

## Records of petrels (families Oceanitidae and Procellariidae) in the Cook Islands, 1970 to present

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**Abstract:** The Cook Islands are a scattered group of mainly inhabited tropical islands in the South Pacific Ocean. We provide a comprehensive review of petrel and shearwater (Oceanitidae and Procellariidae) records for the Cook Islands. Records include new fossil and subfossil records; however, the focus is on specimen records and observations made on land since 1970. Records and observations comprise details of 13 species of seabirds within the order Procellariiformes, from the Northern and Southern Groups, Cook Islands. This paper includes extensions to the breeding ranges of some Procellariiformes within the South Pacific Ocean. Significant new records include confirmation of Herald petrel (*Pterodroma heraldica*) breeding on Rarotonga, and the suspected breeding of black-winged petrel (*P. nigripennis*) on Ātiu, wedge-tailed shearwater (*Ardenna pacifica*) on Aitutaki, and tropical shearwater (*Puffinus dichrous*) on Mangaia. A thorough field survey across all islands needs to be conducted to determine more completely the breeding status and distribution of these species, and to potentially locate other species. We recommend surveys using a range of methods to determine the breeding status of species in the Cook Islands and, importantly, developing local capacity towards improving conservation efforts to protect Procellariiformes, including urgent predator control at some locations on Rarotonga.

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### INTRODUCTION

Seabirds are among the most threatened birds globally (Croxall *et al.* 2012; Dias *et al.* 2019). Across the Pacific, storm-petrels, petrels, and shearwaters (families Oceanitidae and Procellariidae; here collectively referred to as petrels) are among the seabird species that have experienced large population declines and local extinctions (Steadman 2006). The loss of Oceania's seabirds also represents a loss of cultural values for Oceanic people. There are eight petrel species in the Cook Islands classified as threatened, including several seen at sea (Table 1) (IUCN Red List of Threatened Species, viewed July 2024). Additionally, many

more species have become locally extinct due to human activity, both in recent and prehistoric times (Steadman 1991, 1995 & 1997). The Mangaia fossil record details human occupation overlapping with the extirpation of numerous bird species, drawing the conclusion that the arrival of early Polynesian settlers, and the dogs (*Canis familiaris*) and Pacific rat (*Rattus exulans*) that accompanied them, had a major effect on island biodiversity (Steadman & Kirch 1990).

### Geography of the Cook Islands

The Cook Islands is made up of 15 separate islands spread over an Exclusive Economic Zone (EEZ) of around 2 million km<sup>2</sup> (Pettersen & Tawake 2019). The total land area is 237 km<sup>2</sup>, and the islands are divided geographically into two

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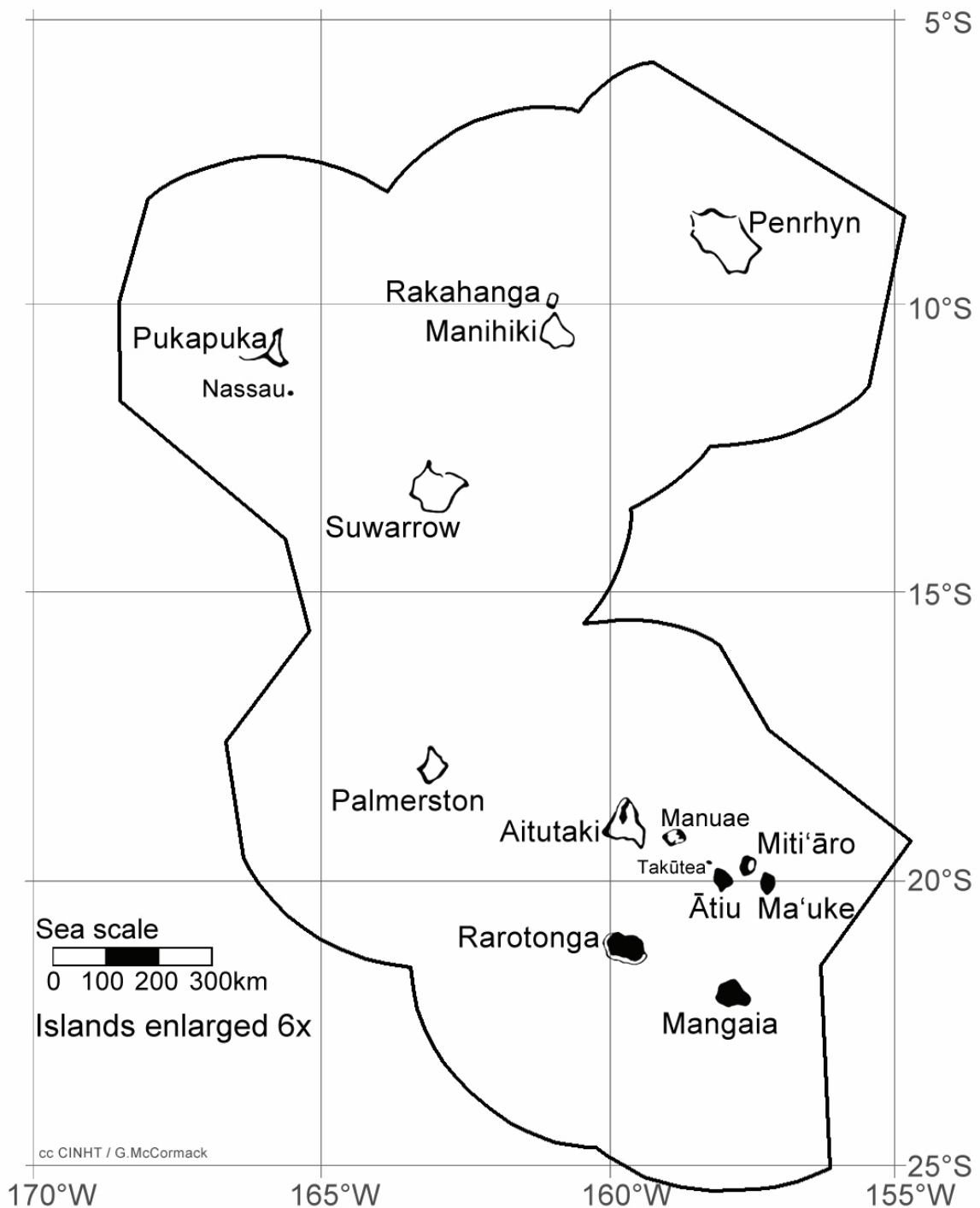
**Table 1.** Threatened petrels (families Oceanitidae and Procellariidae) recorded in the Cook Islands EEZ (IUCN Red List of Threatened Species, viewed July 2024).

