

# MISCELLANEOUS BIRD NOTES FROM THE KINGDOM OF TONGA \*

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## ABSTRACT

This paper presents bird records from the Kingdom of Tonga which do not fit into other publications about the extensive field work of the Brehm Fund South Seas Expedition. Results of the first ornithological survey of the small island of 'Eue' iki are presented. Most remarkably, this island has small numbers of *Vini australis* and *Clytorhynchus vitiensis*, which became extinct on 'Eua and Tongatapu at the end of the 19th century.

Other new distribution records for *C. vitiensis* are presented, and the record of its distribution in Tonga is revised. Its absence from the larger islands in southern Tonga is a result of human disturbance, most likely the introduction of *Rattus rattus*, while in the Vava'u group, competitive exclusion by *Pachycephala jacquinoti* may be the reason.

*Hirundo tahitica* is now known from many locations. Breeding colonies seem to exist on Tofua and Nomuka, and a breeding population is probably establishing on 'Eua.

A few new data are added to the sparse knowledge about *Pachycephala jacquinoti*. *Ardea novaehollandiae* was recorded again from Tongatapu and *Circus approximans* for the first time from Tongatapu and Niufo'ou. Records of *Prosopaea tabuensis* from Tongatapu and two of its offshore islands are given, and some remarkable changes in behaviour of *Porphyrio porphyrio* on small islands are reported.

The brown female morph of *Gallicolumba stairii*, which has been known from Fiji and Samoa, is also in Tonga.

An unidentified storm petrel has been seen close to Tongatapu. Breeding has been confirmed for *Pterodroma nigripennis* and *Sterna sumatrana* on several islands in the Tongatapu group. Some new breeding records for noddies (*Anous spp.*) on islands off Tongatapu are presented. Observations of *Procelsterna cerulea* on 'Eua suggest that the species breeds in the cliffs of the east coast. *Sterna anaetheta* certainly breeds in cliffs on the southern coast of Tongatapu. The discovery of new breeding colonies of *Pterodroma nigripennis* supports the hypothesis that the species is extending its range.

Blue-crowned Lorikeets and Fiji Shrikebills have been isolated on 'Eue' iki for more than a century. These populations, and others, are very small (fewer than 100 birds each). Their size and long isolation call into question the concept of Minimum Viable Populations.

## INTRODUCTION

Field work during the Brehm Fund South Seas Expedition (BFSE) since 1989 has so far resulted in comprehensive surveys of wildlife on most Tongan islands. By this, the incomplete data of the Whitney South Sea Expedition (WSSE) of the 1920s have been largely revised or updated. Many new distributional records of birds within the Tongan archipelago have been added, and some important seabird colonies have been discovered. Conservation programmes for the endangered Niufo'ou Megapode (*Megapodius pritchardii*), the Red Shining Parrot (*Prosopaea tabuensis*) and

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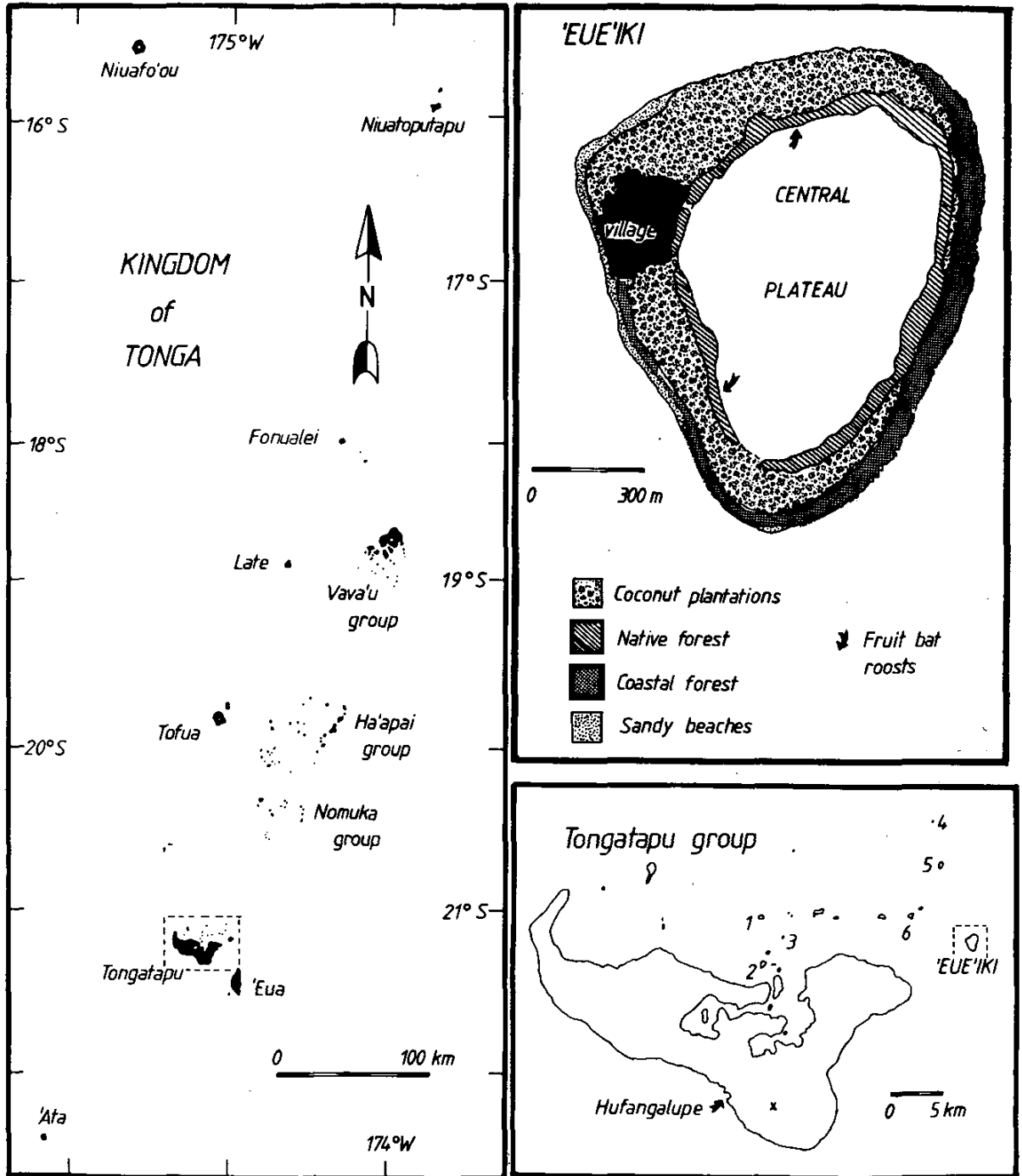


