

## Reptiles, Birds, and Mammals of Mokil and Pingelap Atolls, Eastern Caroline Islands

DONALD W. BUDEN

*Division of Mathematics and Science  
College of Micronesia  
P.O. Box 159, Kolonia, Pohnpei FM 96941*

**Abstract**—This is the first systematic survey of vertebrates on Mokil and Pingelap atolls, Pohnpei State, Federated State of Micronesia. Fourteen species of reptiles, 17 birds, and four mammals are recorded from Mokil Atoll, five of the reptiles and four of the birds for the first time. Eleven species of reptiles, 20 birds, and four mammals are recorded from Pingelap Atoll, two of the reptiles and 14 of the birds for the first time. Previous records of the lizard *Lipinia noctua* and four birds on Mokil are considered hypothetical or represent introductions that never became established, and they have been omitted from the faunal list. No terrestrial vertebrate is endemic to any of the islands and all the resident species tend to be widespread in Micronesia. The established introductions include all of the mammals (*Felis catus*, *Sus scrofa*, *Rattus exulans*), the Red Junglefowl (*Gallus gallus*), and the monitor lizard (*Varanus indicus*). Introduced dogs (*Canis familiaris*) have been extirpated in recent years. The Micronesian Starling (*Aplonis opaca*) is the only resident land bird, occurring on Mokil but not Pingelap. All the terrestrial reptile species occur in forest, the most common habitat, but show perch site selectivity and other habitat preferences.

### Introduction

Many of the atolls of Micronesia have been incompletely surveyed biologically, and information on the distribution and relative abundance of terrestrial vertebrates is especially scanty. Small island size, low habitat diversity, depauperate biotas, and in many cases inaccessibility doubtless have contributed to the paucity of visiting biologists. The vertebrate faunas of Mokil and Pingelap have not been previously reviewed systematically. Marshall (1957) reported one mammal, eight lizard, and four bird species on Mokil, and two mammal, seven lizard, and four bird species on Pingelap after brief visits to both atolls—Pingelap Island on 28 November, and Kalap Island, Mokil on 29 November 1955. Two additional seabird records for Mokil were extracted from Marshall's field notes by Engbring et al. (1990). Baker (1951) summarized locality records of birds throughout Micronesia, but he listed none for Mokil and only one record of an *Anas clypeata*

for Pingelap. Bentzen (1949) and Weckler (1949) listed the domesticated animals found on Mokil, and Weckler (1949) also mentioned a large lizard on Urak, Mokil, presumably the monitor *Varanus indicus*. The status of marine turtles at both atolls was discussed briefly by Pritchard (1981), and both Bentzen (1949) and Weckler (1949) commented on the role of turtles in the economy of the Mokilese. The present study is based largely on my observations on Mokil during 22–25 October 1993 and 27 December–3 January 1994, and on Pingelap during 20–27 December 1993, together with records extracted from the literature and information provided by local residents.

### Study Area

Mokil and Pingelap atolls, each with three islands covering 1.3 km<sup>2</sup> and 1.8 km<sup>2</sup> respectively, are located in the eastern Caroline Islands, 174 km (in the case of Mokil) and 289 km (Pingelap) southeast of Pohnpei, the administrative seat and nearest other island (Fig. 1). In December 1993, approximately 350 people were living on Mokil, all on Kalap Island (I. John, pers. comm.), and about 500 were on Pingelap, all on Pingelap Island (S. Jerry, pers. comm.). Populations have fluctuated by as much as several hundred on each atoll within the past 50 years (Pohnpei State Office of Budget, Planning and Statistics 1992), and all the islands have been occupied at some time in the past (Murphy 1948, A. Edward, pers. comm.). Initial dates of human occupation are unknown, but the first foreign contacts were in the late 1700's and early 1800's. By the middle of the 19th century missionaries were established on both atolls and trading ships and whalers visited regularly (Hurd 1977, Murphy 1948).

Climatological data are generally lacking although Bentzen (1949) indicated diurnal temperatures on Mokil ranged from 78° to 90° F, and that seasons consisted of a period of "endless tradewinds" from December to April followed by a calmer period of increasingly more frequent showers, becoming heaviest in September. Soucie (1983) reported that rainfall on Mokil averaged 127.3 cm/yr during 1941–1970. There is no permanent standing water on either atoll; rain-water for drinking is cached in cisterns.

