

SOME RECENT OBSERVATIONS ON SEABIRDS BREEDING IN FIJI

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ABSTRACT

Descriptions, distribution, banding data and details of nesting seabirds are given for various islands within the Fiji group visited during 1974, 1975 and 1976. These include Vatu-i-Ra, Vatu Lami, Yabu Is., Mabulau, Nuku-i-Cikobia, Sovu, Cikobia-i-Lau, Qilaqila, Lakeba, Nanuku Levu, Nanuku Lailai and Nasautabu. Species found nesting were Red-footed, Masked and Brown Boobies, Lesser Frigate Bird, White-tailed Tropic Bird, Reef Heron, Black-naped, Sooty, Bridled and Crested Terns, Common and White-capped Noddies.

INTRODUCTION

The seabird breeding situation in Fiji before European contact will never be fully known. The introduction of the cat and the mongoose to the major islands Viti Levu and Vanua Levu presumably ended the breeding of large numbers of petrels and shearwaters on them. The early literature recording seabird nesting is incomplete. Many nesting sites were misnamed or not named at all and several of the scientific names used can no longer be associated confidently with a particular bird.

W. B. King (1967), working with the Smithsonian Institution, summarised much of the literature, but without giving Fiji breeding locations. King (1974), being concerned with the findings of the Pacific Ocean Biological Survey Program 1963-1968, could give little information on Fiji. J. B. Smart tried to gather as much published breeding data as possible referring to Fiji and then to locate what nesting he could in 1969-1970. To my knowledge, his findings have not been published. This paper records my 1974-1976 observations, to provide some basis for future work.

The following terms are used to define the ages of birds. A pull is a nestling incapable of leaving the nest. A runner is a nestling capable of moving or which has moved a short distance away from its nest. Juveniles can fly but because of colour, size or the presence of down can be recognised as having fledged during the current breeding season.

VATU-I-RA

The higher north-east side and each end of this island are composed of volcanic rock. The rest of the island consists of flat coral sand, not far above spring high tide level. Most of the island is covered by vegetation, with taller *Pisonia* trees in the centre and on the outside

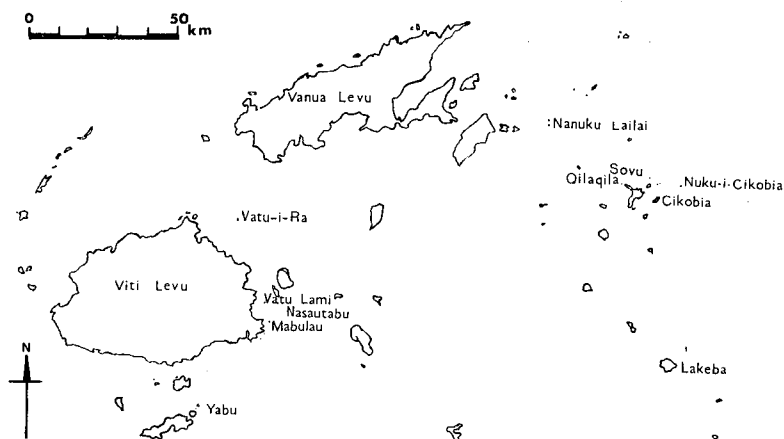


FIGURE 1 — Fiji Islands — locality of islands visited.

shorter shrub-like trees of two species: the yellow-flowering Vau (possibly *Hibiscus tiliaceus*) and an unknown species. Several exposed areas become covered with couch-grass after sufficient rain. Four visits were made on 12-14 July 1974, 2-6 December 1974, 2-5 October 1975, 14-15 November 1976.

RED-FOOTED BOOBY *Sula sula*

It was estimated on 12-14 July 1974 that there were 400 nests, a figure matching an estimate of 300-500 made by Morris (unpub. MS.) in June 1963. Of the accessible nests examined, 41 held pulls old enough to be banded and 28 contained eggs. 15 sitting birds handled were of the intermediate colour phase, two of the dark phase and only three had reached the white phase.

Nests were all on branches of *Pisonia* trees at heights between 2.5 and 6 metres. Some of the larger trees contained up to ten nests but two nests per tree were more usual. The nests were substantial stick structures 35-45 cm across, with occasional pieces of nylon rope, plastic and leaves also used. Egg chambers were 12-18 cm across and not lined. Strong winds and interference by humans seemed to have almost totally destroyed some nests. Only 5-10 nests remained from one breeding season to the next. White-capped Noddies (*Anous minutus*) and Lesser Frigate Birds (*Fregata ariel*) shared the same trees for nesting. Smaller trees, whether *Pisonia* or the yellow flowering Vau, were not used by boobies but were extensively used by the White-capped Noddy. Five eggs ranged 58-65.5 mm by 39-43 mm, average 62.7 x 40.9 mm. They were off-white in colour, becoming more brown and less smooth with age.

