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Report on the First Monitoring

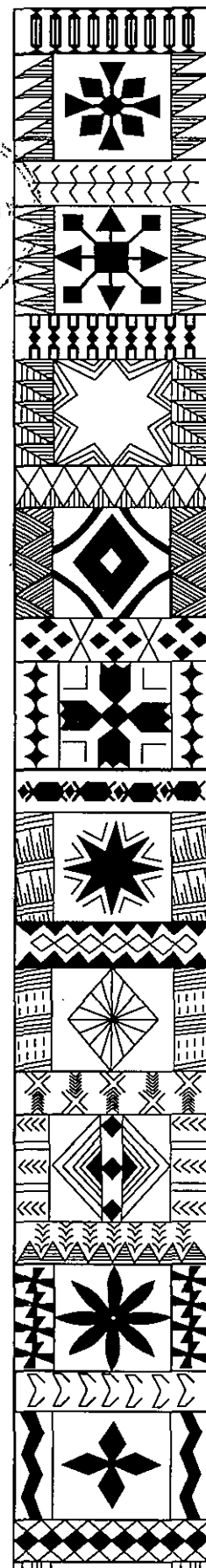
Visit to Nu'utele and Nu'ulua

Islands, 25-31 July 2000

IAS TECHNICAL REPORT NO. 2003/10

INSTITUTE OF APPLIED SCIENCES

REPORT



**Institute of Applied Sciences
University of the South Pacific**

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by

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October 2003

REPORT ON THE FIRST MONITORING VISIT TO NU'UTELE AND NU'ULUA ISLANDS, 25-31 JULY 2000

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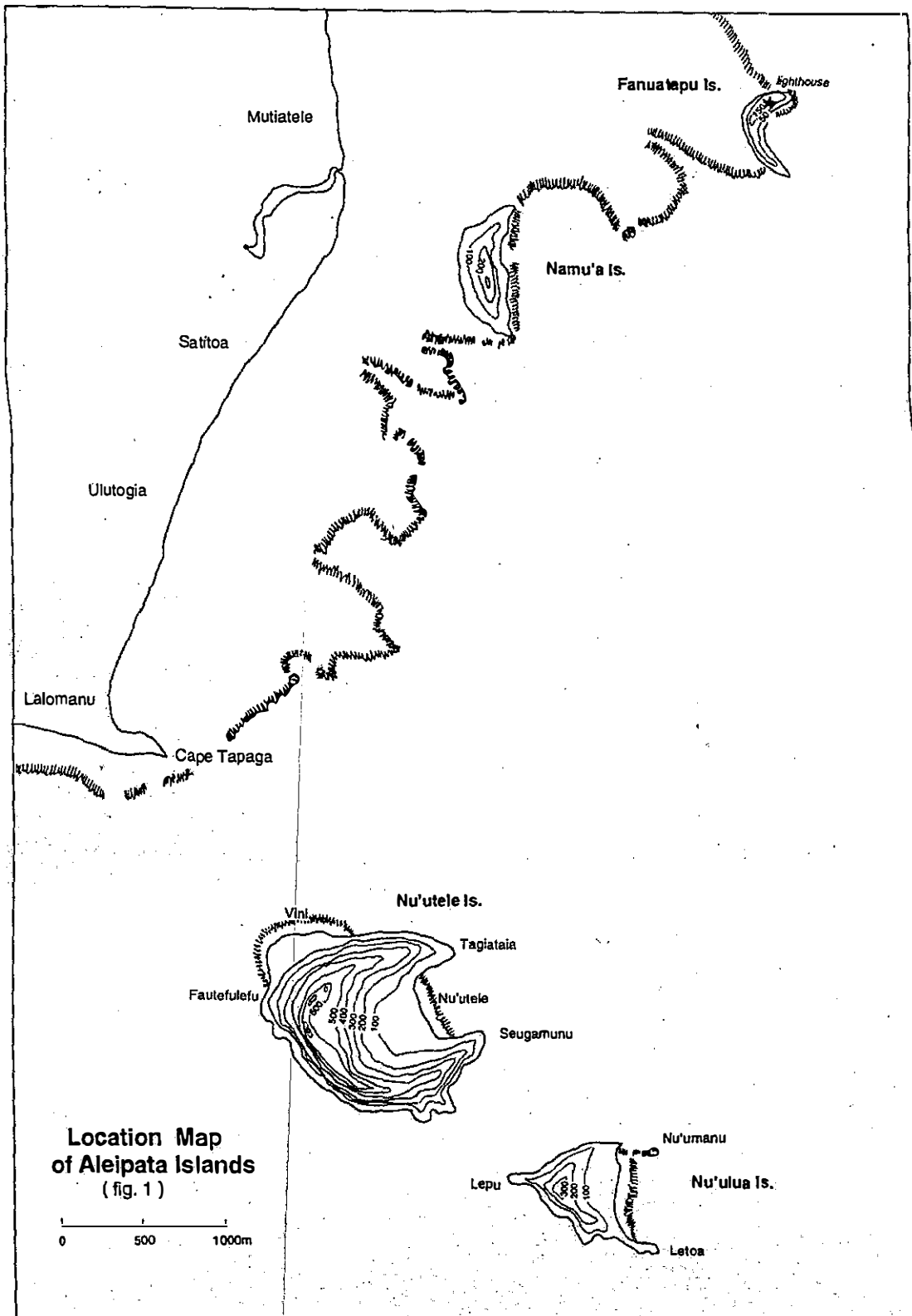
INTRODUCTION