Scientific name	Common name	Threatened Status
<i>Nesofregetta fuliginosa</i>	Polynesian storm petrel	Endangered
<i>Pterodroma cervicalis</i>	White-naped petrel	Vulnerable
<i>Pterodroma cookii</i>	Cook's petrel	Vulnerable
<i>Pterodroma brevipes</i>	Collared petrel	Vulnerable
<i>Ardenna bulleri</i>	Buller's shearwater	Vulnerable

distinct groups, a Northern and a Southern Group (Fig. 1). The Northern Group consists of five atolls (Suvarrow, Manihiki, Penrhyn, Pukapuka, and Rakahanga) and one sand cay (Nassau). The Southern Group has one high volcanic island (Rarotonga) (Fig. 2), four uplifted volcanic/limestone islands known as *makatea* (Ātiu, Miti'āro, Mangaia, and Ma'uke), one near-atoll (Aitutaki), two atolls (Manuae and Palmerston) and one sand cay (Takūtea). The islands where petrels have been recorded breeding or seen flying over are Rarotonga, Mangaia, Ātiu, Aitutaki, and Takūtea.

**Trans-equatorial migrations**

Many petrels are pelagic, renowned for covering large distances across the open ocean with minimal effort.



**Figure 1.** Exclusive Economic Zone of the Cook Islands showing the position of all 15 islands that make up the Cook Islands.

Many species make trans-equatorial migrations, for example, the annual migration of sooty shearwaters (*Ardenna grisea*) follows a broadly figure-eight pattern across the Pacific Ocean, with latitude coverage ranging from Antarctic waters to the Bering Sea and longitude ranging from Japan to Chile (Shaffer *et al.* 2006).

In tropical marine environments, food resources have less seasonal variation than in temperate and polar regions (Ashmole 1971; Weimerskirch 2007), which partly explains why most tropical seabirds, except for populations breeding at the edge of tropical zones, do not perform migrations to the same extent as their temperate or polar counterparts (Catry *et al.* 2009). There is a pressing need to increase understanding of how seabirds find food in tropically unpredictable tropical ocean ecosystems at a time when the world's marine ecosystems are undergoing unprecedented change (Dunn *et al.* 2024).

### Invasive predators

There are many threats to seabirds globally, with one of the worst being invasive predators. Invasive predators in the Cook Islands include dog, Pacific rat, ship rat (*Rattus rattus*), Norway rat (*R. norvegicus*), feral cat (*Felis catus*), and pig (*Sus scrofa*) (Townsend *et al.* 2011). Breeding seabirds are at particular risk from predatory mammals when ashore due to their limited mobility on land and predictable occurrence once nesting. Petrels are often social or colonial breeders, nesting on the surface or in burrows (Warham 1990). Of these introduced predators, the ship rat is considered to have the greatest impact on tree-nesting birds (Robertson & Saul 2007). Norway rats have more limited distribution compared with other rats; however, they have greater impact on seabirds (Moors *et al.* 1992). The Pacific rat has less impact on birds compared to the ship or Norway rats; however, Pacific rats can still have a significant impact on procellariiform species (Pierce 1998a & b; Rayner *et al.* 2007). Dogs, cats, and pigs can also have a devastating impact of ground nesting seabirds, taking breeding adults as well as chicks, with pigs also digging out burrows.

### Conservation history

Apart from ongoing rat poisoning to protect the highly threatened Rarotonga monarch (*kākerōri*, *Pomarea dimidiata*) over 150 ha within the Takitumu Conservation Area on Rarotonga since 1989 (Saul *et al.* 1998; Robertson & Saul 2007; H. Robertson, *pers. comm.*), there is no regular predator control done on any of the four islands that are or have been inhabited by breeding petrels and shearwaters in the Cook Islands. Whilst the conservation area was established for threatened land birds, the very steep, high peaks covered with thick, evergreen bush within the conservation area provide suitable habitats for petrels to nest and breed. However, cats, rats and dogs continue to pose threats to the distribution and abundance of seabirds, requiring an urgent extension in conservation efforts.

There have been three rat eradication projects undertaken in the Cook Islands: Suvarrow Atoll (Cook Islands' only national park) in the early 2000s, Palmerston Island, completed in September 2023, and Takūtea Island, a Wildlife Sanctuary that is home to the largest and most important seabird colony in the Southern Cook Islands, completed in 2024. Although no Procellariiformes were recorded breeding at the time of eradication, these projects provided predator-free habitat suitable for colonisation by petrels.

The following documentation of observations made within the Cook Islands is intended to provide background material for future surveys and conservation effort at the terrestrial breeding grounds, which is pivotal to species recovery efforts across the Cook Islands.

## MATERIALS AND METHODS

This paper presents records of field observations of petrels observed within the Cook Islands EEZ since 1970, plus an overlooked record from 1904 that we have included because of its importance. Field observations were conducted by local Cook Islanders who were either fisherman or terrestrial game hunters, as well as ecologists who have had a long association with Cook Islands birds. Additional records include from museum collections, acoustic recordings, online global database records (notably eBird), and literature reviews. At-sea and offshore observations have also been made by birders including D. Holyoak, R. White, and various contributors to eBird. We have taken these records at face value.

Nomenclature and presentation order follows the *Checklist of the birds of New Zealand* (<https://www.birdsnz.org.nz/society-publications/checklist/>) (viewed July 2024) where possible. For species not in the New Zealand checklist, we list them in the sequence shown in Birds of the World Online (<https://birdsoftheworld.org/bow/home>) (viewed July 2024). Local names (if known) are included following common and scientific names at the start of each entry. Cook Islands Māori names, are based on <https://naturalheritage.gov.ck>, the national biodiversity database of the Cook Islands.

## RESULTS

An annotated checklist of petrels found within the Cook Islands is presented here and summarised in Table 2.

