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Chapter 4

Bats of the Nakorotubu Range, Ra and Tailevu Provinces, Fiji.

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SUMMARY

Three main survey techniques were used: general observations, bat detector, mist nets and harp trap. Only three species of bats were recorded: *Pteropus tonganus*, *P. samoensis* and *Emballonura semicaudata*. The latter two species are listed in the IUCN Red List 2007 as Near Threatened and Endangered respectively. At least three large roosts of *P. tonganus* were recorded within the area covered during the survey. More surveys are needed to locate possible roosting sites and monitor the presence of other bat species that forage within the area.

INTRODUCTION

There are fifteen species of mammals native to Fiji, of which six are terrestrial (bats belonging to the order Chiroptera) and nine are marine (whales belonging to the order Cetacea) (IUCN 2007). There are fourteen non-native species of mammals present in Fiji, all of which are terrestrial and have been introduced to Fiji in the last 3000 years since the arrival of humans (Pernetta and Watling 1978). This survey focused on the native bat species present in the Nakorotubu Range.

To date there has been no record of terrestrial mammal research conducted in the Nakorotubu Range area, apart from the limestone caves near the villages of Wailotua and Nasau which have been visited in the past to survey the Fiji blossom bat (*Notopterus macdonaldi*). Fiji's native bats are poorly studied, yet this group should be of high conservation importance as they include an endemic monospecific genus (*Mirimiri acrodonta*) and several near endemic species. Additionally, Fiji's bats play an essential role as seed dispersers, pollinators of flowers and in controlling nocturnal insect populations in rainforest and other terrestrial ecosystems (Manueli 2001, Palmeirim et al. 2007).

Some previous work on bats in Fiji includes a collecting trip in 1990–1991 by the Australian Museum, the results of which is published in Flannery (1995); work by Dr. Jorge Palmeirim (Universidade de Lisboa, Portugal) in 2000–2001 (Palmeirim et al. 2007); and studies on *Pteropus samoensis* by Dr. Ruth Utzurrum (Department of Wildlife and Marine Resources, American Samoa, Pagopago) in 2002. The work by the Australian Museum and Palmeirim provide good baseline data for bat research in Fiji.

The main objectives of this survey were to:

- a) produce a checklist of the bat species found in the Nakorotubu Range and
- b) focus on the conservation status of the rare and endangered species and their

habitats.

METHODS

Three main methods were used to survey the bat fauna of Nakorotubu:

- 1) Mist nets and harp trap,
- 2) Bat detectors and
- 3) General observation.

The location of sites and surveys are shown on Map 6.

Mist nets and harp traps

A pair of 12 x 2.7 m mist nets was used to trap larger fruit bats. The use of the nets was mainly to verify the identity of the larger fruit bat species, especially to the locals. The mist net was only used in fine weather conditions, set up for use from dusk to dawn and was regularly checked every hour.

Bat detector

A Tranquillity II bat detector was used to detect the presence of microbats in caves. It was also used during the night around the camp by walking a 50 m non-linear transect to detect foraging microbats.

General observations

We made general observations while walking through and around the forest during the day and hiking from one camp to another. Any species of fruit bat observed were noted. This was also carried out while conducting bird surveys in the early mornings and afternoons.

RESULTS

Only three species of bats (50% of the bat species found in Fiji) were recorded during the survey. Two were confirmed based on direct observations and one was only

detected using a bat detector. They are presented in Table 4.1 along with their conservation status as assessed by the IUCN 2007, Red List. Table 4.2 shows a summary of the sites surveyed for bats which are also presented in Map 6.

The most common species observed was *Pteropus tonganus* with about three large roosts each containing at more than 1000 bats, recorded from Matuku, Soa and Nasau villages. *P. samoensis* was rarely observed in Base camp 2 and none were observed in Base camp 1 however it was more commonly observed in the intact lowland rainforest around Base camp 3. While conducting a bird survey along a transect near Base camp 3 for two hours we observed four *P. samoensis*. However no *P. samoensis* were observed while surveying along bird transects in Base camp 1 and Base camp 2. Only one *Emballonura semicaudata* was detected on the night of December 6 using the Tranquillity II bat detector while walking a 50 m non-standardised transect near Base camp 2. Two mist nets were set up near Base camp 2 in a clearing on the ridge along the traditional track to Bureiwai on December 5 and 6; however, we were not able to catch any bats despite the fine weather. We did not set up mist nets in Base camp 1 as there was no ideal clearing and neither at Base camp 3 due to the rainy weather encountered. The harp trap was also not set up near the cave openings and entrance at these camp sites because we did not detect their presence using the bat detector.