This report documents our first visit to assess the fauna of Nu'utele and Nu'ulua Islands (Fig.1), Samoa, as a preliminary step towards carrying out a demonstration rodent eradication project for the South Pacific. These are the largest uninhabited islands of the eight small vegetated islands off the main islands of Samoa, and seem to be the most suitable for such a project. Both are > 500 m outside the fringing reef and have nationally significant populations of seabirds, friendly ground dove (*Gallicolumba stairi*), fruit bats (*Pteropus samoensis*, *P. tonganus*) and coconut crabs (*Birgus latro*), while hawksbill turtles (*Eremochelys imbricata*) also breed on them (Witzell and Banner 1980; Lovegrove *et al.* 1992; Park *et al.* 1992). Nu'ulua Island, furthermore, has no mature coconut palms which suggest that Polynesians have not lived on it.

The concept of a demonstration eradication project stems from the draft Regional Invasive Species Strategy (Sherley, 2000) which notes the need for advocacy measures to promote the eradication and control of pest species threatening native biodiversity. Consequently funds were sought from AusAID to fund a demonstration project and \$US45,000 was awarded. This money has been used to start the process with a feasibility study and monitoring exercise of beneficiary and rodent species numbers using standard techniques. The involvement of local conservation staff has been mandatory to facilitate on the job training of officers in basic wildlife practices which go with an eradication exercise of this kind. The project has been funded through the Regional Invasive Species Programme (RISP) administered by the South Pacific Regional Environment Programme, Apia, Samoa. Given the mutual needs of the Regional Avifauna Conservation Programme and the RISP, these islands were chosen because two endangered bird species occur there (tooth-billed pigeon (*Didunculus strigirostris*) and friendly ground dove), rodents (Pacific rats *Rattus exulans*) are known from Nu'utele Island from previous wildlife survey work (Park *et al.* 1992). There are also training possibilities for at least three Division of Environment and Conservation (DEC) conservation workers and one Marine Protected Area Officer (Aleipata District), and the advocacy potential for pest control in the South Pacific.

The work was carried out 25-29 July 2001 by Ian Stringer, Richard Parrish and Greg Sherley with assistance from Latu Afioa, Lima Aluini, Afele Faiilagi, Pulea Ifopo, Nu'utele Sagapolutele, Toni Tipamao, Foua Toloa and Fa'afetai Uitime. Brian Bell

was also on the trip carrying out rodent eradication feasibility studies. His work is reported in a separate report (Bell 2000).



Location Map
of Aleipata Islands
(fig. 1)

