Identification of prions (Procellariidae: *Pachyptila*) in South Australian waters

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Abstract

Digital photographic evidence is provided for the identification at sea of all six species of prion recognised in the literature. Of particular interest is the first identification at sea of Fulmar Prion in Australian waters. Some examples of intergrades between recognised species are also provided to illustrate the limitations of using bill size and shape to identify prions at sea or from digital photographs.

INTRODUCTION

Identification of prions at sea is difficult and their taxonomy is unsettled. However, digital photography has now made it possible to identify at sea examples of the six species recognised in the *Handbook of Australian, New Zealand & Antarctic Birds* (HANZAB) (Marchant and Higgins, 1990) and by many authorities, in particular the checklists produced by the International Ornithological Committee (IOC), Gill and Donsker (2013) and BirdLife International (2012). This does not mean that all prions can be so identified to these forms or that the taxonomy adopted therein is correct. Cox (1980) illustrated, and HANZAB (1990) agreed, there are many intergrades and much overlap in plumage, bill shape and size, so allocating *all* birds to species on the basis of photographs is not possible. Subject to that caveat, this paper provides photographs from waters off South Australia (38° S 140° E) to show that the use of digital photography at sea has now made it possible to identify examples of all six species currently listed in the literature.

PRION TAXONOMY AND IDENTIFICATION CRITERIA

Prions are divided into two groups: the Whalebirds and the Fairy Prions.

In the first group, the Whalebirds, four species were tentatively recognised in HANZAB (1990, Vol. 1, Part A);

1. Broad-billed Prion, *Pachyptila vittata*
2. Salvin's Prion, *Pachyptila salvini*
3. Antarctic Prion, *Pachyptila desolata*
4. Slender-billed Prion, *Pachyptila belcheri*.

Some contemporary field guides, for example Shirihai (2002, 2nd ed. 2007) and Onley and Scofield (2007), identify five species, with MacGillivray's Prion, *P. macgillivrayi*, placed between Salvin's and Broad-billed Prion. Shirihai (2007, p. 194) names this prion St Paul Prion, *P. [vitta/salvini] macgillivrayi*.

In the second group, the Fairy Prions, two species are recognised in HANZAB (1990);

5. Fairy Prion, *Pachyptila turtur*
6. Fulmar Prion, *Pachyptila crassirostris*.

Cox (1980), Harrison (1983, revised 1985) and Penhallurick and Wink (2004) identified only one species and treat Fulmar Prion as a subspecies of Fairy Prion. Bretagnolle, Zotier and Jouventin (1990) did not study the relationship between Fairy and Fulmar Prions. Christidis and Boles (2008) tentatively recognised two species; Fairy and Fulmar Prion. To complicate identification further, both Fairy and Fulmar Prion are considered to be polytypic by

HANZAB, each with two sub-species while Gill *et al.* (2010, p. 105) recognise three sub-species of Fulmar Prion and that is the current situation on the IOC checklist (Gill and Donsker 2013).

For identification, Whalebirds generally show a pronounced collar and have longer bills, varying from relatively narrow and thin to broad and duck-like and some species have less black at the tip of the upper tail. Fairy Prions, which lack the pronounced collar of Whalebirds, have shorter, narrow bills that may appear stout, and have broad black bands on the upper tail.[1]

Apart from the collar patch and terminal tail band on the dorsal surface, other upper part plumage features are sufficiently variable across described prion species to be of limited use for identification purposes. In that respect there is a view that the width of the tail band on Whalebirds varies consistently from narrowest on *belcheri* to broadest on *vittata* but published data to support that view is lacking. A frequently overlooked feature is the pattern of the under-tail when in a closed position as documented by Carter (1978, 2005). Unfortunately photographs of this feature are difficult to obtain at sea although they would be useful if available. Consequently, this paper pays more attention to bill shape and structure when classifying species but as noted above this also has its limitations because of the extent of the overlap in dimensions between recognised species.