The visit of 2-6 December 1974 was obviously much nearer the end of the breeding season as there were only 20-30 adults attending

nests. Ten adults, 116 runners and 11 pulls were banded. Only five eggs were found.

The visits of October 1975 and November 1976 were timed for the period between the previous visits of July and December and confirmed breeding for the same period in similar numbers for 1975 and 1976.

303 Red-footed Boobies were banded on Vatu-i-Ra: 127 as runners, 122 as adults and 54 as pulls. To date, seven band recoveries have been made, all on Vatu-i-Ra and all had been banded as adults. Three were found dead after a storm by a Royal Fiji Navy patrol, 32 months after banding, and one of the four live recoveries was found 13 months later, having lost its intermediate colour phase. The dark feet, primaries and bill had been replaced by red feet, white plumage and light coloured bill.

The dark phase of this species probably lasts only to the first moult and then several moults gradually change the birds into the final all-white phase (except for black primaries and secondaries), when the pink and blue tues on the bill are diagnostic of the completed plumage change. The grey or black edges to the skin beneath the lower mandible seem to be associated with either age or individual character, but not with sex, as breeding pairs were sometimes observed to be both grey or both black.

LESSER FRIGATE BIRD *Fregata ariel*

60 birds were counted overhead on 12 July 1974, 200 over the island on the 13th, and an estimate of 250 nests was made on 14 July. Birds not occupied on nests were overhead all night whenever we were banding right through the night. Even when we were not active, only those building nests or incubating would land.

In December 1974 no eggs or pulls were found but 27 runners were banded and most of the 70 birds in the air were immature. In October 1975 only five or six young were in nests and in November 1976 only 115 birds were counted altogether on the island. Together these observations suggest an early nesting season for this species. A decrease in the breeding population cannot be discounted as Morris (unpub. MS.) found between 500 and 700 pairs breeding here in June 1963.

Their stick nests were much less bulky than those of the Red-footed Booby from which they commonly steal material.

Juveniles are liable to damage themselves when approached in the tree tops and both they and adults may break their wings while being handled. Because of this and the soft nature of the feathered tarsus which swells considerably just before the juveniles leave the nest, we discontinued banding after the first season. I found several birds on the ground with their wings broken after fishermen had come ashore to collect chicks for pets.

Locality	Date	Booby				Lesser Frigate Bird	White-Tailed Tropic	Tern				Noddy	
		Red-Footed	Masked	Brown				Reef Foror.	Black-Island	Sooty	Bridled	Crested	Common
YATU-I-RA	July 1974	400	-	(16)	250	-	(1)	-	-	-	-	(5)	(5960)
	Dec 1974	50 (500)	-	-	10 (70)	-	1	-	-	16	-	15 (70)	4050 (1200)
	Oct 1975	200 (500)	-	(5)	5 (60)	1 (1)	-	-	-	-	-	80 (50)	10000-15000
	Nov 1976	100 (400)	-	-	(115)	-	-	-	-	-	-	20 (40)	13000-15000
YATU-LANI	Jan 1974	-	-	-	(4)	-	(4)	(50)	-	(3)	-	-	(75)
	Aug 1974	-	-	-	-	-	1 (10)	1 (80)	-	-	16	-	(200)
	Oct 1974	-	-	-	-	-	(6)	11 (48)	-	-	-	-	(1)
	July 1975	-	-	-	-	-	(5)	-	-	-	-	-	-
YABU	June 1975	100+ (500)	-	(6)	(200)	-	-	-	-	-	-	-	-
KABULAU	June 1975	270	-	(6)	(70)	-	(28)	-	-	-	-	(1)	(2600)
	July 1975	(350)	-	-	-	-	2 (10)	-	-	-	-	-	(40)
NURU-I-CIKOBIA	Jan 1976	(50)	1 (2)	(40-50)	(3)	-	-	7 (10)	580 (90)	-	380	450 (40)	-
SOVU	Jan 1976	350 (50)	-	(10)	(30)	-	-	-	-	-	-	-	-
CIKOBIA-I-AU	Jan 1976	(25)	-	-	(1)	2+3?	(3)	-	(8)	-	(45)	-	-
QILAQILA	Jan 1976	-	-	-	-	3?	-	-	-	-	-	-	-
LAKEBA	Dec 1975	-	-	-	-	6? (15)	-	-	-	-	-	-	-
NANUKU LATILAI NANUKU LEVU	Aug 1976	(12)	-	(1)	(4)	-	-	(16)	-	-	-	(70)	-

TABLE 1 — Number of occupied nests and (in brackets) unoccupied birds.