0 500 1000m

METHODS

Sample sites

Nu'utele Island

A line of 17 sample stations was set up from the base of the hill on the northern side of Nu'utele (Vini) to Nu'utele Bay. These were established at roughly equal intervals and followed the traditional cross-island track which leads over to the old leper village site on the caldera side of the island. The track is relatively level for about 400m across a flat formed by beaches left from a drop in sea level over time to the foot of the non-vent side of the old volcano (Whistler 1983). It then follows up the only available route between the bluffs to near the high-point of the island then zigzags down to Nu'utele Bay. Sample sites were established about 50 m apart along this track. They were marked with white numbered plastic animal ear tags that were wired to trees. At most sites, one of each of the following was set: an insect pitfall trap (100mm cup covered with dinner plate sized cover; half filled with car anti-freeze), rodent tracking tunnel (500mm long, 75mm high, 55mm wide, painted cardboard cover, two tracking brown papers each end with moist food dye saturated foam pad in the middle), rat and mouse snap-traps. Samples taken from each site are given in Table 1 together with the GPS positions of most sites. No GPS positions were obtained at sites 10 and 14 and that at site 9 is inaccurate because these were covered with a dense canopy and were in valleys. All invertebrates collected in pitfall traps were stored in 50% ethanol and lodged in the Auckland Museum.

Lizard pitfall traps (4 litre tapered plastic paint pails) were set in groups of ten consisting of five pairs – one set above high water near the camp, one at the crest of the cross-island track, one on the flat about 200m off the steep slope on the caldera side of the cross-island track and one set above the high water mark in Nu'utele Bay. Each was covered by a plywood sheet 300 mm x 300 mm sitting on rocks or pieces of branch so it was raised about 1 cm above the both the rim of the paint pail and the ground.

Each day the snap-traps were cleared and re-baited, and the tracking tunnel papers were replaced. Lizard pitfall traps were checked each day; half were baited and half unbaited. The half that was baited were restocked (peanut butter and catfood on fresh leaves on the base of the trap). Peanut butter was used on the rodent snap-traps. Insect pitfall traps were cleared after the first night but thereafter left in place to the end of the four night period of trapping when all insects that were caught were removed from the pitfall trap and retained together with the anti-freeze for later sorting.

Notes on all birds and bats seen and heard were kept and estimates of numbers of seabirds nesting were made. Watling (1982) was used for identifying bird species.

Snails were collected by hand while on the islands. Bags of leaf litter were removed from the islands and later searched on a background of white paper under a strong lamp and the snails extracted and later sorted.

Spotlighting for geckos was carried out at night with most being caught, identified and measured. Skinks were also caught by hand by day and likewise, were identified and measured.

Table 1. Positions of sample sites on Nu'utele Island, together with the samples taken at each site.

Site	South	West	Notes
Beach at Vini	14° 03' 39.1"	171° 25' 37.7"	Start of 10 lizard pitfall traps; 20 m to start of tracking tunnels and insect pitfall trap sites A, B, C, and D.
1	14° 03' 45.2"	171° 25' 34.9"	Insect pitfall, tracking tunnel, snap traps
2	14° 03' 46.8"	171° 25' 39.3"	Insect pitfall, tracking tunnel, snap traps
3	14° 03' 47.3"	171° 25' 37.3"	Insect pitfall, tracking tunnel, snap traps
4	14° 03' 47.5"	171° 25' 36.2"	Insect pitfall, tracking tunnel, snap traps
5	14° 03' 50.5"	171° 25' 34.8"	Insect pitfall, tracking tunnel, snap traps
6	14° 03' 50.6"	171° 25' 32.0"	Insect pitfall, tracking tunnel, snap traps, 10 lizard pitfall traps
7	14° 03' 52.4"	171° 25' 32.5"	Insect pitfall, tracking tunnel, snap traps
8	14° 03' 54.1"	171° 25' 32.6"	Insect pitfall, tracking tunnel, snap traps
9	(14° 04' 20.7")	(171° 25' 53.7")	Insect pitfall, tracking tunnel: Inaccurate GPS reading: too few satellites
10	-	-	Insect pitfall, tracking tunnel: No GPS reading
11	14° 03' 56.8"	171° 25' 27.9"	Insect pitfall, tracking tunnel, snap traps
12	14° 03' 55.9"	171° 25' 26.4"	Insect pitfall, tracking tunnel, snap traps
13	14° 03' 56.1"	171° 25' 24.2"	Insect pitfall, tracking tunnel, snap traps
14	-	-	Insect pitfall, tracking tunnel, snap traps. No GPS reading
15	14° 03' 56.0"	171° 25' 21.3"	
16	14° 03' 55.6"	171° 25' 18.0"	Insect pitfall, tracking tunnel, snap traps, 10 lizard pitfall traps
17	14° 03' 55.2"	171° 25' 14.3"	Insect pitfall, tracking tunnel, snap traps
Nu'utele Bay	14° 03' 54.0"	171° 25' 11.1"	10 lizard pitfall traps

Nu'ulua Island

Twenty rodent snap traps and 20 lizard pitfall traps were set on Nu'ulua Island on 25 July 2000 and cleared on 31 July 2000. The snap traps were set in groups of three and in a line which extended from near the beach to about halfway up the hill. Each group was 7-15 m apart and comprised two snap traps set on wooded trays set on pedestals 250-300 mm above the ground so as to prevent crabs reaching them and one snap trap

set horizontally on a rock, branch or logs. The trays were placed about 100 mm from rocks or fallen logs to provide easy access for rats.

