

THE BIRD FAUNA OF NIUE COMPARED WITH THOSE OF TONGA, SAMOA, THE SOUTHERN COOKS, AND FIJI

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Several people interested in birds visited Niue Island in 1986-87. Our combined observations amplify or confirm those of Wodzicki (1971), made in November 1968 and July-August 1969, and of Kinsky & Yaldwyn (1981), made in June 1971 and August-September 1972. Wodzicki (unpubl.) also visited Niue in June-July 1976 but added no new species to his earlier list.

We visited most habitats and different parts of the island by road, by rough vehicle track or on foot, and spent some time gazing out to sea. Yet we added no new species to the checklist of Kinsky & Yaldwyn (1981). We suppose that no other, unrecorded bird species are resident on Niue and that local lore is now unlikely to reveal other species recently extinct. Much remains to be done for Niuean ornithology, but in particular the status of the Wedge-tailed Shearwater needs to be explored and a search for fossil bones in caves should be rewarding; almost nothing is known about the breeding biology of the resident birds.

This paper is in two sections. In the first, we record our limited field observations; in the second, we suggest reasons for the few species of birds breeding on Niue and compare the breeding bird faunas of the different island groups.

GEOGRAPHY

The quality of Niue as a bird habitat is largely dictated by its geography. Niue (19°02'S, 169°52'W) is a raised coral atoll of 258 km² and is roughly circular (21 x 18 km). It lies about 1320 km east of Viti Levu, the largest of the Fijian Islands, 525 km east of Tongatapu in the Tongan Islands, 600 km south of Apia in Western Samoa, and 1080 km west of Rarotonga in the Southern Cook Islands. The nearest land is the Vava'u Group of the Tonga Islands, 430 km west of Niue.

Niue is saucer-shaped in section: its interior (the former lagoon) is surrounded by twin terraces (the former reef) rising to about 70 m a.s.l. The rest of the topography is flat or gently undulating. The ground is rocky limestone and porous, in places studded with sharp pinnacles up to about 5 m tall. The cliffs are precipitous and pierced with many caves. There are no natural harbours or sandy beaches. The island is nearly surrounded by an intertidal platform up to 100 m wide, with fine rock pools and a veneer of coral. There is no surface water of any kind, no proper reef or lagoon,

no inshore shallow water, offshore stacks or sandbars; and the sea runs deep close inshore.

The climate is broadly tropical. The mean annual temperature is 24.7 °C and the rainfall about 2050 mm. Southeast trade winds blow for much of the year. Niue lies on the edge of the cyclone belt; the last destructive hurricane hit the island in February 1968, and before that others in 1959 and 1960. The natural vegetation (Sykes 1970) consists of rainforest with a canopy reaching to about 20 m. Many of the trees are heavily buttressed or supported by stout aerial roots, and so they remain standing though utterly defoliated when hurricanes strike (J.M. McEwen, pers. comm.). Frost & Berryman (1966, *The timber resources of Niue Island*, unpubl. NZ Forest Service report) classified the forest resources of Niue as comprising about 5500 ha of merchantable forest, 14 000 ha of light scattered forest, 2400 ha of coastal scrub, and 3900 ha of fernland (resulting from overcropping and burning). The shallow soil is moderately fertile and supports a labour-intensive shifting agriculture. Typically, the bush 'gardens' are broken in (recently with bulldozers), planted and cropped for 1-3 years, and then abandoned for 10 years or more. Consequently much of the island is now a mosaic of forest in varying stages of regeneration, interspersed with cultivated or freshly abandoned gardens. There are also scattered coconut plantations, three small farms with some open ground, and a few citrus orchards.

Niue may have been inhabited by Polynesians for 2000 years (J.M. McEwen, pers. comm.). Fourteen small villages are strung along the road encircling the island. The population exceeded 5500 in about 1960 but is now about 2000 and still falling. Eales (1965, 1968)* and Given (1968) collected insects on Niue, and Whitaker (1969)* described four species of lizard. Wodzicki (1969)* surveyed the rodents (*Rattus exulans* and *R. rattus*), and Wodzicki & Felten (1975) described the fruit bat (*Pteropus tonganus*). Domestic dogs and both feral and domestic cats are common.