WHITE-TAILED TROPIC BIRD *Phaethon lepturus*

In October 1975 one bird was found on an egg in a crevice right on top of the northern end. Another was seen making passes over the south end of the island but no nest was found. The nest site was overgrown in November 1976. The egg measured 54 x 40 mm. The nesting bird had only one of its extended rectrices, as did a nesting bird seen at Lakeba by Clunie (pers. comm.).

REEF HERON *Egretta sacra*

Seen occasionally. Only one nest was found, in December 1974, fairly high up under scrub at the north end of the island. The pair was of the grey form. The first of the blue coloured eggs hatched on 3 December 1974. Egg sizes were 48.2 x 32 mm, 48.5 x 34 mm and 49 x 31.6 mm.

BRIDLED TERN *Sterna anaetheta*

A very difficult bird to catch. I was unable to band any, largely because of their small numbers. In December 1974 I found 14 eggs higher up than the Common Noddy eggs on the rocks of the north-east

corner of the island. There were two very young chicks. Six eggs averaged 46.8 x 32.97 mm, range 46-48 x 32-33 mm. They were straw-coloured with brownish and grey blotches.

COMMON NODDY *Anous stolidus*

This larger, browner noddy is not in large numbers on this island. None were seen by Morris (unpub. MS.) in June 1963 nor by myself in July 1974 until two were caught at night. A search the following morning revealed few birds. In December 1974 some 90 birds were present. Five pulls, one runner and two adults were banded. The highest estimate was 200 made in October 1975 when 70 eggs were counted, seven runners and one adult banded. The latter was not moulting. Unlike the White-capped Noddy this species is apparently largely absent from Vatu-i-Ra when not breeding.

The eggs and chicks were found on exposed rock ledges at each end of the island and along the eastern side at heights of 1-5 m above high tide level. No nests were constructed and 12 eggs averaged 52.7 x 35.8 mm, range 50-56.8 x 34-37.2 mm. They are larger and darker than the eggs of the Bridled Tern which lays in similar sites. The chicks are very agile but may be killed by rats.

Because of this bird's occasional habit of swooping at persons near its nest, it falls foul of visiting fishermen who strike it with sticks. I saw one killed in this manner and on the first trip found a grounded bird with one wing missing, possibly from a similar incident.

WHITE-CAPPED NODDY *Anous minutus*

Easily the most common species on Vatu-i-Ra. It appears to roost there at night throughout the year, which is contrary to my findings on the islands and sand bars in the Bau Waters where roosting is sporadic or at best seasonal.

As the sky darkened on the night of 12 July 1974, thousands of these birds gathered into flocks and rafts 200-400 m offshore. On the western side of the island counts were made of the groups of birds that broke from the offshore flocks to pass over on their way to roost. This seemed satisfactory, provided no one was moving about on the island, which would send large flocks back out to sea. We counted 5960 noddies arriving from the western side and the next day made a less accurate count of 6000. These arrivals were spectacular because there was only one derelict nest on the island and no noddies at all during the day.

As the trip of December 1974 was in the midst of nesting and it was hard to count all the birds within the tree canopy of a given area, I decided to do a nest count. Birds were coming and going at all hours of the day and the use of a light to count them at night sent large numbers back out to sea, making counting very inaccurate. A nest count along adjacent transects for about a quarter of the island totalled 1010 nests. By climbing to the lighthouse and

superimposing the counted portion over the rest of the island I estimated some 4550 nests on the island. The figure of 9,000 adult birds attained by this method seemed reasonable while viewing the whole island from the lighthouse.

The start of breeding may vary from year to year, as Morris (unpub. MS) found between 1000 and 2000 pairs reoccupying and rebuilding nests in trees on Vatu-i-Ra in June 1965.

