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IDENTIFICATION AT SEA OF COOK'S, DE FILIPPI'S, AND PYCROFT'S PETRELS

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Petrels of the genus *Pterodroma* are notorious for being difficult to identify at sea. Among the most problematic species are Cook's (*P. cooki*), de Filippi's (*P. defilippiana*) and Pycroft's (*P. pycrofti*) petrels, the three most similar of those small *Pterodroma* united in the subgenus *Cookilaria*. P. defilippiana has also been called Defilippe's Petrel (Roberson and Bailey 1991) or Masatierra Petrel (Harrison 1983, 1987). "Defilippe's" is an anglicization of *defilippiana*, but as Giglioli and Salvadori (1869) named the bird for Professor F. de Filippi, the correct English spelling should be "de Filippi's Petrel."

Cook's Petrel breeds from October to April on islands off New Zealand and migrates to the northern and eastern Pacific, where nonbreeding birds occur mostly from April to November in the Peru Current, the California Current, and the North Pacific Convergence (Roberson and Bailey 1991, Spear et al. 1992). De Filippi's Petrel breeds from June to January on islands off central Chile and ranges at sea in the nearby Peru Current, south of the equator (Harrison 1987, Roberson and Bailey 1991, Spear et al. 1992). Pycroft's Petrel breeds from November to March on islands off New Zealand (Dunnet 1985), and until recently its nonbreeding distribution was unknown. It is now apparent that Pycroft's Petrel disperses into the tropical Pacific in waters of the Equatorial Countercurrent and South Equatorial Current between longitudes 99° 29'W (July 1995; Howell) and 167° 45'W at latitudes from 5° S to 18° N (Spear et al. 1992). Records to date are mainly from April to June but also from October to December, so some Pycroft's Petrels probably occur in this area throughout the year. While the occurrence in North American waters of de Filippi's and Pycroft's petrels seems unlikely, this cannot be assumed, and, unless identification characters are fully understood, the pelagic distributions of these forms will remain incompletely known. All three of these *Cookilaria* petrels share a gray

crown (concolorous with the back) and narrow black underwing margins. The identification criteria in Harrison (1983, 1987) were refined by Roberson and Bailey (1991), although the latter authors' experience with de Filippi's and Pycroft's petrels was limited to museum specimens. Spear et al. (1992) added first-hand identification data, confirmed by collecting specimens, and described these species' molt schedules: Cook's and Pycroft's molt their flight feathers from March to August, while de Filippi's molts from November to March. To the best of our knowledge these periods encompass the molts of both immatures and adults. Thus, Cook's and de Filippi's petrels molting their primaries can be identified readily to species, even in March, when the molting periods overlap, as a few de Filippi's Petrels are then replacing their outermost primaries while a few Cook's have dropped their innermost primaries. Molting birds characteristically exhibit conspicuous white patches, formed by exposed inner webs of the primaries, on the dorsal surfaces of the wings (Spear et al. 1992, figure 10b). During recent cruises in the eastern Pacific Ocean, Howell and Webb assessed the marks proposed by these authors for Cook's and de Filippi's petrels. Here we summarize our results and briefly discuss Pycroft's Petrel.

METHODS

We studied Cook's and de Filippi's petrels during cruises between California and Chile in March and April 1994 (northbound; Webb; 50 Cook's, 220 de Filippi's), April and May 1995 (northbound; Howell, Webb; 430 Cook's, 160 de Filippi's), and July and August 1995 (southbound; Howell, Webb; 135 Cook's, 40 de Filippi's, 1 Pycroft's). We did not observe Cook's and de Filippi's petrels together but saw both species within a few days of one another. Most birds were observed with 8-power binoculars at ranges of less than 300 m from the ship, many within 100 m, and ample time usually was available to double-check identification criteria. At ranges greater than 300 m, specific identification often was not possible without the aid of mounted 25 × 150 binoculars. Spear et al. (1992) summarized our cumulative previous experience with these species.

RESULTS AND DISCUSSION

The characters we looked at when confronted with a Cook's/de Filippi's Petrel were, as the bird approached, structure and flight manner, underwing pattern, dorsal tail pattern, face and neck pattern, and bill size.

Structure and Flight Manner

We did not find the differences in wing length [1.7% greater in Cook's, from measurements of Roberson and Bailey (1991)] or tail length (7.8% greater in de Filippi's) useful in distinguishing these two species, *contra* Roberson and Bailey (1991). At sea, variation due to molt, flight behavior, and wind speed often masks such small differences. Also, differences in proportion may evoke perceptions of the birds' shapes different from those implied by measurements alone.

