Botanical Survey of the Nakauvadra Range, Ra Province, Fiji

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Source: A Rapid Biodiversity Assessment of the Nakauvadra Range, Ra Province, Fiji: 36

Published By: Conservation International

URL: https://doi.org/10.1896/054.057.0106

Chapter 5

The Invasive Mammal Fauna of the Nakauvadra Range, Ra Province, Fiji

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SUMMARY

Using a combination of standard traps and opportunistic surveys, we recorded six invasive mammal species in the Nakauvadra Range. These included two rat species (*Rattus exulans* and *R. rattus*), one mongoose (*Herpestes fuscus*), domestic horses (*Aquus caballus*), goats (*Capra* sp.) and domestic dogs (*Canis familiaris*). Although most of these species were observed in very low densities, they were found throughout the area surveyed including fairly secluded and hard to reach regions on mountain ridges and denser forest.

The finding of a decomposing mongoose that resembled the skull size of *H. fuscus* was the most interesting find as its occurrence in Fiji was not confirmed until after the Nakauvadra survey (C. Morley pers. comm., Feb. 2009) however, its distributional range is yet to be verified.

Due to the size of the area and accessibility, eradication of most of these invasive mammal species is not feasible. However it may be possible to increase reforestation rates of the native flora through the removal and/or exclusion of goats from the area. Any remedial activities undertaken in the area will need to be done with the consent and co-operation of the local communities who use the forests as part of their sustainable livelihoods.

INTRODUCTION

"…humans rank among the most successful invasive mammal species….. The human invasion did not reach many Pacific Ocean islands until 1,000 to 2,000 years ago….. other mammal species accompanied the human invasions. Besides livestock like sheep, goats, cattle, pigs and horses, there were stowaway species like rats. Later, predators like the mongoose were deliberately introduced to help control the rats." (Anon. 2009).

The many trails through the Nakauvadra Range (many of which are still used today by pig hunters and fishermen) have opened up pathways for intrusion of various introduced and invasive species over many years in the past and continuing today. This is complimented by negative animal husbandry (animals allowed to graze freely over open country) and agriculture practices (deliberate burning of grassland) that occurs on its periphery.

Introduced mammal species in Fiji

Rodents are a major contributor to the extinction and endangerment of native animals and plants. This has been observed in many parts of the world. Apart from wiping out native populations by predation, rodents are also known to be major carriers of diseases and to distribute alien and invasive species which can be very destructive to indigenous ecosystems.

There have been four species of rodents recorded in Fiji; Pacific Rats (*Rattus exulans*), Norway Rats (*R. norvegicus*), Ship Rats (*R. rattus*) and the House Mouse (*Mus musculus*).

The Pacific and Ship rats are common forest dwellers, consuming a wide range of prey, including many invertebrates such as earthworms, centipedes, larvae of some butterflies and moths, ants, beetles, weevils, cicadas, snails, spiders, lizards and birds; and plant items such as fleshy fruit, seeds, flowers, stems, and roots. They may also prey on the eggs and young of forest birds. (Sherley 2000)

One mongoose species was introduced to Fiji in the 1800s, *Herpestes javanicus* (Gorman 1975). The Small Indian Mongoose (*H. javanicus*) population in the Fiji Islands was established by an independent introduction of a single founding pair from the Calcutta region in 1883, after an attempted introduction in 1870 failed (Gorman 1975). This species is also responsible for the extinction of many species due to its mobility and ability to enter ground burrows and climb trees (personal observation).

The presence of a second mongoose species was highlighted by Craig Morley in 2007 (Morley et al. 2007). It had earlier been reported as *H. edwardsi* by Paddy Ryan (1988) but was confirmed to be *H. fuscus* in 2009 (D. Simberloff and C. Morley pers. comm., Veron et al. in press). "Activity of this species in Fiji has not been studied, but it has been observed in the morning and evening… and is believed to be nocturnal." (Veron et al. in press).

Survey objectives

- To determine the diversity of rodents in the Nakauvadra Range;
- To investigate the presence of other notorious invasive mammals such as mongoose and cats;
- Investigate and propose habitats and areas for more detailed studies.

A presence-absence survey was conducted for invasive mammals in the area; with a standardized study conducted for rodents. Investigation for evidence of existence for mongoose, cats, and other mammals was opportunistically carried out.