FIGURE 1 — Map of the Kingdom of Tonga, with more detailed maps of the Tongatapu group of the 'Eue'iki. Marked Islands in the Tongatapu group: 1. Fafa, 2. Pangaimotu, 3. Monuafe, 4. Tau, 5. Ata, 6. Fukave. x indicates the location of Toloa forest.

the declining Blue-crowned Lorikeet (*Vini australis*) have been initiated, and several islands have been proposed as nature reserves.

Publications from the BFSE were planned to cover either geographical units (Rinke 1991, Onnebrink & Rinke, in press, Muller & Rinke, in prep.) or conservation-related topics (Rinke, in prep.), with the aim of presenting the data in a comprehensive form. This paper sums up noteworthy new distributional records of birds in Tonga, which do not fit into this concept or which add details to previous observations.

## BIRDS OF 'EUE' IKI

### Description of the island

'Eue' iki is a raised coral island of 1.3 km<sup>2</sup> in area, lying 6 km north-east of Tongatapu and about 19 km north of 'Eua. The main area of root crop plantations is a plateau of 25 - 30 m a.s.l., which is surrounded by steeper slopes and low coastal areas. These are very narrow in the east, with coastal forest remaining largely intact, gradually widening towards the west, where coconut palms grow, interspersed with native bush. A village lies at the westernmost tip of the island, the only place where reasonably safe landing is possible.

Remains of native forest are on the steep slopes around the plateau. The diversity of forest trees seem to be rather high, with a species composition similar to that of northern 'Eua, especially with respect to the occurrence of the pekepeka, *Maniltoa amicorum* (Caesalpinaceae). A few fan palms, piu *Pritchardia pacifica*, grow in the east. This is only the fourth island (others are 'Eua, Vava' u, and Toku) from which this assumed Tongan endemic has been reported. All plantation areas had a remarkable abundance of *Cordyline terminalis*, the tubers of which had been an emergency food during droughts.

Non-avian vertebrates include fruit bats (*Pteropus tonganus*); one large colony is in the forested slopes of the north-west and a smaller one in the south. Fruit bats were seen crossing to Tongatapu every evening. Three species of skink were recorded - *Emoia cyanura*, *E. impar* (described as *E. pheonura*, cf. Ineich & Zug 1991), and the large *E. trossula* - and the island has a reputation for its abundance of banded iguanas (*Brachylophus fasciatus*).

The human population is fewer than 100 for most of the year, while children of school age are on Tongatapu. *Rattus exulans* is the only rodent on the island. Cats and pigs roam freely everywhere.

During 1-3 November 1990, DR and EC visited the island. It was the first ornithological survey of 'Eue' iki, mainly to follow up rumours of Blue-crowned Lorikeets being on the island. Bird sightings were recorded while we were exploring most parts of the island. Two 18 m mist-nets were set up in a coconut plantation with dense undergrowth in the south of the island, but the relative abundance of birds has not been assessed.

### BROWN BOOBY *Sula leucogaster*

A few seen fishing outside the reefs.

**PACIFIC REEF HERON** *Egretta sacra*

A single heron of the dark phase was seen at the coast.