* *Unpubl. DSIR reports*: Eales, A.C. 1965, 1968. First and second interim reports on the insects of Niue Island. Whitaker, A.H. 1969. Lizards collected on Niue Island, 15 November - 4 December 1968. In Wodzicki, K. 1969. A preliminary survey of rats and other land vertebrates of Niue Island, South Pacific, 2 November - 4 December 1968.

BIRD OBSERVATIONS ON NIUE, 1986-1987

The following visited Niue on the dates given and contributed to these notes: Andrew and Mary McEwen, 10-22 May 1986, and, with Alison and David McEwen, 22 August-5 September 1987; Ian J. Sewell with Hilary Chapman, Stephanie Gemmell and Nigel Haskins (from Cambridge University), 3 July-25 August 1987; Peter and Mary Bull, 31 July-7 August 1987; and John and Judy Gibb, 22 August-5 September 1987.

WEDGE-TAILED SHEARWATER, *Kalangi*

Not seen; birds are unlikely to have come ashore until October, after we had left (Falla *et al.* 1979). Kinsky & Yaldwyn (1981) reported *kalangi* with eggs on cliffs near Namukulu and Vaiea in December; they saw none in June or August-September.

WHITE-TAILED TROPICBIRD, *Tuaki*

Seen commonly at sea, less commonly inland; nowhere abundant. Breeds solitarily in trees in the forest.

FERAL FOWL, *Moa*

Free-ranging fowl have the run of the villages. Small groups of feral birds were seen through the forest and bush gardens, and cocks were often heard crowing. Kinsky & Yaldwyn (1981) reported a tibia excavated by M.M. Trotter, of Canterbury Museum, near Pulaki in 1974, carbon-dated at 1270 ± 40 years BP. Its length corresponded to that of a female Jungle Fowl from Fiji in the New Zealand National Museum.

BANDED RAIL, *Veka*

Ubiquitous and common, often seen crossing the road or running for cover in open or partially cleared country, and on the hotel lawn. The species has staged a remarkable recovery since being reported as extinct by Smith (1902, quoted by Wodzicki 1971) and still very scarce in 1953 (Wodzicki 1971).

PURPLE SWAMPHEN, *Kale*

In the 1950s *kale* were very common (J.M. McEwen, pers. comm.); Kinsky & Yaldwyn (1981) described them as "locally common". We saw only a few birds, singly, running for cover beside the road, mostly in the northern half of the island. We agree with Wodzicki (1971) that they are now much less common than *veka*. They are unpopular, and shot, because of the damage they do to taro.

GOLDEN PLOVER, *Kiu*

A. and M. McEwen found *kiu* much more numerous in May 1986 than in August-September 1987. We probably left Niue (in September 1987) before the first birds of the year arrived. Most of those we saw were on village greens, the airport and other open spaces, including the hotel lawn; only one or two were seen on the shore.

WANDERING TATTLER, *Kiu-tahi*

Small numbers were seen on tidal rocks, for example, near Namukulu and Avatele. Presumably we left before the main influx.

COMMON NODDY, *Ngongo*

A few seen at sea off the southeast coast. No evidence of breeding, now or in the 1950s (J.M. McEwen, pers. comm.).

WHITE TERN, *Taketake*

Seen at sea and over the island, but less often than tropicbirds. No positive evidence of breeding, though single birds and pairs were displaying (prospecting for nest sites?) in coastal forest in late August. In the late 1950s *taketake* nested in trees behind the New Zealand Residency at Tapeu (J. M. McEwen, pers. comm.).

PACIFIC PIGEON, *Lupe*

Not abundant, but frequently seen flying over the forest in the early evening, and probably heard calling in the forest. Served to some of us when we were guests in a village home, though "protected".

PURPLE-CAPPED FRUIT DOVE, *Kulukulu*

Common in the forest and bush clearings; much more often heard than seen.

