

Vanuatu petrel (*Pterodroma occulta*) discovered breeding on Vanua Lava, Banks Islands, Vanuatu

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Abstract *Pterodroma occulta* was described by Imber and Tennyson in 2001 and tentatively named Vanuatu petrel. The first specimens of this bird were collected in Jan 1927, east of the island Mere Lava in Vanuatu (then New Hebrides), but their breeding grounds have remained unknown. After several exploratory visits to the Banks Islands I discovered a breeding colony of Vanuatu petrels on Vanua Lava in Feb 2009. Statements that this species breeds on Mere Lava were not substantiated.

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INTRODUCTION

During the Whitney South Sea Expedition of the American Museum of Natural History (AMNH) 6 specimens of a medium-sized gadfly petrel were collected at sea on 28-29 Jan 1927 near Mere Lava. Initially labelled as *Pterodroma externa*, they were later referred to white-naped petrel (*P. cervicalis*), but of a smaller form (Falla 1976). A 7th specimen was found near the coast on eastern Australia in 1983 (Boles *et al.* 1985). In 2001 these specimens were described and named *Pterodroma occulta*, closely related to *P. cervicalis* but smaller in size with a relatively longer tail and dark grey exposed primaries underwing (Imber & Tennyson 2001). The common name Vanuatu petrel was proposed on the assumption that it bred there.

A search for Vanuatu petrels and other seabirds breeding on the Vanuatu Islands has long been overdue. Here, I describe the results of my searches for the breeding sites of the Vanuatu petrel.

STUDY AREA & METHODS

The Banks are a group of 13 oceanic islands in the north of the Vanuatu archipelago (Fig. 1). Vanua Lava (13° 49' S, 167° 28' E) is the largest and most

mountainous (area 331 km², highest point 946 m). Near the centre of Vanua Lava, Mount Suretamatai (elevation 921 m) is an active complex volcano with numerous solfatara fields. Mere Lava (14° 27' S, 168° 03' E) is a steep, cone-shaped extinct or dormant stratovolcano (area 15 km², highest point 883 m).

I have been observing birds in Vanuatu since 2003. In my travels, I would note local reports of breeding seabirds. I then visited these sites, during the suspected breeding season, to investigate. I have searched for Vanuatu petrel on Mere Lava in 2005 and Vanua Lava in 2007 and 2009. With local guides, initial burrow searches were made in areas where they knew seabirds continued to breed or there was historical breeding. On Vanua Lava these 'cold' searches were not successful. I then used listening observations at night to direct further efforts. Upon finding seabirds I collected evidence and some information on the breeding locality. Measurements and photographs were taken, in the field, for species identification. Limited burrow searches were made. Specimens were not collected as I had no authority.

RESULTS

Mere Lava

In 2004 I learnt from Mere Lava islanders that seabirds breed there and chicks are harvested from burrows in Jan and Feb each year. It is the closest

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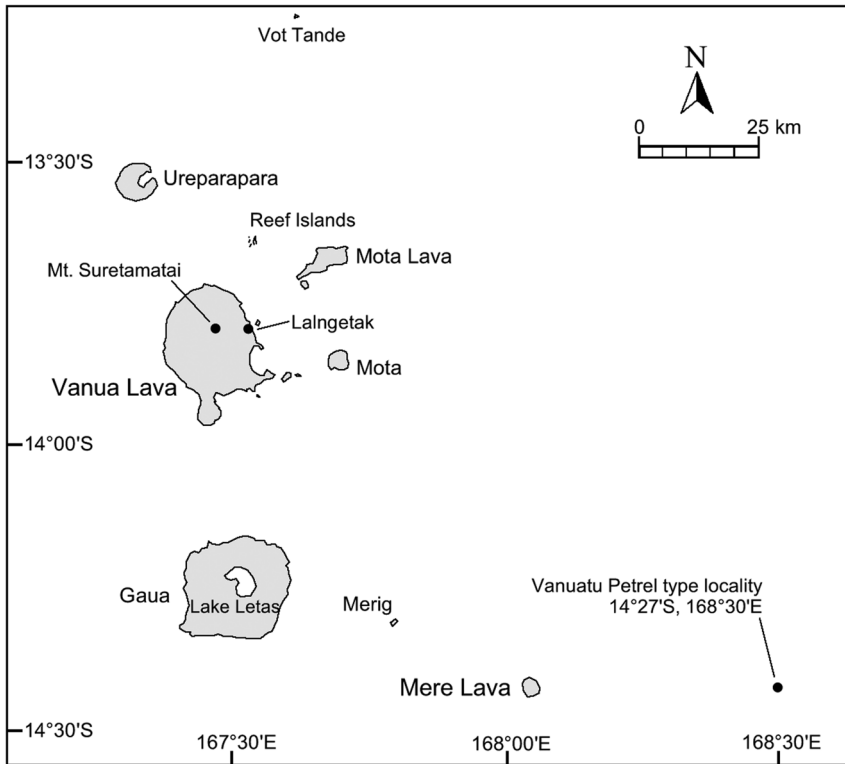


