

**PELAGIC OBSERVATIONS  
DURING A CIRCUMNAVIGATION OF THE MARQUESAS ISLANDS,  
FRENCH POLYNESIA, SEPTEMBER–OCTOBER 2021**

by

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Dark-morph Herald Petrel *Pterodroma heraldica*, 05 October 2021, off Ua Pou, Marquesas Islands (*Kirk Zufelt*).

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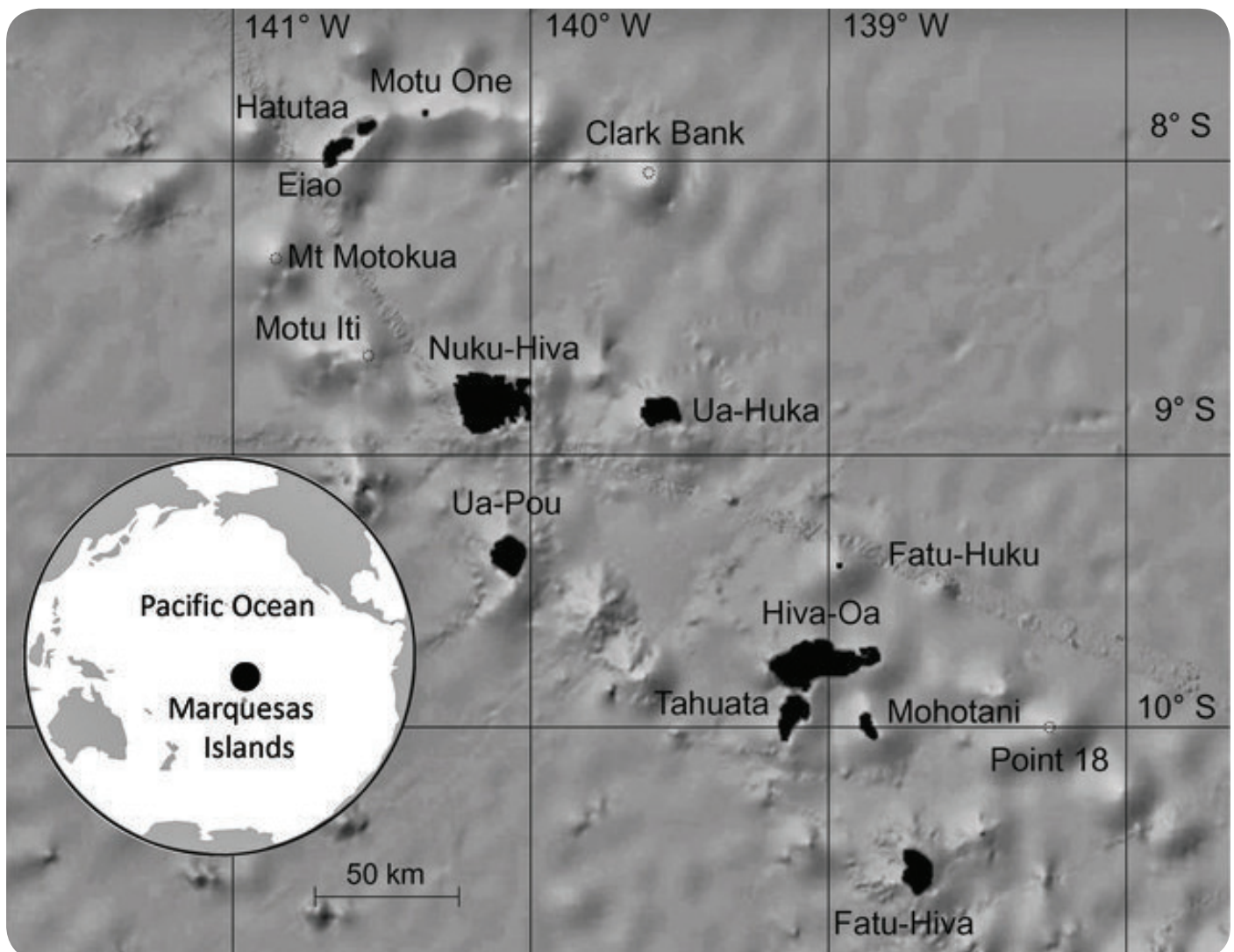
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Light-morph Herald Petrel *Pterodroma heraldica*, 05 October 2021, off Ua Pou, Marquesas Islands (Kirk Zufelt).

## ABSTRACT

We report pelagic observations of seabirds from an 18-day circumnavigation of the Marquesas Islands, French Polynesia, made during a dedicated at-sea survey of seabirds, September–October 2021. We recommend that the documented regional occurrence of some species be modified. De Filippi's Petrel *Pterodroma defilippiana* should be added to the avifauna of French Polynesia, and White-faced Storm-Petrel *Pelagodroma marina* should be added to the avifauna of the Marquesas Islands. We did not find the historical Marquesan streaked storm-petrels and suggest they were New Caledonian Storm-Petrel *Fregetta lineata*, now known to breed in New Caledonia, which dispersed eastwards in the non-breeding season. We found and photographed dark-morph Herald Petrel *Pterodroma heraldica* at sea off Ua Pou. Photographs permit better understanding of the dark-morph plumage and sightings confirm that a small number still breed at Ua Pou. Photography of ca. 70 light-morph Herald Petrels gives insight into plumage variation of this morph. Four photographed White-bellied Storm-Petrels *Fregetta grallaria* are the first documented records for Marquesas. None looked large like Titan Storm-Petrel *F. [g.] titan* and one had narrowish white fringes on the upperside eliminating Titan. Notable concentrations of Polynesian Storm-Petrel *Nesofregetta fuliginosa* were encountered indicating that a number of island populations remain intact to some degree. Only three Phoenix Petrels *Pterodroma alba* were found, raising some concern over the status of the current breeding population in Marquesas. We encountered an evening gathering of 2,000–3,000 Bulwer's Petrels *Bulweria bulwerii* off Motu Oa, at the south end of Ua Pou, indicating a notable breeding population on the islet. Alongside them were similar numbers of Polynesian Shearwaters *Puffinus [dichrous] polynesiae*. Only small numbers of Wedge-tailed Shearwaters *Ardenna pacifica* were found during the expedition. Unexpected in Marquesas was at least one Indo-Pacific White Noddy *Gygis [alba] candida*, a golden-morph White-tailed Tropicbird *Phaethon leturus*, a Nazca Booby *Sula [dactylatra] granti*, and a Brewster's Booby *Sula [leucogaster] brewsteri*, the booby sightings consistent with reports of recent range expansion. Our survey adds significant new information to the knowledge of seabirds in this region, and highlights several conservation-related issues that warrant further study and future action.



**Figure 1.** The Marquesas Islands, French Polynesia. Generalised circumnavigation: Depart Nuku Hiva, to Motu Iti, to Hatutaa, pass west of Ua Huka, to Fatu Huku, to Fatu Hiva, to Tahuata, to Ua Pou, to Nuku Hiva.

## INTRODUCTION

The remote Marquesas Islands are the northernmost island group in French Polynesia, South Pacific. They divide into two groups of islands (Figure 1): the northern group clustered around Nuku Hiva (8.87°S, 140°W), and the southern group clustered around Hiva Oa (9.75°S, 139°W). The islands are volcanic except for the sandbank Motu One in the far north. Inhabited islands of the northern group are Nuku Hiva, Ua Pou, and Ua Huka; and of the southern group are Hiva Oa, Tahuata, and Fatu Hiva. The combined island area is 1,049 square kilometres. The combined human population is 9,346 (2017 census). Only Nuku Hiva, Ua Huka, and Hiva Oa are served by flights from Tahiti Island – the hub of French Polynesia, Society Islands. The climate is tropical. The wind pattern is subject to the southeasterly trade winds that dominate between 5°S and 30°S. Hence, windward eastern coastal areas and mountains of the islands on average receive the highest rainfall.

Rollo Beck of the Whitney South Sea Expedition (WSSE) visited Marquesas from 28 September to 11 October 1921 and, with Ernest H. Quayle, from 11 September to 08 December 1922 (Beck 1922, Murphy 1922, Bryan 1969), mainly collecting birds for study and safe keeping at the American Museum of Natural History (AMNH). The WSSE to Marquesas is the principal documentation of the seabirds of the islands. Thibault & Cibois (2017) updated and summarised the occurrence of seabirds in Marquesas in their biogeographic atlas for East Polynesia. Further updates are given in Flood & Zufelt (2021) and Flood *et al.* (2021), with the former most relevant here. These publications highlight the great paucity of at-sea survey work undertaken in Marquesas since the WSSE. The general purpose of our expedition was to help to fill this knowledge gap. In addition, the expedition had two specific aims: to search for a twice-recorded streaked storm-petrel, and to find and document dark-morph Herald Petrel at sea (details in the respective species accounts).

## METHODS

In September–October 2021, we undertook an 18-day, yacht-based, at-sea survey, making a clockwise circumnavigation of the islands, commencing and concluding at Taioha'e Bay, Nuku Hiva (Figures 1–2). The date, time, location, and weather conditions during each day of the survey are detailed in Table 1. To attract seabirds, we dripped fish oil from dawn to dusk, while sailing and while drifting, supplemented by fish offal when available. While sailing, we towed a splasher / teaser and, when available, a fish carcass. Drift points were chosen from advice given by Vincent Bretagnolle and mapped large seamounts that we identified near to our planned route, though final choice was modified by weather conditions at the time and progress of the circumnavigation. Each day, there were periods of sailing and periods of drifting. Periods of sailing are identified in time order, e.g., *Sail 1* then *Sail 2*, as are periods of drifting, e.g., *Drift 1* then *Drift 2*. These periods and the dates are used in the species accounts to position sightings. Counts were standardised for effort. For each period of sailing and each drift, we made an estimate of the total number of individuals of each species seen (A). Hourly counts were made during each sail and each drift and 'A' was estimated from the maximum number of birds in view simultaneously and turnover of birds in each hour.

The next section presents species accounts for the tubenoses recorded during our survey. Each account begins with our assessment of the species' status in Marquesas, then presents our sightings, notes on range, criteria for species recognition, behaviour, taxonomy, variation, and moult. Sometimes the reader is directed to sister publications for this information (i.e., Flood & Zufelt 2021, Flood *et al.* 2021). Occasionally, small portions of Flood & Zufelt (2021) are copied into the accounts herein for convenience of reading. Short species accounts that document our survey results for other seabirds follow. A conclusion rounds off the report. We mainly adhere to the IOC World Bird List v11.2.



**Figure 2.** Taioha'e Bay, Nuku Hiva, Marquesas Islands, place of departure and return for the sailing expedition.

**Table 1.** Survey effort: date, location (start positions), general notes (approximate distances travelled in kilometres and main activities), and weather conditions.