Although this noddy has nested sometimes on rocks (Mayr 1968), all nests on this island were in *Pisonia* shrubs or Vau trees. The nests, 100-180 mm across with very shallow egg chambers (12-20 mm), were placed in horizontal and vertical forks or on the upper side of larger horizontal branches. They were composed mostly of dried leaves and excreta, sited 1-4.5 m from the ground, below the canopy. Many nests were empty but as there were numerous juveniles in flight and runners moving amongst the branches it was assumed that the peak of nesting had just passed. 410 of the 1177 White-capped Noddies banded were juveniles, readily separated by their light weight (86-100 g), shorter bill (32-40 mm) and smaller white cap streaked with black. Over 200 eggs were counted but there would have been many more as most nests were seen only from below. Ten eggs averaged 44.45 x 31.53 mm, range 40-48 x 30.8-33 mm. They were off-white with an even spread of reddish-purple and brown blotches. 27 pulls were large enough to band.

The rats that had been very numerous and quite a nuisance at the tent during the first visit in July 1974, were scarce on this visit, only two being found together with their young. This rat is a good climber and was seen running up the trees with great agility. Although we saw them eating only dead birds, they may well prey on noddies caught up in the *Pisonia* fruits. The early nesters seemed to be most readily trapped by the *Pisonia* fruits that had fallen to the ground. About 20 birds were freed from *Pisonia* in October 1975; of these only 8 were considered strong enough to be worth banding. About eight *Pisonia*-covered birds were found dead. This problem did not exist on the other three trips.

The visit of December 1974 was the only time when anything other than small fish was found in the regurgitated crop contents. Eight young sea snakes (White-banded Sea Kraits, *Laticauda* sp.) measuring about 90-150 mm were found in the regurgitated material in the bottom of the holding bag.

In December 1974, 13 of the 809 noddies banded in July 1974 were retrapped among the 1190 birds handled. In October 1975, 15 retraps were among the 664 handled; five having been banded in July 1974 and ten in December 1974. In November 1976, 48 retraps were among the 818 birds handled; six had been banded in July 1974 (28 months previously), 20 in December 1974 (23 months previously), and 22 in October 1975 (13 months previously). Four bands to date have been returned from locations away from Vatu-i-Ra. The first

was a juvenile from December 1974 found ten months later at Yandina in the Russell group of the Solomon Islands, 2900 km WNW. The second, one which I had freed from *Pisonia* berries, was found 14 days later at Sigatoka, 150 km SW on the opposite side of Viti Levu. The third had been banded in November 1976 and was found four months later at Toberua Island, off south-east Viti Levu. The fourth had been banded in December 1974 and was found 32 months later at Lautoka, western Viti Levu. The first return surprised me because I had followed the general belief (Serventy *et al.* 1971) that this species, unlike the Common Noddy, was sedentary.

No moult was observed on the three visits (Oct.-Dec.) during the breeding season, but on the July visit about 75% of the birds were moulting their last or second to last primaries. This correlates with the moult data from Mabulau in June 1975.

NON-BREEDING SPECIES

The Brown Booby (*Sula leucogaster*) is a very timid visitor to this island from late afternoon to evening. All birds landed in the trees atop the cliff at the south-east corner. Six were seen on 13 July, 16 on 14 July 1974 and five in October 1975. Up to six have been seen resting on reef marker posts (as is typical of this species) along the Ra coast south-west of this island (12 Dec. 1974). Groups of two and four Crested Terns (*Sterna bergii*) were seen in December 1974. Groups of seven and 21 Black-naped Terns (*S. sumatrana*) were seen in July 1974, and larger flocks in December 1974, the most being 70 on 3 December.

VATU LAMI

Vatu Lami consists of three rocks at 178°40'E 17°48'S. The tops are about 3-4 metres above reef level and are covered with low succulent plants and ferns amongst which White-banded Sea Snakes (*Laticauda* sp.) are always to be found resting. Visits were made 27 January 1974, 25 August 1974, 28 August 1974, 10 October 1974, 15 June 1975.

BLACK-NAPED TERN *Sterna sumatrana*

Vatu Lami is much visited and this species loses a large number of eggs through repeated disturbance. 1974 records indicate that they may lay at two peaks or that they are persistent replacement layers. On 27 January, 50 birds were present but there were no eggs or other signs of nesting. On 25 August, 80 birds were present with many old nesting scrapes on two of the rocks. There was one abandoned egg and only one juvenile flying with the adults. Lots of young people had been seen running over the rocks 2-3 weeks earlier (W. Sachs, pers. comm.). This almost total failure was apparently followed by another laying for, by 10 October, when 48 birds were present, 11 added eggs were found. W. Sachs informed me that the birds nested again in the first week of May 1975 but I was unable to get there to confirm it.

