common when initially encountered at 45° S 145° W on 23 September, and later, were widely distributed and frequent south of the Antarctic Convergence during the remainder of Cruise 20 (see Fig. 9). Likewise Szijj (1967) recorded more "prion spps" (very probably *P. belcheri*) during the latter part of his voyage (11-17 September 1964). Szijj's records in the eastern Pacific of 4 to 50 prions seen during his two hour daily observations are approximately the same as my own observations in the western sector, a week or so later, in 1965.

During the latter part of October and into November the trend southwards in the Pacific continued and the number of *P. belcheri* rapidly increased in the antarctic waters, where they were found with Antarctic Petrels *(Thalassoica antarctica)*, Antarctic Fulmars *(Fulmarus glacialoides)* and many Cape Pigeons *(Daption capensis)*. The effectiveness of this migration may be seen in the figures given for Cruise 21 (Table 1); by late December no *Pachyptila* were observed north of the Antarctic Convergence except around the coastal southern region of South America. However, numerous flocks of up to 150 birds were commonly encountered south of 59° 30′ S, where the Antarctic Convergence was found in late December 1965.

The large number of *P. belcheri* inhabiting the South Pacific in December is rather interesting because the species arrives at the Falkland Islands to breed in late September, and does not complete breeding activities until March (Cawkell & Hamilton 1961). Further, this aggregation of birds remains in the Pacific area most of the summer, as Holgersen (1957) was undoubtedly encountering *P. belcheri* "between longitudes 90° and 125° W, between the pack ice and the Antarctic Convergence" from 3 December 1947 to 8 February 1948 (see Fig. 6 for summer distribution of western *P. belcheri;* Holgersen's prior records and *Brategg's* cruise track have been added, since his observations correlate so well with my own).

Apparently the cold antarctic waters of the Pacific with their rich summer supply of plankton serve as a summering ground for a sizeable population of sub-mature *P. belcheri.* Many of these non-breeding birds undergo an early moult, most prions recorded in December (Cruise 21) showing missing flight feathers indicating active moult. To an observer, these gaps display the usually concealed broad white inner webs of the remaining feathers as a characteristic flash of white in the wing.

On 21-22 January, Holgersen also observed two 'types' of prion, noting "one being paler than the ordinary one and with white on some of the primaries so that the posterior edge of the wings to some extent looked white." Upon renewal of the plumage, *P. belcheri* (and *P. desolata*) show significant white bordering to the secondary feathers and scapulars and while Holgersen may have seen both *P. desolata* and *P. belcheri,* I believe it more likely that the prions