BLUE-CROWNED LORY, *Henga*

Single birds seen by IJS in regenerating bush near Lapeka and near the airport, and another by PCB near Avatele.

BARN OWL, *Lulu*

Seen almost daily hunting over bush gardens and around the villages in early evening. One was perched statuesquely on a roadside gravestone in mid-morning.

WHITE-RUMPED SWIFTLET, *Pekapeka*

Locally very common, especially along certain stretches of road, in forest clearings, along forest tracks and in other semi-open places. They usually hunt below the tree-tops. No breeding sites were visited.

POLYNESIAN STARLING, *Miti*

Common in most types of vegetation, though not greatly abundant; often in pairs.

POLYNESIAN TRILLER, *Heahea*

Common, and noisier than *miti*; often seen around gardens and other open places in villages as well as in the interior. On 3 August 1987 PCB saw an adult carrying food to a nest c. 12 m up an almost leafless tree and remain as if brooding young.

THE AVIFAUNA OF NIUE

Compared with those of Tonga, Samoa, and the Southern Cooks, the Niuean avifauna is sparse. The only introduced species is the feral fowl. Year-round watching (lacking on Niue) would no doubt extend the list of visiting sea and shore birds. Holyoak (1980), for instance, added nine Procellarii to the Cook Islands' list when cruising in July-September 1973, and he suggested that 30 more seabirds (and some waders, Holyoak 1976) could be added by sustained observation.

Table 1 lists the bird species recorded on Niue and the neighbouring islands of Tonga, Samoa and the Southern Cooks, excluding Procellarii seen only at sea.

It includes the status of these species on Fiji. Despite its isolation, with no other land within 430 km, its considerable size and its dense cover of vegetation, Niue has only 3 breeding seabirds and 11 breeding landbirds (including the feral fowl). For comparison, Tonga has 13 (+ 4 unconfirmed) breeding seabirds and 23 (+ 2?) others; Samoa has 12 (+ 4?) breeding seabirds and 32 (+ 2?) others; while the Southern Cooks have 13 (+ 2?) breeding seabirds and 15 others. The three seabirds breeding on Niue are the Wedge-tailed Shearwater, obviously scarce, and the White-tailed Tropicbird and White Tern, both of which nest in trees and are moderately common. Wedge-tailed Shearwaters breed also on Tonga and Samoa but probably not on the Southern Cooks, and the White-tailed Tropicbird and White Tern breed on all three island groups besides Niue.

TABLE 1. List and status of birds (excluding non-breeding Procellarii) recorded on Tonga, Samoa, Niue and the Southern Cooks, with their status on Fiji (after Ashmole 1963, Dhondt 1976, Holyoak 1976, 1980, Kinsky & Yaldwyn 1981, Watling 1982). B = Breeding, V = Visitor, * = Introduced

Species	Tonga	Samoa	Niue	S. Cooks	Status in Fiji
Tahiti Petrel <u>Pterodroma rostrata</u>				V(B?)	
Phoenix Petrel <u>Pterodroma alba</u>	B			V	
Herald Petrel <u>Pterodroma arminjoniana</u>	B			V(B?)	
Wedge-tailed Shearwater <u>Puffinus pacificus</u>	B	B	B	V	B
Audubon's Shearwater <u>Puffinus lherminieri</u>	B	B		V	B
White-throated Storm Petrel <u>Nesofregatta albigularis</u>		B		V	B
Red-tailed Tropicbird <u>Phaeton rubricauda</u>	B?	B?	V?	B	B
White-tailed Tropicbird <u>Phaeton lepturus</u>	B	B	B	B	B
Brown Booby <u>Sula leucogaster</u>	B	B		B	B
Blue-faced Booby <u>Sula dactylatra</u>		B		B	B
Red-footed Booby <u>Sula sula</u>	B?	B?		B	B
Greater Frigatebird <u>Fregata minor</u>	B?	B?	V	B	B?
Lesser Frigatebird <u>Fregata ariel</u>	B	B		B	B
Reef Heron <u>Egretta sacra</u>	B	B	V?	B	B
Grey duck <u>Anas superciliosa</u>	B?	B?	V?	B	B
Australasian Harrier <u>Circus approximans</u>	B				B
Peregrine <u>Falco peregrinus</u>		V			B
Niuafou'ou Megapode <u>Megapodius pritchardii</u>	B				
*Jungle (Feral) Fowl <u>Gallus gallus</u>	B		B	B	B