The lizard pitfall traps were set in two groups of 10. One group was placed along the beachfront and the other inside the bush on the flat behind the beach. The positions of these sites are given in Table 2. We followed Gill (1993) in identifying the reptiles.

Table 2. Positions where rodent snap traps and lizard pitfall traps were set on Nu'ulua Island.

Site	South	West	Notes
North end beach	14° 04' 22.8"	171° 24' 32.8"	Landing site
-	14° 04' 22.8"	171° 24' 32.8"	10 lizard pitfall traps on beach edge
-	14° 04' 22.3"	171° 24' 36.3"	High end of snap trap line
-	14° 04' 22.7"	171° 24' 33.3"	Low end of snap trap line; 10 lizard pitfall traps in forest
South end beach	14° 04' 35.4"	171° 24' 32.3"	

RESULTS

Rodents

A single male Pacific rat was caught in the snap traps (at site 3) together with 7 land crabs during 36.5 corrected trap nights on Nu'utele Island, but nothing was caught in a total of 120 corrected trap nights on Nu'ulua Island (Table 3). A second Pacific rat (sub adult female) was caught on Nu'utele Island in a snap trap set at high water mark to the north of the fale, and there was clear evidence of a rat eating bait and leaving droppings in one of the bait stations that Brian Bell was testing out. One rat was seen during the day at site 15 but there was never any evidence of rat tracks at this site. All of the rat traps on Nu'utele Island were set up trees either vertically or horizontally on suitable branches in order to reduce the chances of crabs reaching them. Mouse traps were also set on top of the tracking tunnels in many of the sites on Nu'utele Island but most of these disappeared overnight. We caught nothing in the mouse traps in a total of 13.5 corrected trap nights. No rodent tracks were found in any of the tracking tunnels during 44 tunnel-nights, but 52% of the tracking tunnels had land crab tracks through them. We conclude that rodents are only in low densities on Nu'utele Island.

Table 3. Results of rat snap trap catches on Nu'utele and Nu'ulua Islands (corrected numbers per 100 trap-nights).

Species/traps	Nu'utele	Nu'ulua
Rats	2.74	0
Land crabs	2.74	0
Hermit crabs	8.22	0
Coconut crabs	8.22	0
No. traps set per night	17	20
No. traps sprung but empty	24	3

Reptiles

The lizard pitfall traps caught only two skinks during 160 trap nights on Nu'utele Island (one white-bellied skink *Emoia cyanura* on Vini beach and one Pacific black skink *Emoia nigra* on the flats in the bush behind Nu'utele Bay): both were caught in unbaited traps. No lizards were caught in the pitfall traps on Nu'ulua Island during 120 trap nights but two lizard species (blue tailed skinks *E. cyanura* & *E. impar*) were seen on this island. Data from captured lizards are listed in table 4.

White-bellied skink *Emoia cyanura*

This species was abundant on the coral rubble beaches of Vini and Nu'utele beaches. Some were also seen in clearings on the Vini plantation area. This species was probably the species abundant on the beach on Nu'ulua Island although none were captured to confirm their identification.

Dusky-bellied skink *Emoia impar*

Blue tailed skinks were seen in patches of sunlight in deep forest on Nu'ulua Island. This species inhabits forest whereas *E. cyanura* inhabits open areas (Gill 1993). This species is probably present on Nu'ulua Island but we cannot confirm it.

Pacific black skink *Emoia nigra*

This species was common on Vini flats and the forested flats behind Nu'utele Bay. Their range extended up the steeper slopes almost to the highest point but they were less abundant high up.

Samoan skink *Emoia samoensis*

E. samoensis had a similar distribution to *E. nigra* but tended to be more common in the deeper forest and less common in the modified areas.

