

New information on the distribution of three species of Southern Ocean gadfly petrels (*Pterodroma* spp.)

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ABSTRACT

We present new distributional data from the eastern South Pacific Ocean for the White-headed Petrel (*Pterodroma lessonii*), Kerguelen Petrel (*P. brevirostris*), and birds showing characters of the endangered Magenta Petrel (*P. magentae*). Extrapolation of density for White-headed Petrels suggests a pelagic population of 18,770 birds for the 10° x 5° block of subtropical surface waters between 27-37°S and 80-85°W (August 1995). Two Kerguelen Petrels were noted off Chile at around 40°30'S 74°50'W (August 1995). Three sightings of apparent Magenta Petrels between 28°44'S 72°40'W (March 1992) and 36°24'S 78°02'W (August 1995) are reported to alert observers to the potential occurrence of this species off South America.

KEYWORDS: Distribution, South Pacific, *Pterodroma lessonii*, *P. brevirostris*, *P. magentae*

INTRODUCTION

During a cruise from Seattle, U.S.A., to Punta Arenas, Chile, in July- August 1995 we gathered new distributional data for three species of gadfly petrels (genus *Pterodroma*): the White-headed Petrel (*P. lessonii*), the Kerguelen Petrel (*P. brevirostris*), and birds showing characters of the enigmatic Magenta Petrel (*P. magentae*). We herein provide details of our observations to supplement the knowledge of the pelagic distributions of these poorly-known seabirds.

The White-headed Petrel nests biennially during September-May south of New Zealand on Auckland, Antipodes, and Macquarie islands, and in the southern Indian Ocean on Kerguelen and Crozet islands (Marchant & Higgins 1990, Zotier 1990). Its pelagic distribution is circumpolar, generally over waters south of 40°S, but reaching a northern limit around 30°S during the height of austral winter, in August-September (Fleming 1950, Watson 1975, Marchant & Higgins 1990). In the eastern Pacific, birds have been reported north to 33°S off the Chilean coast (Szijj 1967).

Kerguelen Petrels nest during August-February on islands in the southern Atlantic and Indian oceans and have a circumpolar pelagic distribution (Harper *et al.* 1972, Watson 1975, Marchant & Higgins 1990). Although birds range north to 33°S off South Africa and Australia, the only report off western South America north of Cape Horn appears to be that from Mehuin, Chile (39°30'S) (Araya & Millie 1986). Those authors provided no supporting details, however; if at Menhuin, the record may refer to a beached carcass.

The Magenta Petrel, described from a bird collected at 39°38'S 125°58'W on 22 July 1867 (Giglioli & Salvadori 1869), was rediscovered in 1978 on the Chatham Islands (44°S 176°W), where it has been found nesting during October-May and where the total population is estimated at 50-100 individuals (Crockett 1994, Imber *et al.* 1994a). Breeding birds appear to forage over subantarctic waters to the east and south of the Chatham Islands (Imber *et al.* 1994b), while the pelagic distribution of non-breeding birds is thought to be eastward in subtropical waters to 88°W, north to 26°S, and south to the Subtropical Convergence, with sightings in August 1867 at 32°23'S 92°39'W and 26°07'S 88°50'W (Giglioli & Salvadori 1869, Marchant & Higgins 1990).

METHODS

With two or three persons observing simultaneously, we conducted continuous strip-transects from dawn to dusk while the ship was underway. Transects were partitioned into half-hour intervals. All birds seen within a 90° quadrant on one forequarter were counted. The width of the transect zone was 300 m, estimated after the method of Heinemann (1981). By noting ship speed (kmh⁻¹) we calculated surface area of ocean censused.

For each sighting we noted behaviour: resting on water, feeding or circling over a potential food source, or flight in a steady direction. For the last behaviour we noted flight direction to the nearest 10°. We adjusted observed numbers of White-headed Petrels (hereafter termed the "adjusted count") to correct for the effect of movement of birds flying through the transect zone relative to ship's speed and direction (Spear *et al.* 1992b). Data also recorded for each transect interval were Greenwich Time, ship position and course, water depth (m), sea-surface temperature (°C) and salinity (ppt), wind and wave direction (nearest 10°), wind speed (kmh⁻¹), wave height (nearest 0.3 m), and cloud cover (oktas).