The 11 eggs averaged 29 x 39 mm, range 28-30 x 37-41 mm. Their ground colour was either light or moderate brown, evenly covered by three types of marking: the largest blue-grey, the smallest almost black and the other chocolate brown.

REEF HERON *Egretta sacra*

On 25 August 1974 ten birds were in trees and on the reef and one egg was found among the ferns. What was possibly a very old nest constructed of fern mid-ribs was found nearby. The egg measured 53 x 35mm, a large example. There are always several birds at Vatu-Lami, with a ratio as high as 2:1 for dark and white phases.

NON-BREEDING SPECIES

Other birds often rest on or fish near Vatu Lami. For example, 4 Lesser Frigate Birds on 28 August 1974, 3 Bridled Terns on 27 January 1974 and 16 Crested Terns on 25 August 1974. The most common bird resting on the sand bar was the White-capped Noddy; 75 on 27 January 1974, 200 on 25 August 1974 and one on 10 October 1974. The only other species seen have been waders.

YABU ISLAND

Yabu Island is in the Astrolabe Lagoon just north of Ono Island at 178°30'E 18°51'S. It is thickly vegetated despite its numerous cliffs. Many of the trees are 20-22 m high, so that most Red-footed Boobies can roost and nest and Lesser Frigate Birds can roost safely. Because of this we could reach and band only one booby after covering 75% of the island. Only two visits were made, on 13 and 17 May 1975.

RED-FOOTED BOOBY *Sula sula*

On 13 May about 500 birds were present and on 17 May we counted 100 nests, an under-estimate for in the same week F. Clunie counted 300-400 occupied nests. This was probably early in the nesting season so that more nests were yet to be built. The number of un-occupied birds also suggested this. The one egg reached measured 58 x 39.8 mm.

NON-BREEDING SPECIES

Only 60 Lesser Frigate Birds were counted on the 13th but 200, both perched and flying, were present on 17 May. Kinsky and Clunie (pers. comm.) estimated that one in five of the frigate birds in the Astrolabe Lagoon at this time were Greater Frigate Birds (*Fregata minor*), confirming this by collecting two specimens.

Crested Terns constantly fished the surrounding waters in small numbers. A few were in full breeding plumage and Kinsky and Clunie (pers. comm.) found a runner on nearby Tagua rocks. Black-naped Terns were found on nearby Yanu-i-sau and Vurolevu by Kinsky and Clunie (pers. comm.); some were breeding. On several evenings moderate numbers of Common Noddies were seen on a flight line past the north-west of Ono and seemed to pass by Yabu as they flew north-eastwards. A few nights later, Kinsky and Clunie found them roosting

on Tagua Rocks. Two Brown Boobies were seen on 13 May and 30 on 17 May. Clunie (pers. comm.) found some roosting on Yabu. Wedge-tailed Shearwaters (*Puffinus pacificus*), which seem to move through Fiji waters at this time of year, were seen in a flight line with boobies off eastern Ono where I collected one dead and saw a very weak bird inshore on 18 May. Kinsky and Clunie collected one on 16 May and another on 17 May. On dissection, all three proved to be emaciated juveniles, apparently just off the nest (Clunie, pers. comm.). In June 1975, a bird was found on Suva foreshore. The species has been found breeding on Kadavu in the past.

MABULAU ISLAND

Mabulau is near the edge of the reef on the south-eastern end of Bau Waters at 178°46'E 17°58'S. There is only one small beach on the north-western corner, all other sides having 2-4 m wave-cut walls breached at intervals by eroded clefts. The limestone surface is very eroded, for the most part making movement across the island difficult. Vegetation is low and wind-pruned on the eastern side but rises to a maximum of 20 m on the north-western side.

Two visits were made on 12-15 June 1975 and 29-30 July 1976. On both trips several hundred Banded Sea Snakes (*Laticauda* sp.) were resident, a small number almost constantly coming and going at all hours of the day and night.

RED-FOOTED BOOBY *Sula sula*

In June, 270 nests were counted. Most of the 63 birds banded were non-breeders of intermediate colour phase, roosting on the lower trees of the eastern side. 13 of the banded birds were pulls, one of which was on the ground. Few eggs were found.