Murphy's skink *Emoia m rphyi*

A single specimen of this species was caught by Foua Toloa on a rock at the western end of Vini beach.

Oceanic gecko *Gehyra oceanica*

Most were found around the camp fale on Nu'utele Island with perhaps 20 living there. A couple were seen when spotlighting along Vini beach and one was found in a rotten tree trunk on the flats behind Nu'utele Bay suggesting that they are widespread on Nu'utele Island.

Mourning gecko *Lepidodactylus lugubris*

Three were seen in shrubs along the beach at Vini.

Pacific boa *Candoia bibroni*

One was seen on 27th July by one of the Samoan helpers. This was in the plantation behind the camp fale on Nu'utele Island but it had moved away by the time we arrived back in camp to check.

Turtles

Tracks of a turtle were seen on the beach at Nu'ulua Island. The species identification is unknown.

Table 4. Numbers of lizards caught on Nu'utele Island and morphometric data.

Species	Snout-vent mean (mm)	Snout-vent range (mm)	Total tail mean (mm)	Total tail range (mm)	Mean weight (g)	Weight range (g)
Pacific black skink n=5	97.6	76-110	156.6	122-195	23.92	10.6-39.2
Samoan skink n=8	102.25	99-111	157.85 n=7	24-219	20.64	17.4-29.7
White-bellied skink n=1	51		88		2.8	
Murphy's skink n=1	66		127		5.4	
Mourning gecko n=2	42	42-42	30	25-35	1.2	1.1-1.3
Oceanic gecko n=3	81.3	77-85	60	52-65	12.9	10.2-15.4

Birds

The birds observed on Nu'utele and Nu'ulua Islands are given in Table 5. One Polynesian starling (*Aplonis tabuensis*) was found with a deformed wing near site 16 on 27th July. It was caught and brought back to camp because we thought the wing was broken initially. Feather lice were collected from it for Ricardo Palma in the National Museum in Wellington, and then the bird was liberated again.

Table 5. Birds seen or heard on Nu'utele and Nu'ulua Islands.

Species	Island	Nu'utele	Nu'ulua
Red-footed booby <i>Sula sula</i>		Breeding ca 100 pairs. Large chicks present and birds sitting.	Breeding ca 200 pairs. Large chicks present and birds sitting.
Brown booby <i>S. leucogaster</i>		Breeding ca 30 pairs around island. Large chicks present.	Breeding ca 50 pairs on rocky islets either end of beach.
Greater frigatebird <i>Fregata minor</i>		Seen flying over island and off western end.	At least 200 birds present, some chicks visible.
Reef heron <i>Egretta sacra</i>		Up to 3 seen at a time.	
Banded rail <i>Rallus phillippensis</i>		A few heard/seen.	Common, 1 chick seen.
Turnstone <i>Arenaria interpes</i>		Seen.	Seen.
Wandering tattler <i>Tringa incana</i>		Seen.	Seen.
Common noddy <i>Anous stolidus</i>		Breeding, c50 pairs mostly on cliffs between Vini & Tagiataia Point. Also on Seugamunu headland.	Probably 20 or more pairs on rocky islets either end of beach.
Blue noddy <i>Procesterna cerulea</i>		2 seen on cliffs between Vini and Tagiataia Point.	
White tern <i>Gygis alba</i>		Seen.	2 Seen.
Friendly ground dove <i>Gallicolumba stairi</i>		3 seen top 2/3rds of island on caldera side.	1 seen.
Crimson crowned fruit dove <i>Ptilinopus porphyraceus</i>		Seen.	
Many coloured fruit dove <i>P. perousii</i>		Seen.	
White-throated pigeon <i>Columba vitiensis</i>		Heard.	
Pacific pigeon <i>Ducula pacifica</i>		Common – feeding on <i>Dysoxylum</i> fruits. 15 seen in one tree.	1 seen.
Tooth billed pigeon <i>Didunculus strigirostris</i>		Heard on one occasion.	
Flat billed kingfisher <i>Todirhamphus recurvirostris</i>		A few seen.	1 seen.
Barn owl <i>Tyto alba</i>		1 seen.	