To sum up, the current situation is that most authorities follow HANZAB and tentatively recognise six species of prion: four Whalebirds and two Fairy Prions. Harrison (1987) reverted to six species and Christidis and Boles (2008) tentatively adopted the prevailing view and recognised six species of prion, treating MacGillivray's as a subspecies of Salvin's Prion. The IOC recognises the six species listed above, as do Gill *et al.* (2010).

PHOTOGRAPHS OF PRIONS OFF PORT MACDONNELL, SOUTH AUSTRALIA

The following notes highlight the main identification features stressed in the literature for each of the species identified in HANZAB (1990 Vol. 1, Part A). Examples of prions with features associated with all six species will then be given from birds photographed off Port MacDonnell in South Australia. Photographs are by the author unless otherwise accredited.

Whalebirds

Starting with the first group of four Whalebirds, HANZAB (1990, Vol. 1, p. 516) states:

> [**Broad-billed**, ***P. vittata***] "***Easiest prion to identify:*** stands out by large size, ***huge blackish bill***, large head with steep forehead profile, dark-headed appearance, ***pronounced collar*** and ***narrow tail-band***; flight slower with more gliding that other prions; does not bank so steeply with wing-tips approaching vertical as smaller species. **Salvin's *P. salvini*** and **Antarctic *P. desolata* Prions** differ by smaller size, smaller, ***mostly bluish (not blackish) bill***, and usually whiter lores and longer supercilium giving ***paler face*****. Slender-billed Prion *P. belcheri*** smaller, with more slender build, smaller head and ***much finer bluish bill***; less bluish grey above with paler, less well defined M-marking, ***narrower tail band***, much ***longer broader white supercilium and usually clean white lores***, giving much whiter face."

[The information that would be useful for identifying prions at sea and from photographs has been highlighted ***thus***.]

These comparisons obviously include much anecdotal and subjective information that is difficult to evaluate without observational data such as wind and sea conditions or time of year that dictates state of plumage and possible age of the birds observed.

1. Cox (1980, p.97, Figure 3) noted that the black on the tail tip of prions does not extend across the tail as a complete band as all prions have some grey outer rectrices. Nevertheless, field guides describe it as a band and I retain that usage in this paper.

Figure 1. This prion has a very narrow longish bill consistent with specimens of *P. belcheri* from Iles Kerguelen

Slender-billed Prion, ***Pachyptila belcheri***

When discussing Antarctic Prion and its similarity with Slender-billed Prion, HANZAB (1990, p. 527) states:

> "**Slender-billed Prion** *P. belcheri* closely similar, with overlap in pattern of plumage (especially in s. Indian Ocean and A'asian waters) and jizz; separation difficult and should be based on combination of following typical characters: Slender-billed slightly smaller and ***slimmer-bodied***, with proportionally smaller head and slimmer neck; ***bill, more slender, delicate, not so deep at base***; in flight, head not tucked into body, wings usually held straighter, and projection of body about equal in front of and behind wings, giving generally more compact appearance (on Antarctic, head usually tucked into body, giving thick-necked and deep-chested appearance, and carpal joints usually held well forward, giving greater projection of body behind wings than in front); ***mostly white lores and long broad white supercilium form striking pale face***; M-marking, less distinct; tail-band, narrower; flight, dainty, often with much aerobatics; in calm weather often faster and more manoeuvrable."

Again much of this information is subjective and of little use for this paper but highlighted sections do indicate what observers are looking for to identify Slender-billed Prion at sea.

Figures 1-3 illustrate Slender-billed Prion based on morphological characteristics mentioned in the literature. However, as Cox (1980) illustrated and HANZAB agreed, there are some *belcheri* and *desolata* that are very difficult to allocate to species even in the hand.[2]

The prion in Figure 1 has a very narrow longish bill consistent with B5 or B6 in Cox (1980, p. 106) for specimens of *belcheri* from Iles Kerguelen. Figure 2 shows typical facial and tail patterns. Similarly, the bird in Figure 3 has a typical facial pattern, pronounced collar and bill structure for *belcheri* – the bill appears long and slender and is narrow below the nostrils, similar to B6 or B7 in Cox (1980, Fig. 12, p. 106).

