

A New Zealand Storm Petrel *Fregetta maoriana* off Gau Island, Fiji, in May 2017

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SUMMARY.—We document a sighting of the Critically Endangered New Zealand Storm Petrel *Fregetta maoriana* made during a pelagic expedition in May 2017 off Gau Island, Fiji. This is the first confirmed record of this recently rediscovered species away from New Zealand, and provides evidence of long-distance dispersal by failed or non-breeders to tropical waters. It expands the known range by c.2,000 km north. Identification necessitated a thorough review of the ‘streaked storm petrels’ of the Pacific Ocean and this is summarised.

We undertook an expedition on 17–26 May 2017 to observe tubenoses off Gau (Ngau) Island, Fiji. The vessel used was the 18-m sailing yacht *Sauvage*. The weather map for 17 May shows the large-scale weather conditions preceding the expedition (Fig. 1). At chosen locations, we drifted, set up an oil slick using Menhaden fish *Brevoortia*, and then added other fish products to the slick. Morning and evening chumming sessions lasted 3–5 hours. The 15–20-knot south-easterly winds spread the smell of the chum widely and assisted storm petrels to forage.

Results

On 20 May 2017, c.26 miles south-west of Gau airport, at 18°26'S 179°08'E, a New Zealand Storm Petrel *Fregetta maoriana* visited our oil slick during both the morning and

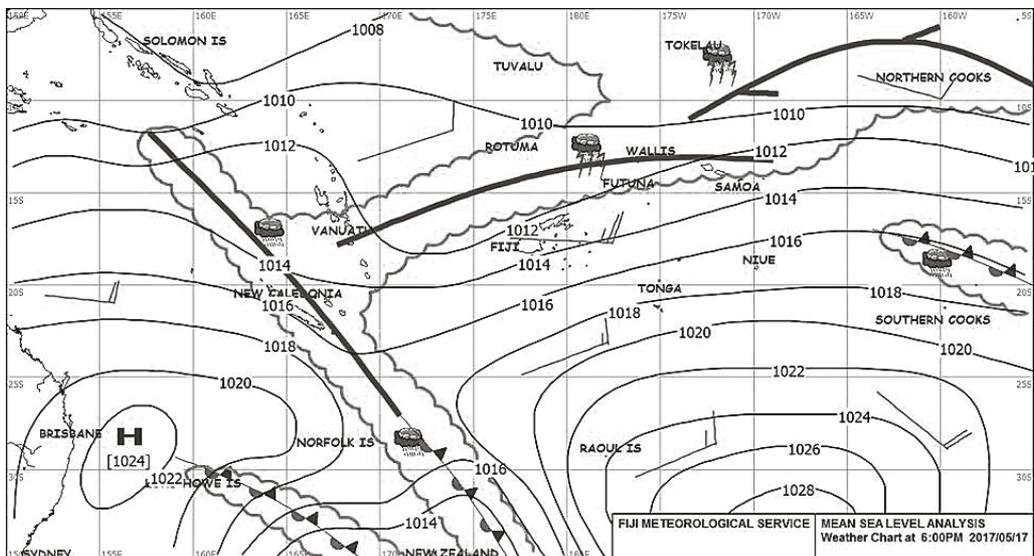


Figure 1. Large scale weather map for the south-west Pacific, 17 May 2017 (courtesy of Fiji Meteorological Service).



Figures 2–3. New Zealand Storm Petrel *Fregetta maoriana*, off Gau Island, Fiji, 20 May 2017 (John & Jemi Holmes). Note clean-looking, largely white central underwing panel and dark streaks mainly restricted to sides of lower breast and belly, as well as white bases to underside of outer rectrices (at least r5 and r6).