Glassman (1953) recorded 73 species of vascular plants on Mokil and 78 on Pingelap. All the islands are well-forested, with coconut (*Cocos nucifera*) being dominant and usually spaced about 5–10 m apart. Other common forest trees include *Morinda citrifolia*, *Guettarda speciosa*, *Hernandia sonora*, *Artocarpus altilis*, and one or more species of *Terminalia*, *Ficus*, and *Pandanus*. The understory consists of numerous ferns, vines, herbaceous plants, and small trees, varying in density as to the extent and recency of clearing. Grasses predominate in the more open areas and epiphytic mosses and ferns festoon tree trunks and larger limbs. Soils are shallow and the coral substrate is frequently exposed. The forest extends directly to the beach or merges with scrub up to several meters wide and consisting largely of *Scaevola*, *Tournefortia*, and *Guettarda*. Narrow, discontinuous patches of low strand (sparse grasses, vines, small shrubs) often occur between the beaches of coral rubble and/or sand and the denser vegetation inland. Mangroves (*Rhi-*

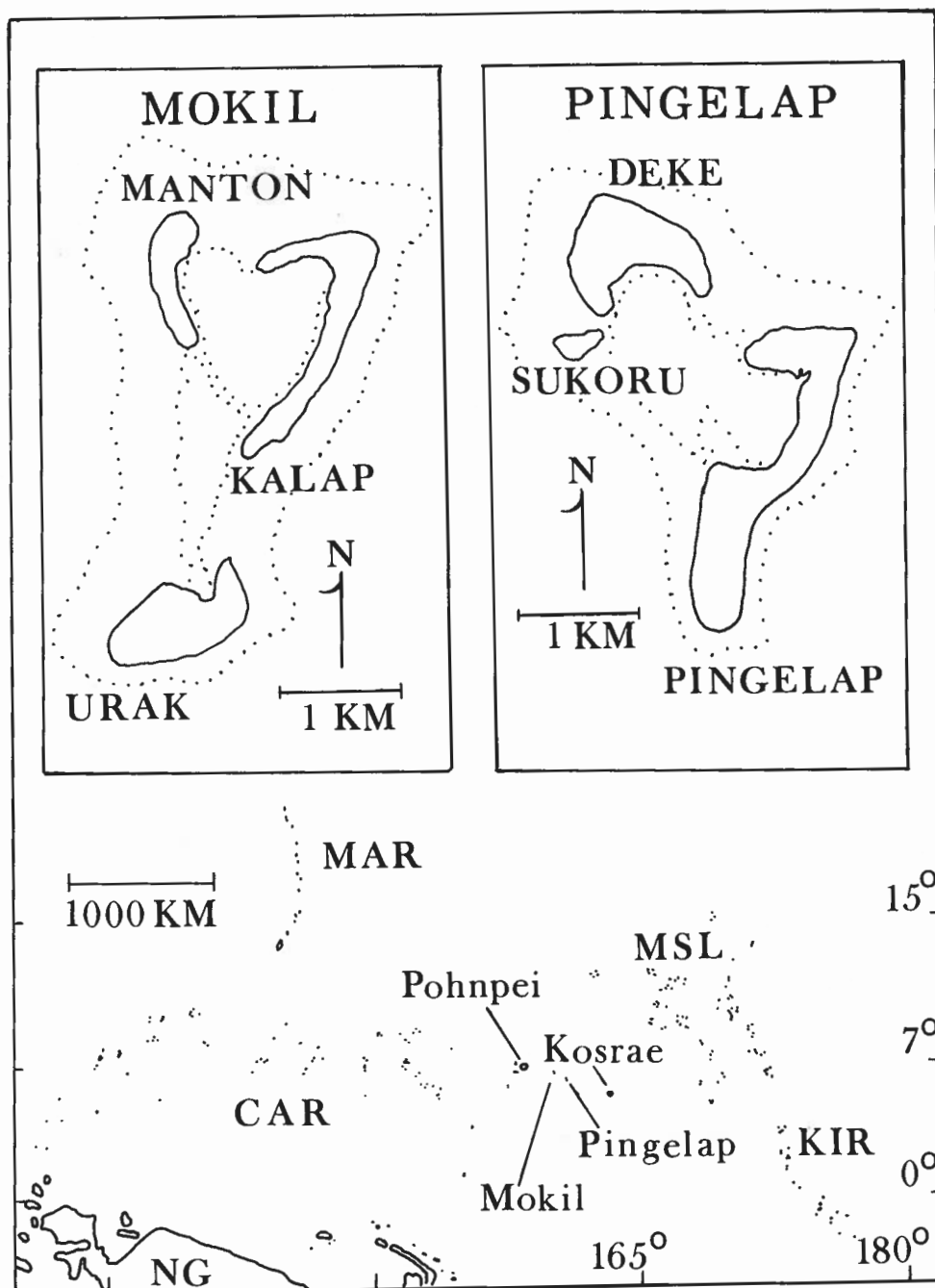


Figure 1. Location map for Mokil and Pingelap atolls. CAR = Caroline Islands, KIR = Kiribati (formerly Gilbert Islands), MAR = Mariana Islands, MSL = Marshall Islands.

