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MIGRATION OF WHITE-FACED STORM-PETRELS *PELAGODROMA MARINA* IN THE SOUTH PACIFIC AND THE STATUS OF THE KERMADEC SUBSPECIES

SOUTH PACIFIC SUBSPECIES

Three subspecies of the White-faced Storm-Petrel *Pelagodroma marina* are presently accepted as living in the South Pacific Ocean (Murphy & Irving 1951). Others breed in the Atlantic Ocean.

The Australian race *P.m. dulciae* breeds on many islands from Abrolhos Islands, Western Australia at 28°S, anti-clockwise to Broughton Island, New South Wales at 32°S (Serventy *et al.* 1971). After breeding many migrate north-west to winter near the tropical convergences in the Arabian Sea and Indian Ocean (Bourne 1953). As Serventy *et al.* (1971) point out, the destination of birds from eastern colonies is unknown. They may head north or north-east rather than westward, in the same way that Flesh-footed Shearwaters *Puffinus carneipes* from Western Australia and Lord Howe Island migrate differently (Serventy *et al.* 1971).

The New Zealand race *P.m. maoriana* breeds on many islands from the far north at 34°S to Auckland Islands at 50°S, and is especially abundant at Chatham Islands, 44°S, the type locality (Oliver 1955). Like *P.m. dulciae* its breeding season extends from late August to mid-March, but south of 42°S breeding is a month later (Falla 1934; Richdale 1943). Although absent from colonies and adjacent seas for almost five months (Falla 1934; Richdale 1943; Oliver 1955; Kinsky *et al.* 1970; Falla *et al.* 1979) only Falla (1934) tentatively, and Jouanin & Mougin (1979) recorded it as migratory.

There are numerous records of *P. marina* from the eastern tropical Pacific (Loomis 1918; Beebe 1926; Murphy 1936; Murphy & Irving 1951; Leveque *et al.* 1966; Harris & de Vries 1968; Crossin 1974). Few specimens have been obtained there but one was identified as *P.m. maoriana* by Murphy & Irving, who implied that New Zealand was the likely provenance of all birds. Crossin considered Australasia to be the most probable place of origin but he seemed unaware of the distinctiveness of *dulciae* and *maoriana*. He reported several hundred sightings concentrating in a triangular zone west of Galapagos Islands (5°N, 112°W to 8°S, 112°W to 3°S, 100°W), particularly in August - September, and that the condition of specimens was consistent with that of petrels before pre-breeding migration.

The Kermadec (White-faced) Storm-Petrel *P.m. albiclunis* was named by Murphy & Irving (1951) from fifteen specimens collected at sea close to the Kermadec Islands between 18-20 November 1925. Since then a further fifteen birds have been attributed to this race (Table I), all within sight of the Kermadec Islands until Jenkins (1982) saw four near Australia. It has never been found breeding despite numerous searches (Oliver 1955; Sorensen 1964; Merton 1970; Crockett 1975; B.D. Bell pers. comm.; T.G. Lovegrove pers. comm.).

P.m. dulciae and *P.m. albiclunis* are distinguishable only by the whitish rump of the latter, *dulciae* and *maoriana* having pale grey rumps. Dimensions of *albiclunis* are slightly smaller than those of *dulciae* (Table II) but both have almost square tails and more white on the face and sides of the breast than *maoriana* (Murphy & Irving 1951). In contrast, *maoriana* is a fork-tailed race, with dark patches on the sides of the breast, and with shorter culmen, tarsus and mid-toe plus claw than in *dulciae* and *albiclunis*, but with longer tail dimensions (Table II).

NEW DATA ON TRANS-PACIFIC MIGRATION

On 10 February 1980, Brian D. Bell and I banded 265 adult White-faced Storm-Petrels on South East Island,

TABLE I

Localities and dates of collection or reported sightings of White-faced Storm-Petrels Pelagodroma marina *at Kermadec Islands, or of* P.m. albiclunis *elsewhere. b = beached corpse, c = collected at sea, s = sighting, f = flew aboard ship.*

Date	Locality	No.	References
Sept. or Oct. 1908	Raoul I.*	2 b	Iredale 1910, Oliver 1955
18-20 Nov. 1925	Raoul and Herald Is.*	15 c	Murphy & Irving 1951
22 Nov. 1964	Herald Is.*	2 s	Edgar *et al.* 1965
Sept. - Dec. 1974	Raoul I.*	6 s	Smuts-Kennedy 1975
25 Nov. 1974	Raoul I.*	1 b	Smuts-Kennedy 1975
31 Oct. 1979	Raoul I.*	1 s	Jenkins 1980
15 Oct. 1980	Curtis I.*	1 f	Jenkins 1981
10 Oct. 1981	35°43′S 155°50′E+	4 s	Jenkins 1982

* Kermadec Islands
\+ 450 km off the east coast of Australia

Chatham Islands (44°21′S, 176°11′W), the largest storm petrel colony in the New Zealand region. On 21 May 1980 one of these banded birds, dazzled by a searchlight, flew aboard MV *Sonne* (a West German research vessel) at 9°52′S, 88°42′W: about 1000 km south of the Galapagos Islands and a similar distance west of Peru. It was in wing moult (5 new, 1 growing and 4 old primaries) and is now preserved as a study skin in the National Museum of New Zealand.