Figures 4–5. New Zealand Storm Petrel *Fregetta maoriana*, off Gau Island, Fiji, 20 May 2017 (Angus C. Wilson). Dorsal view suggests Wilson's Storm Petrel *Oceanites oceanicus* but the bird's foot-pattering shown in Fig. 5 is inconsistent with the 'dance' of Wilson's Storm Petrel (Flood & Fisher 2013).

afternoon chumming sessions (Figs. 2–5). Photographs revealed that just one individual was involved. Feather abrasion featured distinctive nicks and notches (Fig. 3). Identification was based on our previous experience of the species and the criteria in Flood (2003) and Stephenson *et al.* (2008a).

Description

Jizz Like a Wilson's Storm Petrel *Oceanites oceanicus* with a *Fregetta* head shape, white central underwing panel, and dark-streaked white belly and flanks. In the afternoon, it

arrived with three Wilson's Storm Petrels from which it most obviously differed by its white underparts and foraging behaviour.

Size Slightly larger than Wilson's Storm Petrel and moderately smaller than Black-bellied Storm Petrel *F. tropica*, based on comparative views (unanimous judgement of all observers, named in Acknowledgements). Nominate Wilson's Storm Petrel from the subantarctic on average is smaller than *O. o. exasperatus* from Antarctica, although size variation may be clinal (Marchant & Higgins 1990).

Flight behaviour When moving towards the oil slick—strong, direct, and purposeful low flight, with continuous, fast, fairly stiff wingbeats. On reaching the slick—slowed to forage, skimmed across surface, with some gliding, often changing direction using one foot to push off from the surface. Frequently stalled, hovered, foot-pattered and dipped head to collect food. Wings held in V shape when hovering and foot-pattering. Long legs often left dangling when progressing short distances after foot-pattering.

Structure Bill slim, slightly decurved, tip hooked and pointed. Nasal tubes c.40% of bill length. Head fairly large and squarish, at times looked disproportionately large compared to body. In profile, forehead slope reasonably steep. Angle of forehead slope to chin slope 'squared off'. Crown slightly convex. Neck quite thick and shortish. Body mid-length and rather slim-looking. Wings medium length: short broad inner wings, medium-length outer wings, pointed wingtips. In travelling flight, leading edge moderately angular and smoothly rounded at carpal joint; trailing edge straight or slightly concave. Paddle-shaped when manoeuvring and foot pattering. Straightened when viewed head-on. Projection behind wings fairly long: long base, mid-length tail, long toe projection c.35% of length of outermost tail feather. Tail closed and somewhat concave in travelling flight, spread and somewhat rounded when manoeuvring and foot pattering. Mid-toe / tarsus ratio 0.80–0.84 estimated from photographs, middle toe longest.

Plumage aspect Overall dark, except white uppertail-coverts and central underwing panel, and dark-streaked white belly and flanks. Head and neck darkest (blackish) affording subtle dark-hooded look. Brownish-black back and remiges contrasting moderately with somewhat paler / browner upperwing-coverts. Dull paler / greyer upperwing ulnar bars on median and greater coverts. Brownish-black rump. White uppertail-coverts formed U shape from above. Broad dark leading edge to underwings, linking blackish upper breast to dark greyish-brown underside of primaries (involving marginal and most of lesser coverts). Clean-looking, largely white central underwing panel, involving axillaries, and greater and median primary- and secondary-coverts. Greyish underside to greater primary-coverts becoming progressively paler inwards. Dark fingers in median coverts protruded into white underwing panel (photographs lack sufficient detail, but dark outer webs and white inner webs to these coverts are considered diagnostic of New Zealand Storm Petrel: Stephenson *et al.* 2008a). Dark of upper breast bled into white of lower breast. Mainly thick (and some narrow) dark streaks either side of lower breast, tending to converge towards thighs, creating dark thigh patches. Flanks less heavily streaked and central belly largely unstreaked. Border of dark upper breast and white lower breast aligned with rear of dark leading edge to underwings. Dirty look to undertail-coverts; dark lateral undertail-coverts with narrow pale fringes and some dark in central undertail-coverts. White bases to outer rectrices (r5 and r6 at least) evident from below when tail spread.