Antarctic Prion, *Pachyptila desolata*

From the descriptions of Slender-billed and Antarctic Prions given in the literature, Antarctic Prion has a bluish bill that is broad and deep at

Figure 2. This bird has the facial pattern of *P. belcheri* and narrow tail band restricted to the tail tip

2. It is possible that the narrow black stripe on the under-tail of *belcheri* as illustrated by Carter (1978) and Harrison (1985, p. 63.) is diagnostic but data are needed to confirm this.

Figure 3. This bird has a typical facial pattern, pronounced collar and bill structure for *P. belcheri*

the base. The distinction from Broad-billed Prion rests largely on bill colour as plumage features of some Antarctic Prions resemble that of Broad-billed Prions; HANZAB (1990 Vol. 1, p. 527):

"…in South Atlantic and Heard I. birds, sub-orbital patch bolder and darker, and some have lores freckled black and supercilium reduced, giving more sombre facial pattern (recalling that of Broad-billed Prion *P. vittata*). …***Bill, chunky, deep at base in profile; pale blue except for blackish nostrils, culminicorn and sulcus***…"

Figures 4 - 6 illustrate the features of Antarctic Prion listed in the literature but do not resolve

Figure 4. Antarctic Prion with pronounced collar and chunky blue bill deep at base in profile

Figure 5. Antarctic Prion showing pronounced, broad bluish bill, blackish nostrils, culminicorn and sulcus. (Grant Penrhyn)

the difficulty of defining the phenotypes *desolata* and *belcheri*.

Figure 5 shows a bird close to the inter-grade between Antarctic and Salvin's Prion. See Cox (1980, Fig. 14, p. 109).

The facial pattern shown in Figure 6 is typical of illustrations of Antarctic Prion in field guides. It lacks the narrow black eye-stripe often associated with Slender-billed Prion as illustrated in Figures 1-3 above. Note that the terminal black tail band is broader than in Slender-billed Prion above. The bird in Figure 7 illustrates some of the plumage features often associated with Slender-billed Prion (two-tone M-mark and narrow tail band) but has the facial pattern of Antarctic Prion and a bill structure close to the overlap zone between Slender-billed and Antarctic Prion. See Cox (1980, Fig. 12, p. 106).

Figure 6. Antarctic Prion showing the blue bill, deep at the base, and narrow tail band

Figure 7. This bird illustrates some of the plumage features of Slender-billed Prion but has the facial pattern of Antarctic Prion and a bill structure close to the overlap zone between the two

Figure 8. This bird shows a large duck-like bill, a lot heavier than that of Antarctic Prion

Figure 9. The same bird as Figure 8 showing the large heavy bill

Salvin's Prion, ***Pachyptila salvini***

The distinction between Antarctic Prion and Salvin's Prion is also somewhat blurred and HANZAB (Vol. 1 p. 521) states that Salvin's Prion is:

> "…***virtually identical to Antarctic Prion*** *P. desolata* in shape, size, flight, appearance and habits and the two are inseparable at sea; ***on average, bill longer and slightly broader than Antarctic Prion.***"

Carter (1978, 2005) argues that *salvini* also has diagnostic barring on the under-tail that is not present on *desolata* and that there is a diagnostic difference between the pattern of black on the under-tail but data on these features are lacking.

The distinction between the two species at sea therefore can be reduced to bill size, steeper forehead and under-tail pattern and these may not be apparent without very close views or digital photographs.

Figures 8 - 9 illustrate a Salvin's Prion based on the size of the bill relative to Antarctic Prion. The bird has a large duck-like bill, a lot heavier than that of Antarctic Prion. It also has a larger sub-orbital eye-stripe giving the face an overall darker, more sombre appearance than Antarctic Prion. However, some observers might not rule out the identification as Antarctic Prion, illustrating the difficulty of separating the two species noted by Cox (1980, Fig. 14 and Fig. 16.) The width of the black eye-stripe behind the eye would be unusual for Antarctic Prion but is not diagnostic.