**BANDED RAIL** *Gallirallus philippensis*

Not seen, but reported to be present.

**PURPLE SWAMPHEN** *Porphyrio porphyrio*

As with the Banded rail, local people reported this species present, but we did not see it. Marks of feeding on unripe bananas by Purple Swamphens were shown to us.

**BROWN NODDY** *Anous stolidus*

Occasionally seen fishing around the island.

**COMMON FAIRY-TERN (WHITE TERN)** *Gygis alba*

Common; one was found breeding in a large ' ifi (*Inocarpus fagifer*) tree close to the village. The egg (weight 21.5 g; 39.5 mm x 31.1 mm) was on a horizontal branch about 8 m above the ground.

**PURPLE-CROWNED FRUIT-DOVE** *Ptilinopus porphyraceus*

Although heard frequently, only one bird was seen.

**BLUE-CROWNED LORIKEET** *Vini australis*

A few pairs were seen in coconut plantations, and up to six were seen on two occasions feeding on ripe mangoes close to the village. The total population certainly does not exceed 100, and is probably close to 60 birds.

**COMMON BARN OWL** *Tyto alba*

Not seen, but reported by local people to be present.

**WHITE-COLLARED KINGFISHER** *Halcyon chloris*

Seen everywhere on the island; common.

**POLYNESIAN STARLING** *Aplonis tabuensis*

The most common bird on ' Eue' iki, in all types of habitat. Twelve were caught in mist-nets set up in a coconut plantation with heavy undergrowth (wing length  $x = 112 \pm 3.7$  mm,  $n = 12$ ).

**WATTLED HONEYEATER** *Foulehaio carunculata*

Common all over the island. A recently fledged bird was caught in a mist-net (wing length 92 mm; of two adults: 104 and 108 mm).

**FIJI SHRIKEBILL** *Clytorhynchus vitiensis*

The rarest passerine on the island, found in forested areas mainly. We recorded it in the forest on the steeper parts of the island in the centre of the northern half, in a tiny patch of forest in the south and, close to this location, in beach forest at the southern tip. Numbers were estimated at about 10 (EC) and at certainly not more than 100 (DR).

One bird was caught in a mist-net, set up along a path in plantation land between the two above-mentioned locations where we found strikebills (wing length 93.5 mm).

**POLYNESIAN TRILLER** *Lalage maculosa*

Fewer than 100 were estimated for the whole island, where we mainly observed them in stands of toa (*Casuarina litoralis*), in low coarse bush in the north of 'Eue' iki, and in fruiting strangling figs, 'ovava (*Ficus obliqua*), in the village.

**NEW RECORDS FROM OTHER ISLANDS****BLACK-WINGED PETREL** *Pterodroma nigripennis*

A fully feathered juvenile of a petrel (wing length 195 mm), most likely of this species, was found dead at Shower Cave, Kenani, in the centre of 'Eua in July 1990. Bones and remains of wings were also found at that site. Shower Cave is in a deep gully with many caves and holes in the steep slopes.

DR's 1984 record of a petrel at Houma Tahi, 'Eua, referred to *Pterodroma heraldica* (Rinke 1987), was very likely of a Black-winged Petrel. When he heard the calls of Black-winged Petrels on Hunga Ha'apai, he immediately remembered his two encounters with petrels on 'Eua. DR reported that they may breed in the cliffs surrounding this point. In June 1991, he found several burrows at the base of the cliffs in very dry soil. They could have been from Black-winged Petrels.

A colony of petrels breeding on Fukave has been assigned to the Herald Petrel (Carlson 1974). However, it is now known that Black-winged Petrels are breeding on Fukave, where a few burrows are at a steep slope east of the island's southern tip, and in the higher parts of Tau, where more than 100 burrows were counted. All burrows on Fukave are under very dense beach vegetation, while on Tau some are rather exposed. Birds were present on both islands in February 1991, but none on Tau in May. DR found a fireplace on the latter, and so most of the birds (chicks as well as incubating adults) were probably eaten by passing fishermen.

Another small colony of Black-winged Petrels is on Toketoke, about 3 km NE of the northwestern tip of Tongatapu. Remains of two dead birds were found, identified from underwing pattern and colouration of the feet. The burrows were on an open area covering the southern third of the island and under adjacent fau (*Hibiscus tiliaceus*) bush. This part of the island had been burnt shortly before the visit on 16 May 1992, and no live birds were found.

**STORM PETRELS** (Hydrobatidae)

HO saw a storm petrel a few kilometres north of Malinoa (which is about 10 km north of Nuku' alofa, the capital of Tonga). The bird could not be identified to the species level. Storm petrels most likely present in Tongan waters are *Oceanodroma oceanicus*, *O. leucorrhoa* (Jenkins 1980), or members of the genera *Nesofregatta* and *Fregatta*.