### Confirmed or suspected breeding species

#### Kermadec petrel (*Pterodroma neglecta*)

Kermadec petrels breed in several island groups across the subtropical South Pacific, from Lord Howe Island to the Juan Fernandez Islands, with the largest population at Pitcairn Islands (Harrison *et al.* 2021). Imber (2004) believed the species was breeding on Rarotonga after hearing vocalisations of these petrels in 1986, and further calls were heard within the Takitumu Conservation Area between 1990 and 1993 (E. Saul, *pers. comm.*). Identifications of the petrels were made by the white shafts of the primaries and their distinct call which sounds like a 'howling primate'. The petrels were seen flying and on the ground in tangle fern (*Dicranopteris linearis*) areas on high ridges overlooking the coast (E. Saul, *pers. comm.*); however, no birds were found nesting. It is likely that ongoing predation pressure prevents Kermadec petrels from breeding on Rarotonga, although intensive survey effort may reveal them to breed, especially as Herald petrels, another surface-nesting procellariiform, continue to do so.

#### Herald petrel (*Pterodroma heraldica*) Kōputu

Herald petrels breed in the Pitcairn Group, Rapanui/Easter Island, Southern Tuamotu, Marquesas, Tonga, Chesterfield Reef (New Caledonia), and Raine Island (Australia) (Harrison *et al.* 2021). The species has an extended breeding season and visits nesting areas throughout the year. Gill (1885) reported that a bird known as the Kōputu, which nested on the high cliffs of Rarotonga, was a source of food and sport. McCormack (1989) concluded that Gill's description was an excellent fit for Herald petrel.

Early records of the Herald petrel in Rarotonga include five seen flying over high ridges 23 Jul 1973 (Holyoak 1980), one over the ridge between Ikurangi and Te Manga and several flying inland over Muri in July & August 1976 (Turbott 1977), and several around the Te Manga-Te Atukura divide in August-September 1981 (McCormack 2007). A nestling was found in a nest on a ridge 480 m just east of Te Atukura in September 1981 (Tim Lovegrove, *pers.*

**Table 2.** Summary of records of petrels (families Oceanitidae and Procellariidae) in the Cook Islands. Breeding\* = assumed to have bred formerly; island names separated by '/' indicates sightings on voyages between islands.

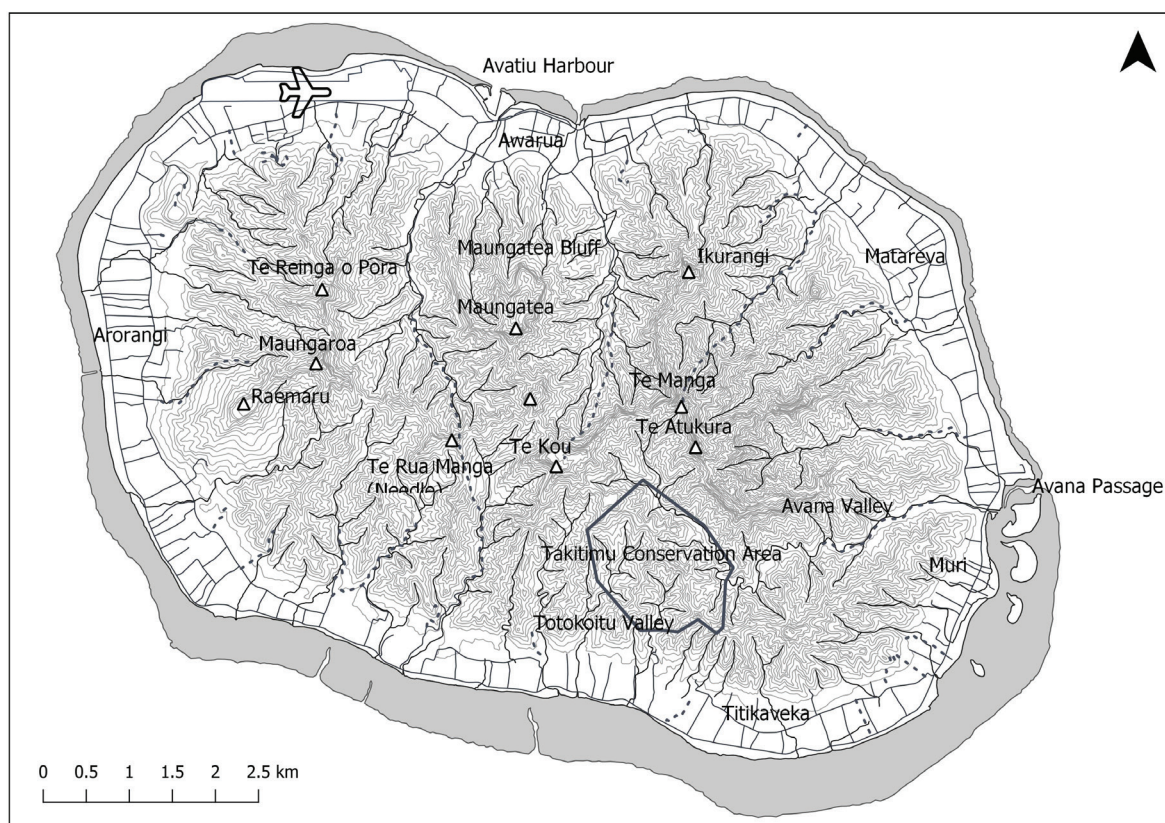
Common and scientific names	Islands	Observations
White-faced storm petrel <i>Pelagodroma marina</i>	Palmerston/Rarotonga	At sea
Polynesian storm petrel <i>Nesofregatta fuliginosa</i>	Mangaia Suvarrow	Breeding* At sea
White-bellied storm petrel <i>Fregatta grallaria</i>	Rarotonga/Ma'uke	At sea
Southern giant petrel <i>Macronectes giganteus</i>	Rarotonga	On land
Northern giant petrel <i>M. halli</i>	Rarotonga Ma'uke Aitutaki	On land At sea At sea
Cape petrel <i>Daption capense</i>	Rarotonga Aitutaki/Rarotonga	At sea At sea
White-headed petrel <i>Pterodroma lessonii</i>	Rarotonga Nassau Ātiu Palmerston	On land and at sea At sea At sea At sea
Kermadec petrel <i>Pt. neglecta</i>	Rarotonga Palmerston	Breeding* and at sea At sea
Murphy's petrel <i>Pt. ultima</i>	Rarotonga Takutea	On land On land
Mottled petrel <i>Pt. inexpectata</i>	Rarotonga Miti'āro	At sea At sea
White-naped petrel <i>Pt. cervicalis</i> or Juan Fernandez petrel <i>Pt. externa</i>	Palmerston Ātiu/ Palmerston Rarotonga/ Palmerston Nassau	At sea At sea At sea At sea
Black-winged petrel <i>Pt. nigripennis</i>	Rarotonga Mangaia Ātiu	Breeding* Breeding Breeding
Collared petrel <i>Pt. brevipes</i>	Palmerston/Rarotonga Aitutaki Palmerston	On land At sea At sea
Herald petrel <i>Pt. heraldica</i>	Rarotonga Aitutaki	Breeding and at sea On land
Phoenix petrel <i>Pt. alba</i>	Rarotonga	At sea
Cook's petrel <i>Pt. cookii</i>	Palmerston/Rarotonga	At sea
Bulwer's petrel <i>Bulweria bulwerii</i>	Nassau	At sea
Tahiti petrel <i>Pseudobulweria rostrata</i>	Rarotonga Palmerston/Rarotonga Mangaia	At sea Breeding* At sea
Buller's shearwater <i>Ardenna bulleri</i>	Rarotonga Mangaia	At sea At sea
Wedge-tailed shearwater <i>A. pacifica</i>	Rarotonga Mangaia Aitutaki	On land and at sea Breeding and at sea At sea
Sooty shearwater <i>A. grisea</i>	Rarotonga Aitutaki Ātiu Palmerston	On land and at sea At sea At sea At sea
Short-tailed shearwater <i>A. tenuirostris</i>	Rarotonga	At sea
Christmas Island shearwater <i>Puffinus nativitatis</i>	Aitutaki	At sea
Tropical shearwater <i>P. dichrous polynesiae</i>	Rarotonga Mangaia	On land and at sea Breeding