<b>Date</b>	<b>Start location</b>	<b>General notes</b>	<b>Weather</b>
19 Sep	Taioha'e, Nuku Hiva Sail 1: 8.92°S, 140.10°W 8.68°S, 140.62°W	Port of departure 1030, 72 km NW to Motu Iti 1730, Motu Iti, sail around island Overnight sail 82 km N to Hatutaa	ESE 15–20 kt
20 Sep	Hatutaa Sail 1: 7.94°S, 140.62°W 7.78°S, 140.46°W Drift 1: 7.65°S, 140.60°W Sail 2: 7.64°S, 140.67°W	At first light 0700, 24 km NE, then change direction 0930, 21 km NW to seamount, then drift 1130, over seamount 1530, sail back to the morning start location	ESE 20 kt
21 Sep	Hatutaa Sail 1: 7.94°S, 140.62°W Drift 1: 7.99°S, 140.55°W Sail 2: 7.98°S, 140.59°W Drift 2: 8.10°S, 140.40°W 8.10°S, 140.47°W	At first light 0700, 10 km SE, then drift 1000, planned location 1300, 23 km SE, then drift 1500, to dark, arbitrary location Overnight sail 77 km SE	ESE 15–25 kt
22 Sep	23 km NNE of Nuku Hiva Drift 1: 8.58°S, 139.98°W Sail 1: 8.56°S, 140.02°W Drift 2: 8.86°S, 139.75°W 8.88°S, 139.78°W	At first light 0530, planned location 0845, 42 km SE, then drift 1530, to dark, arbitrary location Overnight sail 101 km SE	SE 15–25 kt
23 Sep	18 km NW of Fatu Huku Drift 1: 9.36°S, 139.00°W Sail 1: 9.33°S, 139.04°W Drift 2: 9.44°S, 138.79°W 9.42°S, 138.82°W	At first light 0530, planned location 1100, 32 km SE, then drift 1530, planned location Overnight drift	SE 15–20 kt
24 Sep	15 km E of Fatu Huku Drift 1: 9.42°S, 138.79°W Sail 1: 9.42°S, 138.84°W Sail 2: 9.44°S, 138.94°W Drift 2: 9.61°S, 138.87°W 9.60°S, 138.91°W	At first light 0530, planned location 0845, W to Fatu Huku, sail round island 1100, 21 km SSE, then drift 1530, planned location Overnight sail 64 km SE	ESE 15–25 kt
25 Sep	24 km SE of Hiva Oa Drift 1: 10.17°S, 138.58°W Sail 1: 10.06°S, 138.63°W Drift 2: 10.37°S, 138.61°W 10.35°S, 138.66°W	At first light 0530, arbitrary location 1015, 37 km S, then drift 1530, planned location Overnight sail 42 km S	ESE 20–25 kt
26 Sep	19 km SSE of Fatu Hiva Drift 1: 10.72°S, 138.57°W Sail 1: 10.71°S, 138.62°W Sail 2: 10.43°S, 138.71°W Drift 2: 10.40°S, 138.79°W 10.39°S, 138.82°W	At first light 0530, planned location 1000, N to Fatu Hiva, sail south and west coasts 1330, 11 km NW, then drift 1530, arbitrary location Overnight drift	ESE 20–25 kt, though Drift 2 in lee of island where less than 10 kt
27 Sep	29 km WNW of Fatu Hiva Drift 1: 10.33°S, 138.96°W Sail 1: 10.31°S, 139.06°W Drift 2: 10.17°S, 139.07°W 10.22°S, 139.13°W	At first light 0530, planned location 0930, 16 km N, then drift 1400, planned location Overnight sail to roughly maintain position	ESE 25–30 kt
28 Sep	24 km SW of Tahuata Drift 1: 10.20°S, 139.23°W Sail 1: 10.18°S, 139.27°W 9.93°S, 139.18°W 9.94°S, 139.11°W	At first light 0530, planned location 1000, to 8 km W of Vaitahu, Tahuata 1500, head to Vaitahu, Tahuata Overnight at anchor Vaitahu, Tahuata	ESE 20–30 kt
29 Sep	At anchor Vaitahu, Tahuata Sail 1: 9.94°S, 139.11°W Drift 1: 9.80°S, 139.55°W 9.81°S, 139.60°W	At first light 1230, 50 km WNW, then drift 1550, planned location, over undersea feature Overnight drift	ESE 20–30 kt
30 Sep	66 km WNW of Tahuata Drift 1: 9.78°S, 139.70°W Sail 1: 9.76°S, 139.73°W Drift 2: 9.60°S, 139.73°W 9.57°S, 139.81°W	At first light Planned location 0840, 19 km N, then drift 1430, planned location, over undersea feature Overnight drift	ESE 20–25 kt

01 Oct	27 km ESE of Ua Pou Drift 1: 9.57°S, 139.56°W Sail 1: 9.57°S, 139.83°W  Drift 2: 9.57°S, 140.17°W Sail 2: 9.56°S, 140.19°W 9.19°S, 139.58°W	At first light 0530, arbitrary location 0715, to E coast Ua Pou, then twice up and down coast 2.5–8.0 km offshore, then drift 1430, planned location 1630, to 5 km NE Ua Pou Overnight drift	ESE 15–20 kt
02 Oct	5 km NE of Ua Pou Sail 1: 9.20°S, 139.91°W Drift 1: 9.60°S, 139.73°W 9.56°S, 139.85°W	At first light 0700, return 50 km SE to undersea feature 1245, planned location Overnight drift	ESE 15–25 kt
03 Oct	16 km ESE of Ua Pou Drift 1: 9.54°S, 139.91°W Sail 1: 9.53°S, 139.92°W  Drift 2: 9.38°S, 139.82°W 9.39°S, 139.84°W	At first light 0530, planned location 0710, to E coast Ua Pou, then thrice up / down coast 2.5–8.0 km offshore, then to 23 km E, then drift 1500, arbitrary location Overnight drift	ENE 15 kt
04 Oct	16 km SE of Ua Pou Sail 1: 9.40°S, 139.87°W  Motu Oa, S Ua Pou 9.47°S, 140.05°W	At first light 0700, to E coast Ua Pou, then up / down coast four times 2.5–8.0 km offshore, then drift near Motu Oa 1730, observing the evening seabird return to islet Overnight sail 22 km NE, then drift	ENE 15 kt
05 Oct	16 km E of Ua Pou Drift 1: 9.40°S, 139.87°W Sail 1: 9.53°S, 139.92°W Motu Mokohe, N Ua Pou 9.36°S, 140.00°W	At first light 0530, planned location 0710, to E coast Ua Pou, then thrice up / down coast 2.5–8.0 km offshore 1730, observing the evening seabird return to islet Overnight sail 16 km N	ENE 20–25 kt
06 Oct	32 km SSE of Nuku Hiva Drift 1: 9.21°S, 140.01°W Sail 1: 9.21°S, 140.03°W Drift 2: 9.06°S, 140.00°W Sail 2: 9.07°S, 140.02°W 8.92°S, 140.10°W	At first light 0530, planned location 0800, 16 km N, then drift 1200, planned location 1500, N to Taioha'e, Nuku Hiva 1700, arrive Taioha'e, Nuku Hiva	E 15–20 kt

## RESULTS AND DISCUSSION

### TUBENOSES

#### WILSON'S STORM-PETREL *Oceanites oceanicus*

**Status Marquesas Islands** Seasonally regular in small numbers.

**Sightings** Two birds in total. **22 September Sail 1** Two over oily wash while sailing.

**Range** Transequatorial passage migrant in French Polynesia from Antarctic and subantarctic breeding grounds; northward migration April–May, southward migration October–November (Thibault & Cibois 2017). Non-breeders, mainly birds in their first year, to be expected in the tropical region during the breeding season, December–March (as tropical Atlantic Ocean; Flood & Fisher 2013). Seasonally regular in small numbers in East Polynesia, though a distinct paucity of records in the southeast quadrant (Thibault & Cibois 2017, Flood & Zufelt 2021). Rare in Melanesia and West Polynesia (Watling 2004, Dutson 2011). In Hawaiian Islands, scarce in the northwest and rare in the southeast (Pyle & Pyle 2009). Non-breeders were observed from a ship, travelling from Marquesas Islands to Society Islands, at a rate of three to five per day in February 1990, 'but never farther south' (V. Bretagnolle *in litt.*). Not reported in Marquesas on eBird. Paucity of records presumably at least in part due to minimal observational and chumming effort.

**Recognition, behaviour, taxonomy, variation, moult, & conservation** See Flood & Zufelt (2021).

#### WHITE-FACED STORM-PETREL *Pelagodroma marina*

**Status Marquesas Islands** Rare visitor.

**Sightings** Just one bird. **25 September Drift 2** One over oil slick while drifting. The first record for Marquesas.

**Range** Breeders from Australasia (*albiclunis*, *dulciae*, *maoriana*) are presumed to pass through French Polynesia during the non-breeding season, April–September, given that good numbers reach the west coast of South America (Spear & Ainley 2007). Non-breeders, mainly birds in their first year, are to be expected in French Polynesia during the breeding season, October–March. A total of 53 or so previously documented records for East Polynesia (Thibault & Cibois 2017, Flood & Zufelt 2021, Flood *et al.* 2021). However, just one previously documented record in the northern sector (Line Islands, Marquesas Islands, and Northern Cook



Islands) involving an undated at-sea sighting near Jarvis, Line Islands (King 1967). Several birds reported on eBird for the northern sector of French Polynesia, but none for Marquesas. Presumably, Marquesas is north of the main passage from / to Australasia to / from the west coast of South America.

**Recognition, behaviour, taxonomy, variation, moult, & conservation** See Flood & Zufelt (2021).

**WHITE-BELLIED STORM-PETREL** *Fregetta grallaria*

**Status Marquesas Islands** Widespread in small numbers (taxon / taxa unknown).

**Sightings** Four birds in total. Either over oil slick while drifting or oily wash while sailing. **22 September Drift 1** One. **23 September Drift 1** One. **25 September Drift 1** One. **30 September Sail 1** One. These four birds are the first documented records for Marquesas (except for a few on eBird).

**Range** Titan Storm-Petrel *F. [g.] titan* is an endemic breeder of Rapa Island and Marotiri Rocks, Austral Islands, but its distribution away from the breeding islands is virtually unknown (Flood & Zufelt 2021, Flood *et al.* 2021). In the Pacific, *F. [g.] segethi* breeds on Juan Fernández and Desventuradas Islands to the east, and the nominate form breeds on Lord Howe and Kermadec Islands to the west. In East Polynesia, widespread in small numbers, though taxa other than *F. [g.] titan* unknown and there is evidence of multiple taxa (Flood *et al.* 2021). A few at-sea records reported on eBird for Nuku Hiva and Fatu Hiva lack full documentation. Paucity of records presumably at least in part due to little observational and chumming effort.

**Recognition** Introduction to the process of recognition is presented in Flood *et al.* (2021). Here we consider the four Marquesan birds in terms of size judgement and breadth of fringes to the scapulars, mantle to rump, and upperwing greater, median and longest lesser secondary coverts. Broad white fringes *and* relatively large size are diagnostic of *F. [g.] titan*, though broad fringes are also characteristic of the smaller *F. [g.] segethi*.

**22 September** Size judgement difficult as the bird spent little time near to the yacht, plus nearly two years had passed since our previous observations of White-bellied Storm-Petrels (a study of *F. [g.] titan*). However, this bird not obviously large. Plumage fairly fresh. Mid-depth white fringes and no sign of remnant broad fringes.

**23 September** Not obviously large. Plumage fairly worn. Mid-depth white fringes and no sign of remnant broad fringes. **25 September** Not obviously large. Plumage fairly worn. Narrowish white fringes and no sign of remnant broad fringes. **30 September** Not obviously large. Fairly worn. Generally mid-depth fringes with remnants of broad white fringes, especially to scapulars and mantle to rump.

**Assessment** None considered large enough to be *F. [g.] titan* for the following reason. Off Rapa, we noticed that *F. [g.] titan* approached the size of the local population of Polynesian Storm-Petrel (hence ‘*titan*’!). However, the Marquesan Polynesian Storm-Petrel population is known to be smaller than the Austral Islands population (Holyoak & Thibault 1984). So, a *F. [g.] titan* observed side by side with the relatively small-sized population of Marquesan Polynesian Storm-Petrel should look strikingly large, but they did not.