**WHITE-FACED HERON** *Ardea novaehollandiae*

Gill (1988, 1990) reported two sightings of a White-faced Heron on the mudflats in the Sopa area of Tongatapu. In March 1991, DR saw one flying over the swamps close to 'Atenisi Institute, Nuku' alofa, which he identified by its underwing pattern. He saw another (the same bird?) in August 1991,

at first flying along the lagoon of Tongatapu and then perching on top of a mangrove. The bird was seen clearly and easily identified.

On 30 April 1992, DR saw six White-faced Herons on mudflats north of Nuku' alofa (Sopu area), several hundred metres west of the King's Palace. Until 20 May, up to five were seen along the same coast on each visit. A cyclone struck New Caledonia about two weeks before the appearance of the herons, and they may have been blown over to Tonga.

Extensive areas of suitable habitat for these herons are along the coast of northwest Tongatapu. Further monitoring will show whether the species establishes a resident population in Tonga. There is also a slight possibility that the species has been a Tongan resident for some time but has remained unnoticed, because this part of Tongatapu has rarely been visited by ornithologists.

The easternmost record of White-faced Herons in the Pacific is from Niue, where one was seen in April and May 1980 (Child 1982).

#### SWAMP HARRIER *Circus approximans*

In February 1992, EC and Uwe Vogel saw a Swamp Harrier circling around the cliffs of Vai Kona at the south-eastern shore of the crater lake of Niufo'ou, being harassed by Fairy-terns, White-tailed Tropicbirds (*Phaethon lepturus*), Red-vented Bulbuls (*Pycnonotus cafer*), and White-rumped Swiftlets (*Aerodromus spodiopygus*). It was seen twice on this day, but not thereafter, even though the same area was monitored daily up to 15 February.

On 18 August 1990, EC and HO saw a large harrier-like bird flying from a coconut palm near Keleti beach on Tongatapu. The appearance of the bird was accompanied by series of alarm calls of a Wattled Honeyeater, similar to those emitted in the presence of a Barn Owl.

The only raptor reported from Tonga in recent times is the Swamp Harrier. The Whitney South Sea Expedition found the species on 'Ata (Beck, undated), which DR could not confirm (Rinke 1991), and on Tofua (Beck, undated), where we saw Swamp Harriers, too (unpubl.).

Note that 'Ata is the southernmost islands in Tonga, whereas Ata is a small island northeast of Tongatapu. (See Figure 1).

#### PURPLE SWAMPHEN *Porphyrio porphyrio*

On most of the larger islands, the Purple Swamphen is an unusual sight (Rinke 1987). It is considered a pest on crops and, as a result, is often trapped, probably one reason for its shyness. There are, however, a few notable exceptions from this situation. Some small, highly disturbed islands north of Tongatapu, that is, Fukave, Pangaimotu, and Fafa, have unusually high densities of Purple Swamphens.

The last two have tourist resorts, and the swamphens get increasingly tame. Almost 100 swamphens live on Fafa, only 300 m in diameter. They can be approached as close as 10 metres, sometimes even less. Juveniles and birds in immature plumage can be seen all year round. In 1983 and 1984, when DR visited the island several times, swamphens were much more shy and less numerous. The present situation on Pangaimotu resembles that on

Fafa in 1983/84. It would be interesting to observe further changes in timidity and population numbers on both islands.

#### BRIDLED TERN *Sterna anaetheta*

Bridled Terns have occasionally been recorded in Tongatapu and Vava' u waters, but identification was not always certain (Jenkins 1980). Gill (1990) reported a few adults around and a downy chick seen on ' Oto Island in the Vava' u group, which was the first breeding record of this species for Tonga.

In November 1991, DR saw about 15 around the easternmost part of the Hufangalupe cliffs, southern Tongatapu. In two larger cavities, two and three birds respectively were sitting in an incubating position, less than half a metre from each other. No nests or eggs were seen because of the great distance. Several other birds disappeared below the overhanging cliffs.

#### BLACK-NAPED TERN *Sterna sumatrana*

The first Tongan breeding record was given by Carlson (1974) for one or two islands in the Ha'apai group, without further details about the location. In May 1980, "Todd saw an adult feeding a fledged young bird on Onevai Beach off Tongatapu" (Jenkins 1980). 'Onevai Beach' certainly refers to Onevai Island north of Tongatapu.

During our work in Tonga, we found several colonies and single breeding pairs in the Nomuka group (Onnebrink & Rinke, in press.) The fledged young in Jenkins (1980) could have come from Monuafa, a few kilometres north of Tongatapu and very close to Onevai, where DR located 6 nests (3 with two eggs, 3 with one) between pebbles on a sandy bank just above the high tide line on 20 January 1991. About 50 adults were flying around.

Another colony was on a long stretch of sand in the north of Tau, with at least 25 nests containing eggs or newly hatched chicks on 8 February 1991. The number of adults was about 100. Distances between nests often were less than 1 metre.