Cook's impressed us as having narrower wings and a narrower, more rounded tail (Figure 1A) so that, relative to the narrow wings, the tail did not look short. De Filippi's looked broader-winged with a broader, wedge-shaped tail (Figure 1B–D) and so did not appear long-tailed. In heavy wing molt (April 1994, May 1995), Cook's Petrels often appeared narrower winged than usual such that the tail appeared long. Thus, on the first 1995 cruise we had the impression that Cook's was longer tailed than de Filippi's [and compare figures 3 and 7 of Roberson and Bailey (1991)].

In moderate to strong winds, the wings of both species appeared narrower and more pointed than in light winds or calm conditions, when they appeared broader and blunter-tipped. Birds taking off from or landing on the water, even in windy conditions, appeared broader-winged than during active flight. That wing shape changes with behavior and wind speed is often overlooked when slight structural differences are discussed in identification papers.

When Howell and Webb saw their first de Filippi's Petrels (in December 1992 off Valparaiso, Chile) they were struck by the birds' thickset shape and leisurely, buoyant flight, although they recognized the latter reflected a rather low wind speed. However, further experience revealed that flight manner is of little use for identification, the differences in flight between strong and slack wind conditions being greater than between species. In general, both species fly quickly in wheeling arcs in moderate to strong winds; more buoyantly, with a more leisurely, weaving progression, in light winds, and with bursts of fairly quick wingbeats and long, low, fairly level glides in near-calm conditions. Furthermore, molting Cook's (April) flew quickly, with rapid wingbeats and bounding glides, suggesting a Sooty Shearwater, but in similar wind conditions and in fresh plumage or with primary molt all but completed (July), they flew notably more buoyantly, less hurriedly.

While we agree with Roberson and Bailey (1991) that de Filippi's does appear relatively thickset, or "chunky" for a *Cookilaria* (*contra* Spear et al.

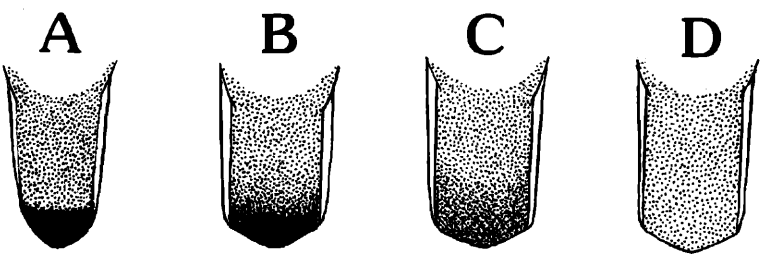

Figure 1. Shape and dorsal pattern of Cook's and de Filippi's Petrel tails. A, Cook's, narrower, more rounded, with black tip. B–D, de Filippi's, broader, more wedge-shaped. B, rare variant (1/100 birds) with blackish tip. C, uncommon variant (5/100 birds) with dusky tip. D, typical pattern of all-gray tail.

Sketch by Steve N. G. Howell

1992), evaluating this at sea can be difficult without considerable experience. Assessing flight manner is highly subjective and generally unreliable for specific identification.

Underwing Pattern

The width and extent of the black underwing margin was of no use for separating Cook's and de Filippi's petrels at sea, as surmised by Roberson and Bailey (1991). Because the human eye emphasizes contrast, at distances greater than 200 m the underwing margins often looked thicker than at close range (Figure 2), especially in bright, sunny (when the underwings were shadowed) and dull, overcast conditions. Then the black underwing margins of both species *appeared* wider than on Stejneger's Petrel (*P. longirostris*), even suggesting a Black-winged Petrel (*P. nigripennis*), although not as bold as the latter species. Therefore we urge caution in distinguishing Black-winged and Cook's petrels by apparent underwing pattern alone. At distances of less than 200 m it was easier to see the true underwing patterns. The black underwing margins of Cook's Petrels in fresh plumage (July) appeared bolder than the narrow and less distinct margins of birds in wing molt (April).