*zophora*, *Sonneratia*, and less commonly *Bruguiera*) border the lagoon side of northern Pingelap Island, and large examples of *Calophyllum inophyllum* and *Barringtonia asiatica* up to about 20 m tall and 2 m in trunk diameter (dbh) grow along the shore on the lagoon side of Manton. The taro-like aroid *Cyrtosperma chamissonis* is cultivated in low, wet, and widely scattered depressions inland, the two largest pits being adjacent to the two settlements. Other common food plants include banana (*Musa*), papaya (*Carica*), and breadfruit (*Artocarpus*). The settlements contain well-groomed yards with fruit trees and numerous ornamental shrubs and herbs.

### Methods

The terms used to describe abundance of birds are: very common (30 or more/day), common (15–30/day), fairly common (5–15/day), uncommon (1–5 on most days), and scarce (no more than four records of singles or small flocks). For lizards, the terms are: common (at least 30 sightings/day in suitable habitat and during optimum time of day and weather conditions), fairly common (10–30/day), uncommon (up to 10/day on most days), and scarce (up to 5/day), but possibly being unrecorded on more than half the days.

The status of lizards and birds was assessed by transect counts and by general observations made throughout the study period. The transects followed paths through the forest or paralleled the strand line at the forest edge; each was covered only once. Distances were estimated from maps—Army Map Service (1946) for Mokil, and United States Hydrographic Office (1945) for Pingelap. Land birds and nesting colonies of seabirds were censused using an estimated 50 m fixed-width, strip transect technique. Counts of waterbirds on reef flats and beaches, and all lizard species are given as numbers of individuals encountered per kilometer, indicating relative abundance without estimating population size.

Place names are those commonly used by local residents, and all locality records unassigned as to authority are my own. Tree trunk measurements are reported as estimates of diameter at breast height (dbh). The 268 specimens of lizards I collected (by hand) have been deposited in the B. P. Bishop Museum, Honolulu; the College of Micronesia Reference Collection, Pohnpei; the National Museum of Natural History, Smithsonian Institution, Washington, D.C.; and the Museum of Comparative Zoology, Harvard University.

### Species Accounts

#### REPTILES

**Green turtle** (*Chelonia mydas*).—Pritchard (1981) reported that *C. mydas* does not nest at Mokil or Pingelap, but that young (less than about 50 cm long) are easily seen and caught in the shallow lagoon at Mokil, and that five were observed during an underwater survey in 1974. The only turtle I saw during my visits to the two atolls was a *C. mydas* with a carapace about 1 m long being butchered on a beach at Urak, Mokil on 23 Oct. 1993. Residents of both atolls

told me turtles nested occasionally on their beaches in the past, but no longer, and that most of those seen in the lagoon now are immediately captured for food. Weckler (1949) remarked that turtles were captured at Mokil mainly in summer, and that they were formerly more plentiful but had become scarce prior to his visit in the late 1940's. Most of the sightings of turtles unassigned as to species probably pertain to *C. mydas*; to what extent other species may be present is unknown.

**Hawksbill turtle** (*Eretmochelys imbricata*).—I am unaware of any specific documented records, but Bentzen (1949:68) stated "a few hawksbill turtles are caught from time to time around Mokil," and that in spite of their being poisonous in some seasons, the people still ate them.

***Gehyra mutilata***.—One collected at night on the outside wall of the Municipal Building at Kalap, Mokil on 27 Dec. 1993, and another on 1 Jan. 1994 are the only records.

**Oceanic gecko** (*Gehyra oceanica*).—This species was common on *Cocos* trunks at night on both atolls and recorded on all islands during my visits in Dec. 1993 and Jan. 1994, but it was less numerous in the settlements than in the forest. Marshall (1957) collected specimens on Kalap and Pingelap islands in Nov. 1955.

**Mourning gecko** (*Lepidodactylus lugubris*).—I observed *L. lugubris* frequently at night on the walls of buildings and less commonly on trees in the settlements on Kalap and Pingelap islands. Marshall (1957) collected examples at both localities in Nov. 1955. The apparent absence of *L. lugubris* on Sukoru probably is an artifact of sampling, although I found it much less numerous outside the settlements generally. I collected three under *Cocos* trash on a sandy beach and another was exposed on the lower leaf of a seedling *Barringtonia* on the strand line, all on Manton during midday on 29 Dec. 1993. The large number (45) collected on Kalap (Table 1) is a sampling artifact as most came from the Municipal Building where I was lodged for several days. I saw none in the forest on Kalap.

**Slender-toed gecko** (*Nactus pelagicus*).—This species is common to fairly common on both atolls, but unrecorded from the two settled islands, Kalap and Pingelap, and not previously recorded from either atoll. The eight I observed on Urak during 2400–0500 on 23 Oct. 1993 were in coral rubble on the upper beach, and within several meters of shoreline trees. But only three among the many others I observed during visits to both atolls in Dec. 1993 and Jan. 1994 were in coral rubble, the remainder being on tree trunks. Crabs were more numerous on Urak and other islands during Dec.–Jan. than in Oct. and possibly contributed to the scarcity of *N. pelagicus* on the ground then.