comm). Several birds were seen circling along the eastern and northern side of Maungatea in July–August 1983 (M. Merlin, pers. comm). From early 1984 to late 1986, GM made several trips to Maungatea and Te Manga, including three overnight trips, to observe Herald petrels (McCormack 2007). In 1984, c.10 birds were seen in aerial displays on the western side of the Te Manga–Te Atukura divide, with infrequent flights to the eastern side of the divide (McCormack 2007). Most of the aerial activity occurred between about 300 m and 700 m asl., with the birds making close approaches to the bush-covered cliffs at 450–550 m

asl. In 1986 GM saw more than 20 birds in the air along the divide and 10 more on the eastern side of Maungatea (McCormack 2007). Past sightings of Herald petrels circling the peaks of Te Atukura were also confirmed by Hugh Robertson (pers. comm.); however, he noted that numbers have dwindled over the last 35 years, and since 2015 the species has been rarely seen. Also recorded by Ray Pierce (pers. comm.) in late 1989.

McCormack (1989) noted that smaller Herald petrel colonies could also be found on Maungatea and possibly even on Maungaroa. These numbers have dwindled





**Figure 2.** Rarotonga showing locations mentioned in text. Herald petrel breeding sites are shown as  $\Delta$ .

over the years; however, birds can still be seen in the late afternoons (E. Saul, *pers. comm.*). More recent records of Herald petrels include birds seen and photographed flying above Maungatea Bluff by Alan Tennyson and Ed Saul briefly around 1730 hrs on 10 Aug 2010 (Ed Saul, *pers. comm.*). Tennyson noted the birds “circling around and hovering on the Maungatea Bluff, with at least 10 that called frequently ‘he he he he ...’ c. 10/second for c. 2 seconds – a staccato, continuous, lower pitched call than other *Pterodroma* species such as black-winged petrels”. Herald petrel calls were confirmed on 3 Nov 2016 from an acoustic recorder placed at the base of the Maungatea Bluff on Rarotonga by CG. AS and GM visited the top of the Maungatea Bluff on 28 Mar 2017 to confirm CG’s 2016 record, and observed four Herald petrels flying above and around the cliff between 1500 and 1600 hrs. During that hour, display chases between two Herald petrels were observed, with one bird calling to the other with its chattering ‘staccato’ call.

Recent inland observations suggest Herald petrels are likely to be breeding in areas of intact montane rain and cloud forests in the upland forest of Rarotonga, which has relatively few invasive plants (GM). On 27 Jul 2024, André Raine and B. Panzarella found three dead Herald petrels up Te Ko’u, all likely killed by a cat or dog(s). On their way down from Te Ko’u, they saw 10+ petrels display flying and calling (A. Raine *pers. comm.*).

In addition to Herald petrels displaying and calling over the high peaks of Rarotonga, M. Feuersenger recorded them flying over a coconut grove on the slopes of Maungapu, at 123 m asl on Aitutaki 25 Jul 2012 (Feuersenger, M. 2012, recording accessible at <https://www.xeno-anto.org/contributor/HBPYQXTJEV?query=herald+petrel>).

In June 2024, there was an extraordinary record of a Herald petrel attacking or approaching a drone that was flown to film a sunset at Te Rua Mangā or Needle, one of Rarotonga’s impressive high peaks. The image was posted on Facebook by M. Tuari’i (5 Jun 2024).

On 26 Aug 2024, a young petrel was found at the top of the Maungatea Bluff on the western side grounded amongst the ferns. AS, B. Panzarella and K. Silk found the bird whilst they were deploying an acoustic recorder to monitor potential petrels in the area. Photos of the petrel was shared with André Raine who confirmed it as a Herald petrel.

Nearshore observations comprise one seen from Rarotonga on 16 Jan 2020 (L. Ballard, eBird, viewed January 2022). At-sea records comprise four pale morph birds in August 1973 in the Northern Cooks; three pale morph birds and one dark morph bird in August and September 1973 in the Southern Group (Holyoak & Thibault 1984); one off Avatiu Harbour on the 3 April, three off Avatiu Harbour 4 April and six off Avatiu Harbour 6 Apr 1999 (Jowett 2000). An additional nearshore sighting about 400 m from the Avatiu Harbour at 14.45 hours was made in October 2020 (AS). The petrel had a white under belly and was possibly feeding at the time of observation.

#### **Murphy’s petrel (*Pterodroma ultima*)**

Murphy’s petrels breed east of the Cook Islands in the Austral, Gambier, Tuamotu, and Pitcairn archipelagos, as well as Easter Island and the Juan Fernandez Islands, off the coast of Chile (Harrison *et al.* 2021). In the Cook Islands, a specimen was collected in the Southern Group, most likely from Rarotonga, sometime between c.1899 and 1904 (Gill 1996). The specimen (AIM, LB6902) was presented to Auckland Museum by R.W. Gosset of Sydney, Australia in 1927, along with a collection of skins and eggs (Anon. 1940; Gill 1996). Although the date, provenance and breeding status of the petrel is unclear, this is the earliest record of any identified petrel documented for the Cook Islands. The specimen was first catalogued as a Kermadec petrel, but was identified by Robert Falla, and more recently by Mike Imber, as *Pterodroma ultima* (see Gill 1996).