Based on these photographs, and despite the caveats noted above, the prion in Figures 8 - 9 fits the description of Salvin's Prion with a light bill illustrated in HANZAB (1990, Vol. 1, plate 40, opposite p. 529).

Broad-billed Prion, *Pachyptila vittata*

HANZAB (Vol. 1, p. 516) states that Broad-billed Prion is the easiest prion to identify. This is not always the case as is revealed by the illustration of a dark-billed Salvin's Prion in HANZAB (1990, plate 40). A dark-billed Salvin's Prion would be difficult, if not impossible, to distinguish from a Broad-billed Prion in a photograph. In this respect, Shirihai (2007, p. 194) has a photograph of a bird in the hand that he labels *P. [vittata/salvini] macgillivrayi* with a blackish (or two tone) bill and notes that for a fledgling it has a rather strong supercilium. This bird would have a bill that appeared blackish at sea. For the similarity in bill shape and size between Salvin's and Broad-billed Prion, and some Antarctic Prions, see Cox (1980, Fig. 14 and Fig. 16). However, most field guides state that a prion showing a large blackish bill at sea is likely to be a Broad-billed Prion.

Figure 10. Broad-billed Prion identified by blackish bill, bill shape and facial colour and pattern

An example of such a prion is illustrated in Figure 10. This prion has the jizz and bill colour associated with a Broad-billed Prion although a dark-billed Salvin's Prion (even *P. [vittata/salvini] macgillivrayi*) cannot be ruled out. Ross Silcock, who has extensive experience with New Zealand seabirds, commented as follows:

> "I think this is a Broad-billed [Prion] - steep forehead, massive bill even from the side, and extensive dark "hood". If it's a May bird, it should be in fresh plumage (moult after breeding) which looks to be the case here. Nice photo - it would be nice to see how much of the tail tip is dark."[3]

Note that Harper (1980, Fig. 4) shows *P. vittata* with black lores that he describes as barred or freckled and examples of this plumage are illustrated in *The Seabirds of Australia* (Lindsay, 1986, pp. 235-236). Other sources do not accept dark lores as diagnostic for Broad-billed Prion. They may be a feature of wear or a characteristic of some populations. For example, HANZAB (1990, Vol. 1 plate 40) illustrates Broad-billed Prion with white lores and a dark line extending from the eye to the forehead as shown in Figure 10, while Onley and Scofield (2007, plate 26) illustrate both plumages, attributing the dark lores to a juvenile.

Fairy Prions

Considering the second group of prions with broader black tail bands and the absence of pronounced collars, two species, Fairy Prion, *P. turtur* and Fulmar Prion, *P. crassirostris*, are recognised in HANZAB (1990), Shirihai (2007), Onley and Scofield (2007) and contemporary checklists. The photographs that follow are intended to illustrate the bill structure associated with representatives of each of these species while at the same time drawing attention to the potential intergradations between them noted by Cox (1980).

Fairy Prion, *Pachyptila turtur*

Fairy Prion breeds widely on islands off SE Australia, New Zealand, in the southern Indian

3. As noted above, distinguishing between *salvini* or *macgillivrayi* with a blackish bill and *vittata* at sea is difficult so to identify the bird in Figure 10 as *vittata* is not definitive.

Figure 11. Fairy Prion, *P. turtur*, identified from Whalebirds by the broad black tail band and from Fulmar Prion by the longer, finer bill

Figure 12. Enlargement of the prion in Figure 11 showing the bill structure attributed to Fairy Prions in the literature

Ocean and Atlantic Ocean.[4] Two sub-species are identified in HANZAB (1990, p. 541): *P. t. turtur* and *P. t. subantarctica* and the latter breeds on Antipodes Is, Big South Cape, Snares Is, and Macquarie Is. Of the two, nominate *turtur* is said to have a dark eye-stripe while *subantarctica* has an indistinct eye-stripe giving the face a pale appearance. However, Onley and Scofield (2007, p. 84) treat the status of *subantarctica* as uncertain.