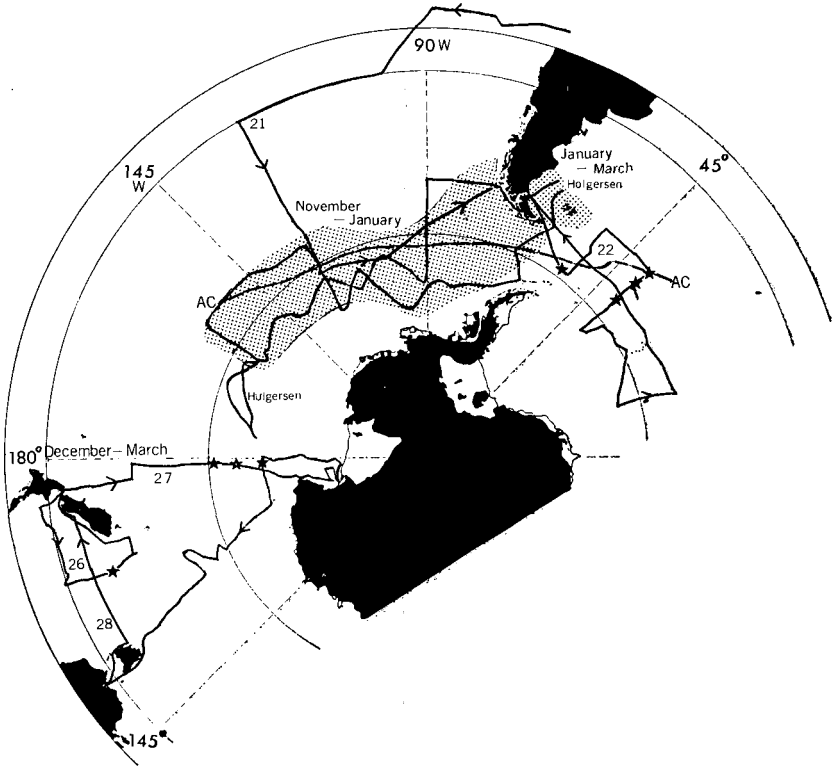

FIGURE 10 — Summer distribution of *P. belcheri* in central and eastern Pacific sectors. Holgersen's (1957) data has been added to my own as mentioned in the text. AC = position of Antarctic Convergence. The stars indicate extralimital sight records.

in question were *P. belcheri* in the final stages of their moult cycle. The Antarctic Prion is very rare in the central south Pacific, particularly in the summer months (see discussion of that species).

I have very little information as to when the adult *P. belcheri* moult, and there appears to be none on record in the literature. A few adult birds were seen in full moult (see Fig. 4) between the Falklands and South Georgia during February and March 1966 suggesting that like *P. desolata,* the breeding birds commence replacing the worn plumage while still feeding well-grown chicks in the latter stages of the nuptial cycle (see Tickell 1962). It should be noted that sub-mature *P. belcheri* are already in new plumage by February. The occasional adult storm-driven birds taken in New Zealand during May to September display various amounts of wear to fresh feathering also indicating that *P. belcheri* finish replacing the nest-frayed plumage shortly before the first birds are driven ashore in May.

plankton rich Ross Sea. Sven specimens of *P. desolata alter* were collected. Thin-billed Prions were rare, being recorded on only three occasions:

6 January. 61° 15′ S, 177° 58′ E; 3.7°C.

A few *P. belcheri* scattered within a large flock of Antarctic Prions. The majority of both species were through the moult, but a few individuals were still replacing worn flight feathers.

8 January. 63° 30′ S, 177° 54′ E; 2.7°C.

A single bird in this position south of the Antarctic Convergence. The first of many icebergs sighted on our southward journey was 24 miles due south of this position.

3 February. 67° 27′ S, 179° 10′ E; 0.4°C.

My last and southermost record for *P. belcheri.* In company with many Antarctic Petrels *(Thalassoica antarctica)*, two birds in fresh plumage were logged in this position due west of Scott Island.

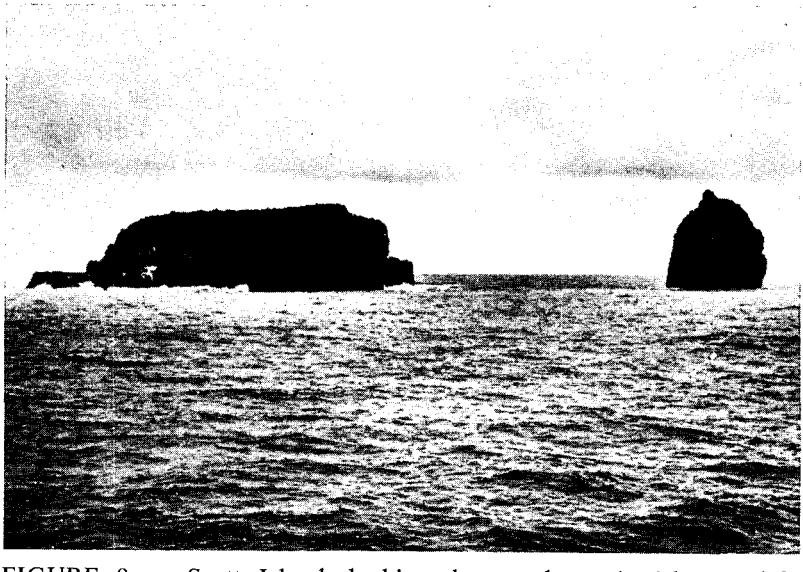

FIGURE 8 — Scott Island, looking due south: main islet on left, Haggits Pillar on right, distance 800 yards (731.5m). The breeding site of Antarctic Prions, Wilson's Storm Petrels and Snow Petrels.