Bare parts Bill blackish. Eyes blackish. Legs and feet blackish, no evidence of pale / coloured webs.

Moult and wear No evidence of moult. Worn primaries, some with heavily abraded tips.

Discussion

The sighting is significant for three reasons. (1) It is the first confirmed record of New Zealand Storm Petrel away from New Zealand (bar one or two pending records off eastern Australia—see below). (2) It provides the first evidence of long-distance dispersal by the species (Fiji is c.2,000 km north of New Zealand, so presumably it was a failed or non-breeder). (3) New Zealand Storm Petrel is listed as Critically Endangered (IUCN 2017).

Identification was far from straightforward because multiple taxa of streaked storm petrels occur in the Pacific Ocean, so below we establish our rationale for identifying this bird as a New Zealand Storm Petrel.

Streaked storm petrels

The term ‘streaked storm petrel’ makes reference to storm petrels with dark streaks on a white belly that occur in the Pacific Ocean. The precise taxonomic relationships and geographical ranges of these streaked storm petrels has been a lasting conundrum.

However, the rediscovery of the streaked New Zealand Storm Petrel in 2003, off the Coromandel Peninsula and in the Hauraki Gulf, North Island (Flood 2003, Saville *et al.* 2003, Stephenson *et al.* 2008b), provided a breakthrough in our understanding of streaked storm petrels, while simultaneously refuting Murphy & Snyder’s (1952) argument that all such individuals are plumage variants of known species (the so-called Pealea phenomenon). Live captures of streaked storm petrels in the Hauraki Gulf followed these sightings and subsequent morphological and molecular studies indicated that they are the same species as three historic specimens at the Muséum national d’Histoire naturelle, Paris (France) and Natural History Museum, Tring (UK), i.e. a distinct taxon—the New Zealand Storm Petrel—and not a plumage variant (Stephenson *et al.* 2008a, Robertson *et al.* 2011). Further research established that New Zealand Storm Petrel breeds in February–July in the Hauraki Gulf (e.g. Rayner *et al.* 2013, Tennyson *et al.* 2016).



Figure 6. Specimen AMNH 194110 (American Museum of Natural History, New York) collected by Rollo Beck off Huapu Island (Ua Pou), Marquesas Islands, 15 September 1922, during the Whitney South Seas Expedition (Angus C. Wilson). A distinct form of White-bellied Storm Petrel *Fregetta grallaria* (Cibois *et al.* 2015, Robertson *et al.* 2016). Note streaking across underparts, including central belly, albeit not as heavy as the Samoa specimen (USNM A15713; see Fig. 7).

Recent molecular analysis indicates that another of these historical streaked storm petrel specimens, AMNH 194110 (American Museum of Natural History, New York), collected off Huapu (Ua Pou) Island, Marquesas Islands, on 15 September 1922 (Fig. 6), is a distinct form of White-bellied Storm Petrel *Fregetta grallaria* (Cibois *et al.* 2015, Robertson *et al.* 2016), in agreement with Murphy & Snyder's (1952) conclusion that it is allied with White-bellied Storm Petrel. Subfossil bones of *Fregetta* storm petrels have been found on two of the Marquesas Islands (Cibois *et al.* 2015), supporting the theory of a former local breeding population. A tantalising view of two streaked storm petrels on 30 September 2013, south-west of Fatu Hiva Island, Marquesas Islands, by a group of birdwatchers (P. Hansbro & R. Johns *in litt.* 2017), provides hope that the Marquesas streaked storm petrel survives.

A further historic streaked storm petrel specimen, USNM A15713 (National Museum of Natural History, Smithsonian Institution, Washington DC), obtained perhaps in October / November 1839 at Upolu, Samoa (Fig. 7) was considered by Murphy & Snyder (1952) to be a Black-bellied Storm Petrel *Fregetta tropica*. This conclusion has been endorsed by regional authorities (e.g. Gill *et al.* 2010). Bourne (2008) presented circumstantial evidence that the specimen's actual collecting location may have been Antarctic seas, where Black-bellied Storm Petrel is common. That said, since 1839, no similar streaked storm petrel has been reported / documented in Antarctic seas despite widespread coverage by birdwatchers and ornithologists.