Fairy Prion, *P. turtur*, is identified from Whalebirds by the broad black tail band and from Fulmar Prion by the longer, finer bill. In Fairy Prion, the gap between the nostril and maxillary unguis is short, equal to or less than the length of the maxillary unguis (HANZAB 1990, Vol. 1 p. 554). The bird in Figures 11 and 12 also shows an indistinct collar.

Fulmar Prion, *Pachyptila crassirostris*

Fairy Prion is common at times in SA waters but, prior to the records presented here, there were no confirmed records of Fulmar Prion and many questionable sight records in Australian waters. However, there is a record of a beach-washed specimen from Tasmania accepted by BARC, (Palliser 1998)[5]. Despite the lack of verifiable records, it is possible to identify from photographs examples of Fulmar Prion in South Australian waters.

Like Fairy Prion, Fulmar Prion is polytypic and HANZAB (1990, Vol. 1 p. 550) identified two subspecies: *P. c. crassirostris* breeding on the Chatham, Snares and Bounty Islands and *P. c. eatoni* breeding on Auckland and Heard Islands. Onley and Scofield (2007, p. 156) also identified two subspecies but allocate a different scientific name to the birds on Auckland and Heard Islands;

> "*P. c. crassirostris* on Chatham Is. (sometimes called *P.c. pyramidalis*), Snares Is. and Bounty Is.; and *P. c. flemingi* on Heard I. and Auckland I."

Gill *et al.* (2010) identify three subspecies; *P. c. crassirostris*, that breeds on the Bounty Islands

4. Fairy Prion is the most common species recorded off Port MacDonnell. Fulmar Prion has been recorded only once when at least four individuals were present on 10th October 2010 in a group of a least 100 Fairy Prions.

5. The Fulmar Prion record from Tasmania was accepted by BARC, (Palliser 1998), on the basis of some key measurements and some characteristics of the bill structure associated with Fulmar Prion. Of the measurements relating to the bill structure only the width of the maxillary unguis, 5.6 mm, is reported and although the length of the culminicorn was measured that information was not provided.

Figure 13. Bill of the holotype of Fulmar Prion, *P. c. flemingi*, Tennyson and Bartle (2005, p. 48, Figs. 1 and 2). For comparison, see Cox (1980, Fig. 7-9) for the similarity of bill dimensions in Fairy and Fulmar Prions.

and Rima and Toru of the Western Chain, Snares Islands / Tini Heke; *P. c. pyramidalis*, that breeds on the Chatham Islands and the Forty-Fours; and *P. c. flemingi*, that breeds on Heard Island, the Auckland Islands and probably on MacDonald Island.

Although Onley and Scofield (2007, p. 156) recognise the existence of *P. c. flemingi*, contra Tennyson and Bartle (2005), they treat its status as uncertain, and state:

> "… *flemingi* has a smaller bill, [than *crassirostris*] different tail pattern … Status of this subspecies requires examination, as in many ways it resembles a large-billed Fairy **rather than a true Fulmar Prion**. "[6]

Cox (1980, p. 104) anticipated this ambiguity in the case of Auckland and Heard Island prions:

> "Most Pyramid Rock, Bounty Is. and Antipodes Is. *crassirostris* can be separated from all other fairy prions by having a bill depth of over 8.0 [mm]; but Heard Is. and Auckland Is. birds present a difficult problem because they appear to be intermediates. Many have stout bills, thus closely resembling *crassirostris* or some *turtur*, but the dimensions of specimens are closer to those of *turtur*."

Cox (1980, Fig. 11) provided details of the bill dimensions of Fulmar and Fairy Prions. For comparison purposes, the bill structure of Fulmar Prion, *P. c. flemingi*, allocated by Tennyson and Bartle (2005) for birds nesting on Auckland and Heard Islands is given in Figure 13.