**Behaviour, taxonomy, variation, moult, & conservation** See Flood & Zufelt (2021) and Flood *et al.* (2021).



**Figures 3–6 (top left to bottom right).** White-bellied Storm-Petrels *Fregetta grallaria*, 2021, Marquesas Islands: respectively, 22 September, 23 September (*Shoko Tanoi*); 25 September, 30 September (*Kirk Zufelt*).

**STREAKED STORM-PETREL** *Fregetta* sp.

‘Streaked storm-petrel’ refers to black-and-white storm-petrels distinctly marked with dark streaks on a white belly. Streaked storm-petrel discoveries and taxonomic deliberations are documented in numerous publications (e.g., Murphy & Snyder 1952, Flood 2003, Saville *et al.* 2003, Howell & Collins 2008, Stephenson *et al.* 2008, Robertson *et al.* 2011, Cibois *et al.* 2015, Robertson *et al.* 2016, Flood & Wilson 2017, Bretagnolle *et al.* 2022).

**Status Marquesas Islands** See ‘General discussion’.

**Sightings** None.



**Figure 7.** Streaked storm-petrel, collected 14–16 September 1922, Ua Pou, Marquesas Islands (*Angus Wilson*). This specimen bears strong resemblance to a specimen collected at Samoa in November 1839 and, since 2008, birds photographed at sea off New Caledonia and in the Coral Sea, off Australia.

September and ashore at Nuku Hiva on 16 September (Beck 1922, Bryan 1969). The skin is held at AMNH (AMNH 194110). DNA studies reveal that the specimen is closely allied to *Fregetta* [g.] *titan* (Cibois *et al.* 2015). Subfossil bones of *Fregetta* storm-petrels have been found on two of the Marquesas Islands – Ua Huka and Tahuata (Cibois *et al.* 2015) – supporting the theory of a former local breeding population that could have survived in small numbers to the modern day. However, none was seen despite a complete circumnavigation of the islands with continual daytime dripping of fish oil that attracted numerous storm-petrels of six species. See Bretagnolle *et al.* (2022) for discussion and resolution of the Marquesan streaked storm-petrel mystery.

**POLYNESIAN STORM-PETREL** *Nesofregetta fuliginosa*

**Status Marquesas Islands** Widespread breeder, least frequently encountered in the far southwest region, west of the line Fatu Hiva to Tahuata.

**Sightings** A total of at least 266 birds. All were light morph. Either over oil slick while drifting or oily wash while sailing. **19 September** Sail 1 One. **20 September** Sail 1 10. Drift 1 15–20. Sail 2 At least 10. **21 September** Sail 1 Eight. Drift 1 10. Sail 2 Seven. Drift 2 20–30. **22 September** Drift 1 Four. Sail 1 Three.



**Figure 8.** Light-morph Polynesian Storm-Petrel *Nesofregetta fuliginosa*, 02 October 2021, Marquesas Islands (*Kirk Zufelt*).

**General discussion** One of the main aims of the expedition was to search for the mythical Marquesan streaked storm-petrel. A streaked storm-petrel was collected in the region of Ua Pou by Rollo Beck on 15 September 1922 (Figure 7; Beck 1922, Murphy & Snyder 1952), with one (possibly two) observed *ca.* 25 km southwest of Fatu Hiva over a chum slick on 30 September 2013 (Flood & Wilson 2017). The 1922 storm-petrel presumably was collected at sea, somewhere between the south of Ua Pou and Nuku Hiva, as documents record the expedition anchored south of Ua Pou on 14

Drift 2 Three. **23 September** Drift 1 20–25. Sail 1 Eight. Drift 2 15–20. **24 September** Drift 1 Three. Sail 1 Five to eight. Sail 2 Five. Drift 2 Five. **25 September** Drift 1 Nine. Drift 2 Three. **26 September** Drift 1 12. Sail 1 Four. Sail 2 Four. **28 September** Drift 1 One. **29 September** Sail 1 One. **30 September** Sail 1 Four. Drift 2 15. **01 October** Drift 1 Three. Sail 1 Three. Drift 2 One. **02 October** Sail 1 Eight. Drift 1 Seven. **03 October** Sail 1 Four. Drift 2 18. **04 October** Sail 1 Seven. **05 October** Drift 1 Two. **06 October** Drift 1 Three. Sail 1 Four. Drift 2 One.

**Range** Knowledge on the past and present breeding ranges in East Polynesia is incomplete and about 60% of data has been obtained since the year 2000, with breeding or possible breeding currently known on only 17 islands (Thibault & Cibois 2017). In the northern region, breeding is restricted to the Line Islands and Marquesas Islands. For Marquesas, Thibault & Cibois (2017) name four islands where breeding occurs and two where it possibly occurs. During the expedition, notable concentrations were encountered around Eiao and Hatutaa, southeast of Fatu Hiva, Fatu Huku, and off Ua Pou. A number of island populations evidently remain intact to some degree. Interestingly, Thibault & Cibois (2017) state that the population on Motu Tui, Fatu Hiva, is probably extinct, though we found a concentration of birds 24 km to the southeast and eBird shows several records off Fatu Hiva, giving some hope that a remnant islet population survives. Recorded every day except 27 September, with only singles on 28 and 29 September in the southwest region of Marquesas, to the west of the line Fatu Hiva to Tahuata. The total number of birds recorded during the expedition is 266–294, which is a significant addition to the 39 or so previously documented at-sea records for Marquesas. The expedition data provides an up-to-date guide to the at-sea distribution of *N. fuliginosa* within the islands.

**Recognition, behaviour, taxonomy, variation, & moult** As Flood & Zufelt (2021).

**Conservation** Endangered (IUCN Red List of Threatened Species). Marquesas clearly is an important stronghold for this species in French Polynesia.

**LEACH'S STORM-PETREL** *Hydrobates leucorhous*

**Status Marquesas Islands** Seasonally quite common.

**Sightings** Two birds in total. Over oil slick while drifting. **25 September Drift 1** One. **26 September Drift 1** One.

**Range** The nominate form considered here occurs in the Atlantic and Pacific. In the Pacific, breeds Japan, Aleutian Islands, and Alaska (May–October); non-breeding period mainly in the equatorial zone of the Pacific, farther south in the East Pacific (Spear & Ainley 2007, Howell & Zufelt 2019, eBird). Rare in Melanesia (Dutson 2011). Visitor in East Polynesia, at times quite common, though nothing specific mentioned for Marquesas (Thibault & Cibois 2017). A few records west and southwest of Marquesas on eBird. Density decreases from South America to 160°W and 27°S in the central Pacific (Pitman 1986, Spear & Ainley 2007).

**Recognition** A medium-sized black-and-white storm-petrel. Ground colour blackish-brown, with a distinct buff upperwing ulnar bar; and white rump patch longer than broad, often with a dark divide in the centre, white folding over a short way to the underside. Long and narrow wings, wings angled at the carpal joint, scooped and forked tail. Flight buoyant like a marsh tern *Chlidonias*.



**Figure 9.** Leach's Storm-Petrel *Hydrobates leucorhous*, 26 September 2021, Marquesas Islands (*Shoko Tanoi*). Primary moult has reached p7 / p8. On this date, presumably completing the second prebasic moult, with completion expected October–December.

**Behaviour** Explored the oil slick in easy loping flight and collected food by foot-pattering (as described in Flood & Fisher 2013).

**Taxonomy, variation, & moult** Polytypic, with *H. l. chapmani* breeding off Baja California and apparently somewhat sedentary. No indication of morphological differences between the two birds observed in Marquesas and elsewhere in the central Pacific and Atlantic. One bird in primary moult.

**Conservation** Vulnerable (IUCN Red List of Threatened Species). Quite common in regional equatorial waters, which therefore are important to the species.

**BAND-RUMPED STORM-PETREL** *Thalobata castro* (*sensu lato*)

**Status Marquesas Islands** Uncertain. Probably a scarce visitor in the South Equatorial Current, though local breeding is worthy of consideration.

**Sightings** Two birds in total. Either over oil slick while drifting or oily wash while sailing. **26 September Drift 1** One, in primary moult with ragged old remiges (see variation and moult below). **27 September Sail 1** One, apparently moderately worn plumage (but poor photographs).

**Range** The *castro*-complex has known representatives in the North and South Atlantic and Pacific, and unknown populations could occur in the Pacific. Several populations have been formally described as species

and it is likely that some / many of the remaining populations will follow suit. In the Pacific, breeding occurs in Japan (June–November), the Hawaiian Islands (May–November), and the Galapagos Islands (two seasonal populations, May–October, December–May). Range at sea away from these breeding sites is poorly known, but it is likely that populations disperse into the tropical and subtropical Pacific from their breeding sites. In East Polynesia, the Pacific Ocean Biological Survey Program recorded *T. castro* several times in the 1960s, from 120°W to Marquesas (Thibault & Cibois 2017). Recorded six times in the Line Islands (Crossin 1974, pp. 178–179). Recorded over the South Equatorial Current in the region of Line and Marquesas 1980–1995 (Spear & Ainley 2007, pp. 35–37). No more documented records until at least two observed at dusk in October 2017 while sailing south from Nuku Hiva, Marquesas (Morris & Beaman 2017). Recorded off Nuku Hiva on eBird. Distances from the nearest breeding sites of the *castro*-complex, the Hawaiian Islands, to Kiribati, Line Islands, is *ca.* 2,000 km, and to Nuku Hiva, Marquesas, *ca.* 3,700 km. The distance to the Galapagos Islands is over 5,000 km. Thus, while it is known that storm-petrels travel such distances, the alternative possibility of local breeding should be borne in mind.

**Recognition** See Flood & Zufelt (2021).

**Behaviour** Appeared rather suddenly over the fish oil. The first bird appeared / behaved surprisingly like *H. leucorhous*, with buoyant flight behaviour. This was a timely reminder that the *castro*-complex can be confused with *H. leucorhous*, in particular taxa such as the recently described Monteiro’s Storm-Petrel *T. monteiroi* with its bold upperwing ulnar bars and forked tail (Flood & Fisher 2013). More generally, though, our two *T. castro* explored the slick mainly in a regular and measured flight, with stiff, shallow wingbeats, and a mixture of short and long sailing glides. Collected food by foot-pattering in a characteristic ‘clumsy-looking manner’, whereas *H. leucorhous* often appears to hang effortlessly over a food source. Overall, contrasts with the truly buoyant, unpredictable, and irregular marsh tern-like flight of *H. leucorhous*.

**Taxonomy, variation, & moult** Taxonomy of the *castro*-complex is not resolved (see Howell & Zufelt 2019, Flood *et al.* 2021). Flood & Fisher (2013) discuss variation in the *castro*-complex. The bird on 27 September was not photographed well enough for analysis. Details of the individual photographed on 26 September may be useful to future studies of taxa in the Pacific. It had recently commenced primary moult with p4–p10 old, p1 / p2 growing, the rest missing / growing. Tips to p4–p10 notably frayed. Tips to rectrices frayed. Long central uppertail-coverts had thick dark tips and the next innermost pair were finely dark-tipped. Frayed tips to old primaries and rectrices suggests weaker juvenile feathers and one possibility is that the two *T. castro* were of the same population, with the moulting bird in its second prebasic moult and the other bird older and thus not yet in moult. Head and body had admixed fresh brownish-black and old bleached brown feathers. The ulnar bars also comprised admixed new / old feathers and were fairly dull in the field. The underbody was uniformly browner than the greyish-black head and neck, giving a hooded appearance when viewed from the underside. The white ‘rump patch’ ‘folded over’ to the underside, reaching about 50% of the way to an ‘imaginary’ line drawn along the central underbody.