**Micronesian gecko** (*Perochirus ateles*).—One collected on a tree trunk near the forest edge at the southern end of the lagoon side of Manton at 2230 on 29 Dec. 1993 is the only record.

***Emoia boettgeri***.—This skink is common in forests and shady areas on both atolls and recorded on all islands, being less numerous or absent in open, broadly sunlit areas. Marshall (1957) collected specimens on Kalap and Pingelap islands.

Table 1. Relative abundance of lizards on Mokil and Pingelap atolls expressed as number of individuals observed per kilometer during survey counts<sup>a</sup>, and with total number of specimens collected during the study in parentheses; nc = no counts made. Island areas (km<sup>2</sup>) are indicated below each abbreviated name.

Species	Mokil			Pingelap		
	Man 0.22	Klp 0.59	Urk 0.44	Suk 0.07	Dek 0.59	Plp 1.10
<b>Gekkonidae<sup>b</sup></b>						
<i>Gehvra mutilata</i>	0	0 (2)	0	0	0	0
<i>G. oceanica</i>	6.8(14)	0 (7)	2.0(8)	16.0(11)	2.2(7)	6.0(1)
<i>Lepidodactylus lugubris</i>	0.4(5)	0 (45)	0.3(2)	0	0.4(2)	0 (6)
<i>Nactus pelagicus</i>	1.2(2)	0	0.9(5)	1.0(1)	2.8(12)	0
<i>Perochirus ateles</i>	0 (1)	0	0	0	0	0
<b>Scincidae<sup>c</sup></b>						
<i>Emoia boettgeri</i>	11.0(2)	11.0(1)	12.7(4)	nc(1)	10.8(1)	4.9(2)
<i>E. cyanura</i>	43.0(20)	14.5(8)	3.9(19)	nc(3)	6.8(4)	26.6(7)
<i>E. impar</i>	10.5(6)	10.0(6)	7.4(5)	nc(4)	18.8(7)	21.1(10)
<i>E. jakati</i>	2.5(2)	5.5(1)	0 (3)	nc	10.4(2)	14.6(1)
<i>Eugongylus</i>	0 <sup>d</sup>	0 (1)	0	nc	0	0 <sup>e</sup>
<i>albofasciolatus</i>						
<i>Lamprolepis smaragdina</i>	7.0(6)	4.5(3)	1.3(1)	nc(1)	2.0(3)	3.7(2)
<b>Varanidae<sup>c</sup></b>						
<i>Varanus indicus</i>	0	0	2.0(1)	nc	0	0

<sup>a</sup> The distances (km) covered during surveys on each island are: Man = Manton 2.0 day/2.5 night, Kal = Kalap 2.0/2.5, Urk = Urak 1.5/3.5, Suk = Sukoru 0/1.0, Dek = Deke 2.5/5.0, Plp = Pingelap 3.5/1.0.

<sup>b</sup> Counted during nighttime surveys only.

<sup>c</sup> Counted during daytime surveys only.

<sup>d</sup> Sight records only, this study.

<sup>e</sup> None seen during this study, but specimen(s) collected by Marshall (1957).

***Emoia cyanura*.**—This species is common on all islands on both atolls, being most numerous in open sunlit areas, especially sand strand—38 were counted on a 0.25 km transect along the upper beach at the southern end of Manton on 29 Dec. 1993. Marshall (1957) reported that he collected examples at Kalap and Pingelap islands, but his reference to *E. cyanura* as having a bluish tail suggests his samples may have included *E. impar*.

***Emoia impar*.**—This species is common in forests on both atolls and recorded on all islands, being less numerous in broadly open, sunny areas. In the field, the blue tail (often greenish blue at the base) readily distinguished *E. impar* from *E. cyanura*, all examples of which I examined had brown or dull, bronzy green colored tails. Additionally, the dorsal ground color is darker in *E. impar*. *E. impar* also was observed in low vegetation (about 1 m high) and on tree trunks more frequently than was *E. cyanura*, which was more terrestrial. I saw one *E. impar* about 7 m high on the trunk of a breadfruit tree in Pingelap settlement.

***Emoia jakati***.—This species is common and widespread, being most numerous in open grassy or weedy areas. Its apparent absence only from Sukoru almost certainly is an artifact of sampling. The striped “bronze back” *Emoia* with striped sides that Marshall (1957) recorded on Kalap and Pingelap islands doubtless is this species.