Dorsal Tail Pattern

Tail pattern has been proposed as a character for separating Cook's and de Filippi's petrels: Cook's has black-tipped central rectrices; de Filippi's has all-gray central rectrices (Roberson and Bailey 1991, Spear et al. 1992). We found this character not 100% reliable. While all Cook's Petrels showed a black tail tip (visible within 100 to 200 m, depending on light conditions;

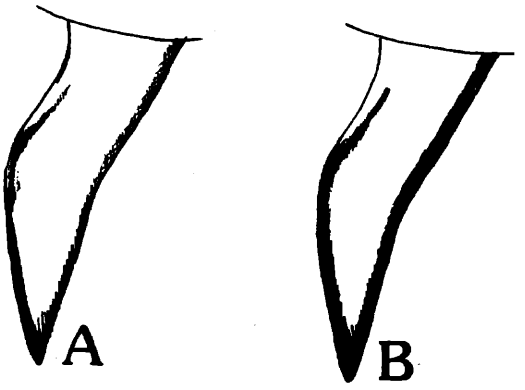

Figure 2. Underwings of Cook's and de Filippi's petrels. A, narrow black margins visible at close range (<150–200 m). B, illusion of thicker black margins sometimes apparent at moderate range (200–300 m).

Sketch by Steve N. G. Howell

Figure 1A), five de Filippi's Petrels in April and July 1995 (of 100 seen very well) showed a slightly contrasting, dusky gray tail tip (Figure 1C), and one (July 1995) showed a quite distinct blackish tail tip (Figure 1B). All of these atypical birds were studied at close range, often in direct comparison with other de Filippi's Petrels, and their overall structure, tail shape, diagnostic face and neck pattern (see below), and thick bill were seen clearly, convincing us the birds were not Cook's Petrels. However, from its black-tipped tail, we initially identified one July bird as a Cook's Petrel. The occasional darker tail tip on de Filippi's Petrel may be caused by wear.

The more extensive white in the outer rectrices of Cook's Petrel (Roberson and Bailey 1991) is of virtually no use in identification at sea under any but the most favorable conditions. In our experience, Cook's often held their tails closed so that the white was not very obvious, whereas on the broader tail of de Filippi's, white sides were usually quite apparent (e.g., figure 7 of Roberson and Bailey 1991). On a bird spreading its tail, when flushing from or alighting on the water, Cook's does show more extensive white in the tail than de Filippi's, although the moment is usually so brief that, unless captured by a photograph, there would be no time to confirm one's first impression.

Thus, while an all-gray tail appears to be diagnostic of de Filippi's Petrel, this species can, at least rarely, show a dusky or dark tail tip suggesting Cook's Petrel. As noted by Roberson and Bailey (1991), birds with very extensive white in their outer rectrices should be Cook's, but the amount of white is often difficult to ascertain at sea, and de Filippi's shows distinct white tail sides as often as Cook's.

Face and Neck Pattern, Bill Size

In a bird seen well, we found face and neck pattern, in combination with bill size, to be the best characters for separating Cook's and de Filippi's petrels at sea. At ranges greater than 150–200 m, however, it was difficult to distinguish these features without the aid of mounted 25-power binoculars. Face and neck pattern were best evaluated with a bird viewed in profile and/or from below but were also of use in dorsal views. Cook's Petrels have a gray cap whose contrast with the white lower face and neck sides varies, being most distinct in worn and/or backlit birds [e.g., figure 2 of Roberson and Bailey (1991)] and least distinct in birds in fresh plumage and/or direct sun. The eye always looked small and "beady" in the gray cap (with no apparent surrounding black eye patch), and the small slender bill was not striking (Figure 3A).

In contrast, de Filippi's Petrels have a distinct gray collar on the sides of the neck [suggesting a Black-winged Petrel; e.g., figure 8 of Roberson and Bailey (1991)]. The eye of de Filippi's appears large and set in a mascara-like black smudge, and the bill is strikingly thick. Thus, de Filippi's looks collared, with the eye patch and thick bill appearing as two equally large and bold black marks on the head (Figure 3B). Roberson and Bailey (1991) described the face/neck pattern difference in terms of de Filippi's having a white "cheek" curving up behind the auriculars in a short "half-collar"; this description is not inaccurate but may reflect specimen versus field experi-

ence. At sea, the gray neck collar stood out, not the white notch in the auriculars.

We disagree with Roberson and Bailey (1991) that "separation of the gray cap from the white lower face is not well-defined" in Cook's Petrel. At sea Cook's often looked distinctly capped unless the birds were in fresh plumage and the sun was behind the observers. Roberson and Bailey (1991) dismissed the larger eye patch of de Filippi's, first suggested by Harrison (1987), as a function of plumage wear, worn birds reportedly having smaller eye patches. Even if so, the two species' different molt schedules (Spear et al. 1992; see above) could make eye-patch size a useful feature. However, we saw no Cook's Petrels (worn or fresh) with large black eye patches approaching the pattern of de Filippi's. Also, de Filippi's Petrels in April, and more so in July, were in worn plumage and so should have had small black eye patches; this was not apparent in the field.