~ Banded Rail — <u>Rallus philippensis</u>	B	B	B		B
White-browed Crake <u>Poliolimnas cinereus</u>		B			B
Spotless Crake <u>Porzana tabuensis</u>	B	B	B	B	B
Purple Swamphen <u>Porphyrio porphyrio</u>	B	B	B		B
Grey Plover <u>Pluvialis squatarola</u>				V	
Golden Plover <u>Pluvialis dominica</u>	V	V	V	V	V
Curlew <u>Numenius arquata</u>		V	V		V
Bristle-thighed Curlew <u>Numenius tahitiensis</u>	V	V	V	V	V
Bar-tailed Godwit <u>Limosa lapponica</u>	V	V	V	V?	V
Yellowlegs <u>Tringa melanoleucos</u>	V	V	V	V	V
Wandering Tattler <u>Tringa incana</u>	V	V	V	V	V
Turnstone <u>Arenaria interpres</u>			V	V	V?
Pectoral Sandpiper <u>Tringa melanotus</u>		V?	V		
Sanderling <u>Calidris alba</u>				V	V
Common Tern <u>Sterna hirundo</u>				V	V
Roseate Tern <u>Sterna dougallii</u>	V				
Black-naped Tern <u>Sterna sumatrana</u>	B	B?		B	B
Sooty Tern <u>Sterna fuscata</u>	B	B		B	B
Crested Tern <u>Sterna bergii</u>	B?	V		V	B
Grey Noddy <u>Procelsterna cerulea</u>	B	B		B	B?
Common Noddy <u>Anous stolidus</u>	B	B	V	B	B
Black (White-naped) Noddy <u>Anous tenuirostris</u>	B	B		B	B

White Tern <u>Gygis alba</u>	B	B	B	B	B
*Feral Pigeon <u>Columba livia</u>	?	?		B	B
White-throated Pigeon <u>Columba vitiensis</u>		B			B
Friendly Ground Dove <u>Gallicolumba stairii</u>	B	B			B
Pacific Pigeon <u>Ducula pacifica</u>	B	B	B	B	B
Tooth-billed Pigeon <u>Didunculus strigirostris</u>		B			
Many-coloured Fruit Dove <u>Ptilinops porphyraceus</u>	B	B	B		B
Cook Island Fruit Dove <u>Ptilinops rarotongensis</u>				B	
Blue-crowned Lory <u>Vini australis</u>	B	B	B		B
Tahiti Lory <u>Vini peruviana</u>				B	
Red-breasted Musk Parrot <u>Prosopaea tabuensis</u>	B				B
Long-tailed Cuckoo <u>Eudynamis taitensis</u>	V	V	V	V	V
Barn Owl <u>Tyto alba</u>	B	B	B		B
White-rumped Swiftlet <u>Collacalia spodiopygia</u>	B	B	B		B
Atiu Swiftlet <u>Aerodromus sawtelli</u>				B	
White-collared Kingfisher <u>Halecyon chloris</u>	B	B			B
Flat-billed Kingfisher <u>Halecyon recurvirostris</u>		B			
Chattering Kingfisher <u>Halecyon tuta</u>				B	
Mangaia Kingfisher <u>Halecyon ruficollis</u>				B	
Pacific Swallow <u>Hirundo tahitica</u>	B				B
*Red-vented Bulbul <u>Pycnonotus cafer</u>	B	B			B
Island Thrush <u>Turdus poliocephalus</u>		B			B