***Eugongylus albofasciolatus***.—This species of skink probably is more numerous than the scanty records indicate, but skulking habits in dense vegetation make assessment of its status difficult. Marshall (1957) collected *E. albofasciolatus* on Pingelap Island and saw it in pig pens there and on Kalap Island in 1955. The only examples I saw during 19 days covering the six islands of both atolls were all on Mokil—four on Manton and three on Kalap. One was on a densely vegetated boulder ridge, two were in dense, grassy areas, and the remainder were in *Cocos* forest, in or near piles of decomposing coconut husks discarded during copra harvests.

**Green tree skink (*Lamprolepis smaragdina*)**.—This species is common on tree trunks on both atolls and recorded on all islands. It is less numerous in shrubs and vines and only occasionally seen on the ground. I counted 23 along a kilometer of forest edge on the lagoon side of Deke Island during 0800–1000 on 25 Dec. 1993, and I saw green, mustard-colored, and brown individuals on both atolls. The distribution of differently colored examples was not quantified, although I noted that green lizards were relatively less common among these islands than on Pohnpei. Among six collected on Manton on 25 Oct. 1993, I noted dorsal coloration as green in one, green with patches of brown in another, mustard-colored in another, greenish brown in another, brown with white flecks in one, and brown in another. The venters were recorded as yellow in three, yellow-green in two, and blue-green in one.

**Monitor Lizard (*Varanus indicus*)**.—The monitor is fairly common on Urak, Mokil, but unrecorded elsewhere. Presumably it was introduced during the Japanese occupation in the early part of the century as suggested by Weckler (1949), who referred only to a “large lizard” on Urak. I observed about 10 per day during visits in Oct. 1993 and Jan. 1994. Most were seen on the ground in scrub or at the forest edge along the beach, but others were in the forest and two were on a sandy beach apparently foraging near the water line. When flushed, most sought refuge by climbing trees and staying on the opposite side of the trunk, away from the perceived threat.

#### BIRDS

**Brown Booby (*Sula leucogaster*)**.—Nonbreeding visitor. Seven were seen together in flight over Urak at dusk on 22 Oct. 1993, and another over the lagoon off Deke on 21 Dec 1993. Marshall (1957) observed a “pet booby (*Sula*) . . . in the village” at Pingelap on 28 Nov. 1955.

**Great Frigatebird (*Fregata minor*)**.—Nonbreeding visitor. I saw one off Pingelap Island on 27 Dec. 1993, 25–30 off the northern end of Manton at dusk on 29 Dec. 1993 (17 the following morning), and two over Urak on 1 Jan., and 15–20 together over Kalap on 2 and 3 Jan. 1994.

**Pacific Reef-Heron** (*Egretta sacra*).—Uncommon and presumably resident on both atolls, whence recorded on all islands, but breeding is unconfirmed. Of the 29 I recorded at Pingelap, during 20–27 Dec. 1993, 13 (45%) were the dark morph, 11 (38%) were piebald, and five (17%) were the white morph. Among the eight I recorded on Mokil during 27 Dec. 1993–3 Jan. 1994, four (50%) were white, three (37.5%) were dark, and one (12.5%) was piebald. Marshall (1957) reported reef-herons being kept as pets in the villages on both atolls, but I saw none there during my visits.

**Northern Shoveler** (*Anas clypeata*).—Nonbreeding visitor. One adult female collected on Pingelap Island on 17 Nov. 1932 (Yamashina 1940) is the only record.

**Red Junglefowl** (*Gallus gallus*).—Introduced and common in the settlements; 392 were counted on Mokil and 440 on Pingelap in 1987 (Pohnpei State Office of Budget, Planning and Statistics 1988). I heard one rooster crowing on Urak on 2 Jan. 1994, suggesting a possible feral population.

**Osprey** (*Pandion haliaetus*).—Nonbreeding visitor. One I observed in flight at Deke several times on 21 Dec. 1993 is the first record for the eastern Caroline Islands. The pale underparts, dark upperparts, nearly completely white head, and crooked-wing flight silhouette were clearly evident. Previous Micronesian records exist for the Marianas (Baker 1951, Stinson et al. 1991, Wiles et al. 1987) and Palau (Baker 1951).

**Black-bellied Plover** (*Pluvialis squatarola*).—Nonbreeding visitor. One I saw on a sandy beach on the lagoon side of Pingelap Island on 27 Dec. 1993 is the only record. The black axillaries seen in flight distinguished this bird from the more common golden-plovers.

**Lesser Golden Plover** (*Pluvialis dominica*).—Nonbreeding visitor. *P. dominica* is fairly common on beaches and reef flats on both atolls, at least in winter. I recorded it on all islands during late Dec. 1993 and early Jan. 1994, and observed many at Mokil also in Oct. 1993.