Pycroft's Petrel

Spear et al. (1992) discussed features for separating Pycroft's Petrel from Stejneger's and Cook's petrels. They noted that Pycroft's differs subtly from Cook's in size, flight profile, and flight behavior, criteria all somewhat difficult to evaluate at sea. In July 1995, Howell saw one Pycroft's Petrel and

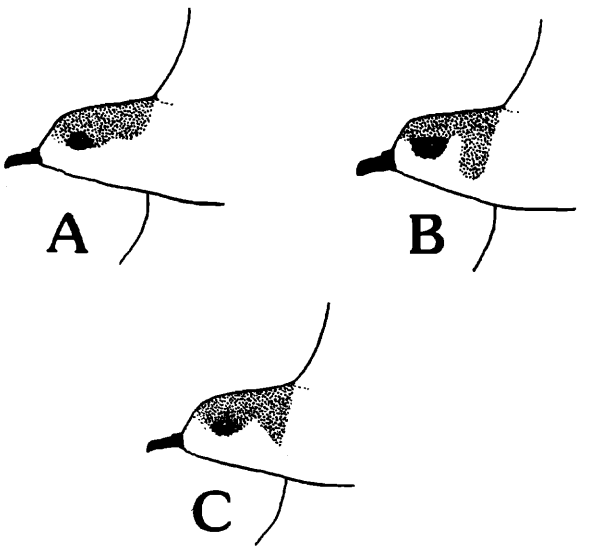

Figure 3. Face and neck patterns, as viewed in profile from below, of A, Cook's Petrel; B, de Filippi's Petrel; C, Pycroft's Petrel. Note the flat gray cap, small "beady" black eye of Cook's, the gray collar mark and bold black bill and eye patch of de Filippi's, and the Stejneger's-like cap of Pycroft's.

Sketch by Steve N. G. Howell

noted its distinctive face/neck pattern (Figure 3C) which, when the bird was backlit, initially led him to consider Stejneger's Petrel (a problem discussed by Spear et al. 1992).

The cap's curving down on to the neck sides is a good character for separating Stejneger's from Cook's Petrel (Roberson and Bailey 1991, Spear et al. 1992). While the similar face/neck patterns of Stejneger's and Pycroft's petrels were illustrated and discussed by Spear et al. (1992, figure 9b), those authors inadvertently failed to mention this character in direct reference to Pycroft's versus Cook's Petrel.

Spear's experience with 100+ Pycroft's Petrels and Howell's experience with four Pycroft's (including a total of five birds collected; Spear et al. 1992) suggest that the differences in face/neck pattern shown by Figure 3 may be the most useful feature for separating this species at sea from Cook's Petrel. Presumably referring to the same character, Roberson and Bailey (1992) noted that 60% of Pycroft's Petrel specimens they examined showed a hint of the white face extending up into the auriculars, compared with only 20% of Cook's Petrels. This difference from our conclusions may reflect specimen "make" and museum versus field experience, and we urge observers to evaluate the face/neck pattern of known Pycroft's Petrels at sea.

SUMMARY

We field-tested identification criteria proposed for separating Cook's and de Filippi's petrels. Variation due to molt, behavior, and wind speed frequently mask the slight differences in shape and flight manner between the two species. Nonetheless, de Filippi's often appears broader-winged and more thickset than Cook's, with a broader and more wedge-shaped (but *not* obviously longer) tail.

Black-tipped central rectrices appear to be universal in Cook's Petrel; uniformly gray ones are usual in de Filippi's. But a few de Filippi's Petrels show a dark tail tip. At ranges of less than 150–200 m, we found face and neck pattern, in combination with bill size, to be the most useful characters for separating the two species at sea: Cook's Petrels show a "flat" gray cap, a "beady" black eye, and a small, slender bill, de Filippi's Petrels show a gray collar (like that of Black-winged Petrel), a bold black eye patch, and a thick black bill (Figure 3).

Pycroft's Petrel typically shows a cap shaped like that of Stejneger's Petrel (and thus different from Cook's Petrel; Figure 3), and we recommend critical observations at sea to evaluate the reliability of this feature for separating Pycroft's from Cook's Petrel.

Despite experience at sea with thousands of *Cookilaria* petrels, including all species found in the eastern Pacific Ocean (Spear et al. 1992), we frequently let birds go as unidentified to species at ranges greater than 200–300 m, and we urge caution with this problematic group of birds.

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