However, based on the measurements presented in Cox (1980, Fig. 11) the bird in Figure 13 has a bill structure virtually indistinguishable from some Fairy Prions from Montanau I. in New Zealand. This highlights a difficulty when using bill dimensions to identify species: there will be significant overlap in one or more dimensions and this cannot be entirely resolved when

6. It is difficult to make sense of these statements by Onley and Scofield. They state that *flemingi* has a smaller bill than *crassirostris* and yet describe *flemingi* as a 'large-billed Fairy Prion'. But as the bills of Fulmar and Fairy Prion overlap in several dimensions, terms like 'large' or 'small' have no descriptive content – to which dimensions do they refer?

using an index of bill shape such as 'stoutness' suggested by Cox (1980, Table 3).

Despite these caveats, HANZAB (1990, Vol. 1 p. 541) describes the difference between Fulmar and Fairy Prion as follows:

> "Fulmar Prion closely similar [to Fairy Prion] and generally indistinguishable at sea: paler blue-grey, with more distinct M-mark, ***slightly broader tail band***, paler facial pattern, largely bluish behind vent and ***slightly larger chunkier bill.***"[7]

HANZAB (1990, Vol. 1 p. 553-4) elaborated on the difference between *turtur* and *crassirostris* as follows:

> "Closely similar to *P. turtur*; *P. crassirostris* ***slightly larger with different bill shape. Maxillary unguis of crassirostris, broad, looks rounded in dorsal view***; maxillary unguis 4.6-5.7 mm wide (3.3 - 4.4 in *P. turtur*) and considered reliable character for separation of *crassirostris* and *turtur* (Harper (1980)."

[But see below, from p. 548.]

> "The distance between the nasal tubes and moderately developed unguis in Fairy Prion is 5.1 mm (4.2-6.0), shorter than in *P. belcheri* (8.3 mm); not so short as *P. crassirostris* (2-4 mm)."

The key features of the bill structure of Fulmar Prion from all these sources are the very short culminicorn (< 4 mm), greater depth of the bill below the nostril (> 8 mm) and broad maxillary unguis (> 4.5 mm). In general, Fulmar Prions have a short stubby or stout bill, broad at the base and deep below the nostrils and with a prominent maxillary unguis. Cox (1980, Fig. 18) shows how the comparative bill stoutness of Fulmar Prion is greatest on Bounty Island and Pyramid Rock in the Chatham Islands, relative to Auckland and Heard Islands.

Plumage features are of less use for identification as the photographs of both pale and well-marked Fulmar Prions in Shirihai (2007, p. 201-202) illustrate. According to the literature the important feature is the stout, deep bill.

Although it is not possible to take accurate measurements, the following photographs taken off Port MacDonnell, SA, show some examples of birds exhibiting these structural characteristics associated with Fulmar Prions in Cox (1980), HANZAB (1990), Shirihai (2007) and Onley and Scofield (2007). These birds all have stout deep bills with a particularly short culminicorn. These photographs are followed by several examples that are intermediate between Fairy and Fulmar Prions. The breeding islands from which the birds originate are unknown.

Figure 14. A prion with a particularly broad tail band and short bill, broad at the base

Figure 15. Enlargement of the prion in Figure 14

7. This description of the bill as 'slightly larger' is misleading as it implies that the bill of Fulmar Prion is larger in all dimensions than that of Fairy Prion. The bill of Fulmar Prion is deeper below the nostrils, broader at the base, with a broader maxillary unguis, and often shorter than the bill of Fairy Prion, giving it a stout appearance.

Figure 16. This prion shows a very short culminicorn and broad, bulbous maxillary unguis with a bill narrower at the base than the bird in Figure 15

Figure 17. This prion also has a bill structure usually attributed to Fulmar Prion

Figures 14 and 15 show a bill structure with very short culminicorn and broad maxillary unguis and shape to latericorn similar to that of *P. c. flemingi* illustrated in Figure 13. Recall that HANZAB (1990, Vol. 1, p. 554) lists the gap between the maxillary unguis and the nostril (length of culminicorn) of Fulmar Prion as 2-4 mm. See also Cox (1980, p.102-104) for a range of bill shapes of Fulmar Prions drawn to scale.