White rumped swiftlet <i>Aerodramus spodiopygius</i>	Very common.	
Samoaan broadbill <i>Mylagra albiventris</i>	Occasional. Fledglings seen.	
Samoaan whistler <i>Pachycephala flavifrons</i>	Occasional. Fledglings seen.	
Polynesian triller <i>Lalaga maculosa</i>	Common.	Common.
Wattled honeyeater <i>Foulehalo carunculata</i>	Abundant. Fledglings seen.	Common.
Samoaan fantail <i>Rhipidura nebulosa</i>		Seen.
Polynesian starling <i>Aplonis tabuensis</i>	Occasional. Downy fledgling seen.	
Samoaan starling <i>A. atrifusca</i>	Common, sometimes in flocks	Common.

Pitfall trapping for invertebrates

A total of 21 invertebrate pitfall traps were run on Nu'utele Island. Four of these were open over 7 nights (24 – 31 July: sites A to D) and 17 were open over 4 nights (24 – 28 July). Four of these were destroyed or filled in with soil (sites 5, 9, 10, and B) presumably by crabs. A total of 406 invertebrates were caught but only 52 were larger than 5 mm in length. These are listed in Table 6. The other invertebrates collected were all less than 3 mm long and most were less than 2 mm long. They comprised, in order of abundance, tiny flies (Diptera: 42.6%), small ants (Formicidae: 20.2%), small spiders (4.9%), springtails (Collembola: 3.7%), small crickets (Gryllidae; 3.4%), rove beetles and sucking bugs (Coleoptera: Staphylinidae + Hemiptera, both 2.0%), landsnails and leaf litter mites (Gastropoda + Acarina; both 1.7%), and minute parasitic wasps (Hymenoptera, 0.7%).

Table 6. Invertebrates 5 mm long or larger caught in pitfall traps on Nu'utele Island.

Invertebrate	No. caught	Body length (mm)	Sites where caught
Earthworms (Oligochaeta)	2	34, 15	17, 4
Earwig (Dermaptera)	1	6	A
Hermit crab (Anomura)	1	15	A
Caterpillar (Lepidoptera)	1	10	22
Large ants (Ponerinae: <i>Odontomachus</i> sp.)	44	Ca 7-11	1, 3, 6, 7, 8, 11, 12, 13, 14, 15, 16, A
Land snails (Gastropoda)	3	7, 7, 9	11, 22

Snails

Fifteen species of land snails were collected, 11 on Nu'utele Island and seven on Nu'ulua Island. The results are shown in Table 7.

Table 7. Snails collected on Nu'utele and Nu'ulua Islands.

Species	Island	Nu'utele Island	Nu'ulua Island
<i>Helicina fulgurata</i>		X	X
<i>Helicina plicatilis</i>		X	
<i>Hydrocena parvla</i>			X
<i>Lamialaxis achatinaceus</i>			X
<i>Liatdetia samoensis</i>		X	
<i>Melampus fasciatus</i>		X	
<i>Omphalotropis biliratus</i>		X	X
<i>Omphalotropis perforata</i>		X	
<i>Ostodes plicatus</i>		X	
<i>Partula sp.</i>		X	
<i>Pythia scarabaeus</i>		X	
<i>Stenogyra upolensis</i>			X
<i>Subulina octona</i>		X	
<i>Succinea crocata</i>		X	X
<i>Succinea putamen</i>			X

Other animals and observations

One mature coconut crab carrying eggs was found near site 17 on Nu'utele Island on 27th July. This was taken inland and liberated again in a rocky place where there were numerous deep holes for it to hide in. Coconut, hermit, grapsid and at least one other species of crab were commonly seen at all elevations on the island. These species all ate rodent bait.

Both species of fruit bats found in Samoa were observed on Nu'utele Island. The Samoan fruitbat (*Pteropus samoensis*) was common on Nu'utele Island and one was seen on Nu'ulua Island. The Tongan fruitbat (*P. tonganus*) was seen flying onto the island every evening coming from Upolu Island.

DISCUSSION

Rodents

The capture of two Pacific rats re-confirms the identity of the rodent species on the islands. The capture rate of 1 rat per 36.5 corrected trap nights suggests that the rats

are in low numbers on Nu'utele Island. The fact that they may be in low numbers does not alter the possible impact they may have on the island's biota. Nothing is known about the impacts of Pacific rats on sub tropical or tropical Pacific island biota but there is extensive knowledge of the impacts they have on species in temperate New Zealand. It appears from our trapping on Nu'ulua Island of no rodents in 120 corrected trap nights that rodents are absent from this island, however we cannot be sure.