Cook Is Warbler <u>Acrocephalus kerearoko</u>				B
Rarotonga Flycatcher <u>Pomarea dimidiata</u>				B
Samoa Fantail <u>Rhipidura nebulosa</u>		B		
Fiji Shrikebill <u>Clytorhynchus vitiensis</u>	B	B		B
Samoa Broadbill <u>Myiagra albibentris</u>		B		
Scarlet Robin <u>Petroica multicolor</u>		B		B
Golden Whistler <u>Pachycephala pectoralis</u>	B			B
Samoa Whistler <u>Pachycephala flavifrons</u>		B		
Polynesian Triller <u>Lalage maculosa</u>	B	B	B	B
Samoa Triller <u>Lalage sharpei</u>		B		
Samoa White-eye <u>Zosterops samoensis</u>		B		
Cardinal Honeyeater <u>Myzomala cardinalis</u>		B		
Wattled Honeyeater <u>Foulehaio carunculata</u>	B	B		B
Mao (honeyeater) <u>Gymnomyza samoensis</u>		B		
Red-headed Parrotfinch <u>Erythrura cyaneovirens</u>		B		B
*European Starling <u>Sturnus vulgaris</u>	B			B
Polynesian Starling <u>Aplonis tabuensis</u>	B	B	B	B
Samoa Starling <u>Aplonis atrifusca</u>		B		
Rarotongan Starling <u>Aplonis cinerascens</u>				B
*Jungle Mynah <u>Acridotheres fuscus</u>		B		B
*Indian Mynah <u>Acridotheres tristis</u>				B

The 11 breeding landbirds on Niue include only two passerines (endemic races of the Polynesian Starling and Triller). This compares with 8 passerines among 23 landbirds breeding on Tonga, 17 passerines among 32 landbirds on Samoa, and 4 passerines among 15 landbirds on the Southern Cooks. In addition, the Long-tailed Cuckoo appears as a migrant on all groups and Niue (where it calls harshly).

Niue has eight species of visiting waders confirmed, compared with five on Tonga, five (6?) on Samoa, and eight (8?) on the Southern Cooks. These are few enough considering the variety reaching New Zealand (Falla *et al.* 1979). Five of the eight Niuean species are recorded also on Tonga, six (7?) on Samoa, and five (6?) on Southern Cooks. The Reef Heron is not confirmed from Niue, though it breeds on the other three island groups.

The fact that Niue is a solitary raised atoll only 20 km across, while the other islands are archipelagos spanning several hundred kilometres, must be largely responsible for its sparse bird fauna. So it is instructive to compare the bird fauna of Niue with that of Rarotonga (67 km²), which, though much smaller, is the largest of the Southern Cooks. Both islands are inhabited (Rarotonga more densely than Niue), largely forested and partly cultivated. Holyoak (1980) placed the breeding birds of Rarotonga in three categories of abundance and we attempt to do the same for Niue (Table 2).

Where Niue has three breeding seabirds, the Southern Cooks as a group have 13 (15?); where Niue has 11 other breeding species, the Southern Cooks have 15. However, Rarotonga alone has only four breeding seabirds and seven breeding landbirds (Table 2). Thus the two single-island avifaunas differ much less in number of breeding species than Niue and the whole Southern Cooks, especially among the seabirds.

THE FIJIAN CONNECTION

The islands of Fiji, 500 km WNW of Tonga (Fig. 1), provide by far the largest land mass and diversity of habitat in the Southwest Pacific.

The seabirds of the Southwest Pacific are mostly widespread tropical species: of the 18 species confirmed as breeding in Fiji (Fig. 1), 10 definitely breed also on Tonga, and 11 each on Samoa and the Southern Cooks. All three species breeding on Niue also breed in Fiji, Tonga and Samoa, and two of them (White-tailed Tropicbird and White Tern) on the Southern Cooks; while 10 of the 12 confirmed breeding seabirds on Tonga, all 11 of those on Samoa and all 11 on the Southern Cooks also breed in Fiji. The Phoenix and perhaps the Herald Petrels (but see Turbott 1977) are the only species apparently restricted to a single island group, i.e. Tonga. The Grey Noddy, which breeds on Tonga, Samoa and the Southern Cooks, is not confirmed from Fiji.