Fig. 1. Banks Islands of Vanuatu, showing locations mentioned in the text.

island to where the first Vanuatu petrel specimens were collected and was considered a likely breeding site. I visited Mere Lava on 22 Mar–24 Apr 2005.

On 22 Mar 2005 I observed numerous Audubon's shearwaters (*Puffinus lherminieri*) at sea, south of Mere Lava. On 23 Mar 2005 I climbed to the summit of the island and inspected some empty seabird burrows, but all had been harvested some weeks before. The search was late in the breeding season and another attempt on 25 Mar 2005 again found no seabirds. Locals reported that eggs are laid around Nov and chicks fledge from Feb. It was accepted that they had a good knowledge of the breeding season from many years of harvesting chicks and no further searches were made.

People of Tasmat village, Mere Lava, were interviewed and shown plates from the field guide *Birds of the Solomons, Vanuatu and New Caledonia* (Doughty *et al.* 1999). The seabird they described was small, black above and white below with black under the tail. Villagers recognised the Audubon's shearwater in the field guide without prompting. They did not recognise the plates of the white-necked (=white-naped) petrel nor the descriptions and photos of the Vanuatu petrel by Imber and Tennyson (2001).

An adult plumage Audubon's shearwater was captured by a school teacher at Tasmat village on the

night of 1 Apr 2005 during heavy rain. The bird was photographed and measured before it was eaten by the captors. Its wingspan of 68 cm agrees with published data of 64–74 cm (Marchant & Higgins 1990). As it was not the target species, no further measurements were taken or any parts collected.

The presumed Audubon's shearwater breeding burrows inspected on Mere Lava were found above 700 m. The summit area is dominated by a large volcanic crater. The ground is steeply sloping and covered in ferns and shrubs. The 2 villages with easiest access to the summit are Tasmat and Aota. About half a dozen boys from each village regularly search for seabird chicks in Jan and Feb each year and they may collect about 100 birds in a season (D. Masur, *pers. comm.*).

The Audubon's shearwater captured on Mere Lava on 1 Apr 2005 was attracted to lights at the school at Mission Passage during heavy rain and dark conditions. This has occurred at least twice before, in Feb 2004 about 70 birds were caught and in Feb 2005, 10 were caught (D. Masur, *pers. comm.*). These were almost certainly fledglings on their first flight (M.J. Imber, *pers. comm.*).

Vanua Lava

There are no published records of seabirds breeding on Vanua Lava. I first learnt of seabirds breeding



Fig. 2. Ventral view and underwing of Vanuatu petrel from Vanua Lava; the dark grey underside of the primaries is clear. The breast and belly are soiled. Lens cap diameter is 77 mm (Photo: S. Totterman).



Fig. 3. Dorsal view of Vanuatu petrel from Vanua Lava. Lens cap diameter is 77 mm (Photo: S. Totterman).

there in Sep 2005 from a friend on the neighbouring island of Mota Lava. Two trips were made to investigate this report, in 2007 and in 2009.