**Conservation** Least Concern if treated as one species (IUCN Red List of Threatened Species). However, if considered separately, most distinct populations would be treated as more threatened, some Critically Endangered (e.g., Japanese population now estimated at less than 50 pairs). Sightings listed here are extremely important and relevant to conservation given limited knowledge about the at-sea range of different populations, the Japanese population crash, and the possibility of an undiscovered population or populations in the tropical and subtropical Pacific. Taxonomic recognition of birds in East Polynesia requires confirmation to eliminate a threatened taxon.

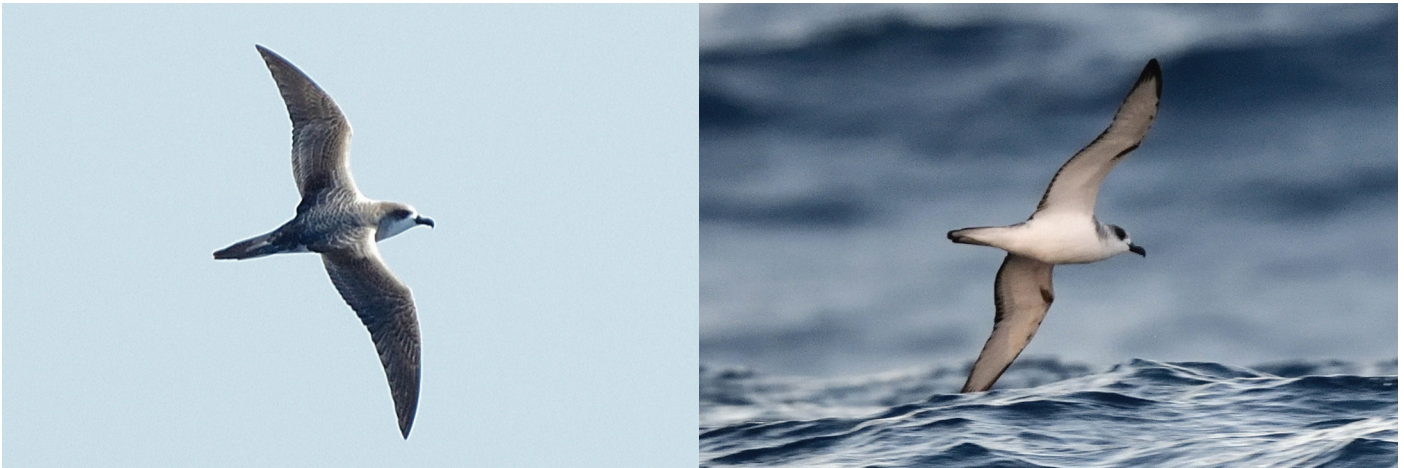


**Figures 10–11 (left to right).** Band-rumped Storm-Petrel *Thalobata castro* (*sensu lato*), 26 September 2021, Marquesas Islands (Kirk Zufelt). Recently commenced primary moult, with p4–p10 old, p1 / p2 growing, the rest missing / growing. The tips to p4–p10 are notably frayed. Note dull ulnar bar and squared-off tail end.

**JUAN FERNÁNDEZ PETREL** *Pterodroma externa*

**Status Marquesas Islands** Seasonally fairly regular, perhaps occasionally quite common.

**Sightings** Four birds in total. **25 September** Drift 1 One. Drift 2 One. **02 October** Drift 1 One. **03 October** Drift 1 One.



**Figures 12–13 (left to right).** Juan Fernández Petrels *Pterodroma externa*, respectively, 25 September 2021 and 02 October 2021 (respectively, Kirk Zufelt and Shoko Tanoi).

**Range** Endemic breeder of the Juan Fernández Islands, December–May (*ca.* one million pairs; Brooke 2004). Undertakes northward transequatorial migration post-breeding (HBWa 2021). Considered a vagrant to the central Pacific in the non-breeding period (Thibault & Cibois 2017). However, significant numbers reported here and in Flood & Zufelt (2021) and Flood *et al.* (2021), in six months spread across the calendar year, in numerous years, demonstrate that *P. externa* has a regular westward dispersal in mid-latitudes and should be included in these terms in future literature. Previous records in Marquesas involve one November 2018 just south of Fatu Huku (Simpson 2018) and, nearby, over 20 in October 2017 en route from Marquesas to Rangiroa, Tuamotu Islands (Morris & Beaman 2017). None on eBird for Marquesas.

**Variation & moult** No indication of morphological differences between *P. externa* observed in Marquesas and in the Juan Fernández Islands. None in primary moult.

**Recognition, behaviour, taxonomy, & conservation** See Flood *et al.* (2021).

**HERALD PETREL** *Pterodroma heraldica*

**Status Marquesas Islands** Year-round breeder, including rare intermediate and scarce dark morphs.

**Sightings** Total number of contacts 241, with 61 birds off Ua Pou and up to 10 others separable from photographs (not every bird was photographed and some photos lacked detail), with the actual number very roughly estimated at 150–200. Five dark morphs and one intermediate morph photographed. **21 September** Sail 1 One. **22 September** Sail 1 Three. **23 September** Drift 1 Two. Drift 2 One. **24 September** Drift 1 One. Drift 2 One. **25 September** Drift 1 Two. Sail 1 Two. **26 September** Drift 1 One. Sail 1 One. Sail 2 One. **27 September** Drift 1 Three. **28 September** Drift 1 Two. **30 September** Drift 1 One. Sail 1 Four. Drift 2 At least 22. **01 October** Drift 1 Two. Sail 1 18. Sail 2 Three. **02 October** Sail 1 21 (one dark morph). Drift 1 Three. **03 October** Drift 1 Three. Sail 1 28 (two dark morphs). Drift 2 Four. **04 October** Sail 1 55. **05 October** Drift 1 Two. Sail 1 48 (two dark morphs, one intermediate morph). **06 October** Drift 1 Three. Sail 1 Three.

**Range** Breeds year-round across the Pacific, from Queensland, Australia, in the west, to Easter Island in the east (HANZAB 1990). Range reflected by records on eBird. Marquesas hold an important breeding population: Ua Pou 800–1,200 pairs, Tahuata 300–400 pairs, and behaviour suggesting breeding on Fatu Hiva; possibly an occasional breeder on Hatutaa, Hiva Oa, and Ua Huka (Thibault & Cibois 2017). During the expedition, seen every day except 29 September (morning at anchor, Vaitahu, Tahuata). The only sizeable daily counts (18–55 birds) were near or adjacent to the east side of Ua Pou, underlining the importance of the island's population. No obvious concentration on the west side of Tahuata, the other island with a sizeable breeding population. Otherwise, daily counts were modest, between one and four, stretching across the islands, supporting the idea of widespread breeding in small numbers. The few eBird reports concentrated around Ua Pou and Nuku Hiva.

**Recognition** The light morph has a warm, light greyish-brown ground colour (upperside, head and neck). It has a whitish noseband and throat patch, suffused dark breast band, and whitish lower breast to undertail-coverts, some with dark-smudged flanks and undertail-coverts. The underwing pattern essentially comprises white tongues basally in the inner web of the primaries, extending 25%–75% the length of the visible primary, and a white crescent basally across greater primary coverts (Thibault & Cibois 2017). The marginal forewing

lining is variably chequered white and dark (from largely white, to largely dark). Variation is illustrated in Figures 16–27. The upperwing primary shafts are dark (*cf.* whitish in similar-plumaged Kermadec Petrel *P. neglecta*). For details of dark-morph plumage see Flood *et al.* (subm.). Briefly, the ground colour is darker than the light morph and the underbody is dark with a subtle ghosting of the light-morph plumage. The underbody of the intermediate morph shows a strong ghosting of the light-morph plumage.

**Behaviour** Most birds encountered at Ua Pou, where they frequented the coastline 2.5–8.0 km offshore (fewer birds by 8.0 km). Individuals at sea showed little interest in the fish oil or travelling yacht. Rather, birds continued in typical *Pterodroma* travelling flight behaviour, only flying close to the yacht perchance.

**Taxonomy, variation, & moult** Monotypic. *P. heraldica* once considered the Pacific race of Trindade Petrel *P. arminjoniana*, but a split into two species is generally accepted. A further split of *P. heraldica* into two species is also generally accepted – *P. heraldica* and the dark-plumaged Henderson Petrel *P. atrata*, which breeds on Henderson Island, Pitcairn Group. Details of these taxonomic developments in Flood *et al.* (subm.). Notwithstanding this split, museum specimens and sightings at colony confirm that *P. heraldica* is polymorphic, with light morph by far the most common morph, dark morph scarce and localised, and intermediate morph rare. Plumage variation of the dark morph has yet to be fully documented as there are no photographs of live birds and the underwings are not accessible in museum specimens. Five dark morph and one intermediate morph were photographed during the expedition and subsequently studied in detail. This core finding of the expedition will be published in Flood *et al.* (subm.).

None in primary moult. Breeding year-round and moult undertaken outside of breeding season, indicating mainly / only breeders present in Marquesas during the expedition.

**Conservation** Near Threatened (IUCN Red List of Threatened Species). The Marquesas holds an important breeding population, with Ua Pou the main breeding island. Clearly, this population will benefit from continued protection. Furthermore, based on current knowledge, Ua Pou has added importance with the greatest number of known dark morphs in recent times.



**Figures 14–17 (top left to bottom right).** Herald Petrels *Pterodroma heraldica*, 01–05 October 2021, near or adjacent to east coast of Ua Pou, Marquesas Islands (*Kirk Zufelt*). Illustrating general plumage variation from dark to light: respectively, dark morph, intermediate morph, ‘dark’ light morph, and ‘light’ light morph.



**Figures 18–27 (top left to bottom right).** Light-morph Herald Petrels *Pterodroma heraldica*, 01–05 October 2021, near or adjacent to east coast of Ua Pou, Marquesas Islands (Kirk Zufelt). Five main plumage characteristics of light morph (rotated photos better illustrate characteristic of interest). Each row compares two extremes of variation of one plumage characteristic (darkest left, lightest right). For each characteristic, the range between the two extremes was roughly divided into three equal-sized categories: darkest, intermediate, lightest. The number of birds that fell into each category is given below as a percentage to nearest whole number ( $n = 56$ ). **Top row** Extent of neck collar, from broad to narrower and indistinct – 41%, 46%, 13%. **Second row** Extent of white basally in under primaries, from least to most white – 16%, 52%, 32%. **Third row** Extent of white basally in greater under primary-coverts, from least to most white – 14%, 45%, 41%. **Fourth row** Extent of white in forewing linings, from narrow and heavily chequered dark, to broad and largely white – 48%, 43%, 9%. **Fifth row** Extent of dark markings over the flanks and undertail-coverts, from heavily marked and dirty-looking, to unmarked and clean-looking; flanks – 12%, 59%, 29%; undertail-coverts – 31%, 39%, 30%.

**PHOENIX PETREL** *Pterodroma alba*

**Status Marquesas Islands** Scarce year-round breeder.

**Sightings** Three birds in total, a surprisingly low number, and found only in the southern group of islands. **25 September** Sail 1 One. **02 October** Sail 1 One. **04 October** Sail 1 One.

**Range** Breeds year-round in the Phoenix, Line, Marquesas, and possibly Pitcairn Islands (may have once bred on Samoa and Tonga). Disperses in the tropical Pacific. In Marquesas, distributed across the small islands Motu Iti, Hatutaa (where most pairs breed), Fata Uku, and the islets off Ua Pou, Motu Mokohe, and Motu Oa (Thibault & Cibois 2017). A small number of records on eBird for northern Marquesas, off Nuku Hiva and Ua Huka, and southern Marquesas, off Tahuata and Fatu Hiva.