About 30 nests were found at the northern end of Toketoke, and a single one at its southern end. All nests were in shallow depressions on barren coral rock, which surrounds the entire island, and on an isolated rock, separated from Toketoke by a narrow channel of water. Nests contained eggs on 16 May 1992, but one almost fledged chick was found.

Black-naped Terns certainly breed on many more islands, especially on uninhabited and cat-free islands in the Ha'apai and southern Vava' u groups. In the latter, they were seen roosting on beaches of 'Euakafa, 'Eue'iki (not to be confused with the island of the same name in the Tongatapu group, see above), Lua Ui, and Lolo (probably breeding on the latter).

#### BLUE-GREY NODDY *Procelsterna cerulea*

Jenkins (1980) reviewed the records of this species in Tonga, where he made two observations near 'Ata, Tonga's southernmost island, and one near Tafahi in the far north. DR reported three birds around the southern cliffs of 'Eua in August 1984 (Rinke 1987) and found some roosting in cliffs on 'Ata in April 1990 (Rinke 1991).

On 1 October 1991, three unidentified small grey terns with conspicuous white heads were observed fishing off the northern tip of 'Eua. The next day, several Blue-grey Noddies were seen around the cliffs of southern 'Eua, up to three at the same time. Some birds came very close and were identified as being dark phase birds. They appeared from steep, sometimes overhanging cliffs, and their roosts were not found. It is remarkable that the birds had not been seen during several other short visits to the same locality (DR), but again in May 1992, two were seen landing on small ledges in the cliffs.

*P. cerulea* is known as a rather sedentary species (Harrison 1985), and it almost certainly breeds on 'Eua, where suitable nest sites are in the cliffs along the eastern coast.

#### BROWN NODDY *Anous stolidus*

Brown Noddies nest in the crowns of coconuts (cf. Onnebrink & Rinke, in press) and so are less vulnerable to predation and disturbance than Black Noddies.

On Fukave, at least one Brown Noddy was seen flying from most coconut trees, which are in great density on the island. Many were seen collecting nesting material from the ground. Several thousand were present on the island.

A few hundred were also on Ata (see Figure 1) on February 1991, likewise flying from coconut palms. They certainly breed on this island, too.

Some 10 - 20 birds were seen on each visit to Hufangalupe, Tongatapu, where a nest was discovered on a very narrow ledge 5 m below the edge of the cliffs. A chick hatched in January 1992. More nests were certainly present under overhanging cliffs.

#### BLACK NODDY *Anous minutus*

Only two colonies of this species remain in the Tongatapu group, one on Kalau (Rinke 1987), the other on Fukave, about 3 km north of the north-eastern shores of Tongatapu. Fukave is owned by the Riechelmann family, who protect the bird life on the island.

The nests are mainly in a grove of giant puko (*Pisonia grandis*) trees in the north of the island, and several thousand Black Noddies breed there. On 7 February 1991, many nests had half-grown chicks, while other birds were still collecting nesting material, mainly dry leaves, from the ground.

Reports that noddies also breed on Nuku could not be confirmed during a short visit on 19 May 1991. No birds rested on the island, and most seen were heading towards Fukave.

#### FRIENDLY GROUND-DOVE *Gallicolumba stairii*

This species has two female colour morphs, which have been known from Fiji, Samoa, and Alofi (French territory of Wallis and Futuna), but not from Tonga (Amadon 1943; Watling 1982a, who erroneously stated that this morph is restricted to Fiji). During field work on Late and Hunga Ha'apai, the only two islands in Tonga with ground-dove populations hitherto surveyed by us, DR caught no brown ground-doves (more than 60 mist-netted) and did not see any of this morph among more than 100 sightings.



In a captive flock, established at the breeding station of the Brehm Fund on Tongatapu, a pair with light-coloured breast-shields, comprising a captive-born female and a wild-caught male from Late, produced 6 chicks, two of which are plain brown. Hence, the genes controlling the 'retarded plumage' (cf. Amadon 1943) are present over the entire range of the species, but are certainly rare and recessive. Future experiments with the brown birds will hopefully give insights into the genetics of the female colour morphs of the Friendly Ground-dove.

Data from eight eggs are: length  $x = 31.5 \pm 1.4$  mm (range 29.6 to 33.7); width  $x = 24.5 \pm 0.5$  mm (range 23.7 to 25.0).

#### RED SHINING PARROT *Prosopeia tabuensis*

In May 1987, Muona (1989, *AOU Newsletter* No. 80) saw two parrots in Toloa forest (which he considered a primary rainforest but, in fact, is a highly disturbed old secondary forest) on Tongatapu and heard a third one.

According to local people, parrots are occasionally seen on Tongatapu. Most reports come from the mangrove forests of Popua, east of Nuku' alofa, and from Toloa forest, where, a few years ago, a nest with two juveniles was found. DR heard a single call of a parrot in Toloa forest on 22 October 1989, and another one on 24 November 1991.