A possible sighting of a Murphy’s petrel was made by AS and K. Floyd on Takutea, during the 2024 rat eradication

project, during 2–8 Sep 2024. The petrel was seen flying to and from the centre of the island in the late evenings and early mornings. It had distinctive white markings on the underside of its primaries; however, confusion with either dark-morph Herald or Kermadec petrels is possible, both species recorded for the Cook Islands.

#### **Black-winged petrel** (*Pterodroma nigripennis*) Titi

Black-winged petrels breed on islands of the southwest and central South Pacific Ocean, including Lord Howe (Australia), Phillip Island (Norfolk Island), New Caledonia, Kermadecs (the largest population), northern North Island offshore islands, and Chatham Islands (New Zealand), the Austral Islands (French Polynesia), and more recently, Motu Nui, Easter Island (Chile), and on islands in the Indian Ocean (Harrison *et al.* 2021). The black-winged petrel was extirpated on Mangaia following the arrival of humans and their attendant predators (Steadman & Kirch 1990; Medway 2001). A total of 37 faunal remains of this petrel were found across all trenches dug at the Tangatatau Rock Shelter (MAN – 44) site (Steadman & Kirch 1990). The relatively high density of remains strongly suggests breeding prior to the arrival of humans.

Gill (1880, p.8) provided oral history of a former hunting practice by Mangaian locals on the petrel:

*“The hunter has only to call at the entrance of the dark cave, in a plaintive tone, E titi e, when the foolish bird, imagining it to be the voice of its mate comes out of its secure hiding place, and dazzled by the unwelcome light, allows itself to be caught by hand”.*

Moreover, Clerk (1981) stated that this species served as a common food source and was harvested regularly from inland burrows. GM concluded that the petrel species mentioned by Gill was the black-winged petrel based on the call and habit of nesting in burrows in the volcanic soils (McCormack 2007).

Records of the black-winged petrel in Rarotonga include one found injured by a dog in February 1986 (McCormack 2007). The petrel died and was donated to National Museum of New Zealand Te Papa Tongarewa (Te Papa; registration no. OR.023679). The bird had been in a horizontal burrow among the roots of a small ironwood tree on a hillside in Muri. A damaged egg, which contained a fully developed embryo, was also found alongside the injured petrel. No other nests were found within the vicinity (GM). The other Rarotongan record was of a bird seen(?) in the Takitumu Conservation Area on the 17 Mar 2000 by Algirdas Knystautas (*pers. comm.*).

In March 1985, three boys found a black-winged petrel in a burrow on Ātiu and gave it to the priest of the St Anthony’s Catholic Church. GM notes that one of the boys who found this bird knew the location of three more burrows and in the previous year, reportedly found a similar bird with a chick during April to August. The identification of the petrel found in 1985 was confirmed by Mike Imber from photographs.

There have been other possible black-winged petrel sightings on Ātiu, with a bird in a burrow under a coconut tree at Te Tiare swamp, about 50–80 m asl in October 2015. Described as small, about the size of two myna birds (*Acridotheres tristis*), its colour was a shade of dark grey with blue and black on its back and head. It had a black bill with a light grey white on its belly and black webbed feet (J. Tuara, *pers. comm.*). Tuara could not confirm whether the bird was on an egg as he could not see into the nest chamber. When presented with an image of a black-winged petrel that was spotted on Rarotonga, Tuara recognised it as like the bird on Ātiu. A nearshore sighting on Rarotonga was of a bird flying over the lagoon at Bella Beach on the south coast 6 Jul 2019 (R. Cannings, eBird, viewed January 2022). The evidence supports the likelihood of breeding on Ātiu, and potentially on Rarotonga.

#### **Collared petrel** (*Pterodroma brevipes*)

The collared petrel’s breeding range is uncertain, but it has been confirmed for Vanuatu and Fiji (Gau and Kadavu) (Harrison *et al.* 2021). It nests in burrows in forest, scrub, or among tree roots (del Hoyo *et al.* 2020).

Records in Rarotonga include an injured collared petrel fledgling found by GM on a ridge (150 m a.s.l.) on the western side of the Avana Valley on 26 Jul 1984. This is the easternmost record of this species (McCormack 2007). The specimen was later donated to Te Papa (OR.023110) (Tennyson *et al.* 2012). In the late 1980s and early 1990s, cat-killed birds were found along the ridge tops at the head of the Totokoitu Valley and on the spur running northeast from the head of the Totokoitu near the outer rim of poison baiting in those days (Hugh Robertson & Ed Saul *pers. comm.*) No remains have been found since about 1997, with extirpation of the colony likely (Hugh Robertson & Ed Saul *pers. comm.*). These records suggest that this species was breeding in the Takitumu Conservation Area from 1984 to 1997. Discovery of any active burrows on Rarotonga should be monitored for the possible presence of this species. At-sea sightings of collared petrels include one near Aitutaki in April 1999 and another between Palmerston and Rarotonga in July 2006 (Jowett 2000; White 2006).

#### **Wedge-tailed shearwater** (*Ardenna pacifica*) Ūpoa, ‘E’engu/‘E’emu (Aitutaki)

The wedge-tailed shearwater is relatively widespread in the tropical and subtropical Indian and Pacific Oceans (Harrison *et al.* 2021). On land and at night it is known for its distinctive call, described as ‘an uncanny imitation of a crying baby’ (GM). An all dark grey-brown bird was found on Mangaia, collected, and later identified from photographs (D. Holyoak *in Clerk* 1981). Historically, it appears that wedge-tailed shearwaters were likely breeding on Mangaia, as locals knew it as ūpoa and could identify it by its call.

On Aitutaki, G. Hancock, reported frequently hearing birds calling inland of the Rapae Motel (now Pacific Resort) from after dark until about 3 am from November to March, 1983–84. The call of birds flying near the colony sounded like a foghorn alternating with a baby’s cry, which led GM to the identify the birds as wedge-tailed shearwater. Residents also reported that the ‘E’engu/‘E’emu was frequently heard west of Mā’ina-‘atupuka near the Rapae Motel. Searches by R. Hay and GM failed to find evidence of nesting in the mid-1980s.