**Recognition** Most like the light-morph *P. heraldica* in structure and plumage. However, it differs by its dark chocolate-brown ground colour, ‘all-dark’ underwings except for a variably chequered marginal forewing lining, and essentially white undertail-coverts.

**Behaviour** Individuals at sea showed no interest in the fish oil or travelling yacht. Rather, the three birds were encountered by chance as their flight trajectory crossed our route. Typical *Pterodroma* flight.

**Taxonomy, variation, & moult** Monotypic, though genetically close to Herald Petrel, Henderson Petrel, and Trindade Petrel (Brooke 2004, Thibault & Cibois 2017). No indication of morphological differences with birds seen elsewhere in the central South Pacific. None in primary moult.

**Conservation** Endangered (IUCN Red List of Threatened Species). Breeding restricted to a small number of localities and the main population on Kiritimati, Line Islands, most recently estimated at 2,300–3,800 pairs, down from 12,000 pairs in the 1970s–1980s due to cat and rat predation (Brooke 2004, Pierce *et al.* 2007, Thibault & Cibois 2017). The small number that breeds in Marquesas, mainly on Hatutaa (Thibault & Cibois 2017), thus is an important secondary population and requires strong conservation measures. The small number observed during the expedition is of concern but might be explained by the breeding schedule. Breeding timing in Marquesas is not well understood, though two laying periods are known and the expedition dates late September into October are during the fledging period of one, and possibly the pre-laying exodus of the other (V. Bretagnolle *in litt.* 2022).



**Figures 28–31 (top left to bottom right).** Phoenix Petrels *Pterodroma alba*, one bird 02 October 2021 (top row) and one bird 04 October 2021 (bottom row), near or adjacent to east coast of Ua Pou, Marquesas Islands (*Shoko Tanoi*). Only three *P. alba* were found throughout the whole of the expedition, which is rather surprising. All *Pterodroma* petrels within range were photographed and ID checked and so we are confident in our count.



**GOULD'S PETREL** *Pterodroma leucoptera*

**Status Marquesas Islands** Seasonally regular in small numbers.

**Sightings** Three birds in total. **26 September** Drift 1 Two. **02 October** Sail 1 One.

**Range** Nominate form breeds late November to April off central New South Wales, Australia (*ca.* 1,000 pairs; Priddel & Carlile 2007, 2009); *P. [l.] caledonica* breeds on New Caledonia (1,000–10,000 pairs, Brooke 2004; 5,000–7,000 pairs, Bretagnolle *et al.* 2021). Non-breeding range extends to the tropical east Pacific (Priddel *et al.* 2014, Rayner *et al.* 2016). There are four or more documented records for Marquesas and adjacent waters (Flood & Zufelt 2021): one off Hatutaa 22 September 2019 (Talbot 2019); one sometime 13–16 October 2019 (Gibbons 2019); one between Hiva Oa and Fatu Hiva 25 November 2018 (Simpson 2018); one photographed and several other *Pterodroma* petrels considered this species, between Fatu Hiva and Rangiroa, Tuamotu Islands (Morris & Beaman 2017). None on eBird for Marquesas.

**Recognition, behaviour, taxonomy, variation, moult, & conservation** See Flood & Zufelt (2021) and Flood *et al.* (2021).



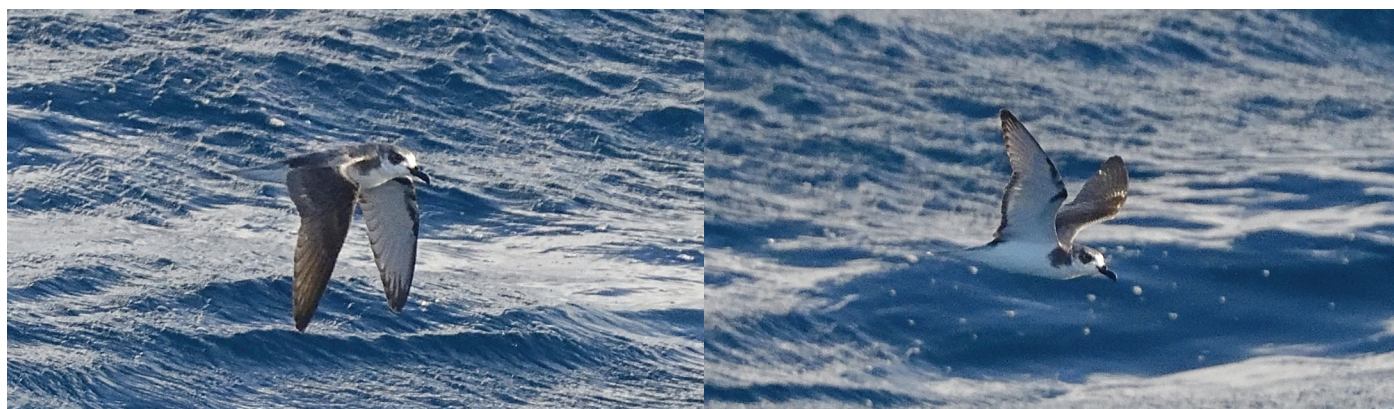
**Figures 32–33 (left to right).** Gould's Petrels *Pterodroma leucoptera*, 26 September 2021 (left), 02 October 2021 (right) near or adjacent to east coast of Ua Pou, Marquesas Islands (Kirk Zufelt). Seasonally regular in small numbers, though taxon involved unknown.

**DE FILIPPI'S PETREL** *Pterodroma defilippiana*

**Status Marquesas Islands** Probably a vagrant.

**Sightings** Just the one bird, which is a first for French Polynesia. **06 October** Drift 1 One.

**Range** Breeds Juan Fernández Islands and Desventuradas Islands, off central Chile, July–December. At-sea range thought to be broadly within the Humboldt Current region, from Peru south to central Chile, March–October (Howell & Zufelt 2019), supported by records on eBird, and the species is considered fairly sedentary (Brooke 2004). However, expeditions to the Juan Fernández Islands found birds foraging over a variety of marine habitats and thus they could wander widely (Shirihai *et al.* 2016, Flood *et al.* 2017). The sighting in Marquesas was completely unexpected and hints that a small proportion of the population could be involved in a westward dispersal into the central Pacific, but of course the bird may have been no more than a lone vagrant. Whichever, this is the first confirmed record in the region and *P. defilippiana* should be added to the list of avifauna for Marquesas and French Polynesia.



**Figures 34–35 (left to right).** De Filippi's Petrel *Pterodroma defilippiana*, 06 October 2021, Marquesas Islands (Shoko Tanoi). First record for French Polynesia, *ca.* 5,000 km west of known range.

**Recognition** A reasonably distinctive *Cookilaria* petrel (subgenus). Relatively well built, long-bodied, broad-winged, with a characteristic long blackish bill. Key plumage features include a blackish eye patch in strong contrast with a broad white fore supercilium and mid-grey crown and nape. It is the sole *Cookilaria* to lack a contrasting dark / blackish tip to the uppertail. Also, its flight behaviour is distinctive (see below).

**Behaviour** In the Juan Fernández Islands we noted that behaviour differs notably from that of other *Cookilaria* petrels, the birds being very curious with the splashers, more inclined to linger in the wake, and more willing to come close to the vessel (Flood *et al.* 2017). The bird south of Nuku Hiva on 06 October behaved in just that manner over the oil slick while drifting. It first appeared over the oil slick close to the yacht and proceeded to make a close and thorough inspection of the slick.

**Taxonomy, variation, & moult** Monotypic. The single bird showed no morphological differences from birds seen off Juan Fernández Islands. Not in primary moult.

**Conservation** Vulnerable (IUCN Red List of Threatened Species). Apparently, Marquesas is not important for this species, but this requires review given future surveys in the region.

**COOKILARIA sp.** *Pterodroma* sp.

**Sightings** **21 September Sail 1** One Cook's *P. cookii* / Pycroft's *P. pycrofti*. **25 September Sail 1** One Cook's / Pycroft's. **02 October Sail 1** One, though distant.

**TAHITI PETREL** *Pseudobulweria rostrata*

**Status Marquesas Islands** Breeds on all islands except Eiao, Fata Uku, Hatutaa, Moti Iti, and Mohotani. Population less than several thousand pairs (Thibault & Cibois 2017), less than 500 pairs (Brooke 2004).

**Sightings** Widespread with a total of at least 215 birds. Our sightings reflect records on eBird. **19 September Sail 1** Three. **20 September Sail 2** Eight. **21 September Drift 1** Three. **22 September Drift 1** Two. **23 September Drift 1** Eight. **Sail 1** Six. **Drift 2** Eight. **25 September Drift 1** One. **Sail 1** Three. **Drift 2** 12. **26 September Drift 1** 10. **Sail 1** One. **Sail 2** Six. **Drift 2** 14. **27 September Drift 1** 14. **Sail 1** Six. **Drift 2** 30. **28 September Drift 1** 16. **Sail 1** Nine. **29 September Sail 1** Three. **Drift 1** 15. **30 September Drift 1** Three. **Sail 1** Eight. **Drift 2** Eight. **01 October Drift 2** One. **Sail 2** Four. **02 October Sail 1** Four. **Drift 1** Eight. **03 October Sail 1** One.

**Range, recognition, behaviour, taxonomy, variation, moult, & conservation** One bird with a white median underwing stripe on 30 September. For other information see Flood & Zufelt (2021) and Flood *et al.* (2021).



**Figure 36.** Tahiti Petrel *Pseudobulweria rostrata*, 03 October 2021, Marquesas Islands (Kirk Zufelt). ‘Classic’ portrayal of the species.

**WEDGE-TAILED SHEARWATER** *Ardenna pacifica*

**Status Marquesas Islands** Breeding known at a few localities (Thibault & Cibois 2017). Fairly scarce at sea.

**Sightings** All dark morph. An unexpectedly low total of 29 birds. **20 September Sail 1** One when we were heading out to sea. **23 September Drift 1** One. **Sail 1** One. **25 September Drift 1** 14, six of which in feeding frenzy. **26 September Drift 1** Two. **27 September Drift 1** Two. **Drift 2** Three. **28 September Drift 1** One. **Sail 1** One. **05 October Drift 1** One. **06 October Drift 1** Two.

**Range** Breeds Pacific and South Indian Oceans, with season varying between populations (*ca.* 5.2 million birds; Brooke 2004), tropical populations largely sedentary, others migrate to the tropics. Thibault & Cibois (2017) observe that 1,000–1,600 pairs on Motu Iti (Champeau *et al.* 2011) seems an overestimate compared to the low number found during a more recent survey (Waugh *et al.* ms). The current expedition found no birds in this region, despite close observation of several mega feeding frenzies in which *A. pacifica* would normally be expected (as occurred elsewhere during the expedition). None recorded there on eBird. Documented records for Marquesas (in Flood & Zufelt 2021) are routine sightings of a few to 12 birds during sea crossings between Hiva Oa and Fatu Hiva in October and November (Scott 2014, Morris & Beaman 2017, Simpson 2018) and, of particular note, in April 2014 at dusk hundreds were offshore Fatu Hiva (Millar 2014). Thus, it is worth emphasising that the largest number of birds found during the expedition was 14 birds on 25 September, to the north of Fatu Hiva. Several records on eBird for Nuku Hiva and in the region of Hiva Oa and Fatu Hiva.

**Recognition, behaviour, taxonomy, variation, moult, & conservation** See Flood & Zufelt (2021) and Flood *et al.* (2021).