**Common Ringed Plover** (*Charadrius hiaticula*)/Semipalmated Plover (*C. semipalmatus*).—One plover I saw at Sukoru on 22 Dec. and another on Pingelap Island on 27 Dec. 1993 were examples of one or both of these species. Pyle & Engbring (1985) consider *C. hiaticula* and *C. semipalmatus* equally as likely to occur in eastern Micronesia. *C. hiaticula* has been recorded occasionally in the Marianas (Glass et al. 1991) and Palau (Engbring & Owen 1981), but there are no confirmed records of *C. semipalmatus* in Micronesia.

**Wandering Tattler** (*Heteroscelus brevipes*) and Gray-tailed Tattler (*H. incanus*).—Pale colored tattlers that I observed on both atolls in all probability were *H. incanus*, whereas conspicuously darker birds doubtless were *H. brevipes*. But as most sightings were at long distances and less than optimum viewing conditions, I have elected to report all the records as a species pair. Both species occur throughout Micronesia as nonbreeding visitors (Pyle & Engbring 1985). Hayes (1986) estimated 95% of the tattlers he saw on Kosrae during 1981–1986 were *H. incanus*, and he reported that a United States Fish and Wildlife Service team found *H. incanus* fairly common there in summer 1983. Tattlers were very com-



mon on Mokil and Pingelap during my visits in Oct. and Dec. 1993 and Jan. 1994, being outnumbered only by Ruddy Turnstones (*Arenaria interpres*) among the visiting migrants.

**Whimbrel** (*Numenius phaeopus*).—Nonbreeding visitor. I saw 1–4 daily among the three islands at Pingelap during 21–26 Dec. 1993, and another on Urak, Mokil on 1 Jan. 1994. The birds were identified by their moderately long, downcurved bill, striped crown, and lack of rufescence on rump and base of tail.

**Bristle-thighed Curlew** (*Numenius tahitiensis*).—Nonbreeding visitor. The one I saw on Sukuoru on 22 Dec. showed the distinctive rufous rump and base of tail when flushed, and is the only record.

**Black-tailed Godwit** (*Limosa limosa*).—Nonbreeding visitor. The one I saw on Kalap, Mokil on 24 Oct 1993 is the only record. The black tail and broad, white wing stripes were clearly evident when the bird flushed.

**Ruddy Turnstone** (*Arenaria interpres*).—Nonbreeding visitor. *A. interpres* was very common and the most numerous migrant on all islands on both atolls during late Dec. 1993 and early Jan. 1994, and at Mokil also in Oct. 1993. I observed turnstones on beaches and reef flats usually in small flocks of 5–15, but counted 102 along several hundred meters of beach on the lagoon side of Pingelap Island south of the settlement on 26 Dec. 1993.

**Sharp-tailed Sandpiper** (*Calidris acuminata*).—Nonbreeding visitor. The only records are the six I saw together and one alone on a beach at Pingelap Island on 27 Dec 1993. The streaked breast (not so sharply demarcated from the abdomen as in *C. melanotos*), pale legs, and reddish brown crown were plainly visible.

**Great-crested Tern** (*Sterna bergii*).—Probably a nonbreeding visitor. The one I saw feeding in the lagoon off Manton Island on 30 Dec. 1993 is the only record.

**Black-naped Tern** (*Sterna sumatrana*).—Probably a nonbreeding visitor. The one I saw on a small sand flat at Deke on 24 Dec. 1993 is the only record.

**Brown Noddy** (*Anous stolidus*).—The Brown Noddy was seen regularly on all islands at both atolls during 20 Dec. 1993–3 Jan. 1994, and probably was breeding. I flushed many from presumed nesting sites in the tops of coconut trees, and others were heard calling. It was much less numerous on Mokil in Oct. 1993, when all records were birds in flight or perched in the open, and none was seen or heard in *Cocos* crowns. Breeding status is difficult to assess for this species because of its cryptic nesting habits, but resident Pingelapese consider it common on the atoll and about as numerous as the Black Noddy (*A. minutus*), which was my overall impression as well. The largest numbers I saw were flocks of 50–75 on Deke and Pingelap islands and on Kalap, Mokil, and 111 counted on rocks off Sukoru, Pingelap on 23 Dec. 1993.

**Black Noddy** (*Anous minutus*).—Very common resident. I observed *A. minutus* regularly and breeding on all islands at both atolls during 20 Dec. 1993–3 Jan. 1994. The greatest density of active nests (28.2/ha) was on Deke. Nests were generally 5–20 m high in trees, mainly *Pisonia* and *Artocarpus* and occasionally *Pandanus*, and usually in small groups of 5–15 spaced one to several meters apart. One egg each was observed in the only two nests I was able to examine,

about 3–4 m high in a *Pandanus* tree on Deke, 21 Dec. 1993. Although I found only 12 nests (all in one breadfruit tree) on Urak, I estimated 1,200 to 1,500 birds arriving from the sea at dusk on 1 Jan. 1994. The Black Noddy was much less numerous and showed no evidence of nesting on Mokil in Oct. 1993. Marshall (1957) reported *A. tenuirostris* (= *minutus*) nesting in breadfruit trees near the settlement on Pingelap Island on 28 Nov. 1955.