OBSERVATIONS AND DISCUSSION

White-headed Petrel

During 3-6 August 1995 we counted 44 White-headed Petrels, including 20 outside the transect zone. The first was sighted on 3 August at 24°26'S 86°22'W (1570 km W of mainland Chile) during the last transect of the day. The last White-headed Petrel, on 6 August, was at 36°38'S 77°51'W (370 km from Chile) despite 6 h more of continuous observations that day, to 37°31'S 77°13'W. None was seen during 10 h of census on 7 August as the ship transited colder (10.4-10.9°C), more inshore (50-135 km from mainland Chile) waters, from just offshore of the continental shelf slope to the continental shelf (39°58'S 75°17'W to 41°36'S 74°00'W).

We recorded 24 White-headed Petrels within the transect zone (adjusted count 12.2 birds; Table 1). Highest densities were seen on 4 August, when the ship transited between 26°52'S 85°06'W and 28°47'S 83°40'W. Densities were slightly lower on 5 August (31°14'S 81°45'W to 33°08'S 80°25'W) and much lower on 6 August (35°39'S 78°36'W to 37°31'S 77°13'W). Extrapolation of overall density for the 410,718 km² area (10° x 5° block between 27-37°S and 80-85°W) where most birds were seen, and which we transited diagonally (Figure 1), suggests a pelagic population there of