On 8 May 1983 a fresh corpse of *P. marina* was picked up from Muriwai Beach, northern New Zealand (36° 45′S, 174°20′E) by C. Exley. I found it to have the characters of *P.m. dulciae*, an identification I was able to confirm by comparison with specimens in the National Museum of New Zealand, where it has been deposited. These measurements were obtained (*cf* Table II):-

Culmen	17.6 mm	Depth of fork of tail	5.0
Wing	149	Tarsus	41.4
Tail	69	Mid-toe & claw	35.5

It was an adult with extremely worn plumage, hence the short wing and tail measurements, and with blunt claws. Wing moult was in progress (2 new, 1 growing and 7 old primaries). This is the first record of this subspecies from New Zealand.

Recent observations at sea by J.A.F. Jenkins and T.G. Lovegrove (pers. comm.) have greatly clarified the winter status of *P. marina* in the south-west Pacific. Though few have been seen in May, June and early August, about fifteen sightings have been made in July, mostly in the area circumscribed by a line from Norfolk Island to the northern extremity of New Zealand to the Kermadec Islands, then north to and along 25°S westwards then south to the origin, with isolated reports from 26°S, 157°E and 24°S, 161°W (Macdonald & Lawford 1954; Bourne 1964; Pocklington 1970; Lovegrove 1978 & pers. comm.; Chapman 1981; J.A.F. Jenkins pers. comm.). Of particular interest is Jenkins' sighting of at least seven on 15 July 1975 at 26°41′S, 178°58′W. None has been identified as *P.m. albiclunis*. There have also been sightings of *P. marina* in

TABLE II

Comparison of dimensions (mm) of Australian P.m. dulciae, *New Zealand* P.m. maoriana *and Kermadec* P.m. albiclunis *subspecies of the White-faced Storm-Petrel.*

	*P.m. dulciae**			*P.m. albiclunis*+*			*P.m. maoriana#*		
	No.	Mean	Range	No.	Mean	Range	No.	Mean	Range
Culmen	46	16.9	15.2- 18.0	16	16.6	15.3- 17.7	42	15.8	14.6- 17.0
Wing	46	158.3	151.0-168.0	16	156.4	144.0-166.0	42	157.2	149.0-169.0
Tail	46	74.0	69.0- 83.0	16	71.2	66.0- 76.0	42	75.6	67.0- 85.7
Depth of fork of tail	32	5.0	2.0- 8.4	16	3.6	1.3- 5.9	36	10.5	4.8- 15.1
Tarsus	46	42.1	39.0- 45.0	16	41.2	37.5- 43.1	42	40.7	37.8- 43.0
Mid-toe plus claw	46	36.8	34.0- 42.0	16	37.0	35.2- 39.3	42	35.2	32.0- 40.9

* Data of Murphy & Irving (1951) and Serventy *et al.* (1971) combined
\+ Data of Murphy & Irving (1951) plus one in the National Museum of New Zealand
\# Data of Fleming (1939) and Murphy & Irving (1951) combined

September apparently moving south-west in the north Tasman Sea and between New Zealand and New Caledonia (J.A.F. Jenkins, T.G. Lovegrove pers. comm.).

DISCUSSION

Migration

The presence of large numbers of White-faced Storm-Petrels in the eastern tropical Pacific when New Zealand colonies and adjacent seas are deserted by this species, the identification of an eastern Pacific specimen as *P.m. maoriana* and the recovery of a New Zealand banded bird in that wintering area, provide strong evidence for trans-Pacific migration by this race. Crossin (1974) suggested that birds migrate to the Peru (Humboldt) Current and follow this north, then west past the Galapagos Islands. That the banded bird was recovered 1000 km south of Galapagos Islands three months before peak numbers build up to the west of the archipelago is consistent with this idea.

Return migration should be more direct as many birds are present in New Zealand waters within a month of the peak of numbers near Galapagos Islands. The earliest documentation of this species, the specimen called *Procellaria passerina* by Solander in an unpublished manuscript (Murphy & Irving 1951), collected at 29° 10′S, 159°20′W on 19 September 1769, was probably a migrant returning to New Zealand on such a direct course.