(4) 2 February. As *Eltanin* circled Scott Island (67° 24′ S, 179° 55′ W), a stream of Antarctic Prions was seen issuing from and disappearing into the many fissures in the broken basalt rock on both Haggits Pillar and the main island (see Fig. 8). A heavy swell prohibited a landing, but a male and female Scott Island *P. desolata* were shot from just offshore by a dory party. The Antarctic Prion is nesting on the upper third of the 205 ft (62.5m) column of Haggits Pillar with a few Wilson's Storm Petrels *(Oceanites oceanicus)* and Snow Petrels *(Pagodroma nivea)* as breeding companions. On Scott Island itself, the northern cliffs and the ice-free upper slopes also appear to provide shelter for a small number of *P. desolata.* The total number of Antarctic Prions seen in the proximity of the islets I estimated to be 200 pairs. No prions were observed beyond a radius of 40 miles (64km) of Scott Island.

(5) 5 February. *Eltanin* approached the Balleny Islands from the east and made a close approach upon Sabrina and Buckle Islands. A few Antarctic Prions in fresh plumage were recorded about a mile off Sabrina Islet. I did not find any evidence to suggest that these islands serve as a prion breeding station.

(6) 12 February. Five Antarctic Prions were collected from a small number seen on this date.

(7) 14 February. Encountered considerable numbers of Antarctic and Fairy Prions during our approaches on Macquarie Island.

(8) 15 February. Landed Macquarie; occasional Antarctic Prions seen offshore at 8.00 a.m. No birds were collected at Macquarie.

(9) 16 February. Whole gale prevented detailed observations.

(h) CRUISE 28 (IN PART): TASMAN SEA, 10 - 28 MAR. 1967

No Thin-billed or Antarctic Prions were recorded for this 18-day cruise. Frequent Fairy Prions *(Pachyptila turtur),* Broad-billed Prions *(Pachyptila vittata)* and the occasional Fulmar Prion *(Pachyptila crassirostris)* were seen during the 43° 15′ S crossing of the Tasman Sea. The sea surface temperature fluctuated between 13 and 16°C. Two Red-tailed Tropic-birds *(Phaethon rubricauda roseotincta)* observed on 14 March and our nearly running down a large Sunfish *(Mola mola)* lying obliquely near the surface on the 15th, emphasized the subtropical elements of this summer cruise.

DISCUSSION

(a) *Pachyptila belcheri.*

There are no data to suggest a regular eastward movement of Kerguelen Island *P. belcheri* travelling east into the South Pacific via Australasian seas, although occasional strays were seen in the Ross Sea during Cruise 27 and two corpses have been found at Campbell Island (Bailey & Sorensen 1962). During winter gales (May to September), a few *P. belcheri* occur on both the west and southern

Not all birds from the South American quadrant migrate into the Pacific for the winter. According to De Schauensee (1966) the Thin-billed Prion " winters off the coast of Argentina north to Uruguay and Sao Paulo, Brazil." Pinto (1938; 1964) reported seven birds from Sao Paulo in June 1903 and August 1925 and one specimen from Praia Grande (just south of Rio de Janeiro). Cuello & Gerzenstein (1962) recorded more than 3,000 dead birds near Montevideo in July 1954. Escalante (1959; 1967) likewise noted heavy winter mortality of *P. belcheri* at the mouth of the Arroyo Carrasco (near Montevideo) in August 1953 and at the La Playa Brava (Uruguay) in July 1959. Further south, Murphy (1936) mentioned a specimen taken from the beach at Mar del Plata, Argentina, on 27 October 1915 and reported that Beck collected 64 *P. belcheri* between late May and 1 October 1915 " in waters between the Falkland Islands, Staten Island, and the coast of Patagonia." I have examined these specimens in the American Museum of Natural History, and they are all in adult plumage. Many hundreds of probable *P. belcheri* outside the eastern entrance of the Magellan Straits and along the east coast of Tierra del Fuego were observed also by Beck on 25 May and 6 August 1915 respectively.

Whether any Falkland *P. belcheri* cross the South Atlantic to perhaps meet and intermingle with prions resident at Kerguelen Island is not known, but adults from both breeding areas are indistinguishable to me.