**SOOTY SHEARWATER** *Ardenna grisea*

**Status Marquesas Islands** Seasonally regular in small numbers.

**Sightings** Two birds in total. **01 October** Drift 1 One. **05 October** Sail 1 One.

**Range** Breeds November–April, southeast Australia and New Zealand, and southern South America and the Falkland Islands. At least 20 million birds, vast majority in Pacific, though recent significant decline (Brooke 2004). Transequatorial migrant in non-breeding season in Atlantic and Pacific. Undertakes clockwise passage in Pacific. Documented records for Marquesas (in Flood & Zufelt 2021) are one between Fatu Hiva and Rangiroa, Tuamotu Islands, October / November 2017 (Morris & Beaman 2017) and six on 25 November 2018 between Fatu Hiva and Hiva Oa (Simpson 2018). No evidence of strong passage in this region. Reported on eBird only off Hiva Oa.

**Recognition, behaviour, taxonomy, variation, moult, & conservation** See Flood & Zufelt (2021) and Flood *et al.* (2021).

**CHRISTMAS SHEARWATER** *Ardenna nativitatis*

**Status Marquesas Islands** Breeds October–March in small numbers (Thibault & Cibois 2017) and observed at sea mostly in the region of two northern islands, Eiao and Hatutaa.

**Sightings** A total of 57 birds, with most concentrated near Hatutaa. **20 September** Sail 1 25. Drift 1 Three. Sail 2 20. **24 September** Drift 1 Five. Sail 1 Three. **03 October** Sail 1 One.

**Range** Two disparate breeding populations, respectively in the North and South Pacific. The southern population (*ca.* 50,000 pairs; Brooke 2004) breeds roughly October–March, from the Phoenix Islands to the Eastern Islands, East Polynesia (Thibault & Cibois 2017). In the non-breeding period migrates towards Middle America (Howell & Zufelt 2019). Documented records for Marquesas (in Flood & Zufelt 2021) are one 25 September 2013 at Hatutaa (Sargeant 2013) and one circling the boat landing site October 2017 at Hatutaa (Morris & Beaman 2017). Reported on eBird in the vicinity of Nuku Hiva and Hatutaa.

**Recognition, behaviour, taxonomy, variation, moult, & conservation** See Flood & Zufelt (2021) and Flood *et al.* (2021).

**POLYNESIAN SHEARWATER** *Puffinus [dichrous] polynesiae*

**Status Marquesas Islands** Probably sedentary, widespread at sea, and a fairly common breeder with main colonies on the neighbouring islands, Ua Pou and Ua Huka.

**Sightings** Widespread, seen all days except 27 September. A total of over 2,849 birds, though *ca.* 2,000 of these were in an evening gathering off Motu Oa, south end Ua Pou (along with a similar number of Bulwer's Petrels). **19 September** One. **20 September** Sail 1 10. Drift 1 15–20. Sail 2 At least 10. **21 September** Sail 1 Eight. Drift 1 10. Sail 2 Seven. Drift 2 20–30 (12 at one time). Sail 3 Three or four. Drift 1 Four. **22 September** Sail 1 Three. Drift 2 One. **23 September** Drift 1 20–25 (eight at once). Sail 1 Eight. Drift 2 15–20. **24 September** Drift 1 Three. Sail 1 Five to eight. Sail 2 Five. Drift 2 Five. **25 September** Drift 1 Nine. Drift 2 Three. **26 September** Drift 1 12. Sail 1 Four. Sail 2 Four. **28 September** Drift 1 One. **29 September** Sail 1 One. **30 September** Sail 1 Four. Drift 2 15. **01 October** Drift 1 10. Sail 1 20. Drift 2 10 (several small rafts). **02 October** Sail 1 Eight. Drift 1 Seven. **03 October** Sail 1 130. Drift 2 50. **04 October** Sail 1 2,100 (including evening gathering of *ca.* 2,000 birds). **05 October** Drift 1 100. Sail 1 200. **06 October** Drift 1 Three. Sail 1 Four. Drift 2 One.

**Range** Breeding phenology and at-sea range unknown, though most found near actual / possible breeding localities suggesting largely sedentary. Widely distributed in Marquesas with population estimates of several thousand pairs for Ua Pou and Ua Huka, at least several hundred pairs on Hatutaa, and around several hundred pairs on Motu Iti (Thibault & Cibois 2017). During the expedition, the largest concentrations at sea found near the neighbouring islands, Ua Pou and Ua Huka. Previous at-sea records (in Flood & Zufelt 2021) are broadly consistent with the expedition sightings. In 2012, two 09 July Ua Huka to Nuku Hiva, four 10 July Nuku Hiva to Ua Pou, eight 10 July sailing south from Ua Pou (van der Vliet & Zantingh 2012). Seen 26 September 2013 between Ua Huka and Tahuata (Sargeant 2013). Seen April 2014 between Hiva Oa and Fatu Hiva (Millar 2014). Four in November 2018 between Hiva Oa and Fatu Hiva (Simpson 2018). In 2019, *ca.* 50 on 21 September at Nuku Hiva, one 22 September off Hatutaa, and two 23 September off Ua Huka (Talbot 2019). Multiple reports on eBird from across the islands.

**Recognition** Easily picked out in the evening gathering on 04 October from the thousands of petrels by behaviour. Mainly actively / frantically foraging in tightly packed groups, typically numbering 20–50 birds, whereas the Bulwer's Petrels *Bulweria bulwerii*, which made up the bulk of the rest of the gathering, flew singly with typical easy, buoyant flight, generally milling around awaiting dark before returning to colony. **Plumage** Bicoloured, uniform blackish upperside in strong contrast to clean-white underside with craggy borders. Markings quite variable (see Figures 37–62). **Head & neck** Least marked 'white-faced' variation is

dark capped and has thick, largely white supercilium, fore-supercilium smudge, ear coverts with few dark markings, and few if any dark markings under eye. Most heavily marked ‘dark-faced’ variation is dark to below the eye, mask largely reaches the gape, may have narrow spectacles, ear coverts densely marked, can show shortish indistinct pale auricular crescent. Neck sides variable; greyish, mottled or barred blackish, more densely blackish on others, craggy margin with white foreneck about 50% of the way to the underside median body line. Overall, dark ‘falconer’s hood’ to well below the eye and over the hindneck. Much variation between the two extremes, with an intermediate variation having thickish though irregularly smudged supercilium, thick and dark posterior lores that join cap, whitish gap separating dark lores from gape, dark markings behind the eye, ear coverts fairly densely marked. *Upperwing* Age of individuals unknown. Freshest individual had whitish tips to upperwing greater secondary coverts, forming a whitish pencil line across inner wing, possibly with a hint of remnant buff tips to outermost median secondary coverts. At the other extreme, individuals had only a possible hint of remnant buff tips to the outermost greater secondary coverts. Intermediate cases had remnants of whitish tips to the outermost greater secondary coverts with the inner coverts showing buff tips, presumably the result of bleaching and wear. *Underwing* Clean-white coverts with variable markings. Blackish ‘thumb print’ at the underside of the shoulder. Marginal coverts dark. Least marked – most lesser primary coverts blackish forming a thick dark leading edge to the outer wing, while only the shortest lesser secondary coverts blackish forming a narrower dark leading edge to the inner wing. Short to long blackish ‘splayed’ fingers basally, typically in outermost eight median primary coverts, thicker and longer outwardly. Some show darker centres to the outermost one or two greater primary coverts. Small amount of dark markings in the longer lesser secondary coverts while greater secondary coverts light grey. Heaviest marked – largely dark coverts, with whitish (presumably) in inner webs of median greater coverts and amongst longest lesser and median secondary coverts (details not clear in photographs). Much variation between the two extremes, with an intermediate variation having a dark triangular wedge in the inner wing, with the base along the leading edge, and the apex in the longest lesser secondary coverts. Greater secondary coverts mid grey with a dark inner web. *Underside* Clean white. *Undertail* Variation in coverts from largely white to largely dark. Lateral undertail-coverts blackish with whitish fringes to tips. *White saddlebags* From none to small. *Legs & feet* Pinkish. *Bill* Bluish-grey, with variable smudgy dark patches on nasal tubes, latericorn, and unguis. *Moult & wear* Six birds photographed in early stages of primary moult late September (see below). Variation in extent of wear, from fairly fresh to quite worn (ages unknown). *Structure: Bill* Shortish and slender, with some variation in depth presumably reflecting sexual dimorphism and / or age differences. *Other* Photographs show significant plumage and structural differences between Tahitian and Marquesan populations of *Puffinus [dichrous] polynesiae*, with Marquesan birds having shorter bill and far more variable plumage characteristics, such as the amount of white in the face and dark in the underwing-coverts (see Table 2).

**Table 2.** Differences in plumages and bare parts of Marquesan *cf.* Tahitian populations of *Puffinus [dichrous] polynesiae* (details of latter in Flood & Zufelt 2021). Significant morphological differences found between the two populations (e.g., see Figures 37–42).

Feature	Tahitian	Marquesan
Bill	Dark with relatively little bluish-grey	Predominantly bluish-grey with variable dark smudging
Face	Only ‘dark-faced’	Range from ‘dark-faced’ to ‘light-faced’
Upperwing	Fresh plumage has whitish / buff tips to median and greater secondary coverts	Fresh plumage has whitish / buff tips to greater secondary coverts, uncertain about medians
Underwing	Heaviest marked roughly as intermediate Marquesan	Least marked as least-marked Tahitian, heaviest marked has largely dark coverts / underwing
Saddlebags	Typically, small and narrow	Some none, others small
Underside	A few individuals with randomly distributed dark feathers, giving a lightly spotted appearance	Unmarked
Primary moult	None in primary moult off Tahiti early November	Three in early stages primary moult mid to late September

**Moult** In the region of 5–10% of birds were in the early stages of primary moult (six photographed and analysed, e.g., Figures 53–54) and none were in advanced primary moult.

**Behaviour, taxonomy, variation, & conservation** See Flood & Zufelt (2021) and Flood *et al.* (2021). *Puffinus* taxonomy in the tropical Pacific is far from resolved. Currently, three taxa of the ‘Tropical Shearwater complex’ are recognised in the tropical west Pacific: *P. [d.] dichrous* (Micronesia), *P. [d.] polynesiae* (Polynesia), and *P. [d.] gunax* (Melanesia) (Austin *et al.* 2004, Howell & Zufelt 2019). Further work is required to establish the scale and importance of the large colony at Motu Oa, south end of Ua Pou, where *ca.* 2,000 birds gathered at dusk. This is a significant observation that invites a follow-up colony assessment.