The following recent developments cast further light on the streaked storm petrel conundrum. On 7 April 2008, a single (or two) streaked storm petrel was photographed off southern New Caledonia during a Western Pacific Odyssey expedition cruise, operated by Heritage Expeditions (RLF was an observer). Howell & Collins (2008) made the reasonable suggestion, at the time, that it was possibly a New Zealand Storm Petrel. However, given further sightings in subsequent years, in the same region, it is apparent that these birds—now labelled 'New Caledonian Storm Petrel'—are not New Zealand Storm Petrel (Collins 2013). In 2013 and again in 2014, separate teams led by C. Collins and P. Harrison tried to



Figure 7. Specimen USNM A15713 (Smithsonian Institution, Washington DC) obtained perhaps October / November 1839, US Exploring Expedition 1838–42, Upolu, Samoa (Brian K. Schmidt). Considered to be a Black-bellied Storm Petrel *Fregetta tropica* (Murphy & Snyder 1952, Gill *et al.* 2010). Note heavy streaking across underparts, including the central belly; outer and middle toes of comparable length.

capture birds to record morphometrics and take blood samples for DNA analysis, but these efforts were unsuccessful (C. Collins *in litt.* 2017, P. Harrison *in litt.* 2017).

Meanwhile, since 2010, streaked storm petrels have been seen in various pelagic locations off eastern Australia. Again, the initial sighting, off south-east Australia, was thought to involve a New Zealand Storm Petrel. However, subsequent sightings, documented with good photographs, revealed structure and plumage of the great majority of them to be like New Caledonian Storm Petrel, not New Zealand Storm Petrel. By 2017, pelagic trips to Queensland and Britannia Sea Mounts, in the Coral Sea, led by P. Walbridge, had encountered 62 streaked storm petrels (P. Walbridge *in litt.* 2017). Photographs of streaked storm petrels off New Caledonia and in the Coral Sea show that their structure and plumage bear a striking resemblance. One of the Coral Sea birds was captured in April 2014 on the Britannia Sea Mount off southern Queensland and the results of research into this bird are in preparation, including its relationship to the Samoa streaked storm petrel that it also resembles (P. Walbridge *in litt.* 2017). Streaked storm petrel sightings off Australia currently await final assessment by the BirdLife Australia Rarities Committee until the taxonomy of New Caledonian / Coral Sea storm petrels is resolved. However, the Committee considers that just one or possibly two records exhibit the credentials of New Zealand Storm Petrel (T. Palliser & J. Davies *in litt.* 2017).

Additionally, a feather louse, possibly from a *Fregatta* storm petrel, collected ashore in Vanuatu from a Collared Petrel *Pterodroma brevipes* in 2011 (Tennyson *et al.* 2012) hints that this country might host another undiscovered breeding site for a *Fregatta* taxon.

Process of identification

Photographs show that the middle toe of the Fiji streaked storm petrel was longest, whereas in White-bellied Storm Petrel the outer toe is longest (Marchant & Higgins 1990). White-bellied Storm Petrel lacks or has a short toe projection beyond the tail tip (Flood & Fisher 2013); the Fiji streaked storm petrel had a long toe projection. In addition, White-bellied Storm Petrel has broader wings and a chubbier body. The streaked form



Figure 8 (left). Coral Sea Storm Petrel (undescribed taxon?), Britannia Seamount, Coral Sea, Australia, 13 April 2014 (Raja Stephenson). Extensive dark markings in the white underwing panels, mainly in the primary-coverts, and heavy streaking on the white belly, including the central belly, give a dirty appearance.