Two specimens of the Thin-billed Prion have been taken from South African coasts. Winterbottom (1956) reported that the first known record was a bird collected at Muizenburg on 27 April 1897, and a second specimen turned up 57 years later in a large wreck of Fairy Prions at Durban, Natal, on 6 August 1954 (Clancey 1955).

Figure 11 shows the known distribution of *P. belcheri* and has been prepared from my own data and that of other workers. It is purely tentative and is offered as a basis for further research. Much work remains to be done, particularly in the Atlantic and Indian Ocean sectors, where records of the Thin-billed Prion are very few. The area outlined for the range of Kerguelen birds is based upon the trends of dispersal which I found for the species in the Pacific, and is therefore liable to considerable modification in the future.

Dr. R. A. Falla has drawn my attention to an early distributional record of the Thin-billed Prion. It is clearly identifiable from the S. Parkinson drawing number 15 in the British Museum (Natural History), London (see Lysaght 1959) of a specimen shot by Banks on 1 February 1769 in 58° 46′ S, 78° 42′ W (the western approaches of the Drake Passage). To the drawing is attached Solander's manuscript name "*Procellaria turtur*" and it was later (1820) the basis of Kuhl's description of his *P. turtur*. This has disturbing implications for nomenclature, but at least the distributional data are clear.

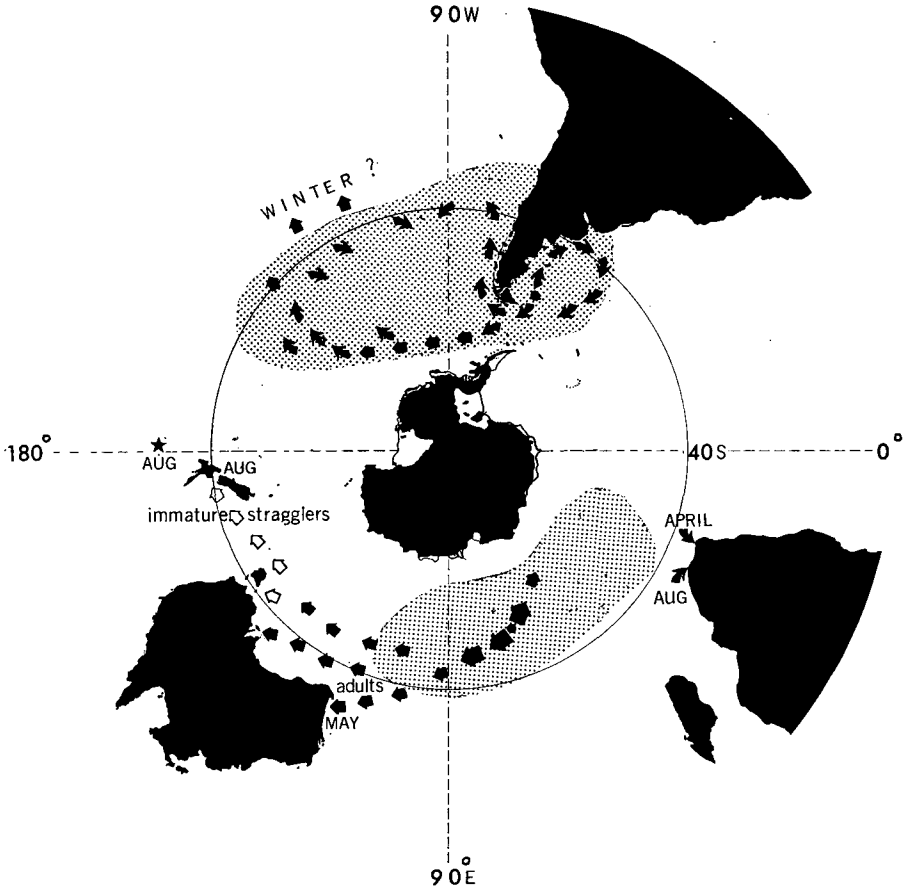

FIGURE 11 — The distribution of the Thin-billed Prion showing main migration routes. Based upon the work of others and my own data.