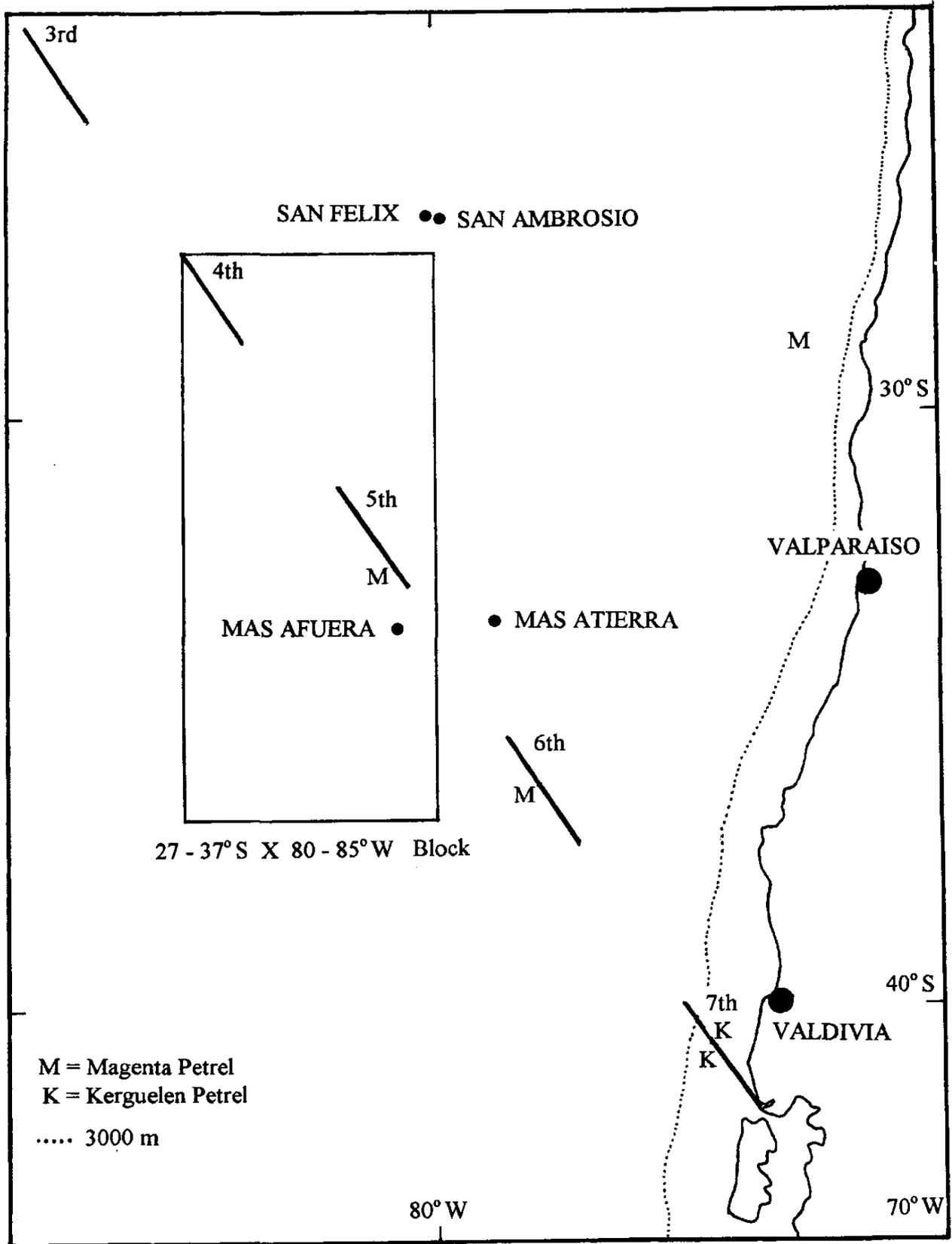


FIGURE 1 - Cruise track off Chile during 3-7 August 1995, showing locations of Kerguelen Petrels (K); apparent Magenta Petrels (M); and area of population estimate for White-headed Petrels

TABLE 1 - Numbers and density (birds km⁻²) of White-headed Petrels observed on transects off the coast of Chile, 3-6 August 1995, with area surveyed (km²), and mean sea-surface temperature (SST ± S. D., °C) and salinity (SAL ± S. D., ppt) for sites of observations. 3 August sighting not included in overall adjusted number or density. Values below overall SST and SAL are ranges for all sightings.

Date	Number seen	Adjusted count	Area surveyed	Density	Sea-surface temperature	Sea-surface salinity
3 August	1	0.36	-	-	18.8	34.68
4 August	12	6.59	87.7	0.0751	18.2±0.21	35.13±0.057
5 August	9	4.41	87.3	0.0494	15.6±0.24	34.79±0.045
6 August	2	0.87	82.3	0.0106	12.9±0.07	34.41±0.042
Total	24	12.23	257.3	0.0457	16.9±1.74 (12.8 - 18.8)	34.95±0.234 (34.38 - 35.19)

18,770 White-headed Petrels (Table 1). This assumes our transect was representative; habitat in the 10° x 5° block we used would be expected to be fairly uniform, the whole area being subtropical surface waters (Wyrski 1967; see below).

Sea-surface temperatures (mean=16.9°C) and salinities (mean=34.38 ppt; Table 1) for the 24 petrel sightings are typical of subtropical surface waters lying to the north of the Subtropical Convergence (Wyrski 1967). Winds were 15-25 knots, changing from SE on 3-4 August to W and NW on 5-6 August, i.e. the interface between trade winds and mid latitude westerlies. Other birds characteristic of the area where we found the highest density of White-headed Petrels were De Filippi's Petrel (*P. defilippiana*; for spelling of the English name see Howell *et al.*, 1995), Murphy's Petrel (*P. ultima*; north of 31°S; details to be published elsewhere by Spear *et al.*) and, south of 31°S, Black-browed Albatross (*Diomedea melanophrys*), White-chinned Petrels (*Procellaria aequinoctialis*) and Cape Pigeons (*Daption capense*).

Ten of 34 birds in which moult of primaries could be evaluated were moulting. None was seen in which moult had progressed beyond primary 7 (numbered outwards): 3 were moulting inner primaries (numbers 1-3), and 7 moulting middle primaries (numbers 4-7). Whereas some of the advanced moulting birds may have bred in the 1995/96 season (wing moult of breeders is completed by September or October; Warham 1967, Marchant & Higgins 1990), most birds we saw were probably immatures and non-breeders. A putative moult schedule for such birds was put forward by Warham (1967).

The majority of birds were transiting (see Methods), i.e. flying in a steady direction. On 3-4 August most were heading W to N (260° to 30°) while on 5-6 August most were heading SW to NW (190° to 350°). We saw none feeding and only three sitting on the water; none associated strongly with other species. Birds occurred singly or, occasionally, two or three flew by in quick succession and may have been associated loosely with one another. A few birds seemed attracted slightly to the ship (as noted by Nakamura 1982) but none stayed with us for more than 1-2 minutes.