Much smaller numbers of *P. marina* have been seen wintering in the south-west Pacific, and this would be expected if only the eastern Australian populations wintered there. The *P.m. dulciae* beach-cast in northern New Zealand was at a similar stage of moult as the banded *P.m. maoriana* recovered off Peru, and was presumably at a similar stage of migration. Probably birds from eastern Australian colonies move north-east after breeding to winter near the southern tropical convergence, particularly north of New Zealand. Heath (1981) places this convergence near 26°S between Kermadec Islands and Fiji, and it was there that Jenkins saw the largest reported winter concentration of *P. marina* in the south-west Pacific. Presumably some of these pass close to the far north of New Zealand in late autumn and early winter (Lovegrove 1978; this paper).

Status of P.m. albiclunis

If one considers Oliver's original suggestion (1911), based on 10 months' observations on Raoul Island, that *P. marina* is only a visitor to Kermadec Islands, similarities can be found between *albiclunis* and *dulciae*, as already described. Though *albiclunis* is consistently slightly smaller, except in mid-toe plus claw, Jones (1937) and Richdale (1943) pointed out that immatures measure less than breeding adults. It is also characteristic of petrels that birds which have not begun to visit the breeding places have unworn claws, and hence tend to have longer mid-toe plus claw measurements than breeders. Thus the dimensions of *albiclunis* are what one could expect from pre-breeding *dulciae*.

The only plumage difference is in rump colour. Fledglings of White-faced Storm-Petrels tend to show paler rumps than adults, by having the feathers prominently barred grey and white, and with white bases. This has been observed in *hypoleuca* (Murphy & Irving 1951; Cramp & Simmons 1977), *dulciae* (Serventy *et al.* 1971) and *maoriana* (pers. obs.). *P. marina* with white rumps frequenting Kermadec Islands seas have occurred exclusively from September to early December, over seven months after fledging of *dulciae*. It is conceivable that fading and wear of grey and white barred feathers over that period could produce the white-rumped state. Murphy & Irving remarked that a few of their specimens showed 'a slight grayish wash or fine barring'.

I examined the two specimens of *albiclunis* in the National Museum of New Zealand: one of the paratypes, dated 18 November 1925, collected 'off Herald Is.', 'sexual organs: small' (the label presumably written by R. H. Beck); and C. Smuts-Kennedy's specimen of 25 November 1974. In both, the contour feathers show considerable wear. The rump feathers and upper tail coverts are particularly worn, or eaten away, or even missing. In the paratype only two of the longer upper tail coverts remain but the distal halves of their vanes are virtually non-existent; what remains is distinctly grey. Only the white bases of these main coverts remain in the more recent specimen. The consequence of the degree of wear evident in these two specimens is obvious. These specimens show nothing to dispel the impression that they are young Australian birds with whitish rumps due to heavily worn plumage. Murphy & Irving themselves observed that 'The odds and ends of captures at sea, representing many uncertainties of age, and of stage and wear of plumage, are of little present critical value.'

If there is no Kermadec Islands race, some comment is required on the uniformity of plumage reported and on their seasonal occurrence. Australian birds return to breed in late August - September and the young depart mainly in February - March (Jones 1937; Murphy & Irving 1951). As little seems to be known about age at first breeding and movements of pre-breeders in this species, some assumptions can be made. In Leach's Storm-Petrel *Oceanodroma leucorhoa* nearly all birds of 1 and 2 years remain at sea during the breeding season (Huntington & Burtt 1972), but some begin

visiting colonies at 3 years and some breed at 4 years. Thus if *P. marina* at Kermadec Islands are Australian, most, perhaps all, will be yearlings. However, the important sighting (Table I) of four white-rumped birds off the east coast of Australia in October (Jenkins 1982) suggests that some yearlings may return earlier to seas adjacent to the colonies. The occurrence of these storm-petrels close to the Kermadec Islands only during a 3-month period may be related to seasonal food supply, just as some *P. marina* frequent New Zealand coastal waters from September to February.

CONCLUSION

It is premature to synonymise *albiclunis* with *dulciae* until more research has been done. Further exploration of the little-studied southern Kermadec Islands (Curtis, Cheeseman and Haszard) must be done during the probable breeding season of a hypothetical colony of *albiclunis* (September to November preferably), and nocturnal observations are obligatory. Alternatively, the problem may be solved in a positive way by research in Australia. Studies should be made on specimens in museums, at breeding colonies, and at sea to provide information on occurrences of white-rumped birds. Apparently there are no white-rumped birds at the Australian Museum and the National Museum of Victoria. In view of the likely pelagic habit of yearlings this is not surprising.

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