More recently at Aitutaki, Russell *et al.* (2025) in October 2014 found ten burrows on the eastern ridgeline of Rapota and about 50 on the south-western dune faces of Maina. Some of the medium-sized burrows found had recently been excavated on each island indicating the commencing of prospecting and start of the breeding season. Adult feathers collected around burrows on Rapota appeared to be wedge-tailed shearwater, and a wedge-tailed shearwater was observed east of Aitutaki on passage to Manuae atoll (Russell *et al.* 2025).

A dark morph wedge-tailed shearwater was found during a stormy evening on Rarotonga’s main road in Arorangi in December 1984 (McCormack 2007). It was released after photographs and notes were taken. Its identity was later confirmed by Mike Imber (McCormack 2007).

Further records of this species in the Cook Islands include three dark-morph birds seen at sea in between Nassau and Suwarrow on 7 Aug 1973, and two in the Southern Group in September 1973 (Holyoak 1980). Sightings at sea for the Cook Islands include 16 near Aitutaki in April 1999 and another near Rarotonga in September 2000 (Jowett 2000), one north east of Mangaia on 19 May 2019 (M. Rigney, eBird, viewed 2022), and two between Palmerston



and Rarotonga 23 Jan 2025 (P. Chaon, eBird, viewed February 2025).

#### **Tropical shearwater** (*Puffinus dichrous polynesiae*) Rākoa

The tropical shearwater was formerly considered part of the Audubon shearwater (*P. lherminieri*) complex. It breeds in the Marianas Islands, Palau, Solomon Islands, Vanuatu, Kiribati (Phoenix and Line Islands), Fiji, Tonga, Samoa, American Samoa, and French Polynesia (Harrison *et al.* 2021). The earliest record in the Cook Islands is from Mangaia at the Tangatatau Rock Shelter, where a total of three faunal remains were identified (Steadman & Kirch 1990). Unlike the black-winged petrel or the Polynesian storm petrel, which the authors suggest were extirpated on Mangaia, Steadman & Kirch (1990) clearly stated that these small shearwaters were still breeding there. Steadman (1997) stated that numbers had declined to less than 100 birds, although archaeological and ethnographic evidence suggests it was once a common and widespread species on Mangaia.

With tropical shearwaters formerly known as Audubon's shearwaters, and confusion with little shearwaters *P. assimilis*, a fledgling found on Mangaia in April 1984 was described by Steadman & Olson (1985) as *P. lherminieri/assimilis*. He also obtained the local name rākoa for the species (GM). Little shearwaters are winter breeders, as are Rapa shearwaters (*P. myrtae*) in the Gambier Islands and Rapa (French Polynesia) and their chicks fledge between September and November (Harrison *et al.* 2021). This suggests that the fledgling seen on Mangaia was possibly a tropical shearwater rather than a little shearwater.

A dead tropical shearwater was found on a northern coastal road in Rarotonga in July 2003, possibly attracted to the bright lights of the all-night fuel station. The specimen was collected and donated to Te Papa (OR.027467; McCormack 2007).

A nearshore sighting off Rarotonga was recorded on the 16 Jan 2020 (L. Ballard eBird, viewed January 2022). Other records of this species in the Cook Islands are 10 birds seen at sea in the Southern Group in July and August 1973 (Holyoak 1980).

#### **Unidentified procellariid**

During a biodiversity survey on Manuae atoll in October 2024, petrel or shearwater feathers were found in burrows in a section of eroded beach (J. Russell *pers. comm.* to CPG).

#### **Migrant or vagrant species**

##### **White-faced storm petrel** (*Pelagodroma marina*)

The white-faced storm petrel breeds in eastern Australia and New Zealand and has a range as far as the northern Indian Ocean and the north-west coast of South America (Southey 2013). The only record from the Cook Islands is one seen at sea between Palmerston and Rarotonga 21 Sep 2006 (White 2006).

##### **White-bellied storm petrel** (*Fregatta grallaria*)

The white-bellied storm petrel breeds across the South Pacific, South Atlantic, and South Indian Oceans, and migrates north towards the tropics after breeding (Tennyson 2013). A single bird was seen at sea on 26 Aug 1973 during a cruise between Rarotonga and Ma'uke (D. Holyoak, eBird viewed January 2022).

##### **Polynesian (white-throated) storm petrel**

###### (*Nesofregatta fuliginosa*)

The Polynesian storm petrel breeds in New Caledonia, Phoenix, Kiritimati (Line Islands), and French Polynesia

(Harrison *et al.* 2021); Pierce 2012; Pierce *et al.* 2020). Bones of two Polynesian storm petrels were found at the Tangatatau Rock Shelter on Mangaia (Steadman & Olson 1985; Steadman & Kirch 1990). They suggested that extirpation of this species coincided with early human arrival.

Later records in the Cook Islands are of six light morph and one dark morph bird seen at sea in the Northern Group on 6 Aug 1973 (Holyoak 1980). A much later nearshore sighting from Suwarrow was recorded on 10 Aug 2011 (H. Krajewsky, eBird viewed January 2022).

##### **Southern giant petrel** (*Macronectes giganteus*)

In June 2015, a live juvenile found in a swimming pool at Crown Beach Resort, Rarotonga, was identified from photographs taken by GM that showed an ivory bill-tip.

##### **Northern giant petrel** (*Macronectes halli*)

Northern giant petrels breed on islands in the subantarctic region (Harrison *et al.* 2021). Records in the Cook Islands include live juveniles found at Ma'uke in 1970 and Aitutaki in 1985 (McCormack 2007), and a dead juvenile found in Titikaveka (Rarotonga) in 1998 (J. Bosanquet, *pers. comm.*). In 1997 another juvenile was rehabilitated on Rarotonga by a local fisherman (McCormack 2005; J. Papa, *pers. comm.*), and others were rehabilitated in Rarotonga in 2009 and in June 2012 (Smylie 2012). Identifications (other than for the Ma'uke specimen in 1970) were made by M. Imber and/or GM.

##### **Cape petrel** (*Daption capense*)

Cook Islands sightings include five seen at sea from Aitutaki to Rarotonga on 19 Aug 1973 and one at sea 10 miles ENE off Atiu 16 Sep 1973 (Holyoak 1980). In 2001, there is an inshore record from Rarotonga in August 2001 (C. Boyle *pers. comm.*; McCormack 2007) comprising 8 individuals seen flying around a dive boat for roughly one hour. Another reported inshore sighting was at Avarua in July 2009, where a Cape petrel joined a local outrigger canoe training session and followed them back to the Avarua Harbour (GM).