The prion shown in Figure 17 clearly has a deep bill below the nostril, large and bulbous maxillary unguis, and very short culminicorn - at least as short as that illustrated in HANZAB plate 39 (Vol.1 opposite p. 258) for Fulmar Prion and shorter than the illustration in Onley and Scofield plate 27 for Fulmar Prion. In fact the illustration in Onley and Scofield looks more like

Figure 18. Prion showing deep bill below the nostrils, very short culminicorn and bulbous and broad maxillary unguis

Antarctic Prion than Fulmar Prion. The bill on the bird in Figure 17 is also very similar to that of a Fulmar Prion from the Auckland Islands labelled A 27 (DMW 17500) in Cox (1980, p.104). John Cox (pers. com.).

The prion in photograph 18 has a bill rather similar to the photograph of Fulmar Prion from the Bounty Islands in *The Seabirds of Australia*, (Lindsay 1986, p. 246). An enlargement of the photograph from *The Seabirds of Australia* is reproduced below as Figure 19.

Figures 14-18 were taken on 10 October 2010 on a trip that also recorded an estimated one hundred

Figure 19. A pair of Fulmar Prions from Bounty Islands, New Zealand, *The Seabirds of Australia* (Lindsay 1986, p. 246)

Figure 20. Prion with a deep bill, bulbous maxillary unguis but the culminiorn is marginally longer than on the prions in Figures 15-18

Figure 21. Fulmar Prion, adult, The Snares, New Zealand, November, *The Seabirds of Australia* (Lindsay 1986, p. 247)

Fairy Prions. The synoptic situation showed a high-pressure cell centred in the western Tasman Sea with a cold front approaching from the west.

The prion in Figure 20 has a bill similar to that of the Fulmar Prion from the Snares in *The Seabirds of Australia* (Lindsay 1986, p. 247) reproduced in Figure 21.

Although these examples illustrate that it is possible to find photographs of prions with a bill structure fitting that for Fulmar Prion described in HANZAB and other sources it should also be conceded that there are many others that are unidentifiable.

HANZAB (1990, Vol.1 p. 554) contains the following warning:

> "However, width of unguis of *crassirostris* from Heard I. overlaps with that of *P. turtur*; birds with unguis between 3.8 and 4.4 mm wide cannot be identified on this character. … Also, length of culminicorn usually shorter in *crassirostris*: 2.0 - 4.0 mm long (4.2 – 6.0 mm in *P. turtur*)… however, on basis of Heard I. measurements, prions with culminicorn between 4.2 and 5.00 [mm] long cannot be identified."

The following photographs illustrate some prions that have stout bills intermediate between Fulmar and Fairy Prion. The prion in Figure 22 has a stout bill, deep below the nostrils and broad at the base, with bulbous, broad maxillary unguis but culminicorn not as short as that in Figures 15-18 but not dissimilar from that in Figure 21. Figure 23 shows a prion with a longish chunky bill and broad maxillary unguis but with a longer culminicorn than Fulmar Prion. See Cox (1980, p. 100, DMW 14902) for a specimen of *P. turtur* from Motunau Is., New Zealand with a similar bill structure.

Figure 22. Prion showing a stout bill, deep below the nostrils and broad at the base

The prion in Figure 23 could be described as a "large-billed Fairy Prion" but it is certainly not consistent with the bills of Fulmar Prions sketched to scale by Cox (1980) or even the bill of *P. c. flemingi* presented by Tennyson and Bartle (2005), contra Onley and Scofield. Perhaps the prion in Figure 23 is *P. t. subantarctica* or just a

Figure 23. This prion has a longish chunky bill and broad maxillary unguis but with a longer culminicorn than Fulmar Prion

Fairy Prion with a chunky bill. As the status of *P. t. subantarctica* is treated as uncertain by Onley and Scofield but is used in HANZAB (1990) and others the identification of sub-species of Fairy Prion also remains unclear.