Most, if not all, parrots on Tongatapu are probably escapees. After the breeding season, many young Red Shining Parrots are taken into captivity from 'Eua to the main island.

A few parrots are reportedly also present on Pangaimotu, where they undoubtedly have been released. DR heard a single bird there in May 1991. The owners of Fafa also released parrots on the island, of which two survived and successfully raised three young in 1991. The nest was in a hollow branch of a large kau (*Burckella richii*) tree.

#### PACIFIC SWALLOW *Hirundo tahitica*

Based on recent records and our own findings, Pacific Swallows seem to be widely straggling within Tonga, or even expanding their breeding range.

The Whitney expedition recorded swallows on Kelelesia and Tonumea in the Nomuka group in July 1925 (Beck, undated). None were seen on these two islands, but HO found them in good numbers on Nomuka, especially around and in the village, and a single on Fonoifua in May 1991 (Onnebrink & Rinke, in press). A single bird was seen three times on Lofanga in the central Ha'apai group in July 1988, and a few at the airstrip on Vava' u in 1987 (Gill 1988).

HO and EC saw Pacific Swallows twice on Tofua in October 1990. DR recorded a single bird in June and two on 31 August 1991, both at the airport of Vava' u. On 'Eua, the local representative of the Royal Tongan Airlines saw a 'new kind of bird', which fits the description of the Pacific Swallow, for the first time in 1987. Numbers of these birds which roosted under the roof of the small airport building increased slowly but steadily, and this year, he has seen as many as 15 swallows in one time (L. Sifa, pers. comm.). These observations are quite remarkable because Tongans usually confuse the species with the White-rumped Swiftlet (*Aerodramus spodiopygius*). The

identity of the birds was confirmed by DR in June 1991, when he saw up to six swallows flying around the airstrip. None were seen in March and May 1992.

In May 1992, one swallow was seen above mudflats near the village of Fo' ui, north-west Tongatapu, and up to three on several visits to the Sopa area. Most sightings were of birds hunting over mudflats at low tide.

#### FIJI SHRIKEBILL *Clytorhynchus vitiensis*

In addition to the 'Eue' iki records, we found the species to be rather common on Tofua and mist-netted one in a heavily overgrown coconut plantation during a very short stay on Kao. Shrikebills were collected on both islands during the WSSE (Mayr 1933).

They were not on six islands in the northern Ha'apai group where they had been reported previously (Mayr 1933), leaving 'Uiha the only island with a shrikebill population in this group.

An old man on 'Eue' iki stated that he saw shrikebills on Ata. DR neither heard nor saw one there, but he spent only two hours on the island on 8 February 1991. Ata has patches of forest and regrowing bush in many places as well as some tracts of beach forest which are suitable shrikebill habitat.

#### TONGAN WHISTLER *Pachycephala jacquinoti*

New island records of this little known species include 'Utungake (Gill 1990) and Pangaimotu in the Vava' u group, where DR saw whistlers at two locations. HO and EC confirmed their presence on Kapa, where a few were seen in a tiny patch of forest. On the main island of the Vava' u group, 'Uta Vava' u, we found whistlers in most forested areas, with about one singing male per 50 m in the forests of the north coast (DR) and one every 150 m at Mt Talau (EC). They were also heard or seen on the peninsula close to the village of Taoa, in forested areas around lake Ano in the south-west of 'Uta Vava' u, and east of Makave.

It is noteworthy that, in October 1990, HO and EC found no whistlers on the three raised coral islands of Kenutu, 'Umuna and Faloa in the very east of the Vava' u group, even though mature forest largely covers these islands.

Tongan Whistlers are usually encountered in native forests (cf. Rinke 1991) but were occasionally seen in secondary bush adjacent to forests (cf. Rinke 1986). DR saw several birds in regrowing bush north of Holonga, and HO and EC saw a male in a patch of secondary forest near the Paradise International Hotel in Neiafu. This patch of forest is relatively isolated in a suburban environment.

During 4 days of mist-netting (54 metres of nets in total) in the forests on the steep slopes north of Holonga, DR caught 6 Tongan Whistlers (3 females, 3 males), 4 Polynesian Starlings, 3 White-collared Kingfishers, 3 Wattle Honeyeaters and 1 Long-tailed Cuckoo. Five of the whistlers were caught in a single net (18 m) which was set up along a path separating native forest from secondary bush. This result corroborates the data from Late (Rinke 1991), where whistlers were the most common passerine in the lower stratum of the forest.

## DISCUSSION

### Records of Black-winged Petrels

Harrison (1985) suggested that *Pterodroma nigripennis* is extending its range northwards. All records for this species in Tonga are very recent (Jenkins 1973, Gill 1988, Onnebrink & Rinke, in press, Müller & Rinke, in prep.), including misidentifications of *P. heraldica* (Carlson 1974). Black-winged Petrels were found to be common on Hunga Ha'apai in April 1991 (Rinke, in prep.), and even Todd's observation of Herald Petrels flying above this island and Hunga Tonga in August 1979 may have been of *P. nigripennis*.