The 'other' species (mainly landbirds) in Table 1 have differentiated more extensively than the seabirds, even if we ignore subspecies. Of 63 species of birds breeding in Fiji (Watling 1982), 22 also breed on Tonga and 22 also on Samoa (16 are common to both); but of these 63, only seven are included in the small total of 15 'others' in the Southern Cooks. All 11 of the landbirds breeding on Niue also breed on Tonga and Fiji, and 10 of

TABLE 2. Breeding birds of Niue (this paper) and Rarotonga (Holyoak 1980).
 + = Uncommon, ++ = Moderate numbers, +++ = Common

Species	Niue	Rarotonga
Wedge-tailed Shearwater	+	
Red-tailed Tropicbird		+
White-tailed Tropicbird	++	++
Reef Heron		+
Jungle (Feral) Fowl	+++	++
Banded Rail	+++	
Spotless Crake	+	
Purple Swamphen	+	
Common Noddy		+
White Tern	++	+
Many-coloured Fruit Dove	+++	
Cook Island Fruit Dove		+++
Pacific Pigeon	++	+++
Blue-crowned Lory	+	
Barn Owl	++	
White-rumped Swiftlet	+++	
[Rarotongan Kingfisher (undescribed)		Extinct by 1940]
Rarotonga Flycatcher		+
Polynesian Triller	+++	
Polynesian Starling	+++	
Rarotongan Starling		+++
Indian Mynah		+++

them (not the feral fowl) on Samoa too; but only three (the fowl, Spotless Crake and Pacific Pigeon) on the Southern Cooks. Of the 23 'other' species breeding on Tonga and 33 'others' on Samoa, 22 from each group breed on Fiji.

As Mayr (1945) pointed out, about two-thirds of the landbirds of the South Pacific are on only one island group. Consequently there is a longish list of landbirds, but not of seabirds, that breed on one or other of the other island groups, but not on Fiji:

- Tonga: Niuafo'ou Megapode (restricted to this far northern volcanic outlier).
- Samoa: Tooth-billed Pigeon, Flat-billed Kingfisher, Samoan Starling, Samoan Fantail, Samoan Broadbill, Samoan Whistler, Samoan Triller, Samoan White-eye, Cardinal Honeyeater, and Mao (a large honeyeater): total 10 species.

Southern Cooks: Cook Is Fruit Dove, Tahiti Lory, Atiu Swiftlet, Chattering and Mangaia Kingfishers, Cook Is Warbler, Rarotonga Flycatcher, Rarotonga Starling: total 8 species.

Niue: None

Combining sea with landbirds, 32 (88.9%) of the 36 confirmed breeding species on Tonga definitely breed on Fiji, 33 (75.0%) of the 44 on Samoa, 14 (100%) of the 14 on Niue, but only 18 (64.3%) of the 28 on the Southern Cooks. Of the 14 species breeding on Niue, all breed on Tonga and Fiji and all except the fowl on Samoa, but only 5 on the Southern Cooks.

DISCUSSION

Slud's (1976) massively comprehensive summaries of the number of landbirds resident on single islands, and island groups, in the 'warmer oceans' of the world placed Niue low on the list, with only about one-third as many species as the average for islands of its size, and with notably few passerines. According to biogeographic theory (e.g. MacArthur & Wilson 1967), the number of species in any large taxonomic group that inhabits an island is held within narrow limits by forces balancing the rates of colonisation and extinction. It is worth examining the bird fauna of Niue in this context.

King (1973) and Hay (1986) have stressed that petrels and shearwaters are among the first of the seabirds to be displaced by man on newly inhabited islands, and Niue has few Wedge-tailed Shearwaters. Moreover, the numerous cats and rats, as well as dogs and people, are likely to have excluded burrowing petrels, especially where the soil is shallow and there are no high mountains (e.g. for *Pterodroma* spp.), as there are on Fiji.