My first visit to search for seabirds on Vanua Lava was on 31 Jan-7 Feb 2007. People from Lalngetak village, east Vanua Lava, confirmed that seabirds were breeding in the mountains but they knew little about them. I visited the interior of Vanua Lava on 2-3 Feb 2007 and camped on the crest of a ridge which leads to Mount Suretamatai. This site is 800 m east of where Vanuatu petrels were found in 2009. Shortly after dark on 2 Feb, unidentified seabirds were heard flying inland towards the mountains from about 1900h to 2000h. These were recorded using a Sony MZ-NH700 MiniDisc recorder and Audio-Technica 835b microphone. I returned to the coast the next day and other commitments forced me to leave Vanua Lava within a week. I could not identify the recorded calls and did not have access to a collection of calls for comparison.

I made a 2nd visit to Vanua Lava to locate and identify the unknown seabirds on 14 Feb-4 Mar 2009. More interviews with villagers at Lalngetak were conducted. An elderly man, Augustin, described the place where seabird chicks were harvested in the past. This location is called Qwelrakrak ($13^{\circ} 47' 46''$ S, $167^{\circ} 28' 54''$ E; elevation 590 m) and it is a solfatara field at the base of Mount Suretamatai. Qwelrakrak is 130 km northwest of the Vanuatu petrel type locality (Fig. 1). A path was cut and I visited Qwelrakrak during the day on 18 Feb 2009. Searches covering approximately 2 ha were made to the southeast, above, adjacent and below the solfatara. The remains of 4 procellariids were found, but no live birds. The wingspan was estimated at 80 cm from measurements of the weathered remains. Various holes and cavities in the ground were investigated, but they did not look like seabird burrows and there were no signs of birds using them.

I returned to Qwelrakrak on 20-21 Feb 2009 for an overnight visit and in the evening there were many seabirds in the area, calling noisily. These were recorded on MiniDisc and areas of persistent calling from the mountain slopes were noted to help locate burrows. On 21 Feb 2009 new burrow searches were made at Qwelrakrak, a little north of previous efforts. After about 30 minutes of searching, my guide had found an adult procellariid. I was searching some distance in the opposite direction and heard this bird call as it was removed from its burrow. The calls were similar to those heard on the preceding night. I agreed to meet my guide down at the base of the solfatara and there we discovered that the bird had died, probably due to rough handling. I asked of the burrow contents and my guide said there was an egg inside which was broken during removal of the bird.

The dead bird was photographed and measured immediately (Fig. 2, 3; Table 1). It was then carried down to the coast to show to the villagers at Lalngetak. Augustin recognised this bird as the species they had collected many years ago. The local name for the bird is Qolav. The bird was given to the villagers who ate it. Three primary feathers were retained from the fresh bird and 3 more primaries from 1 of the remains found on 18 Feb 2009.

Reviewing my photos and measurements with reference to Doughty *et al.* (1999), I realised that the seabird found at Qwelrakrak was like a white-naped petrel, but smaller. Imber and Tennyson's (2001) description of *Pterodroma occulta* was not available in the field and the bird was not confirmed to be a Vanuatu petrel until measurements and photos were sent to M.J. Imber and A.J.D. Tennyson (*pers. comm.*) in Mar 2009.

I visited Qwelrakrak a 3rd time on 24-25 Feb 2009 to photograph a live bird, now presumed to be a Vanuatu petrel. In the afternoon, new areas

Table 1. Measurements of a Vanuatu petrel on Vanua Lava compared with data in Imber and Tennyson (2001). Measurements are in mm, mean \pm sd are shown with range in parentheses.

Sample	Fresh bird (this study)	Study skins (Imber & Tennyson 2001)
Number	1	6
Location	Vanua Lava	AMNH
Date collected	21 Feb 2009	28-29 Jan 1927
Wing	301	288.0 \pm 5.2 (282-295)
Tail	130	125.8 \pm 5.5 (118.0-132.5)
Bill	33	33.0 \pm 0.7 (31.9-33.9)
Tarsus	35	36.4 \pm 1.3 (35.0-38.8)
Mid-toe + claw	49	47.9 \pm 2.2 (45.0-51.0)
Tail/bill	3.9	3.8
Tail/tarsus	3.7	3.5
Total Length	355	Not reported
Wingspan	820	Not reported

were searched for burrows, hundreds of metres to the north of Qwelrakrak and hundreds of metres to the east. Mount Suretamatai is largely covered in a dense undergrowth of ferns and grasses and no burrows were located by 'cold' searching. On the evening of 24 Feb 2009 I made additional MiniDisc recordings and performed some aural surveys. The first calls were at 1900h and seemed to be coming from the mountain. Later, other birds arrived from the east. There were 2 basic calls: a rapid, decelerating 'kek-kek-kek-kek-kek-kek' and a drawn out 'toooooo-wit'. As on 20 Feb, the seabirds at Mount Suretamatai were noisy for 2 to 3 hours and calls were occasionally heard from the campsite, 200 m north of Qwelrakrak, late into the night.