METHOD

Rodent Survey

A basic method of capture and data collection was conducted as outlined in Cunningham and Moors (1983) "A Guide to the Identification and Collection of New Zealand Rodents". Metal snap traps were

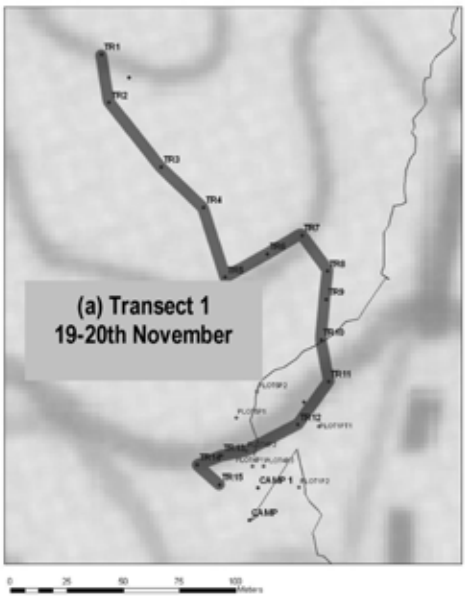


Fig. 5.1a First rat trap transect setup

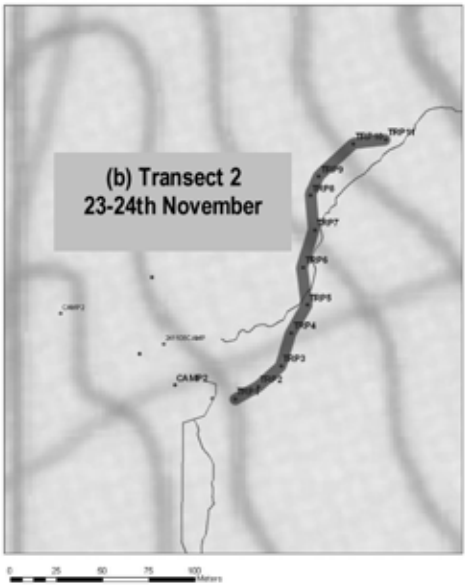


Fig. 5.1b Second rat trap transect

used as they have been proved to be more effective due to their camouflaging nature and snapping tension in similar environments.

Trapping data were recorded according to the "Trap data and Abundance" Sheet from Cunningham and Moors (1983); i.e., noting the presence of a rat, sprung and unsprung traps and the presence and absence of baits. These data would provide an estimate as to the density of rodents in the area. Measurements of captured rats were carried out using vernier calipers and a 1 kg (x 5g) scale. The species and sex were determined for each captured animal along with an estimate of its age (based on body size). The area covered by the invasive mammal surveys are shown in Map 6.

Transect 1

Fifteen traps were set for two nights (19th & 20th November), beginning from beside the first base camp (Camp 1), on the confluence of the Nabiya and Volivoli Creeks and running north up the slope at the back of the camp (Fig. 5.1a). Traps were baited with

Table 5.1. Captured record sheet for Transects 1 & 2. (Record codes; S/BP - Sprung/Bait Present, OK/BP - Unsprung/Bait present

Trap #	Transect 1			Transect 2		
	Night 1	Night 2	Night 3		Night 4	
1	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP
2	OK/BP	OK/BP	S/BP	OK/BP	OK/BP	OK/BP
3	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP
4	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP
5	OK/BP	OK/BP	OK/BP	**RAT**	OK/BP	OK/BP
6	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP
7	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP
8	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP	**RAT**
9	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP
10	OK/BP	**RAT**	OK/BP	OK/BP	OK/BP	OK/BP
11	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP	OK/BP
12	OK/BP	OK/BP				
13	OK/BP	OK/BP				
14	OK/BP	OK/BP				
15	OK/BP	OK/BP				

Table 5.2. Details for captured rodents

Transect	Night	Trap #	Species	Sex	Weight
1	2	10	*Rattus exulans*	Male	50g
2	3	5 right	*R. rattus*	Male	135g
2	4	8 right	*R. rattus*	Male	27g

roasted coconuts and positioned well under hanging boulders, large tree bases and below fallen logs, over a total distance of 280-300 m between 300-350 m a.s.l.

Transect 2

Eleven pairs of traps were set, two in each location marked on Fig. 5.1b above, for two nights (23rd & 24th November) using the same bait as for Transect 1. Traps were set on an uphill track from behind the second base camp site (Camp 2), climbing from an elevation of 240 m a.s.l. to close to 300 m a.s.l, on the eastern bank of Vavituka Creek.

Five key elements of the skull (Nellis 1989, DeBlase and Martin 1984) were measured (Table 5.3); including the Condylo-basal length, the length of a skull that is measured from the anterior points of the premaxilla to the posterior surfaces of the occipital condyles (Fig. 5.2) and serves as a common indicator of body size (Simberloff et al. 2000), and hence species identity in this case. These data present the larger size of this newly confirmed invader for

Table 5.3. Five key measurements in identifying mammal species (taken from Deblase and Martin 1984)

Entity	Description	Measurement
Condylo-Basal Length	From a line connecting the posteriormost projections of the occipital condyles to the prostheon	79.9 mm
Skull width	Greatest width across the braincase posterior to the zygomatic arches	30.0 mm
Skull height	From the foramen magnum to the attachment point between the sagittal and nuchal crests (or the mediam contact point between the squamosal and parietal bones)	18.2 mm
Zygomatic breadth	Greatest distance between the outer margins of the zygomatic arches	42.9 mm
Maximum diameter of the upper canine	Maximum breadth of one of the two upper canines	5.0 mm