Figure 9 (right). New Caledonian Storm Petrel (undescribed taxon?), New Caledonia, south-west Pacific Ocean, 20 March 2013 (Kirk Zufelt). Note long front-end projection, long tail and broad wings compared to the Fiji New Zealand Storm Petrel *Fregatta maoriana*, which is an altogether more compact bird.

of White-bellied Storm Petrel from the Marquesas Islands also differs from the Fiji bird (Fig. 6). It has similarly proportioned legs with a ratio of toes / tarsus length of 0.58 (Murphy & Snyder 1952) to other White-bellied Storm Petrels, which is unlike the ratio of the Fiji streaked storm petrel, estimated from photos to be 0.80–0.84. Further, dark streaking on the Marquesas streaked storm petrel is quite dense across the entire lower breast, and also occurs on the central belly, albeit is finer and less dense. The central lower breast and belly of the Fiji streaked storm petrel were largely unstreaked.

In Black-bellied Storm Petrel the outer toe is slightly longer than the middle toe (Marchant & Higgins 1990) and it has broader wings and a chubbier body than the Fiji streaked storm petrel. The streaked storm petrel from Samoa (Fig. 7) also differs from the Fiji bird in that the dark streaking is thicker, denser and more widespread.

The Coral Sea / New Caledonian Storm Petrels (Figs. 8–9) can be ruled out because they are larger (using the size of Wilson's Storm Petrel as a guide), with a longer front-end projection, longer tail and broader wings. The Fiji streaked storm petrel is an altogether more compact bird. The Coral Sea / New Caledonian storm petrels consistently exhibit extensive dark markings in the white underwing panels, mainly in the primary-coverts, and heavy streaking on the white belly, including across the central belly, which combine to give a rather dirty appearance to the underparts. Conversely, the underparts of the Fiji streaked storm petrel had a relatively clean appearance, with the underwings less heavily marked and central belly virtually unstreaked.



Figure 10 (left). New Zealand Storm Petrel *Fregetta maoriana*, off North Cape, North Island, New Zealand, 2 March 2013 (Kirk Zufelt). In dorsal view very similar to Wilson's Storm Petrel *Oceanites oceanicus*, but the head is *Fregetta*-like (see main text) and the ulnar bars on the upperwing are subdued.

Figure 11 (right). New Zealand Storm Petrel *Fregetta maoriana*, Hauraki Gulf, North Island, New Zealand, 1 February 2017 (Kirk Zufelt). Greyish underside to greater primary-coverts becomes progressively paler towards innermost feathers; dark fingers in median primary-coverts protrude into white underwing panel.

We therefore conclude that the Fiji streaked storm petrel was a New Zealand Storm Petrel as it satisfies published criteria for the species' field identification (Flood 2003, Stephenson *et al.* 2008a; compare the description above to New Zealand Storm Petrels; Figs. 10–11), rather than other streaked storm petrels. Furthermore, the bird strongly resonated with our experience of New Zealand Storm Petrel in the Hauraki Gulf. It seems highly unlikely that we observed a new taxon in the Fiji archipelago because previous mass-chumming efforts off Gau Island at the same time of year yielded no streaked storm petrels (Shirihai *et al.* 2009). Pending final review of the Australian records, ours is the first documented example of New Zealand Storm Petrel away from New Zealand.

Given that the breeding season of New Zealand Storm Petrel is February–July (Rayner *et al.* 2013, Tennyson *et al.* 2016), the Fiji New Zealand Storm Petrel was either a non-breeder or a failed breeder. A non-breeder could be an immature or an adult that did not achieve breeding condition. Heavy abrasion to the primary tips could be caused by burrow activity by an adult or result from daily wear to the feathers of a juvenile (assuming no complete pre-formative moult). Whether the species regularly disperses to tropical waters north of New Zealand is an open question. Our expedition was preceded by a huge high-pressure system over the south-west Pacific Ocean (Fig. 1) providing favourable winds for long-distance northward movement by a storm petrel from New Zealand.

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