In April 1983, Clark (1986) transited the area where we found large numbers of White-headed Petrels; he saw none there but found the species common west of 100°W and south of 50°S, suggesting birds may reach the area of our observations only in mid winter. In December 1947, Holgerson (1957) found White-headed Petrels common at 52-53°S from 75°W to 90°W. Given the mid summer date, distance from colonies, and this species' biennial breeding cycle, these may have been non-breeding adults as well as immatures. Possibly they had moved south into this area from the northern winter range where we found large numbers in August.

Kerguelen Petrel

On 7 August 1995 we saw single Kerguelen Petrels at 40°33'S 74°49'W and 40°39'S 74°50'W, about 80 km SW of Valdivia, Chile. Sea surface temperature was 10.7°C and salinity 34.55 ppt. These birds were along the continental shelf slope over waters 2500 m deep. Both were flying NW and both appeared to be in fresh plumage, with a strong, steely-grey reflective cast to their upperparts and no signs of moult.

Adult dispersal is often not far from colonies, which are re-occupied in August-September (Mougin 1969, Watson 1975, Marchant & Higgins 1990). Thus, given their distance from breeding grounds, the birds we saw probably were immatures. Our observations, together with the Menhuin record (see Introduction), indicate that small numbers of Kerguelen Petrels range into waters off Chile's southern Pacific coast. Neither Jehl (1973; in May-June 1970) nor Brown *et al.* (1975; in March-April 1970) reported Kerguelen Petrels in these waters although they are widespread south of 57°S during those periods (Harper *et al.* 1972). Like White-headed Petrels, the northernmost extension of the Kerguelen Petrel's pelagic range off western South America may be during mid winter.

As moult data for this species appear to be scant (Watson 1975, Marchant & Higgins 1990) we note here the following supplemental information. Of 390 Kerguelen Petrels seen by Howell in the Scotia Sea during 6-11 December 1994, 30-40% showed active moult of primaries (mostly of inner to middle primaries); given the date, these presumably were non-breeding immatures.

Magenta Petrel

Single individuals of *Pterodroma* sp. showing characters of Magenta Petrel were noted on 5 August by Webb at 32°39'S 80°44'W (110 km N of Isla Mas Afuera; sea surface 15.5°C, salinity 34.77 ppt) and by Howell and Webb at 36°24'S 78°02'W (295 km S of Mas Afuera; sea surface 12.8°C, salinity 34.31 ppt). In addition to these, Spear noted a similar *Pterodroma* on 30 March 1992 at 28°44'S 72°40'W (150 km W of mainland Chile; sea surface 20.0°C, salinity 34.60 ppt). All three birds were at ranges of 300-500 m from the ship, heading SW, NW, and WNW, respectively. Our August sightings are 3800-3900 km E of where the type specimen of *P. magentae* was collected, and 940-1500 km E and SE of the sightings made in August 1867 (Giglioli & Salvadori 1869); all of these July-August records were over subtropical surface waters.

The description taken in the field by Howell on 6 August fits the characters seen on each of the three birds: "On first glance, size and white underbody contrasting with dark underwings suggested White-headed Petrel. However, the bird was dark grey-brown above from head to tail. The apparently all-dark head and upper chest and all-dark underwings (no white flashes) contrasted with the white lower chest to undertail coverts; the back looked slightly greyer than the upperwings which appeared to show a subdued darker M pattern. Recalled Phoenix Petrel (*P. alba*) but greyer above and apparently larger (no direct size comparison, but White-headed Petrels seen before and afterwards)." The bird's flight was of relatively low, long-wavelength, wheeling arcs, similar to the flight of White-headed or the Juan Fernandez Petrel (*P. externa*) in the same conditions and quite distinct from the more bounding flight of small and medium-sized *Pterodroma* spp. (e.g. *P. ultima*, *P. mollis*, *P. defilippiana*).

None of the birds was close enough to discern if its throat was pale. No wing moult was apparent on either of the birds seen in August. Spear further noted on the March bird that its dorsal pattern of greyer back and subtle dark M pattern recalled Murphy's Petrel. Although the subtle dorsal M pattern we observed has not been described for Magenta Petrel, this may reflect in-hand versus at-sea experience or time of year. That is, in the hand and in fresh plumage, species such as Murphy's Petrel do not appear to have a dorsal M pattern (Spear, pers. obs.) but, when seen at sea a dorsal M pattern is noticeable.