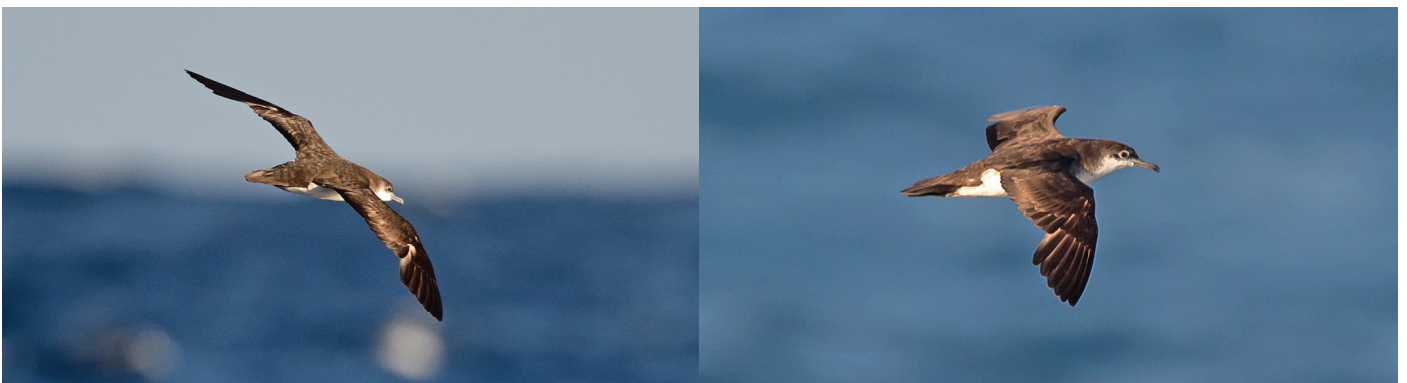
**Figures 37–42 (top left to bottom right).** Polynesian Shearwaters *Puffinus [dichrous] polynesiae* (Kirk Zufelt). **Top row** 19 November 2019, lagoon of Tahiti Iti, Tahiti, Society Islands, French Polynesia. **Bottom two rows** 03–05 October 2021, near or adjacent to east coast of Ua Pou, Marquesas Islands. The bill is longer in Tahitian *cf.* Marquesan populations (no overlap detected). The top row shows longest (left) and shortest (right) bills in birds photographed off Tahiti Iti. The middle row (right) shows longest bill in birds photographed off Ua Pou, with the remaining three images showing the more typical, relatively short bill of Marquesan birds.



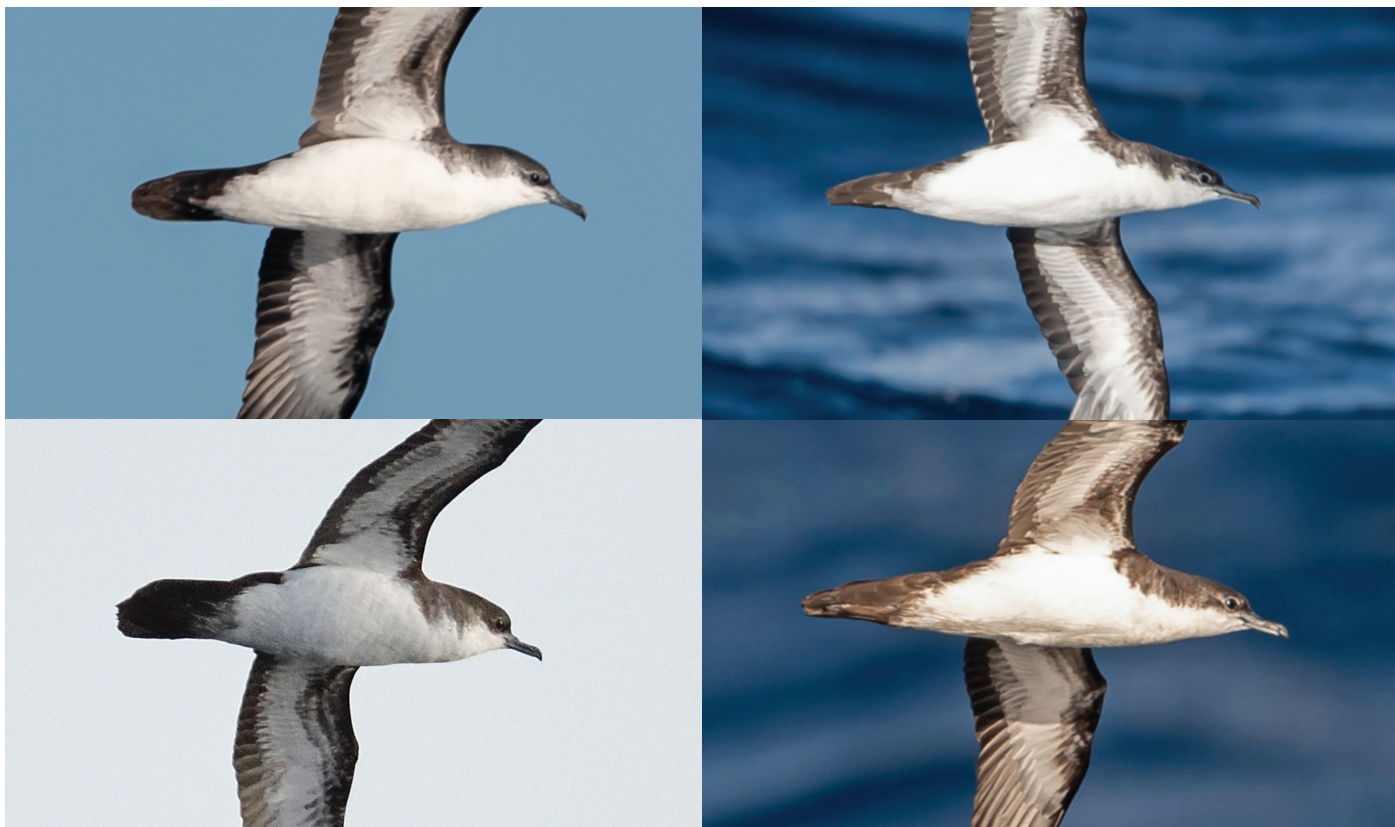
**Figures 43–46 (top left to bottom right).** Polynesian Shearwaters *Puffinus [dichrous] polynesiae*, 03–05 October 2021, off Ua Pou, Marquesas Islands (Kirk Zufelt). Variation in face markings, from least marked ‘white-faced’ (top left; though in strong sunlight) to most heavily marked ‘dark-faced’ (bottom right). ‘White-faced’ is capped, with thick, largely white supercilium, fore-supercilium smudge, ear coverts with few dark markings, and few if any dark markings under eye. ‘Dark-faced’ is dark to below the eye, largely reaches gape, may have narrow spectacles, ear coverts densely marked, can show indistinct pale auricular crescent.



**Figures 47–52 (top left to bottom right).** Polynesian Shearwaters *Puffinus [dichrous] polynesiae*, 03–05 October 2021, off Ua Pou, Marquesas Islands (*Kirk Zufelt*). Variation in underwing-covert markings, roughly from least marked (top left) to heaviest marked (bottom right). See main text for details. There is wider variation in the underwing markings of Marquesan birds *cf.* those from Tahiti Iti, another notable difference.



**Figures 53–54 (left to right).** Polynesian Shearwaters *Puffinus [dichrous] polynesiae*, 03–05 October 2021, off Ua Pou, Marquesas Islands (*Shoko Tanoi*). A small minority of birds were in early stages of primary moult.



**Figures 55–58 (top left to bottom right).** Polynesian Shearwaters *Puffinus [dichrous] polynesiae*, 03–05 October 2021, off Ua Pou, Marquesas Islands (Kirk Zufelt). Variation in undertail-covert markings, from largely white (top left) to largely dark (bottom right). Generally speaking, there are lighter birds, intermediate birds, and darker birds, where the face, underwing and undertail-coverts vary roughly in line with each other.



**Figures 59–62 (top left to bottom right).** Polynesian Shearwaters *Puffinus [dichrous] polynesiae*, 03–05 October 2021, off Ua Pou, Marquesas Islands (Kirk Zufelt). Variation in whitish / buff tips to upperwing greater secondary coverts, from a few buff tips (top left) to fully white-tipped (bottom right). Freshest plumages had whitish tips, forming a whitish pencil line across the inner wing, possibly with a hint of remnant buff tips to the outermost median secondary coverts. Worn plumages had only a possible hint of remnant buff tips to the outermost greater secondary coverts. Many were intermediate. Ages of birds unknown.

**BULWER'S PETREL** *Bulweria bulwerii*

**Status Marquesas Islands** Widespread and common breeder in Austral summer and present year-round (Thibault & Cibois 2017). Apparently, two ‘types’ noted during the circumnavigation (see ‘Recognition’). Presumably a large colony on Motu Oa, south end of Ua Pou (see ‘Sightings’ and Figures 63–66).

**Sightings** Seen every day with a total of over 937 birds at sea, plus an evening gathering of 2,000–3,000 birds off Motu Oa. **19 September** Sail 1 25 including a feeding group of 15. **20 September** Sail 1 12. **21 September** Sail 1 Three. Drift 1 Six. **22 September** Drift 1 12. Sail 1 15. Drift 2 At least 20. **23 September** Drift 2 Three. **24 September** Drift 1 Three. Sail 2 One, plus raft of nine. **25 September** Drift 1 38. Sail 1 Eight. Drift 2 12. **26 September** Drift 1 14. Sail 1 Eight. Drift 2 10. **27 September** Drift 1 25. Sail 1 Eight. Drift 2 15. **28 September** Drift 1 Eight. Sail 1 Five. **29 September** Sail 1 12. Drift 1 30. **30 September** Drift 1 Seven. Sail 1 10. Drift 2 At least 30. **01 October** Drift 1 Five. Sail 1 Ca. 100. Drift 2 10. Sail 2 15. **02 October** Sail 1 Ca. 40. **03 October** Drift 1 18. Sail 1 Ca. 25. **04 October** Sail 1 At least 110. At dusk Off Motu Oa, gathering of 2,000–3,000 birds (likely more, though count difficult as birds present in all directions in great density) along with a similar number of Polynesian Shearwater. **05 October** Drift 1 18. Sail 2 At least 100. At dusk off Motu Mokohe, north end of Ua Pou, relatively small gathering ca. 100. **06 October** Drift 1 12. Sail 1 15. Drift 2 Ca. 20.



**Figures 63–66 (top left to bottom right).** Bulwer's Petrels *Bulweria bulwerii*, 29 September to 04 October 2021, Marquesas Islands (Kirk Zufelt). Apparently, photographs captured two ‘types’ of *bulwerii* (irrespective of birds’ actions and posture): ‘Type 1’ (left column) was quite rakish, with relatively long neck, long body, and long tail. ‘Type 2’ (right column) was more compact, with relatively short neck, short body, and short tail.



**Range** Breeds on islands throughout a disjointed pan-oceanic range, mainly in tropical waters (Flood & Fisher 2013). In Polynesia, breeds only in Marquesas, where colonies are known from less than 10 islets: off Fatu Iva, Hiva Oa, Nuku Hiva, Ua Huka, and Ua Pou (possibly Hatutaa, Motu Iti, and Fatu Uku; Thibault & Cibois 2017). Numbers estimated at 2,000–6,000 pairs (Holyoak & Thibault 1984), though, more recently, colonies investigated each numbered just a few 10s of pairs (Thibault & Cibois 2017). Expedition sightings are thus important to understanding the current population size, confirming that the population remains at least several thousand birds, with a large and thus key colony presumably on Motu Oa. Also, widespread sightings support the idea of widespread breeding. Counts away from Ua Pou and worthy of extra note are 25 birds broadly centred around Motu Iti in the afternoon of 19 September (reinforcing the idea of breeding there), 38 birds west of the line ‘Hiva Oa to Moho Tani’ early morning on 25 September, 25 birds between Moho Tani and Fatu Hiva early morning on 27 September, and over 30 birds between Tahuata and Ua Pou early morning on 30 September. Multiple reports on eBird from across the islands and to the southwest of the archipelago.

**Recognition** Populations across the oceans differ in their physical structure. The following is a generic description of ‘the basic’ *B. bulwerii*. Peculiar shape, ‘all-dark’ plumage, buff ulnar bars, and effortless flight contribute to the feel of something prehistoric. Typical structural characteristics are small head, long slim body, long wedge-shaped tail; and very long arched wings, with long arm, very long attenuated hands, and pointed wing tips. Low wing loading and very long flexible wings give a unique buoyant flight that separates *B. bulwerii* from all other petrels. For separation from ‘all-dark’ Pacific storm-petrels, see Flood & Fisher (2013). Easily picked out by flight behaviour from the thousands of petrels during the evening gathering 04 October. Flew singly with typical easy, buoyant flight, generally milling around, awaiting dark for return to colony, whereas the Polynesian Shearwaters, which made up the bulk of the rest of the gathering, were actively / frantically foraging in numerous tightly packed groups, typically numbering 20–50 birds.