Niue's isolation should be no deterrent for breeding seabirds or migratory waders; but the lack of surface water, any proper reef, lagoon or other shallow water, offshore islets or sand-bars must make it inhospitable for wetland and shorebirds alike, and for some terns that frequent shallow water. Hunting by Niueans may also restrict the numbers of tropicbirds and White Terns, which breed solitarily; and there is no safe resort for ground-nesting or colonial seabirds.

Sheer isolation is likely to be more of an obstacle to colonisation by vagrant landbirds than by seabirds; and it is the smaller passerines that are so conspicuously missing from these islands. The larger islands should be more readily encountered by chance than smaller ones, and they should offer more diverse habitats; also, as a rule, they should carry larger populations of landbirds, which should be less likely to become extinct. Mayr (1941b) does not rule out the destructive effects of hurricanes in limiting the bird fauna of small islands; and J.M. McEwen (pers. comm.), who saw the devastation caused by hurricanes on Niue in 1959 and 1960, recalls the complete stripping of all green vegetation, which must have drastically reduced the numbers of forest birds (and fruit bats).

Yet the chances of small passerine birds ever reaching small remote islands must be exceedingly slender. Landbirds on tropical islands are notoriously sedentary; for, as Mayr (1941b) put it, they "use their ability

to fly less for active spreading than to return to their home island in heavy storms". The open sea lets pass only the small minority of strong-flying species.

If potential colonists with the ability to reproduce soon after arrival (Mayr 1941b) did reach Niue, the forest and forest edge habitats might prove acceptable to a greater variety of landbirds than is now present. Judging from the birds already on neighbouring groups of islands, new settlers might include (not in order of probability) a forest kingfisher, the Island Thrush, a flycatcher, shrikebill, whistler, white-eye or honeyeater.

On Niue, the reduction in area of the primary forest, for cultivation, must have already reduced the numbers of pigeons and lorries; but it may have favoured the Banded Rail, the Barn Owl and perhaps the swiftlets, which frequent more open country. Wodzicki (1971) warned of the effects of introduced *Rattus rattus* as predators on smaller birds: a timely warning in view of current research on the breeding of the Rarotonga Flycatcher (R. Hay, pers. comm.).

Legislation ostensibly limiting the use of firearms is either weak or weakly enforced; and nestling tropicbirds, White Terns and pigeons are still taken as food. The population of Banded Rails, thriving in the face of heavy predation by cats and rats, remains anomalous.

Despite the shift in habitats from primary forest to cultivation, the development of second-growth forest and fernland, and the recent widespread use of firearms, the species composition of the resident Niuean avifauna has apparently not changed in historical times.

Figure 1 shows that many of the seabirds breeding in Fiji are common to the other island groups to the east, including the Southern Cooks, and that these smaller groups share many of the same species too. Thus, of the 18 seabirds breeding in Fiji, 10 breed in Tonga, 11 in Samoa and 11 in the Southern Cooks; and of the 13 breeding in Tonga and 12 in Samoa, 9 from each group also breed in the Southern Cooks.

By contrast, most of the landbirds breeding in Tonga, Samoa, Niue and the Southern Cooks are at least subspecifically distinct from their congeners in Fiji, and many of them are endemic species. Samoa, in particular, an older island group with a relatively rich landbird fauna (Slud 1976), has several endemic passerines derived from Fiji. Of the 63 'other' species breeding in Fiji, just 22 breed in Tonga and Samoa (16 being common to both) and only seven in the Southern Cooks.

This high degree of endemism confirms the very slow turnover of landbirds in the island groups. The much weaker link between the landbirds of the Southern Cooks and the other groups upholds Mayr's (1941b) placing of the Southern Cooks in the Eastern Polynesian subdivision, and Fiji, Tonga, Samoa and Niue in the Central subdivision, of the Polynesian subregion.