The eastward side that had in June been well populated with sleeping birds low down, was almost deserted in July. Several dead birds, including one caught in a tree-fork, and wind-stripped trees were evidence of storms. 300-400 birds were present and 21 were banded.

REEF HERON *Egretta sacra*

In June, 28 birds were seen, mainly on the southern end. In July, two nests were found, one with a clutch of four, the other with two which measured 49.5 x 34 mm and 51 x 33.5 mm.

NON-BREEDING SPECIES

One Collared Petrel (*Pterodroma leucoptera brevipes*) flew by the island on the mainland side during the June visit. 2-6 Brown Boobies were observed each day in June. They roosted in a tall dead tree on the western side each night and for more of the day than those at Vatu-i-Ra. 70 Lesser Frigate Birds were overhead at sunset on 12 June. None was seen to land after having harassed the boobies and only 16 were present the next day. The only Common Noddy seen was one caught in June among the White-capped Noddies.

At sunset on 12 June 1975, White-capped Noddies amassed offshore and some 2600 were counted as they came in to roost. Only

27 could be banded on the first evening because of the rugged terrain and the height of the roosting trees. 71 were banded on the third night and six on the fourth.

The birds were moulting and not breeding. In a sample of 12 birds, one had 4 primaries yet to moult on each wing, two had 3 primaries, three had 2 primaries, five had 1 primary and one had completed moult.

In July 1976 the trees on the east, after four weeks of high winds, had lost most leaves. We saw only about 40 birds and caught nine.

NUKU-I-CIKOBIA

Nuku-i-Cikobia is a roughly circular sand cay upon a reef at 178°39'W 17°12'S, scarcely above high water level and without vegetation. Only one visit was made, from the afternoon of 4 January to the morning of 5 January 1976. Breeding of several species was well under way for, although there were no pulls on the cay, there were 1500 eggs. During the evening two very large turtles came ashore and laid. I was told that both turtle eggs and bird eggs are used at times by the local folk for Christmas cooking.

MASKED BOOBY *Sula dactylatra*

Two pairs were present. One pair had two eggs and the other none. One of the latter was in moult. Three of its tail feathers, two secondaries and the eighth (third last) primary were being replaced. The sitting bird allowed itself to be picked up and two of the others were caught soon after dark. The former returned to its nest soon after being released. The nest was a slight scrape, with no nesting material. The clutch measured 61 x 42 mm and 68 x 45 mm. The smaller egg was chalky white with a tinge of blue and the larger was slightly brownish.

BROWN BOOBY *Sula leucogaster*

40-50 were on the island when we arrived but were as timid as usual and departed as we landed or soon after. Most returned to roost a few hours later and we banded ten. One bird only was nesting and was brooding two eggs. These were a dirty dull green-blue but where scratches had exposed the inner layers it was a deeper blue. They measured 69 x 44 and 64 x 42 mm.

BLACK-NAPED TERN *Sterna sumatrana*

Up to 20 birds were seen around the shores. Seven eggs were found, two measuring 28 x 40 mm and 29 x 39 mm. No chicks or juveniles were present. These birds were almost as hard as the Crested Tern to capture at night; only one was caught for banding.

SOOTY TERN *Sterna fuscata*

Three nesting areas totalled 580 sitting birds, each with an egg in a shallow scrape. As the sun set, the sitting birds were joined by their mates. There were 90 recently fledged juveniles as well as 20-30 dead juveniles at high-water level on the south-western side.

Five eggs averaged 54.8 x 36 mm, range 51-57 x 35-37 mm.

Ground colour was brownish and blotches of variable purplish-brown were evenly distributed.

CRESTED TERN *Sterna bergii*

There were 390 birds by day and almost all were incubating their one egg. None could be caught at night. Ten eggs averaged 61.3 x 41.1 mm, range 58-64 x 39-43 mm. The ground colour and both the shape and colour of the splotches varied widely. In general the markings were much more linear than on other tern eggs. One, 60 x 42 mm was a definite pear shape. All eggs lay in shallow scrapes and no nesting material was used. No eggs had hatched and the few unoccupied birds seemed about to lay.

COMMON NODDY *Anous stolidus*

Of the 495 birds sitting during the day well over three-quarters were brooding an egg. The brownish-white eggs were only lightly patterned by blue-grey and darker brown splotches. The markings were concentrated around the large end and on some to a lesser extent around the pointed end. This was the only species on the cay that arranged any nesting material. Larger pieces of coral were loosely arranged to form a nesting perimeter. Quite a number of primary wing feathers lay between the nests. Five runners and 70 adults were banded.