The assumption of a range extension is supported by the lack of old records from Tonga and other Pacific Islands. The WSSE did not find the species on the two Hungas in July 1925 (Beck, undated), and as a result of his few Tonga records, Jenkins (1980) supposed that this species is probably wandering from the Kermadecs rather than a Tongan resident.

Off Rapa, Austral Islands, a breeding colony of 200 - 300 pairs was found on two islets in 1974 (Holyoak & Thibault 1984), where about 700 pairs bred in 1989 (Thibault & Varnes 1991). The WSSE did not record Black-winged Petrels on Rapa, but collected three specimens off Marotiri (Bass Rock), south of Rapa (Murphy 1929). In a review of the migration and distribution of the species, these were considered migrants because Marotiri was regarded as an unsuitable breeding site for the species (Jenkins & Cheshire 1982).

Breeding Black-winged Petrels were also recently discovered on Rarotonga, Cook Islands (G. McCormack, M. Imber, pers. comm.), and on small islands off New Caledonia (de Naurois 1978).

Recent records, however, do not tell the whole story. Bones of Black-winged Petrels have been found in archaeological sites on Mangaia, Cook Islands, and may appear from similar locations on other islands as well (Steadman & Kirch 1990). Is *Pterodroma nigripennis* actually recolonising parts of its former range?

### The distribution of the shrikebill in Tonga

In Tonga, the Fiji Shrikebill is restricted to Niuatoputapu and Tafahi (subspecies *C. v. keppeli*) in the far north and to several islands in the Ha'apai and Tongatapu groups (subspecies *C. v. heinei*, cf. Mayr 1933). The WSSE found it on 15 islands in the Ha'apai group and on both Hungas (Hunga Tonga and Hunga Ha'apai). Rinke (1987) discovered shrikebills on Kalau off 'Eua, the first record of the species for the Tongatapu group during this century.

Table 1 reveals some differences between the WSSE records and our own work. Although the WSSE apparently visited Lalona and Telekivava'u, shrikebills have not been collected on these two islands, although on Lalona, shrikebills were extremely common in 1991 (Onnebrink & Rinke, in press). Unfortunately, the journals of Beck and Correia, the WSSE collectors, lack any entry from the 'Otu Tolu group.

Most remarkable are the differences found in the Ha'apai islands (Tungua to Fotuha'a, 'Uonukuhifo to Ofolanga). *Clytorhynchus* has disappeared from all but two islands ('Uiha and Ha'afeva), where it had not been seen by the WSSE. It was not seen on one of the many islands which were not surveyed by the WSSE (Müller & Rinke, in prep.). All of those have suffered considerable modification by humans, in the course of which they lost most of their native habitat. On both Ha'afeva and 'Uiha, shrikebills are very rare. They may become extinct throughout the Ha'apai group in the near future because these two islands have not much native habitat left, too. At the end of the 19th century, the Fiji Shrikebill was also collected on and recorded from Tongatapu (Gräffe 1870, Watling 1978), 'Eua (Finch 1877), and possibly on Vava'u (Finsch & Hartlaub 1870).

TABLE 1 — Records of Fiji Shrikebills in southern Tonga (X = recorded; N = not visited; - = visited but shrikebills not recorded. Records of the WSSE after Beck, undated, and Mayr 1933. Data for the Ha'apai group from Müller & Rinke, in prep.).

	WSSE	BFSE		WSSE	BFSE
Kelelesia	x	x	Tungua	x	-
Nuku	N	x	Teaupa	x	-
Tonumea	x	x	Ha'afeva	-	x
Telekitonga	x	x	Fotuha'a	x	-
Lalona	-	x	Tofua	x	x
Telekivava'u	-	x	Kao	x	x
Fetokopunga	N	x			
Nomuka'iki	x	x	Uonukuhifo	x	-
			Uonukuhahake	x	-
Hunga Ha'apai	x	x	Tofanga	x	-
Hunga Tonga	x	N	'Uiha	-	x
			'Uoleva	x	-
'Eue'iki	N	x	Nukunamo	x	-
Kalau	N	x	Ofolanga	x	-

The absence of the Fiji Shrikebill from all islands in the Vava'u group, including Late, may be due to the presence of the Tongan Whistler. Similarly, a whistler (*Pachycephala flavifrons*) and the Fiji Shrikebill show an exclusive distribution pattern in Samoa, where the Samoan Whistler is restricted to Western Samoa and *Clytorhynchus* is only on a few small islands in American Samoa (Mayr 1933).

In Fiji, however, and on all four islands of the Lau group where whistlers (*P. pectoralis*) are present (Mayr 1932 b), the Fiji Shrikebill also occurs. The allopatric distribution of the two genera in Tonga and Samoa may have resulted from niche broadening of the earlier successful coloniser. This change may have prevented the arrival and successful colonisation of a second, ecologically similar species.