Apparently, photographs captured two ‘types’ of *bulwerii* (irrespective of birds’ actions and posture). Structural differences not easily explained by sexual dimorphism. ‘Type 1’ was quite rackish, with a relatively long neck, long body and long tail. ‘Type 1’ is reminiscent of birds that we have observed around Réunion Island, Indian Ocean. ‘Type 2’ was more compact, with relatively short neck, short body, and short tail. ‘Type 2’ is reminiscent of birds that we have observed around Hawaii, and showed some similarities with the Japanese population, though the balance of the head size and body shape differed somewhat from Japanese birds. Substantial morphological and genetic research into the *bulwerii*-complex worldwide is overdue.

**Behaviour** Behaves like other populations seen elsewhere in the Pacific, Atlantic, and Indian Oceans. Over the oily slick, kept low, made a handful of shallow wingbeats followed by a long searching glide. Sometimes powered across the oil slick with continuous strong wingbeats. Slowed to sniff the oil. In windier conditions, rose up over the oil slick and descended to check for a possible item of prey. Sometimes hawked over the oil slick. Foot-pattered to collect prey (fish bits), looking like a giant storm-petrel. Seen mainly in breezy conditions in travelling flight when flight looked easy but strong and fast, arcing like a *Pterodroma* petrel. Gathered in large numbers at dusk, spread out over a wide area off Motu Oa, in preparation for return to colony.

**Taxonomy, variation, & moult** Monotypic, but geographically / temporally isolated cryptic taxa / species likely (Howell & Zuffelt 2019). For example, North Atlantic populations breed over summer, except Cape Verde population that breeds from midwinter (Flood & Fisher 2013). This is contra discussion of systematics in Thibault & Cibois (2017). Structural differences noted (see ‘Recognition’). None in primary moult.

**Conservation** Least Concern (IUCN Red List of Threatened Species). Possibly involves cryptic taxa, thus conservation status requires configuring. Further work required to establish the scale and importance of the presumed large colony at Motu Oa.

## OTHER SEABIRDS

**Brown Noddy** *Anous stolidus* Generally common in feeding frenzies.

**Black Noddy** *Anous minutus* Generally common in feeding frenzies.

**Blue Noddy** *Anous ceruleus* On 19 September, 20–30 over the day, mostly in singles / small groups. Small numbers on 20 September, though one group of *ca.* 40 was the largest group of the trip. Very few recorded on 26 and 27 September. Eight on 01 October were the first for a few days. Six each on 02 and 03 October. Otherwise, fairly regular in small numbers.

**Little White Noddy** *Gygis [alba] microrhyncha* About 20 on 18 September in Taioha’e, Nuku Hiva, including several juveniles in trees. Generally common at sea in small numbers. A feeding flock of *ca.* 45 birds on 27 September, including just a few dark noddies, was the only large group comprising mainly this species. Typically seen in small numbers in feeding frenzies. At least one Indo-Pacific White Noddy *G. [alba] candida* photographed on 26 September.

**Grey-backed Tern** *Onychoprion lunatus* Scarce and irregular, but included two juveniles. A few birds on 19 September, including a juvenile. An adult on 21 September during Sail 1. Three adults on 23 September during Sail 1. One juvenile on 01 October during Sail 1 (Figure 68). Three adults on 06 October during Drift 2.

**Sooty Tern** *Onychoprion fuscatus* Common and regular, seen every day with the following notable counts: On 19 September, *ca.* 30. On 22 September, *ca.* 10 during Drift 1 and 100+ during Drift 2.

**Red-tailed Tropicbird** *Phaethon rubricauda* Rather scarce. One 23 September during Drift 1. Eight 24 September at Fatu Huku. *Ca.* 10 on 25 September. One 01 October. One 06 October.

**White-tailed Tropicbird** *Phaethon lepturus* On 18 September, a golden morph flew over Taioha'e, Nuku Hiva. White birds seen at sea most days, typically one bird per day, but two–five recorded on five days. On 19 September, common on cliffs of Motu Iti, with a few at sea.

**Great Frigatebird** *Fregata minor* On 18 September, two in harbour at Taioha'e, Nuku Hiva. Regular at sea in small numbers, mostly near islands. *Ca.* 1,000 *Fregata* at first light 20 September over Eiao, mainly circling very high, with the small number identified being *F. minor*. However, at first light 21 September, only *ca.* 100 *Fregata* circling over Eiao. On 24 September, *ca.* 150 *Fregata* and those identified were *minor*.

**Lesser Frigatebird** *Fregata ariel* Twelve 18 September in harbour at Taioha'e, Nuku Hiva. Small numbers at sea on several days.

**Masked Booby** *Sula dactylatra* Least common of the boobies. Seen in small numbers on about half of the days, with largest numbers near to breeding islands. Multiples per day recorded as follows: eight 20 September, four 01–03 October including three immatures, and seven 04–05 October including five immatures. On 05 October, at least 50 pairs on Motu Mokohe, north end Ua Pou. A Nazca Booby *S. [d.] granti* photographed off Ua Pou 03 October (Figure 69) is consistent with reports of recent range expansion (Vanderwerf *et al.* 2008).

**Red-footed Booby** *Sula dactylogram* Commonest booby, plentiful numbers every day.

**Brown Booby** *Sula leucogaster* Seen more frequently than Masked Booby. Recorded every day except 22 and 25 September. Juveniles and older immatures quite regular. Most notable sightings follow: Over 50 on 20 and 21 September. Numerous at Fatu Huku 24 September. Fairly common 01–05 October off Ua Pou. A Brewster's Booby *S. [l.] brewsteri* photographed off Ua Pou on 03 October (Figure 70) is consistent with reports of recent range expansion (Vanderwerf *et al.* 2008).

**Feeding frenzies** Encountered most days with two mega-sized frenzies. On 19 September, a mega frenzy of several 1,000 birds not far out to the northwest from Nuku Hiva. On 20 September, two mega frenzies of 1,000s of birds. No subsequent mega frenzy, though large frenzies encountered most days, typically comprising mainly Black and Brown Noddies, Red-footed Booby, and smaller numbers of White and Blue Noddies, Sooty Tern, Brown and Masked Boobies.



**Figures 67–68 (left to right).** Blue Noddy *Anous ceruleus* (left), 20 September 2021, Marquesas Islands (Kirk Zufelt). Fairly regular throughout the circumnavigation. Juvenile Grey-backed Tern *Onychoprion lunatus* (right), 01 October 2021, Marquesas Islands (Shoko Tanoi). Scarce and irregular throughout the circumnavigation, but two juveniles were observed.

## CONCLUSION

This report documents results of an 18-day-long pelagic survey of seabirds September–October 2019 in the Marquesas Islands. Our effort adds substantial new information about seabirds to the key sources Thibault & Cibois' (2017), Flood & Zufelt (2021), and Flood *et al.* (2021). We recommend that the regional occurrence of some species be modified. Notably, De Filippi's Petrel *Pterodroma defilippiana* should be added to the avifauna of French Polynesia and White-faced Storm-Petrel *Pelagodroma marina* to the avifauna of the Marquesas.

One main aim of the expedition was to search for the enigmatic streaked storm-petrel twice recorded in the Marquesas Islands. None was found. The streaked New Caledonian Storm-Petrel *Fregetta lineata*, now known to breed in New Caledonia (Bretagnolle *et al.* 2022), likely disperses eastwards during the non-breeding season March / April to September / October and could well account for the two records of the Marquesan streaked storm-petrels, both in September.

Another main aim was to find and photograph at sea dark-morph Herald Petrel *Pterodroma heraldica* and this was achieved. Our photographs provide valuable information about the dark-morph plumage and presumably confirm that a small number still breed on Ua Pou. In addition, photography of about 70 light-morph Herald Petrels gives insight into plumage variation of this morph.

Seasonally regular tubenoses of conservation concern shown to occur in small to moderate numbers offshore are Band-rumped Storm-Petrel *Thalobata castro* (*sensu lato*) and Gould's Petrel *Pterodroma leucoptera*. Further taxa may visit, especially in months not covered by this survey. Our sightings of Juan Fernández Petrel *Pterodroma externa* provide further evidence that the species has a regular westward dispersal in mid-latitudes of the Pacific and should be included in these terms in future literature.

Four photographed White-bellied Storm-Petrels *Fregetta grallaria* are the first documented records for Marquesas. One showed remnants of broad white fringes characteristic of Titan Storm-Petrel *F. [g.] titan*, but none of them gave the impression of being as large as *F. [g.] titan*. One showed narrowish white fringes unlike *F. [g.] titan*. This provides further evidence of multiple taxa of *F. grallaria* in French Polynesia.

Notable concentrations of Polynesian Storm-Petrel *Nesofregetta fuliginosa* were encountered around Eiao and Hatutaa, and off Ua Pou. A number of island populations thus remain intact to some degree. The population on Motu Tui, Fatu Hiva, is reported as probably extinct, though we found a concentration of birds 24 km to the southeast and eBird shows several records there, giving some hope that a remnant population survives. The expedition found only three Phoenix Petrels *Pterodroma alba* in 18 days and this raises some concern over the status of the current breeding population in Marquesas, though might be explained by the breeding schedule.

We encountered an evening gathering of 2,000–3,000 Bulwer's Petrels *Bulweria bulwerii* on 04 October, off Motu Oa, at the south end Ua Pou (likely more, though counting difficult as birds present in all directions in great density). This is significant as a previous population estimate in Marquesas was 2,000–6,000 pairs in 1984, though more recently colonies investigated each numbered just a few 10s of pairs. The same day, a large evening concentration of *ca.* 2,000 Polynesian Shearwaters *Puffinus [dichrous] polynesiae* was off Motu Oa, consistent with recent population estimates of several thousand pairs on Ua Pou.



**Figures 69–70 (left to right).** Nazca Booby *Sula [dactylatra] granti* (left), 03 October 2021, off Ua Pou, Marquesas Islands (*Shoko Tanoi*). Brewster's Booby *Sula [leucogaster] brewsteri* (right), 03 October 2021, off Ua Pou, Marquesas Islands (*Kirk Zufelt*). These records are consistent with reports of recent range expansion of the two taxa (*Vanderwerf et al.* 2008).

An estimated 1,000–1,600 pairs of Wedge-tailed Shearwaters *Ardenna pacifica* reported in 2011 on Motu Iti was considered an overestimate compared to a low number found during a more recent survey. The current expedition found no birds in this region. Of particular note, though, in April 2014, hundreds were offshore Fatu Hiva at dusk, although we found only small numbers there.

Unexpected in Marquesas was at least one Indo-Pacific White Noddy *Gygis [alba] candida* photographed on 26 September. Also, on 18 September, a golden-morph White-tailed Tropicbird *Phaethon lepturus* flew over Taioha'e, Nuku Hiva. On 03 October, a Nazca Booby *Sula [dactylatra] granti* and a Brewster's Booby *Sula [leucogaster] brewsteri* were photographed off Ua Pou, consistent with reports of recent range expansion.

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**Figure 71.** East coast Ua Pou, waters where we found dark-morph Herald Petrels *Pterodroma heraldica*.



**Figure 72.** The islet Motu Oa at south end of Ua Pou as we sailed away having witnessed an impressive ca. 2,000 each of Bulwer's Petrel *Bulweria bulwerii* and Polynesian Shearwater *Puffinus [dichrous] polynesiae* gathering at dusk before returning to colony.