##### **White-headed petrel** (*Pterodroma lessonii*)

White-headed petrels have a circumpolar range and are found throughout the Southern Ocean (Harrison *et al.* 2021). They breed on Macquarie (Australia), Auckland and Antipodes (New Zealand), Crozet and Kerguelen Islands (French Southern Territories) and possibly on the Prince Edward (South Africa) islands (Harrison *et al.* 2021). The only record of this species from the Cook Islands was one found in Matavera, Rarotonga in July 2016 by the Esther Honey Foundation. The bird was found the morning after a storm and was rehabilitated and set free 2 weeks later (S. John, *pers. comm.*). Russell *et al.* (2015) suggested white-headed petrels may be regular in Eastern Polynesian waters during the mid-year non-breeding season.

At-sea records for the Cook Islands include one in the Northern Group and the other in the Southern Group in August 1973 (Holyoak 1980), and one at Palmerston Atoll on 2 Aug 2006 (M. Greenfelder, eBird viewed January 2022).

##### **Phoenix petrel** (*Pt. alba*)

The Phoenix petrel breeds abundantly on Kiritimati (Line Islands, Gallagher 1960; Schreiber & Ashmole 1970, Pierce *et al.* unpublished), Phoenix Islands (Kiribati, Pierce 2012), Marquesas Islands (French Polynesia) (Gangloff *et al.* 2009) and the Pitcairn Islands (Brooke 1995). Additionally, Russell *et al.* (2015) discovered a beach-wrecked petrel in the Society Islands (French Polynesia), that was later identified by Te Papa staff as *Pterodroma alba*. Colonies tend

to occupy islets in lagoons of coral atolls or volcanic islands (Holyoak & Thibault 1984). The one confirmed sighting of Phoenix petrel off Rarotonga was by J. McCormack August 2021 with photographs (<https://naturalheritage.gov.cu/cibed/dbs/species.html?pval=8723>, viewed 12 March 2025). Two possible offshore sightings for the Phoenix petrel have been recorded from Rarotonga: one flying offshore from the Edgewater Resort 6 May 1994 (A. Starrett, eBird, viewed January 2022), and one off Avatiu Harbour in April 1999 (Jowett 2000). However, confusion with intermediate morphs of either Herald or Kermadec petrels is possible.

#### **Mottled petrel** (*Pterodroma inexpectata*)

Mottled petrel is endemic to New Zealand, breeding in Fiordland, on islands around Rakiura Stewart Island (including Whenua Hou and Big South Cape Island), and the Snares Islands. At-sea records for the Cook Islands (all supported by photographs) are one off Rarotonga on 31 Mar 2023, and two on 2 Apr 2023 (one off Rarotonga and another east of Miti'āro; M. Greenfelder, eBird viewed 10 Feb 2025)

#### **White-naped petrel** (*Pterodroma cervicalis*) or **Juan Fernandez petrel** (*Pt. externa*)

White-naped petrels breed almost entirely on Macauley Island, Kermadec group, apart from a few pairs nesting on Phillip Island, Norfolk group (Tennyson 2013). The White-naped petrel is similar to the Juan Fernandez petrel, but the black cap is split from the grey back by a white collar. At-sea records for the Cook Islands, which could be for either of these species, are a single bird seen halfway between Ātiu and Rarotonga on 30 Aug 1973 (Holyoak 1980), one between Palmerston and Rarotonga, on 24 Sep 2006 (White 2006), and one off Nassau on 26 Nov 2014 (M. Greenfelder eBird, viewed January 2022).

#### **Cookilaria species** (*Pt. cookii/pycrofti*)

Cook's petrel is endemic to New Zealand, where it breeds on Little Barrier, Great Barrier and Whenua Hou (Harrison *et al.* 2021). Pycroft's petrel is also endemic to New Zealand, breeding principally on the Mercury, Poor Knights, Taranga and Marotere Islands. The two species are extremely difficult to separate at sea and consequently are lumped here. Records from the Cook Islands are one individual near Aitutaki in July 2006, another at sea between Palmerston and Rarotonga in September the same year (White 2006), and one between Ātiu and Bora Bora on 28 Oct 2015 (D. Pairo, eBird, viewed January 2022).

#### **Bulwer's petrel** (*Bulweria bulwerii*)

In the central Pacific Ocean, Bulwer's petrel breeds in the Phoenix and Marquesas Islands (Harrison *et al.* 2021). There is one record for the Cook Islands, near Nassau on 26 Nov 2014 (M. Greenfelder, eBird, viewed 2022). The observation was of 'a small dark petrel with a distinctive flight pattern to that of a Bulwer's Petrel'. Bulwer's petrel typically flies with rapid wing beats to short twisting glides, rarely >2m above surface (Harrison *et al.* 2021).

#### **Tahiti petrel** (*Pseudobulweria rostrata*)

Tahiti petrels breed in New Caledonia, Fiji, American Samoa, and French Polynesia, and are commonly seen at sea in the tropical and subtropical South Pacific Ocean (Harrison *et al.* 2021). Excavations conducted in Aitutaki at the Moturakau Rock Shelter revealed Tahiti petrel remains (Steadman 1991). Steadman (1991) postulated that the Tahiti petrel remains from the Moturakau Rock Shelter site on Aitutaki were another example of a seabird species being extirpated in the Cook Islands due to early harvesting and/or predation by introduced mammals.

Recent records of the Tahiti petrel from the Cook Islands were all at sea: three individuals seen out at sea near Rarotonga between 23 July and August 1973 (Holyoak 1980), one between Palmerston and Rarotonga in July 2006, near Ātiu in September 2006 (White 2006), one north east of Mangaia on 19 May 2019 (M. Rigney, eBird viewed January 2022), and one east of Miti'āro on 2 Apr 2023 (M. Greenfelder, eBird viewed 10 Feb 2025).

#### **Buller's shearwater** (*Ardenna bulleri*)

Buller's shearwaters breed only at the Poor Knights Islands, New Zealand. After breeding, they migrate to the North Pacific Ocean passing through equatorial Pacific in May heading north and September/October on their return (Harrison *et al.* 2021). At-sea sightings are one seen near Rarotonga in September 2000 (Jowett 2000), and a second near Mangaia on 19 May 2019 (M. Rigney, eBird viewed 2022).