Table 4.1: Checklist of species of native bats found in the Nakorotubu Range and their IUCN 2007 threatened status.

Common Name	Scientific Name	IUCN Status	Notes	No. of introduced species
Insular flying fox	<i>Pteropus tonganus</i>	Lower risk	Common. Three large roosts recorded.	64
Samoan flying fox	<i>Pteropus samoensis</i>	Near Threatened	None in Base camp 1 and very rare in Base camp 2 but more common in Base camp 3.	1
Polynesian sheath-tailed bat	<i>Emballonura semicaudata</i>	Endangered	Only noted using bat detector in Base camp 2, none seen or caught.	4

DISCUSSION

Pteropus tonganus

This was the most common species recorded in Nakorotubu Range. The presence of three large roosts near each of the base camps is indicative of an abundance of food. This was evident in the presence of extensive stands of *Cananga odorata* (makosoi) and *Piper aduncum* (onalulu) trees in secondary forests and fruit trees and crops near cultivated areas, agro-forest and abandoned gardens, villages and settlements. Some *Pteropus* bat species are known to forage for up to eight kilometres away from their roosts (Markus and Hall 2004). Only a small portion of the Nakorotubu Range was surveyed so there is a high chance of other roosts existing within the range.

Pteropus samoensis

This species is known to be locally rare. As shown in other parts of the Pacific, this species in American Samoa is rarer than *P. tonganus* with the density ranging from 1-18 bats/km² (Brook 2001). As only a few were observed in Base camp 1 and Base camp 2, this may be a sign of the declining health of the forest. The presence of *P. samoensis* has been used to assess the state of a forest system, as these bats roost in smaller colonies preferably in primary forest compared to *P. tonganus* which tends to forage in agro-forest and cultivated areas (Banack 1998). This species was commonly observed in the forests around Base camp 3. This could mean that the lowland rainforests and limestone forests of Nasau are still intact and remain connected to other healthy forest systems.

Emballonura semicaudata

This species only roosts in caves (Tarburton 2002); however, we did not record any in the caves that we visited in Base camp 1 north of Matuku village, at Base camp 2 north of Nalidi village and Base camp 3 north of Nasau village. This species is believed to be extirpated from Viti Levu but is still found in other parts of Fiji; the closest roost to Viti Levu is in the Yasawa Group (Palmeirim et al. 2007). Only a single detection of this species was made using the bat detector along a ridge at Base camp 2. This species, like *P. samoensis*, prefer to forage in well forested areas (Esselstyn et al. 2004). It is highly likely that there are caves in the limestone outcrops near Nalidi and Nasau villages that have not been recorded and/or surveyed. The known caves surveyed were close to villages and are more accessible. For future work, we recommend that the area be surveyed more intensively for other caves and the possible presence of cave-dwelling species, such as *E. semicaudata*.

Similar to the Nakauvadra bat survey in 2008, a problem encountered was that the majority of the local guides at Base camp 1 and Base camp 2 mistook this species for the White-rumped swiftlet (*Aerodramus spodiopygius*), a bird which also nests in caves and sometimes also under large boulder and cliff overhangs. Sites which the guides had marked out on the map as locations of bat caves were

actually cliff and large boulder overhangs where the White-rumped swiftlets were nesting.

Other bat species

Of the other three species that occur in Fiji but were not recorded in the Nakorotubu Range, the only species that may yet be found in this area is the Fiji blossom bat (*Notopterus macdonaldi*). The Fiji monkey face bat (*Mirimiri acrodonta*) is only found in Taveuni, and the Fijian mastiff bat (*Chaerephon bregullae*) has been only known to roost in Vanua Levu and Taveuni (Palmeirim et al. 2007). There are only three recorded roosts for the Fiji blossom bat in Fiji, one in Sawene (Nadroga/Navosa), Kalabu (Naitasiri) and Wailotua (Tailevu) (Palmeirim et al. 2007). The Wailotua cave is part of the limestone outcrops of Nalidi and Nasau and part of the whole system of the Nakorotubu range. We were not able to visit the main cave in Nalidi due to heavy rain causing flooding, preventing us from entering the main cave. We did not record any Blossom bats in any of the caves visited near Nasau village, however, all the caves were occupied by thousands of White-rumped swiftlets. The caves near Nasau village found along Waimaca creek area are large and deep enough to provide ideal habitat for the blossom bats. It was evident after exploring the caves that they have been disturbed a lot by humans, as the cave wall had graffiti and remains of partially burnt bamboos used as torches attested to. The locals later reported that every year around Christmas holidays (December) they would feast on hundreds of White-rumped swiftlets, which they would roast in open fire, a delicacy during that time of the year. However, this practise had been stopped in the last five years by the elders after they noticed the numbers of swiftlets decreasing. This practise by the locals could be a reason why Fiji blossom bats are no longer found in these caves. Cave dwelling bats can be very sensitive to disturbance from humans and a constant influence from humans could cause them to translocate to more ideal roosting places.