Species seen in the same area on 5 August 1995 were Chatham Island (*D. salvini eremita*) and Black-browed Albatrosses, White-chinned, White-headed, De Filippi's, and Blue (*Halobaena caerulea*) Petrels, Cape Pigeons and White-bellied Storm-Petrel (*Fregatta grallaria*). Species in the area on 6 August 1995 were Royal (*D. epomorphora*), Salvin's (*D. salvini*), and Black-browed Albatrosses, White-chinned, White-headed, and Blue Petrels, Cape Pigeons and Wilson's Storm-Petrel (*Oceanites oceanicus*). The White-headed Petrel was considered "particularly abundant" in the vicinity of where the type specimen of *P. magentae* was collected (Yanez 1948), suggesting these two species occur in a similar habitat and range in mid winter.

Associated species on 30 March 1992 were Salvin's Albatross, De Filippi's, Stejneger's (*Pterodroma longirostris*) and Juan Fernandez (*P. externa*) Petrels, Buller's Shearwater (*Puffinus bulleri*), White-bellied Storm-Petrel, Red-billed Tropicbird (*Phaethon aethereus*), Long-tailed Skua (*Stercorarius longicaudus*), and Swallow-tailed Gull (*Creagrus furcatus*).

The observers have extensive at-sea experience with all *Pterodroma* petrels that occur regularly in the eastern and southern Pacific (except the distinctive *P. axillaris*). The general plumage characters fit only Phoenix, Magenta, and Tahiti (*P. rostrata*) petrels, and possibly some light morph Herald (*P. arminjoniana*), Kermadec (*P. neglecta*), or Soft-plumaged (*P. mollis*) petrels.

Although the birds we saw resembled Phoenix Petrel in pattern (e.g. Fig. 14 [lower] of Spear *et al.* 1992a), their grey-brown dorsal plumage was unlike the dark chocolate-brown upperparts characteristic of all Phoenix Petrels we have seen. The Phoenix Petrel also has a more buoyant, less "heavy" flight and is a species of

warmer waters, as indicated by our records of 192 Phoenix Petrels (1984-1991) in the eastern and central Pacific (ECP), where none was seen in waters with sea-surface temperature $<25.6^{\circ}\text{C}$ (Ainley & Spear, unpubl. data). Furthermore, the known pelagic range of Phoenix Petrel lies considerably farther west and north (Harrison 1983, Spear *et al.* 1992a). The birds' flight manner, structure, and greyer-looking upperparts were also unlike the distinctive Tahiti Petrel, a tropical species very familiar to all observers (Spear *et al.* 1992a).

While an odd morph of Herald or Kermadec Petrel perhaps cannot be ruled out, the characters observed fit closely to what is described for Magenta Petrel (Harrison 1983, 1987, Marchant & Higgins 1990). For example, the distinct dark/light demarcation on the underparts, lack of white underwing flashes (which should have been visible under the favorable light conditions at 350 m), and the all-white undertail coverts on all three birds were unlike any light morph Herald or Kermadec Petrel we have seen during extensive surveys in the ECP. The known pelagic distribution of Herald Petrel also lies farther north and west (Harrison 1983, Spear *et al.* 1992a), although sea-surface temperature range for Herald Petrel in the ECP ($>20.3^{\circ}\text{C}$, $N=112$ birds; Ainley & Spear, unpubl. data) approaches that of the suspected Magenta Petrel in March.

Some suggestion has been made that Magenta Petrel can be confused with Soft-plumaged Petrel (Imber 1980, Eades & Rogers 1982). In our experience at sea, Soft-plumaged is distinctly different from the suspected Magenta Petrels we saw. It is a smaller species (300 g versus 450 g; Imber 1980) with paler and greyer upperparts, differently-marked underwings, and, in similar wind conditions, a quite different, more bounding flight. It and Atlantic Petrel (*P. incerta*), ruled out by its dark undertail coverts, are unknown in the eastern Pacific Ocean (Harrison 1987).

The associated southern seabird communities, especially in August (see above) also lead us to suspect the birds were Magenta Petrels (versus the more tropical Phoenix, Tahiti, Herald, & Kermadec petrels), and we note our observations here to alert observers to the possible occurrence of this species off Chile.

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