The Thin-billed Prion is known to breed at two places, the Falkland Group and Kerguelen Island. Another area well worthy of investigation as a possible breeding site is Staten Island (the easternmost island off Tierra del Fuego) and other offshore islets in this little known region. Johnson (1965) remarked: " In southern Chilean waters it is probably more abundant than the scarcity of records indicate and there is at least an even chance that it may nest somewhere in Chilean territory in the neighbourhood of Cape Horn or on one or more of the multiple uninhabited islands south of the Beagle channel." Passing some 19 miles (16km) from Staten Island in the late afternoon of 20 January 1966, *Eltanin* was

surrounded by many *P. belcheri,* all of which were flying towards the island with considerable numbers of Wilson's Storm Petrel *(Oceanites oceanicus).*

The Thin-billed Prion feeds upon swarms of the amphipod *Parathemisto gaudichaudii* of which I have taken as many as 100 individuals from a single dissected *P. belcheri.* Data obtained from the specimens of *P. belcheri* collected during Cruise 23, and direct observations during this and other Pacific cruises, revealed that *P. gaudichaudii* constitutes the bulk of this prion's food. Indeed, despite the many other species of zooplankton (including *Euphausia superba*) regularly caught in the surface tow-nets at night, 2 otoliths from the myctophid fish *Electrona* and a small, semi-digested cephalopod are my only additional evidence of a varied prion diet. Because the soft amphipod would presumably be rapidly digested by these birds, I have seldom found anything but the hard remains of cephalopods beaks and pebbles in the stomachs of storm-killed birds cast ashore in New Zealand. At Kerguelen Island, four specimens of *P. belcheri* collected by Falla (1937) and Paulian (1953) revealed nothing but squid beaks. Whether this prion takes forms of food other than these must await further study.

The known distribution of *Parathemisto gaudichaudii* and the Thin-billed Prion correlate well. Kane (1966) reported that *P. gaudichaudii* is " a conspicuous and frequently occurring constituent of the plankton of the upper water layers of the Southern Ocean " where its range is bounded in the north by the subtropical convergence, and by the East Wind Drift in the far south. The greatest areas of abundance appear to lie approximately 600 miles north and south of the Antarctic Convergence with minimal numbers occurring in the convergence itself (see also Hurley (1969; pl. 19, map 6) for details of distribution of the species of *Parathemisto* in the Southern Ocean). During Cruise 20 there was a notable lack of prions in the convergence, both on the western and eastern sides of the Pacific. *Parathemisto gaudichaudii* is apparently rarely recorded in South African waters where interestingly enough, only two *P. belcheri* have been recognised.

P. gaudichaudii occurs often in large gatherings and according to Kane, " Large swarms of the species are frequently sampled, especially at night when the species evidently accumulates in surface waters." This vertical diurnal migration of *P. gaudichaudii* would explain my observing the Thin-billed Prion feeding at dusk and throughout the night.

(b) *Pachyptila desolata.*

I found no evidence of a sub-mature population of the Antarctic Prion summering on the high seas like juveniles of its counterpart *P. belcheri.* Indeed, from November to the completion of the breeding season, the vast Atlantic population of *P. desolata banksi* (Smith,

1840) is primarily restricted to the Scotia Sea with few birds beyond these limits. To the west, isolated stragglers represented the species in the south-eastern Pacific during November 1965 to January 1966, and to the east, this subspecies has only been seen in small groups east of the South Sandwich Islands in March. Within this sector, however, the birds were ubiquitious, with very dense concentrations between the South Orkney Islands and South Georgia, where, as is well known, the nutrient rich waters teem with the Antarctic " krill " *(Euphausia superba)*.

In the New Zealand region, where the Antarctic Prion (see sub-species listed in OSNZ Annotated Checklist 1970: 25) nests on the Auckland Islands, Macquarie Island and, sparingly, on Scott Island, a similar situation prevailed in that remarkably few birds were recorded away from these islands. Vast numbers of prions were seen off the Auckland Islands in February 1965 and around Macquarie Island during our summer work in this area (Cruises 16 and 27).