Finally, the landbirds breeding on Niue may have island-hopped from Fiji via Tonga or Samoa. Recent taxonomic study suggests that the Banded Rail (Ripley 1977) and White-rumped Swiftlet (Kinsky & Yaldwyn 1981) are fairly recent arrivals on Niue from Samoa. On the other hand, the

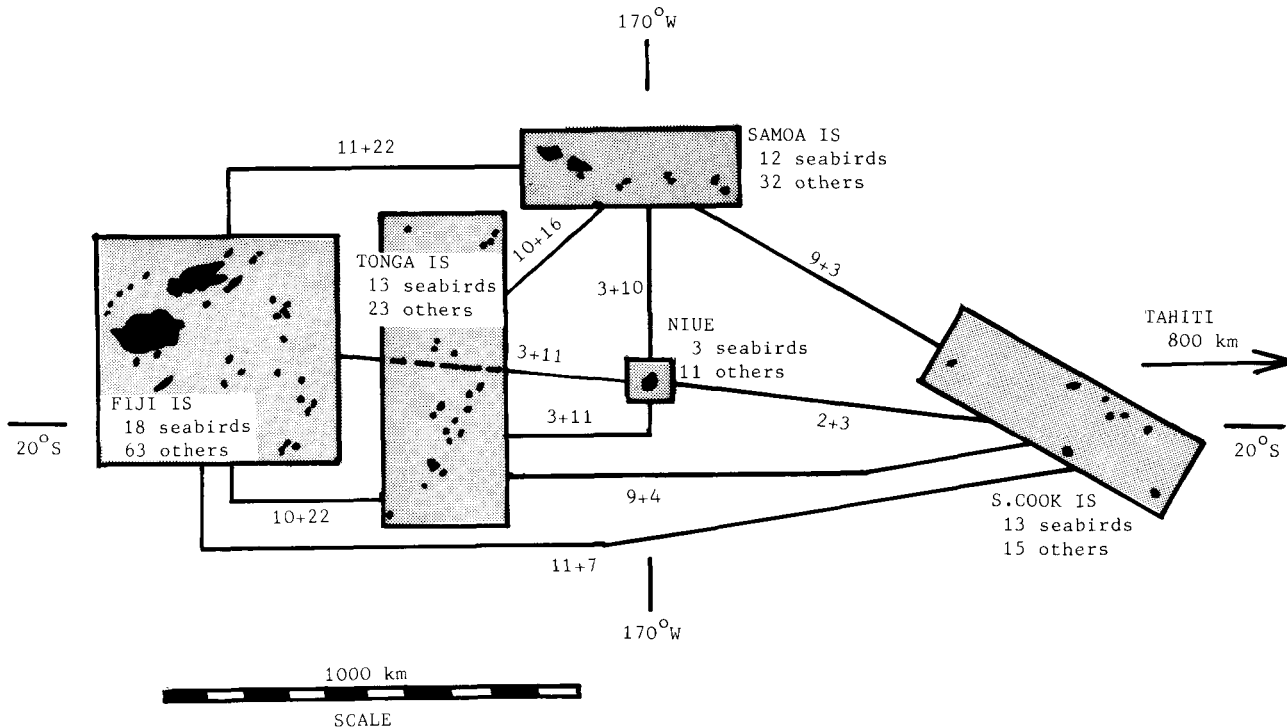


FIGURE 1 — Sketch map showing the central position of Niue relative to Fiji, Tonga, Samoa and the Southern Cooks, together with the total number of sea and other species of birds breeding in each group. The figures printed on the lines joining the island groups refer to the numbers of sea + other breeding species of birds common to each group; e.g. of the 12 species of seabirds breeding in Samoa, 11 are shared with Fiji, 10 with Tonga, 3 with Niue and 9 with the Southern Cooks

nominate race of the Many-coloured Fruit Dove on Niue is identical with birds on Tonga and some of the Fijian islands but differs from those on Samoa (Kinsky & Yaldwyn 1981). The Niuean subspecies of the Polynesian Triller (*L. m. whitmeei*) more closely resembles birds from Samoa than from Tonga (Mayr 1945).

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