The photographs of prions with bill structure intermediate between Fulmar and Fairy Prion (Figures 22-23) clearly illustrate the difficulty of attempting to distinguish between all Fulmar and Fairy Prions on the basis of bill structure or a few millimetres in the length of the culminicorn or width of the maxillary unguis. This difficulty was clearly illustrated by Cox (1980, p. 102-105). Nevertheless, it is possible to find examples of prions in SA waters with bill structures typically associated with Fulmar Prions in the literature.

CONCLUDING REMARKS

This paper illustrates that digital photography has greatly enhanced the ability to identify prions at sea. It shows that it is now possible to identify from photographs examples of all six species of prions identified by HANZAB in South Australian waters. Of particular significance is the first identification of Fulmar Prion from photographs at sea in Australian waters. However, the degree of overlap between recognised species in bill shape and dimensions highlighted by Cox (1980) means that not all prions can be so identified.

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REFERENCES

BirdLife Taxonomic Checklist, 2012 (October) version 5.1, <http://www.birdlife.org/datazone/info/taxonomy>

Bretagnolle, V., Zotier, R. and Jouventin, P. 1990. Comparative population biology of four prions (Genus *Pachyptila*) from the Indian Ocean and consequences for their taxonomic status. *Auk* 107: 305-316.

Carter, M.J. 1978. Undertail patterns of Prions. *Australasian Seabird Group News* 11: 23-26.

Carter M.J. 2005. Revision to BA-Vic Port Fairy pelagic report for 08.05.2005. <http://bioacoustics.cse.unsw.edu.au/birding-aus/2005-06/msg00433.html>

Christidis, L. and Boles, W.E. 2008. *Systematics and Taxonomy of Australian Birds*. CSIRO, Melbourne.

Cox, J.B. 1980. Some Remarks on the Breeding Distribution and Taxonomy of the Prions (Procellariidae: *Pachyptila*). *Records of the South Australian Museum* 18: 91-121.

Gill, B.J., Bell, B.D., Chambers, G.K., Medway, D.G., Palma, R.L., Scofield, R.P., Tennyson, A.D.J. and Worthy, T.H. 2010. *Checklist of the Birds of New Zealand, Norfolk and Macquarie Islands, and the Ross Dependency, Antarctica*. Fourth Edition. Te Papa Press & Ornithological Society of New Zealand.

Gill, F. and Donsker, D. (Eds). 2013. IOC World Bird List (v 3.5). doi: 10.14344/IOC.ML.3.5. <http://www.worldbirdnames.org>

Harper, P.C. 1980. The field identification and distribution of the prions (genus *Pachyptila*), with

particular reference to the identification of storm-cast material. *Notornis* 27: 235-286.

Harrison, P. 1983 Revised 1985. *Seabirds: an identification guide*. Christopher Helm, London.

Harrison, P. 1987. *Seabirds of the world: a photographic guide*. Christopher Helm, London.

Lindsay, T.R. 1986. *The Seabirds of Australia. The National Photographic Index of Australian Wildlife*. Angus and Robertson, North Ryde.

Marchant, S. and Higgins, P.J. (eds). 1990. *Handbook of Australian, New Zealand & Antarctic Birds. Volume 1: Ratites to Ducks*. Oxford University Press, Melbourne.

Onley, D. and Scofield P. 2007. *Albatrosses, Petrels & Shearwaters of the World*. Princeton University Press, Princeton.

Palliser, T. 1998. *Submission No. 198: Fulmar Prion* Pachyptila crassirostris, *Mt Cameron West Tasmania, 11 September 1995*. Birds Australia Rarities Committee.

Penhallurick, J. and Wink, M. 2004. Analysis of the taxonomy and nomenclature of the Procellariformes based on complete nucleotide sequences of the mitochondrial cytochrome *b* gene. *Emu* 104: 125-147.

Shirihai, H. 2007. 2nd edition. *A complete guide to Antarctic wildlife: the birds and marine mammals of the Antarctic continent and the southern ocean*. Princeton University Press, Princeton and London.

Tennyson, A.J.D. and Bartle J.A. 2005. A scientific name for fulmar prions nesting at Auckland and Heard Islands. *Notornis* 52: 47-55.

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