Unlike *P. belcheri,* the sub-mature birds apparently accompany the adult birds both at sea and ashore during the breeding season. Tickell (1962) has commented that while unable to accurately determine the percentage, the Signy Island (South Orkney) breeding population " must contain a considerable proportion of non-breeding birds of several age groups, together with breeders that have been unsuccessful for one reason or another." With such productive and rich plankton pastures so near at hand both in the Scotia Sea and New Zealand subantarctic sectors, this concentration of the prion populations is not surprising.

The collective departure of young and adult birds following breeding activities is a real one in that the species is entirely absent from the breeding islands during the winter months. This exodus is apparently true for all areas (see Falla 1937; Downes *et al.* 1959; Tickell 1962). Where the flocks of *P. desolata* find their winter feeding grounds is not known, and the question as to whether there is any intermingling of the geographical races is an interesting question, but difficult to answer because, apart from minor, somewhat questionable, subspecific characters, all populations of *P. desolata* are remarkably similar in morphology.

Kerguelen Antarctic Prions (*P. desolata desolata,* Gmelin, 1789) migrate eastwards shortly after the Lesser Broad-billed Prion *(P. salvini)* leaves Marion and Crozet Islands. Serventy & Whittell (1951) refer to *P. desolata* as the commonest prion washed ashore in south-west Australian prion wrecks, with *P. salvini* also well represented among the storm victims. Of 20 Antarctic Prion skins collected between May and September from Bunbury and Cottesloe beaches which I have recently examined at the National Museum, Victoria, all are referable to the Kerguelen form. Several of these specimens are adult birds and not immature vagrants that infrequently appear further east with Australasian *P. desolata* on South Australian and New Zealand west coast beaches.

The Macquarie and Auckland Island birds apparently move northwards with the onset of winter as Condon (1944; 1962) reported *P. desolata* as very common in winter 'prion wrecks' from May to October along the South Australian coast. Hindwood & McGill (1958) recorded *P. desolata* from the Sydney beaches in winter and specimens of this subspecies are not infrequent during westerly gales from May to September in New Zealand. Some more fortunate birds reach the Pacific waters east of the Chatham Islands clear of any lee-shore hazard where I found them associating with *P. belcheri* in late September 1965 (Cruise 20).

While the western periphery of the Pacific is receiving visitors from New Zealand waters, some westbound *P. desolata banksi* are rounding Cape Horn. I saw several such birds in April shortly after leaving Pt. Pilar to journey south for Cruise 23. This species does not appear to venture far into the South Pacific since we saw so few during our work in these waters. Apparently they fly north, for Johnson (1965) reported Antarctic Prions occurring irregularly but in some numbers as winter corpses along the long Chilean coast from Maullin at 41° 30′ S to Paposo, 90 miles north of Antofagasto at approximately 23° S.

For the most part however, the vast central South Pacific shelters very few examples of the Antarctic Prion. I saw none during much of our Pacific cruising, and Szijj's winter records in the same region likewise revealed a paucity of prions. It is my belief that neither the New Zealand subantarctic breeding populations nor the South Atlantic Antarctic birds actually traverse the Pacific Ocean regularly in any number, and that the Antarctic Prion is not circumpolar in its travels as previously suspected.

South African records of *P. desolata* are irregular, but specimens have been obtained in substantial numbers in winter prion wrecks. Liverside (1959) recorded them from Walvis Bay to Durban and Mozambique, and mentioned that *P. desolata* was the chief victim in a severe July 1954 storm. These birds could have their origin at Kerguelen or possibly Heard Island, since a bird just off the nest was collected some 20 miles west of Amsterdam Island by Gill (1967) on 8 April 1964. It may have been one of many migrating westwards for the winter. Since the vast Scotia Sea population of *P. desolata banksi* do not pass through the Drake Passage, there may well be some mingling of races of *P. desolata* in the waters south of South Africa. Smith's type of *P. d. banksi* was collected in waters off the Cape of Good Hope.

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APPENDIX (Tables 9-11)

The following tables are those of prion measurements taken during Cruises 16, 22, 23 and 27. The 40 specimens were measured in the flesh aboard *Eltanin,* and are now in the Dominion Museum, Wellington, New Zealand.