The eradication of Pacific rats from Nu'utele Island would we feel, benefit the fauna of the islands immensely. However, there are drawbacks and risks involved. In New Zealand it is recognized that some species will be affected by the toxin but the long term benefits for the ecosystems far outweigh the detrimental effects. On Nu'utele Island animals likely to be detrimentally effected include the Pacific boa, barn owl and possibly banded rail. The effect on other species such as land crabs is not known. One of the rarer species of bird on the islands (and throughout the western Pacific) is the friendly ground dove. Nothing is known about its feeding habits and whether it would be susceptible to toxins either directly or through secondary poisoning. This also applies to the tooth billed pigeon. It may be possible to remove some birds into captivity although the expertise for this probably does not exist. If ground doves were badly effected, then they could probably be re-introduced from Nu'ulua Island and likewise tooth billed pigeons could be reintroduced from the main islands of Upolu and Savai'i.

Reptiles

Gill (1993) reports 13 species of skinks and geckos in Samoa and one snake. On Nu'utele Island we recorded six species of lizard (4 skinks & 2 geckos) and the one snake. On Nu'ulua Island we recorded two skinks. As no night time visits were made and virtually no time was spent searching for geckos by day on Nu'ulua Island we do not know the gecko fauna of this island.

The use of pitfall traps for capturing lizards on these islands appeared to have limited success. In New Zealand baited pitfall traps are very successful. The reason for the lack of success is due we feel to the abundance of ants and crabs. In the baited traps the bait attracted huge numbers of ants and large numbers of crabs. The ants would be swarming all over the trap and bait and the crabs would be lined up around the ply lid trying to get to the bait. In this situation, it is not surprising that no lizards were caught in baited traps. The ants would have cleaned up the bait very quickly and the sheer presence of ants in the traps and crabs around the rim would have probably deterred any lizard from trying to approach the trap. Because of this, experiments were carried out using an ant spray around the rim of the pitfall traps and using traps without bait. The spray had some affect but may have deterred the lizards as well and unbaited traps are haphazard in that they only catch lizards that fall in through mistake or curiosity. The use of unbaited pitfall traps may still be affective in monitoring any response by lizards to the removal of rats as a huge rise in the population of lizards would almost certainly result in more lizards being caught.

The identification of the turtle tracks seen on Nu'ulua Island this trip is unknown. Both green turtles (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*) are known from the area. Witzell & Banner (1980) reported that hawksbill turtles bred on Nu'ulua Island and on both Nu'utele Bay and Vini beach on Nu'utele Island.

Birds

These two islands hold significant populations of birds. They probably hold the most significant breeding populations of seabirds and the best populations of friendly ground doves in Samoa. It is not known what effects Pacific rats have on some of these species, but evidence in New Zealand show they have a detrimental affect on most ground nesting birds.

Standard bird counts were started on Nu'utele Island this trip by Fa'afetai Uitime and others but were discontinued because of strong winds.

Insects and Molluscs

The length of time that the pitfall traps were set (7 nights) is unlikely to produce a good representative sample of the invertebrates that are active on the forest floor on Nu'utele Island. We suggest that this may be better accomplished by leaving them open for at least a month. Nevertheless, 406 invertebrates were collected in these pitfall traps, but only 12.8% of these were potentially large enough to have been eaten by rats (i.e. 5 mm or larger) (Table 6) and of these, most were probably not edible (44 were ants, 3 were gastropods with thick shells, and 1 hermit crab). The other invertebrates collected were all less than 3 mm long and most were less than 2 mm long.

The mollusc *Subulina octona* is a widespread introduced species (Cowie 2000). We recorded it on Nu'utele Island where it is abundant. Cowie (2000) says...."*S. octona* is probably the most widespread and abundant subulinid in the Pacific. It may even be the most common land snail (native or alien)". Steps to prevent it being accidentally introduced to Nu'ulua Island need to be taken in the form of a hygiene plan and ensuring that plan is implemented.

RECOMMENDATIONS

- Carry out further surveys of rodents on Nu'utele and Nu'ulua Islands.
- Proceed with the eradication of Pacific rats on Nu'utele Island.
- Carry out further survey work on reptiles and birds on both islands.
- Prepare and implement a hygiene plan to prevent introductions of any potential pest species.

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