CONCLUSIONS AND CONSERVATION RECOMMENDATIONS

Conservation significance of the Nakorotubu Range for bats

Only three species were recorded, two of which are listed as vulnerable and endangered. Apart from *P. tonganus*, no roost for any of other two species were located in this survey and there is a need for more surveys spread over the Nakorotubu Range to locate existing roosts and bat colonies. The findings of this survey is similar to the findings of other large forest areas surveyed in Viti Levu including the Nakauvadra Range, Sovi Basin and the Wabu Reserve.

Future work

More surveys need to be conducted to locate the presence of any roosting colonies of each bat species and also to monitor population size of the different bat species foraging in the Nakorotubu Range. Other species like the Fiji blossom bat (species) could also be present in the Nakorotubu Range (apart from Wailotua) and there is a need to survey

the limestone outcrops of Nakorotubu for caves and bats. There is also a need for community awareness and education in the villages and communities surrounding the Nakorotubu Range. Local communities also need to be taught about the importance of bats and their ecological role, something which has been neglected in many Fijian communities where bats are not seen as important species, but only as a nuisance.

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Table 4.2: Summary of the sites surveyed for bats during the Nakorotubu Biodiversity Survey. These sites are also represented on Map 6 marked by the numbers which appears on this table.

No.	Date	GPS 1 (E)	GPS 2 (N)	Name of site	Description
1	12/01/2009	019-59-350	039-33-056	Esiesi	Rocky overhang along Nabavatu stream, plenty swiftlets, at least 2 overhangs but no bats
2	12/01/2009	019-59-091	039-33-557	Base Camp 1	along stream, secondary lowland rainforest, disturbed from feral cattle. Only <i>P. tonganus</i> observed flying.
3	12/01/2009	019-59-372	039-33-694	Nakorowaiwai	Rocky overhang, camp site for villagers, a lot of swiftlets. Pair of <i>P. samoensis</i> roosting near
4	12/02/2009	019-59-407	039-34-489	old fort, lookout	primary lowland rainforest. A few <i>P. tonganus</i> seen flying.
5	12/03/2009	019-58-315	039-29-990	Na me	Primary lowland rainforest, along Nalilo creek, above Matuku village, <i>P. tonganus</i> roost (>1000 individuals), roosting on several trees.
6	12/04/2009	019-63-042	039-24-186	Leuleu	Intact limestone forest near Nalidi village, could not enter cave due to flooding. Visited 2 small caves and 1 rocky overhang but no Blossom bats.
7	12/04/2009	019-60-023	039-27-523	Soa village	Secondary forest, <i>P. tonganus</i> roost (>1000 bats)
8	12/06/2009	019-61-201	039-33-604	Base Camp 2 (Nalalau)	Intact Montane forest. Few <i>P. tonganus</i> , 1 <i>P. samoensis</i> and detected 1 Pacific sheath tail bat.
9	12/06/2009	019-61-135	039-33-812	Base Camp 2 (Nalalau)	Set up 2 mist nets on ridge along track to Bureiwai, but did not catch any bats.
10	12/08/2009	019-65-531	039-17-973	Delailagi	Intact limestone forest near Nasau village. Big rock overhang, no bats only swiftlets.
11	12/08/2009	019-65-323	039-18-506	Waimaca cave 1 & 2	Large limestone caves suitable site for Blossom bats. No bats but >1000 swiftlets in each cave. Signs of a lot disturbance with graffiti on the walls, and burnt bamboos used as torches
12	12/08/2009	019-65-378	039-18-515	Waimaca cave 3	Limestone cave, big, suitable site for Blossom bats. No bats only lots of swiftlets. Signs of a lot disturbance and visit from humans by graffiti on the walls and burnt bamboos used as torches.
13	12/09/2009	019-65-287	039-20-788	Camp 3, Nubunivonu.	Intact lowland tropical rainforest above camp, a lot of <i>P. samoensis</i> in forest, and a lot of <i>P. tonganus</i> as well seen flying.
14	12/10/2009	019-65-882	039-20-186	Nasau village	<i>P. tonganus</i> roost above settlement (Wainara) towards camp 3.