NON-BREEDING SPECIES

There was an erratic stream of Red-footed Boobies passing overhead from the south-east, several of which paused to circle before continuing on to roost on Sovu. Three Lesser Frigate Birds circled the island for a short time near sunset.

SOVU ISLANDS

The Sovu Islands consist of three islands and a rock, at 179°49'W 17°10'S. The afternoon and evening of 5 January 1976 were spent on the second largest island. A small number of unidentified birds landed near the summit of the largest island. At the same time scores of fruit bats were leaving the smallest island and flying to Cikobia and a few to Vanua Balavu. The rock was occupied by a few Black-naped Terns. On the second largest island Red-footed Boobies were nesting in the trees. On the ground were numbers of Banded Rail (*Rallus philippensis*).

RED-FOOTED BOOBY *Sula sula*

The only nesting sea-bird. It was late in their breeding season and the few remaining nests in the fairly high trees were occupied mostly by runners. Some immatures (still with some down around their necks) and adults were resting there and in the 2-3 m high trees on the edge of the beach.

16 runners, two immatures and 76 adults were banded by 11 p.m. when rising wind and waves, almost covering the island's little beach, forced us to leave. 300-400 pairs were on the island.

At dusk the adults returned with a strong tail wind from the direction of Tonga. Their speed was thought to be at least 110 km

per hour. Many, with feet extended, overshot the island by a considerable distance. Perhaps they had been fishing in Tongan waters, an idea supported by the recovery of a banded bird six months later from Niua Fo'ou, Tonga, 700 km east of Sovu.

NON-BREEDING SPECIES

Ten Brown Boobies were present but whether they normally roosted or had moved because we had been on Nuku-i-Cikobia the previous night is uncertain. Probably Sovu is used as a roost whenever Nuku-i-Cikobia is awash in bad weather.

30 Lesser Frigate Birds were present at sunset but were not seen after they had finished harassing the boobies. It was fairly dark but the frigate birds were still marauding when I noticed one to have much broader wings than the others. It was overhead for only a minute but I am sure that it was *F. minor*, the Greater Frigate Bird.

CIKOBIA-I-LAU

A mountainous island at 178°47'W 17°17'S, with one village, some forest, caves, gardens and cliffs. I was there on 2-3 and 5-6 January 1976.

WHITE-TAILED TROPIC BIRD *Phaethon lepturus*

Six were seen on 2 January, all on the western and southwestern cliff area. One entered the vegetation and was not seen to emerge. The tail feathers of another jutted out from a ledge some 12 m up a cliff and the others were displaying over the water adjacent to the cliffs. The following day two birds were seen doing aerial displays over the cliffs nearest the village. On 6 January several birds were seen along the south side where there are no real cliffs on the shoreline. We looked in vain for nests in an area a little inland where the birds went periodically. One bird entered a hollow horizontal branch about 5 m over the beach. It was caught and banded but its egg was not handled.

NON-BREEDING SPECIES

On 2 January, 25 Red-footed Boobies, two Black-naped Terns, eight Bridled Terns and 28 White-capped Noddies were offshore; 45 Crested Terns were onshore; one Lesser Frigate Bird, two grey and one white Reef Heron were inshore.

QILAQILA

A precipitous rocky island close to the north-west end of Vanua Balavu at 179°02'W 17°10'S. We sailed around it on 1 January 1976.

WHITE-TAILED TROPIC BIRD *Phaethon lepturus*

Five birds were flying close to the cliffs. Two were attempting to land and one seemed to succeed. Although we did not land (it would be extremely hard to climb the cliffs even with ropes), their behaviour indicated attempts to nest. A few minutes after seeing these birds, three more were seen flying along cliffs on Vanua Balavu. One bird flew in among the trees, again indicating probable nesting. Villagers from Vanua Balavu say sea-birds nest on this island, but

most refer to the Lesser Frigate Bird after which the island is named and which they say are often flying over the island.

LAKEBA

WHITE-TAILED TROPIC BIRD *Phaethon lepturus*

This island was visited for five days in December 1975. 9 December was devoted to finding these birds at the three cliff areas on the western side where Clunie (pers. comm.) had observed their nesting in November 1974. We found 15 birds either close offshore or moving in over the land and near the northernmost cliff, among the trees. However, no nests were found. Some broken egg pieces under a cliff face belonged to this species. My guide and friend said they had eaten this bird in earlier years. The land tenants nearby said they had presented five or six tail feathers to the Prime Minister (the paramount chief of the island) a month or so previously. They denied knowing of nests.