Aural surveys were conducted along the foot of the eastern mountain slopes. My aim was to listen for any other colonies and to locate their position from intersecting bearings. There were 3 listening stations: Qwelrakrak (0 m), 180 m north and 240 m north. These stations were located with a handheld Global Positioning System (GPS) receiver and areas of repeated calling activity were noted with compass bearing, estimated distance and elevation (low, medium, high). Three sub-colonies were



Fig. 4. Vanuatu petrel outside its burrow on Vanua Lava. (Photo: S. Totterman).

indicated and the furthest was about 400 m to the north of Qwelrakrak. Intersecting call-lines at the middle sub-colony indicate that Vanuatu petrels were audible up to about 180 m.

On the morning of 25 Feb 2009 another burrow search was made at Qwelrakrak in a new area, where calling activity had been most intense. My guide located about 10 burrows in an area of about 0.5 ha and he reported that all were occupied. Burrows were found on steep slopes of about 45 degrees inclination with their entrances facing to the east. They were tunnelled under large rocks and boulders and about 70 cm long. An adult bird was retrieved from 1 burrow, photographed (Fig. 4), and returned. Measurements were not taken to minimise stress to the bird and because it was difficult to handle.

DISCUSSION

Mere Lava and Audubon's shearwater

Audubon's shearwaters were 1st found at Mere Lava by The Whitney South Sea Expedition. Four specimens of the subspecies *P.l. gunax* (see *P.l. nugax* in Murphy 1928) were collected at sea on 28 Jan 1927. An entry on this day in F.P. Drown's unpublished journals adds that R.H. Beck 'secured one specimen of shearwater from Manelav where the natives hunt them out in their burrows' (reproduced in Imber & Tennyson 2001).

A breeding colony of Audubon's shearwaters on Mere Lava is indicated in historical records, local knowledge and the captured bird noted in this paper. Regarding the conservation of this species, the colony has survived annual harvesting of chicks for many years. The summit of the island has a difficult topography and burrows are mostly well hidden. There must be a good number of burrows that are never found and chicks that survive to fledging. The recently arrived technology of electric lighting to Mere Lava and its use in opportunistic

harvesting of Audubon's Shearwaters at night is of some concern.

I found no evidence of Vanuatu petrels on Mere Lava. Audubon's shearwaters are small: length 27-33 cm, wingspan 64-74 cm, mass 150-230 g (Marchant & Higgins 1990). Vanuatu petrels are larger: length 35.5 cm, wingspan 82 cm (Table 1) with an estimated mass 300-350 g (Imber & Tennyson 2001). Vanuatu petrels have a white nape collar, but Audubon's shearwaters do not and no other procellariids recorded from Vanuatu and its waters have this character. Mere Lava islanders have a long tradition of harvesting seabirds and it is unlikely that a distinctive species like the Vanuatu petrel would have been overlooked.

BirdLife International has reported that Vanuatu petrels breed on Mere Lava (BirdLife International 2008). This is most likely false as I found that on Mere Lava it is the Audubon's shearwater that is well known to local communities. I discussed my findings with Ian McAllan, BirdLife's source, and we agreed that his local source in Vanuatu was unreliable (*pers. comm.*).

Vanua Lava and Vanuatu petrel

Identification

Vanuatu petrels are consistently smaller than White-naped petrels (Imber & Tennyson 2001). Measurements of the petrel that I found on Vanua Lava fit Vanuatu petrel (Table 1), except that my wing measurement is inaccurate due to wrong technique (the wing was not folded and the result is too long). My wing measurement of 301 mm is 6 mm longer than the range for Vanuatu petrels, but at 299-322.5 mm is at the lower limit for white-naped petrels (Imber & Tennyson 2001).