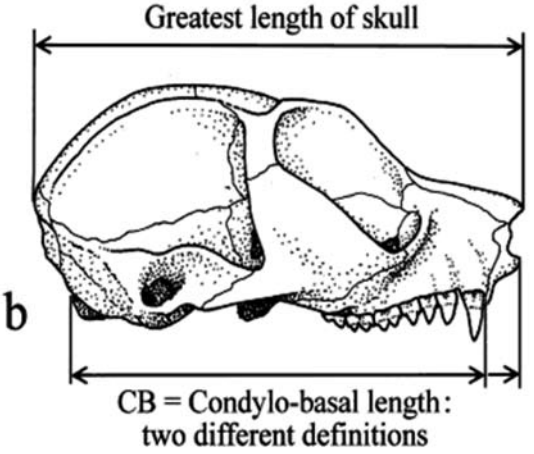
Fiji; *H. fuscus* (S. Meiri pers. comm. April 2009, D. Simberloff pers. comm. April 2009) simply described as a large red/brown species.

Other Mammals

Goats

Goats (*Capra sp.*) are a key obstacle to the re-growth of native forest in grassland-dominated areas that have encroached well towards to the higher slopes of the Nakauvadra Range. Goats were observed on the rocky ridges above Narara Village and close to the legendary peak of 'Uluda'. Goat scats were also observed close to the ridge, above farming settlements between Narara and Vatukacevaceva Villages.

Fig. 5.2. Condylo-basal length on skulls (taken from DeBlase and Martin 1984)



Horses

Domesticated horses (*Aquus caballus*) in the villages and farming settlements on the periphery of the Nakauvadra Range are used as transportation means between villages and into the Nakauvadra forest facilitating hunting parties and various traditional practices. These horses, with strong-minded owners, proved during the surveys that they are capable of reaching higher into the forest, even beyond the current trails.

Sticky seed producers such as *Bidens spirosae* were recorded on horse tails demonstrating the ability, although unintentional, of horses to disperse alien plant species into the forest, some of which may be destructive to native species.

Pigs

Aside from listening to hunters' numerous recollections of wild pigs (*Sus scrofa*) hunting operations, dug-up cool resting places for pigs were observed under large hanging boulders, flat shady areas and beside bases of bigger trees. The only time an adult pig was viewed during this survey was when a group of porters for the survey team displayed their catch while resting just below the Camp 1 towards Nayaulevu Village along Volivoli Creek.

Dogs

The wild pigs in the Nakauvadra Range attract hunters who are normally accompanied by hunting dogs (*Canis familiaris*). In cases similar to horses, dogs may be unintentional agents of introduced invasive plant species.

Cats

Feral cats (*Felis catus*) were not observed during the survey but are believed to occur in the Nakauvadra forest. Cats are proven predators of wildlife in many countries including Pacific Island nations leading to the extinction of many native species.

CONCLUSIONS AND CONSERVATION SIGNIFICANCE

Invasive mammals in the Nakauvadra Range

The Ship Rats (*Rattus rattus*) and Pacific Rats (*R. exulans*) co-exist in the Nakauvadra forest. The Ship rat reproduces successfully in the area as evidenced by the capture of a juvenile on *Transect 2*. The Indian Brown Mongoose (*Herpestes fuscus*) occurs in the forest and may well be co-existing with the Small Indian Mongoose (*H. javanicus*) despite the latter's non-sighting. The presence of these five species poses a serious threat to native wildlife. They are particularly dangerous in island ecosystems due to their impacts on the survival of native birds and animals because of their preying ability. As the Nakauvadra Range can be referred to as an island (it is a high mountain range surrounded by vast low grassland areas), the impacts of these species in the area is potentially very serious. Consequently, the impacts of rats and mongoose on native wildlife in the area may be exacerbated when compared to other large forested regions in Fiji.

In addition to the negative impacts of rats and mongoose on native fauna, goats are a major hindrance to the re-growth of native forest especially on the periphery and in the high rocky and grassland areas of the Nakauvadra Range.

Conservation recommendations

- It would be difficult to conduct eradication work for any of these species as use of the forest and encroachment of the local community is high thereby increasing the chances of accidental re-introductions. More detailed surveys over a larger area (including those areas further away from the common use areas of the local community) are advisable before eradication of any of these species is seriously considered.
- Potential reforestation sites should be identified in consultation with the local communities. Goats should then be removed and excluded from the proposed project sites. The removal of goats will in itself lead to a major re-establishment of native trees and other flora without costly replanting exercises.
- Local communities should be made aware of the impacts of invasive species on both local fauna and flora and encouraged to reduce their activities in the areas where possible.

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