#### **Short-tailed shearwater** (*Ardenna tenuirostris*)

Short-tailed shearwaters breed around Tasmania and on islands off the coast of South Australia. Like the sooty shearwater, it undertakes trans-equatorial migration, wintering in the North Pacific Ocean, with some moving north through the Bering Strait (Harrison *et al.* 2021). The return migration route for most birds is through the central Pacific. The only records from the Cook Islands are of two seen at sea, both near Rarotonga, in April 1999 (Jowett 2000).

#### **Sooty shearwater** (*Ardenna grisea*)

Sooty shearwaters breed on islands around New Zealand and southern South America during the Austral summer (Harrison *et al.* 2021). Post-breeding, they migrate to the North Pacific Ocean, passing through the tropics mainly in May and June when northbound, and September and October southbound (Shaffer *et al.* 2006).

The only land record for this species was one on Rarotonga on 9 Dec 2021. The bird was found at the Punanga Nui Market, Avarua by S. George, possibly attracted by the harbour and town lights. Identification of the bird was confirmed by CG from photographs and measurements.

Records of sooty shearwaters seen at sea in the Cook Islands are of 18 individuals flying south 12 miles ENE of Ātiu in the Southern Cook Islands in September 1973 (Holyoak 1980), one near Rarotonga in April 1999, another near Aitutaki in April, three near Rarotonga in September 2000 (Jowett 2000), and near Palmerston in September 2006 (White 2006). One was found aboard a ship on 12 Dec 2023 (A. Williams, eBird, viewed February 2025), and another on 2 Apr 2023 (precise locations not given, but within Cook Islands EEZ) (M. Greenfelder, eBird, viewed February 2025). On Rarotonga, a bird was seen off Turoa Beach on 15 Apr 2019 (C. Stapelmann, eBird, viewed January 2022).

#### **Christmas Island shearwater** (*Puffinus nativitatis*)

The Christmas Island shearwater breeds on remote islands in the central Pacific Ocean, from the Hawaiian Islands (USA) in the north south to Phoenix Islands (Kiribati), and east to French Polynesia and Easter Island (Chile) (Harrison *et al.* 2021). Outside the breeding season it ranges off the coasts of Mexico and northern Chile in the east, to the Bonin Islands (Japan) in the west. At sea sightings include one seen near Aitutaki in April 1999 (Jowett 2000), and another from a yacht between Fiji and Rarotonga on 11 Jul 1990 (P. Rosen, eBird, viewed January 2022).



## DISCUSSION

Archaeological surveys revealed that during the pre-human era, before 900AD, at least four species of Procellariiformes were breeding in the Southern Group, Cook Islands: black-winged petrel, Tahiti petrel, tropical shearwater, and Polynesian storm petrel (Steadman 1991, 1997, Steadman & Olson 1985). Species that may currently be breeding in the Cook Islands include the Herald petrel on Rarotonga, black-winged petrel on Ātiu, wedge-tailed shearwater on Aitutaki, and tropical shearwater on Mangaia. It is possible these species breed, or attempt to breed, elsewhere in the Cook Islands archipelago. Further surveys and observations need to be carried out urgently to determine the breeding status and distribution of all petrel species in the Cook Islands.

With so little known about procellariiform populations in the Cook Islands, the lack of knowledge about their ecology, breeding biology, breeding success and threats is a major obstacle to developing conservation plans. The highest priorities are:

1. Confirm whether certain species are still breeding in known areas, i.e., find nesting sites for Herald petrels on Rarotonga (Fig. 2); work with the Mangaian community to confirm whether small shearwaters are still breeding on Mangaia, and confirm what species they are; with the Aitutaki community to confirm that wedge-tailed shearwaters are breeding on islands within the atoll, with the community on Ātiu to confirm if black-winged petrels are still breeding there 40 years after the initial records; and follow up on sightings of Herald petrels at Aitutaki, and possible Murphy's petrel on Takutea.
2. Extend surveys and outreach to communities in other places and islands in the Cook Islands group.
3. If birds are found breeding in any of these places, seek support for implementation of predator control (i.e., exclude pigs and dogs, and control rats and feral cats) around the remaining nests.
4. Of less immediate concern is the lack of knowledge about diet and foraging, during breeding and movements after breeding. However, if breeding populations can be found, and prove to be reasonably accessible, then diet and tracking studies could be initiated to help broaden our understanding of the ecology of tropical Procellariiformes and their use of the Cook Islands EEZ.

Our recommendation is that a staged survey approach be adopted for the Cook Islands, as follows:

1. There is a wealth of knowledge about seabirds to be found at the grassroots level within the communities of the Pacific, especially among people who are living near where birds could be breeding. Therefore, community surveys can be a good approach to gather more records, either through in-person meetings, or the use of social media and printed posters.
2. Acoustic surveys using automated recorders at all reported and likely breeding localities on Rarotonga, Ātiu, and Mangaia, to identify or rule out sites.
3. Follow-up searches at areas where seabirds were detected during acoustic surveys. This could involve ground searches, use of playback of calls, spotlighting, or the use of a specially trained petrel detection dog.
4. Radio transmitters could be deployed on birds captured during spotlighting/playback surveys and then tracked to their nests. (Rayner *et al.* 2015).

5. Threat assessments need to be made at each stage, and if breeding birds, active nests and burrows are found, then immediate predator control needs to be implemented.
6. There is the potential to recover petrel populations via sustained predator management or eradication of pests from islands, combined with species attraction by broadcasting recorded calls, and/or through translocations to speed up (re)colonisation.
7. Robertson *et al.* (2020) recommended establishing playback stations and artificial burrows in the Takitumu Conservation Area to try to encourage Herald petrels and collared petrels to establish a colony within the 150 ha that is currently being managed. This would require the addition of intensive cat control and a longer period each year of sustained rat control, and/or the construction of a predator-proof fence around any new colony to protect birds on the ground.

Once breeding sites have been located and protection measures implemented, then conservation management plans can be prepared and implemented for each of the islands, through collaboration between Cook Islands environmental groups, government agencies, and (most importantly) local communities, supported by expertise from other countries. Capacity building can also be achieved by strengthening community and institutional capacities, developing appropriate field skills and survey and monitoring techniques, and training on biodiversity, threat assessment and on-going pest management. While the way ahead is extremely challenging for the Cook Islands to recover its petrel populations, it is possible through eradication programmes and sustained predator management, and possibly by translocations of chicks as undertaken successfully elsewhere in the Pacific and the world (Miskelly *et al.* 2009; Gummer *et al.* 2014; Young *et al.* 2023).

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