The overall size of the Vanuatu petrel is about 20% smaller than the white-naped petrel. My measurements of the Vanuatu bird were 35.5 cm for total length and c. 82 cm for wingspan versus white-naped petrels at c. 43 cm for total length and c. 100 cm for wingspan (Marchant & Higgins 1990). The underwing of the Vanuatu bird that I found clearly shows the entirely dark grey primaries beyond the white coverts (Fig. 2), although some white-naped petrels are similar in this respect (Imber & Tennyson 2001).

Breeding notes

Qwelrakrak may be 1 of many small sub-colonies of Vanuatu petrel on Mount Suretamatai. Aural surveys at night on 24 Feb 2009 found 2 more sub-colonies and others could be found in a more extensive search. The area of Mount Suretamatai inside the 590 m contour is approximately 11 square km, so it is premature to estimate the breeding population of Vanuatu petrels on Vanua Lava. Also, this bird may breed on other islands in Vanuatu. At

Qwelrakrak, the burrows were concentrated where vegetation is more open and this may explain the scattered distribution of sub-colonies.

The Vanuatu petrel is closely related to the white-naped petrel and presumably has a similar breeding ecology. White-naped petrels breed on Macauley Is, Kermadec Is, where they arrive in Oct, lay in Dec-Jan and chicks hatch in late Feb, fledging throughout Jun (Marchant & Higgins 1990). In Feb 2009 I found adult Vanuatu petrels in burrows during the day, presumably incubating. Natives on Vanua Lava formerly harvested seabird chicks in Apr (Augustin, *pers. comm.*). Chicks may be quite large by late Apr and a smaller bird may have a shorter breeding cycle.

Conservation

BirdLife International has not yet accepted *Pterodroma occulta* as a new species and includes it as a subspecies of the white-necked petrel (*P. cervicalis*), which is listed as Vulnerable in the 2008 IUCN Red List (BirdLife International 2008). My discovery of Vanuatu petrels breeding on Vanua Lava supports its specific status. If the Vanuatu petrel is treated as a separate species, it is probably more threatened than the white-necked petrel because it likely has a smaller population.

The remains of 4 adult birds found at Qwelrakrak indicate that something is preying upon Vanuatu petrels. On 18 Feb 2009, I observed a peregrine falcon (*Falco peregrinus*) soaring over the slopes of Mount Suretamatai. Peregrine falcons have been reported to hunt Gould's petrel (*Pterodroma leucoptera*) nocturnally and their diet in the Australian region lists several seabird species (Marchant & Higgins 1990). They also frequently prey on collared petrels (*P. l. brevipes*) in Fiji (Clunie 1976). The dispersed location of the dead Vanuatu petrels at Qwelrakrak, on clear ground and at a distance from the burrows is thought to be consistent with aerial predation by peregrine falcons.

Feral cats (*Felis catus*) are another likely predator of Vanuatu petrels. There are feral cats on Vanua Lava, but local people said that they are not present in the interior of the island. Mount Suretamatai should be surveyed for cats and for rats (*Rattus spp.*) as well.

Other potential natural threats to the Vanuatu petrel are tropical cyclones and volcanic activity. The tropical cyclone season in Vanuatu, from to Nov to Mar, overlaps with the breeding season of Vanuatu petrels. A tropical cyclone could seriously disrupt breeding by dispersing breeding birds and perhaps washing out or flooding burrows. Mount Suretamatai is an active volcano and I noted a new solfatara in 2009 compared to previous visits in 2004 and 2007. A major volcanic eruption could be catastrophic for a species with a restricted breeding range.

The Vanuatu petrel is part of the cultural history of Vanua Lava. Before the arrival of Europeans the native peoples of east and north Vanua Lava lived in the hills and probably harvested seabirds annually. When Christian missionaries arrived they moved down to the coast. Indigenous populations declined severely after contact with Europeans and Lalngetak and surrounding villages on east Vanua Lava dispersed in the late 1940s. Harvesting of seabirds from Mount Suretamatai ceased at this time. The community of Lalngetak reformed in 1981, but by this time the tradition of harvesting seabird chicks was mostly forgotten. Before leaving in Mar 2009 I suggested to the people of Lalngetak that they protect their natural history by not harvesting chicks or otherwise interfering with the breeding of Vanuatu petrels.

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