**Common Fairy-Tern (*Gygis alba*).**—Common and presumably breeding on all islands at both atolls, though confirmed only at Pingelap on Deke Island (one egg, 23 Dec. 1993), and Pingelap Island (“nesting,” 28 Nov. 1955—Marshall 1957). Additionally, I saw one pair copulating in a breadfruit tree on Kalap on 3 Jan. 1994, but there was no evidence of breeding in Oct. Most of the birds I saw in Dec. and Jan. were paired and tended to be in small groups of 4–12.

**Oriental Cuckoo (*Cuculus saturatus*).**—Nonbreeding visitor. One I saw at Pingelap Atoll on Sukoru Island on 22 Dec. 1993, and presumably the same bird on Deke the following day, represents the third locality record for the tropical Pacific, the two other localities being Palau and Yap, where it is considered an uncommon migrant and winter visitor (Pratt et al. 1987). The Oriental Cuckoo breeds in eastern Asia and winters to Australia (Pratt et al. 1987). The Pingelap bird resembled a small falcon in flight outline, had a gray dorsum, and tended to flair its tail slightly when perched, showing white spots on the outer rectrices. It flew, perched, and repeatedly flushed several times from scrub and forest edge along the upper beach before disappearing from view. I was unable to see the underparts clearly, but dorsal and lateral views from a distance of 15–30 m for about two minutes, and through 10 × 50 binoculars revealed a yellow eye-ring, brownish colored bill with base of mandible yellowish-orange, and orange colored legs or feet. The Common Cuckoo, *C. canorus*, is a Eurasian species that closely resembles *C. saturatus*, but it is very unlikely to occur in this region of the Pacific, being known only as a vagrant as far east as Palau (Pratt et al. 1987), about 3,000 km west of Pingelap.

**Long-tailed Cuckoo (*Eudynamys taitensis*).**—Nonbreeding visitor. The one I saw in dense scrub and forest on Urak, Mokil on 22 Dec. 1993 is the only record. The bird was observed for only a few seconds before disappearing from view, but the diagnostic combination of long tail, medium brown and dark-barred upperparts and dark-streaked, pale underparts were clearly evident.

**Micronesian Starling (*Aplonis opaca*).**—This species is common and presumed resident in forest throughout Mokil Atoll, but breeding is undocumented. The number of birds I recorded per hectare during surveys in Dec. 1993 and Jan. 1994 are 2.1 on Kalap, 1.9 on Manton, and 1.2 on Urak.

#### MAMMALS

Four mammal species are known from both Mokil and Pingelap atolls, all being deliberate or inadvertent introductions.

**Rats (*Rattus* spp.).**—Local residents I queried indicated rats (*Rattus*) are especially common and widespread, occurring on virtually every island. Marshall (1957) collected examples of the Polynesian rat (*R. exulans*) on Kalap and Pin-

gelap islands. Additionally, he saw one "large rat, possibly *Rattus rattus*" on Pingelap and went on to say that large rats on Mokil Atoll reported by a Kalap resident probably also pertained to *R. rattus*, but these records require confirmation. I saw one to several rats each on Urak and Manton islands, Mokil, and on Deke, Pingelap during visits in Oct. and Dec. 1993, all of them resembling *R. exulans* in their small size.

**Pig (*Sus scrofa*).**—Pigs were common in the settlements on Kalap and Pingelap islands during my visits. The young roamed free (but I never saw any outside the settlements), whereas adults were tethered or penned, or both. A government survey in 1987 revealed 166 pigs on Mokil and 316 on Pingelap (Pohnpei State Office of Budget, Planning and Statistics 1988).

**Cat (*Felis catus*).**—Cats also are numerous in the settlements at both atolls, and I saw one or two feral cats each on both atolls on Urak and Deke islands.

**Dog (*Canis familiaris*).**—Dogs were common in the settlements in the past and were present on Mokil at least into the late 1940's, although there were discussions then among local residents as to the advisability of eliminating them from the island because of the frequency of attacks on people and chickens, and the accumulation of feces (Bentzen 1949). Dogs were eliminated on Pingelap in the early 1980's (A. Edward, pers. comm.). None was present on either atoll during my visits in late 1993.