Gräffe sent a collection of birds from Vava'u and Lifuka to Hamburg, among which were two specimens of shrikebill from Vava'u (Finsch & Hartlaub 1870), although he stated in his own report (Gräffe 1870) that he did not see shrikebills on any other Polynesian island. If these two specimens were not mislabelled, shrikebills and whistlers have been sympatric on

Vava' u, and possible other islands, too. This complicates the distribution pattern of whistlers and shrikebills in the region and demands ecological research on these birds, where both are in sympatry as well as where only one of the two species occurs.

Thus, the present lack of sympatry of whistlers and shrikebills in Tonga demands an alternative explanation. Humans may have disturbed the balance between whistlers and shrikebills by habitat alterations. Rising sea level after the last ice age resulted in fragmentation of land masses and the reduction of island sizes (cf. Onnebrink & Rinke, in press; Müller & Rinke, in prep.). As a result, one of the two species may have expelled the other on islands where formerly resources and area could easily have supported two insectivorous birds.

The present absence of shrikebills from Tongatapu, 'Eua, and the main islands of the Ha'apai group almost completely matches the situation of the Blue-crowned Lorikeet (Rinke, in press), except that shrikebills do permanently inhabit much smaller islands than do lorikeets (cf. Rinke 1987; Onnebrink & Rinke, in press).

As with lorikeets, this pattern could be attributed to the presence of roof rats (*Rattus rattus*), which very likely exterminated Blue-crowned Lorikeets on all islands shortly after their invasion (Rinke, in prep.). Roof rats have contributed greatly to the decline of the Rarotonga Flycatcher (*Pomarea dimidiata*) and are the main target of conservation measures in the recovery programme for that species (R. Hay, pers. comm.).

#### **Are small lorikeet and shrikebill populations viable?**

The single lorikeet population (on 'Eue'iki) and the two shrikebill populations (on Kalau and 'Eue'iki) in the Tongatapu group are very isolated from the remaining populations of both species in Tonga. Fiji Shrikebills do occur on Nuku and Telekitonga, Nomuka group, 73 and 91 km respectively north of 'Eue'iki; Blue-crowned Lorikeets may be found as far south as Kelelesia, which is 68 km north of 'Eue'iki, but the next breeding population is on Nomuka, 94 km to the north.

The last reports of lorikeets and shrikebills from 'Eua and Tongatapu are from the end of last century. Gräffe (1870) gave some details about the life history of both species on Tongatapu. He stated that large flocks of lorikeets sometimes occurred in coconut plantations. He also mentioned the presence of lorikeets on 'Eua, whereas he had no experience with shrikebills on any other Tongan island. Layard (1876) reported lorikeets to be common on Vava' u and 'Eua but rare on Tongatapu. Hübner collected both species on 'Eua (Finsch 1877). The last Tongatapu specimen of a shrikebill was from 1899, collected by Lister (or by von Hügel in 1875?). Watling (1978) stated that most of the Tongan skins in Cambridge were collected by Lister.

The WSSE did not find any evidence of lorikeets and shrikebills on both Tongatapu and 'Eua (Correia, undated; Beck, undated; Amadon 1942 b, Mayr 1933). Lorikeets may have been on the island as late as the 1930s (Rinke 1987), but reports from old people on 'Eua do not seem to be very reliable after further inquiries by DR. It can be safely assumed that shrikebills on 'Eue'iki and Kalau and lorikeets on 'Eue'iki have been isolated for more than 60 years, probably even 100 years. Shrikebills of two populations in

the Nomuka group, separated from each other by 20 km of open sea, differ significantly in wing length (Onnebrink & Rinke, in press). This indicates poor dispersal abilities of the species, and so the birds on 'Eue' iki and Kalau have probably had no contact since the time when the 'Eua population became extinct.

We have increasing evidence that a few other shrikebill populations on tiny islands in the Ha'apai group may be similarly isolated. Thus, at least three populations numbering fewer than 100 birds exist on small Tongan islands and have survived for at least 60 years. The ability of such small birds to survive in small populations exceeds by far that of Socorro Red-tailed Hawks, which have been reported to manage to survive in very low numbers through some 41 generations (Walter 1990).

The discovery of several very small populations of birds raises the question of whether the assumptions of the Minimum Viable Population concept (review by Soule 1987a) are correct. If the result of simulating the survival chances of such small populations is almost certainly extinction after a few generations, some assumptions need to be modified or completely revised. Consequently, we need more long-term monitoring of small populations to overcome the shortcomings of models and computer programs (cf. Soule 1987b).

The discovery of such small, apparently viable populations also raises hopes for the conservation of species. In the present world, we do not need predictions for the probability of survival over the next 1000 years. In a fast-changing environment, survival models need to consider a few decades only, and it seems that a few small populations of a species could form a nucleus for fast recovery in future times, when human attitudes towards wildlife will have changed. Anything else is rather unrealistic, at least in the present world.

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