TABLE 9 *Pachyptila belcheri* Cruise 23

Date	Field No.	Sex	Age	Bill	Width	Wing	Tail	Tars	Toe	Wt
15 Apr	23-1	♀	Imm.	24.0	11.0	181	95	33.1	40.8	132g *
	23-2	♀	Imm.	24.6	10.0	180	90	33.0	40.5	114.7
	23-3	♂	Imm.	24.0	10.6	175	90	34.6	41.8	142.0x
28	23-4	♀	Imm.	24.0	9.5	173	89	31.9	39.0	131.0
	23-5	♂	Imm.	24.4	11.0	183	91	32.5	41.0	146.0x
	23-6	♂	Imm.	22.7	9.6	175	82	33.0	40.0	135.5
	23-7	♀	Ad.	24.4	10.4	176	87	32.6	39.7	122.0
	23-8	♂	Ad.	23.8	10.7	178	89	33.7	40.8	130
	23-9	♀	Imm.	24.5	10.3	177	90	33.7	40.5	129
	23-10	♀	Ad.	24.1	11.2	178	87	32.0	40.4	145
	23-11	♀	Ad.	22.3	11.4	178	86	34.0	39.7	129

* Weight influenced by more than 10g of *Parathemisto* in proventriculus and gizzard.

TABLE 10 *Pachyptila desolata banksi* Cruise 22

Date	Field No.	Sex	Age	Bill	Width	Wing	Tail	Tars	Toe	Wt
24 Jan	22-1	♂	Ad.	28.4	14.1	187	92	35.3	44.1	137.0
10 Feb	22-15	♂	Ad.	28.1	14.3	182	92	34.6	43.7	148.0
12	22-16	♂	Ad.	28.7	14.8	198	100	34.5	43.3	161.5
	22-17	♂	Ad.	28.6	14.9	190	103	36.5	43.6	153.7
	22-18	♂	Ad.	28.0	15.5	194	98	35.0	41.2	165.0
	22-19	♀	Ad.	27.6	14.5	185	96	34.9	43.6	163.5
	22-20	♂	Ad.	27.2	15.2	190	97	35.7	42.7	155.5
	22-21	♀	Ad.	27.5	14.3	191	96	36.5	42.5	154.0
	22-22	♂	Ad.	26.1	15.0	195	99	34.9	42.9	150.5
	22-23	♀	Ad.	28.2	14.9	193	100	36.0	43.5	152.0
16	22-27	♀	Ad.	27.9	14.2	187	94	34.5	41.6	137.0
	22-28	♀	Ad.	28.3	13.7	186	97	33.6	40.3	152.5
	22-29	♂	Ad.	27.9	13.9	190	97	34.4	41.0	147.0
6 Mar	22-52	♀	Ad.	26.7	13.9	185	94	33.9	42.3	138.5
10	22-57	♂	Ad.	29.2	14.1	199	98	35.4	41.8	125.0
	22-58	♀	Ad.	29.5	16.2	193	96	35.3	42.6	128.0
	22-59	♂	Ad.	29.2	15.0	191	moult	35.2	43.1	159.0
	22-60	♂	Ad.	28.1	14.5	195	94	35.4	43.7	118.0

Table 11 *Pachyptila desolata alter* Cruise 16

Date	Field No.	Sex	Age	Bill	Width	Wing	Tail	Tars	Toe	Wt
19 Feb	16-1	♂	Ad.	25.8	15	184	89	33	39	
	16-2	♀	Ad.	25.8	13.5	180	91	27.3	38.3	
	16-3	♀	Ad.	28.2	14	180	86.4	31	38.5	
	16-4	♀	Ad.	28.5	14	192	89.2	31	38.5	

Pachyptila desolata alter Cruise 27

2 Feb	27-3	♂	Ad.	27.4	14.6	183	93	35.3	42.0	131.0
	27-4	♀	Ad.	25.7	14.5	176	93	32.0	41.2	140.0
12	27-11	♂	Ad.	28.5	15.0	185	95	35.3	43.5	148.0
	27-12	♂	Ad.	28.8	15.2	189	90	35.3	42.0	146.8
	27-13	♀	Ad.	28.0	15.2	193	100	36.0	44.0	145.8
	27-14	♂	Ad.	26.9	15.2	180	92	35.0	41.5	150.0
	27-15	♀	Ad.	28.0	14.3	185	92	36.3	40.0	145.0