NANUKU LEVU and NANUKU LAILAI

These islands at 179°60'W 16°41'S were said to be covered with seabirds. So, after checking Raranitiga and finding only one Red-footed Booby and three Lesser Frigate Birds there, we went over to them on 22 August 1976. Both are flat sandy islands. Nanuku Levu was covered in vegetation including coconut trees whereas Nanuku Lailai was bare except for sprouting coconuts.

We visited Nanuku Levu first and noted 10-12 Red-footed Boobies coming in and roosting in the coconut trees. Four were still there when darkness came and a few Lesser Frigate Birds had finished circling the island. At dark we moved over to Nanuku Lailai where we had observed one Brown Booby, 70 Common Noddies and 16 Black-naped Terns. Few of these birds could be picked up by torch when we arrived. We caught and banded five Common Noddies and one Black-naped Tern before a tropical storm hit us and blew a wader net away. Nanuku Lailai is probably a breeding sand cay and temporary roosting site similar to Nasautabu.

NASAUTABU

Nasautabu is a sand cay at 178°46'E 17°49'S. It has some very low vegetation near one end. Its size and shape change from month to month and storm to storm. Friends have described two species which nest on the sand and I have seen two chicks taken from the cay which appeared to be Common Noddies. I was unable to visit the island. Both species of noddy as well as terns roost on the cay periodically but, as it is exposed to wave action, nesting is probably sporadic.

OTHER LIKELY PLACES

Through various individuals I have learnt of other places that may be worth visiting. Aiwa is a small island off Lakeba which the local people visit in punts periodically and where from their descriptions at least one of the noddies may breed. A rock on the western side

of Viwa is said to have breeding boobies. Some small islands in the Ono-i-Lau group according to one of my students has breeding boobies and "many smaller birds." Nukusimanu, both by its name and according to the owners, who live on Taveuni, is a low island with hundreds of birds nesting on it.

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APPENDIX — Table of measurements.

SPECIES	Length	Culmen	Wing Span	Wing	Tarsus	Mid Toe	Tail	Weight	Sample	Location
<u>Puffinus pacificus</u>	450-454	39.4-42.1	1 010-1 044	282-293	51.6-53.5	56.6-64.6	117-127	222-236	3	Ono
<u>Phaethon lepturus</u>	550	45.51		259, 266	21		288 (103)		2	Cikobia, Vatu-i-Ra
<u>S.sula</u>	692-755	83.5-92	1 390-1 580	365-412	35-45		211-272	773-1 041	10	Vatu-i-Ra
	780	88	1 454	402	45		230	915	1	Yabu
<u>S.leucogaster</u>	778	104	1 546	423	50.3	83.4	208	1 450	1	Yabu
	736-746	95-103	1 431	399-431	53		180		4	Nuku-i-Cikobia
<u>S.dactylatra</u>	840-890	104-111	1 622-1 720	442-457	58-60		180-183		3	Nuku-i-Cikobia
<u>F.ariel</u>	720-723	90-90	1 744-1 838	495-551	25		298	1 021-1 133	2	Vatu-i-Ra
	F 1734-1762	103.8		593	22.2	69.5	359	1 100	1	Ono
			1 692-1 740						3	Vatu-i-Ra
<u>E.sacra</u>	669-690	85-95	1 130	313-318	84.4-89.8	70.6-73	103-106	620-685	3	Yabu
<u>S.sumatrana</u>	338-360	33.8-41.5	670-672	224-236	19.6-22.1	19.4-22.8	126-143	105-120	9	Vuro
	336	38	640	229					1	Nuku-i-Cikobia
		39							1	Vatu Iani
		39		223					1	Nanuku Lailai
<u>S.berpi</u>	461-504	58.7-62	1 017-1 058	325-353	28.2-30.1	28	149-168	315-350	3	Ono
<u>S.fuscata</u>	403-461	42-46	878	297-304	26		150		3	Nuku-i-Cikobia
<u>A.stolidus</u>	418-461	37-44	812-885	262-297	27-30		140-170	198-285	6	Vatu-i-Ra
	428	42		275					1	Nuku-i-Cikobia
<u>A.minutan</u>	337-363	42-49	646-717	223-241	22-27		118-126	97-105	15	Vatu-i-Ra
	354	45	682	227	26		111		1	Mabulau