### Discussion

Fourteen species of reptiles, 17 birds, and three mammals occur on Mokil Atoll, and 11 reptiles, 20 birds, and the same three mammal species occur on Pingelap Atoll. The numbers of bird species on Mokil and Pingelap are 18 and 21, respectively, if two species of *Charadrius* occur. Introduced species include one lizard (*Varanus indicus*) on Mokil and one bird (*Gallus gallus*) and all three mammals (*Felis catus*, *Sus scrofa*, *Rattus exulans*) on both atolls. Domesticated ducks (Anatidae) and turkeys (*Meleagris gallopavo*) were brought to Mokil many years ago but died shortly thereafter (Murphy 1948, Weckler 1949) and are not included in the species list, nor is the Pohnpei Lory (*Trichoglossus rubiginosus*), which was reported by local residents as having been released on Kalap several years ago, but apparently never becoming established and not seen recently. I have also omitted Marshall's (1957) unconfirmed and questionable Mokil records of the skink, *Lipinia noctua*, and the White-browed Rail, *Poliolimnas cinereus*.

Five species of reptiles are reported from Mokil for the first time (*Gehyra mutilata*, *Nactus pelagicus*, *Perochirus ateles*, *Emoia impar*, and *Varanus indicus*) and two (*Nactus pelagicus*, *Emoia impar*) are first records for Pingelap. Eleven species of birds are new to Mokil and 14 are new to Pingelap (Table 2).

Combining the lists of both atolls and excluding introduced species, the herpetofauna includes two sea turtles, five geckos, and six skinks, and the avifauna consists of 18 nonbreeding visitors and five resident breeders. The only resident land bird is the Micronesian Starling (*Aplonis opaca*), which occurs on all three islands of Mokil but does not occur on Pingelap. The four other breeding birds

Table 2. Status<sup>a</sup> of birds on Mokil and Pingelap atolls based on general observations and with densities given as birds seen and heard/km<sup>b</sup> or other units as noted. Asterisks indicate first atoll records.

Species	Mokil		Pingelap	
	Status	Density	Status	Density
Brown Booby	NBV S*	0	NBV S*	0
Great Frigatebird	NBV*	0	NBV S*	0
Pacific Reef-Heron	(B) UC	1.1	(B) UC	2.5
Northern Shoveler			NBV S	0
Red Junglefowl	B I	0	B I	0
Osprey			NBV S*	0
Black-bellied Plover			NBV S*	0
Lesser Golden Plover	NBV C*	2.9	NBV C*	2.9
Common Ringed Plover or Semipalmated Plover	NBV S*	0.1	NBV S*	0.2
tattler spp.	NBV C**	4.0	NBV C**	5.7
Whimbrel	NBV S*	0.1	NBV UC*	0.4
Bristle-thighed Curlew			NBV S*	0.1
Black-tailed Godwit	NBV S*	0		
Ruddy Turnstone	NBV VC*	9.2	NBV VC*	18.8
Sharp-tailed Sandpiper			NBV S*	0.6
Great-crested Tern	NBV? S*	0		
Black-naped Tern			NBV? S*	0
Brown Noddy	(B) C-VC	?	(B) C-VC	?
Black Noddy	B C-VC	3.7 <sup>c</sup>	B VC	11.5 <sup>c</sup>
Common Fairy-Tern	(B) C	0.5 <sup>d</sup>	B C	6.1 <sup>d</sup>
Oriental Cuckoo			NBV S*	0
Long-tailed Cuckoo	NBV S*	0		
Micronesian Starling	(B) C	1.8 <sup>d</sup>		

<sup>a</sup> B = resident year-round, breeding confirmed, (B) = resident year-round, breeding not confirmed but very probable, I = introduced, NBV = nonbreeding visitor, VC = very common, C = common, FC = fairly common, UC = uncommon, S = scarce.

<sup>b</sup> Surveys covered 7.3 km along beaches and 5.1 km in forest on Mokil, and 11.5 km along beaches and 3.4 km in forest on Pingelap.

<sup>c</sup> Number of nests per hectare.

<sup>d</sup> Number of birds per hectare.

are an egret, and three species of terns, all widespread on both atolls. Of the 23 indigenous birds, 20 (87%) occur in marine habitats. Aside from the resident starling, the only land birds are the Oriental Cuckoo (*Cuculus saturatus*), and Long-tailed Cuckoo (*Eudynamis taitensis*), both being scarce visitors or vagrants. No terrestrial vertebrate is endemic to either atoll, and all the resident breeders tend to be widespread in Micronesia and adjacent regions of the Pacific.

I observed all the lizard species in forest, but perch site selectivity and other habitat preferences were noted. The geckos were active only at night. *Lepidodactylus lugubris* was the one most closely associated with human habitation, being found on walls of buildings in both settlements. *Gehyra oceanica* was most common 1–3 m high on *Cocos* trunks in the forest, but present also on trees and

buildings in the settlements. *Nactus pelagicus* also was seen frequently on forest tree trunks, but never on *Cocos*, and seemed to prefer the fluted or buttressed trunks of large *Pisonia*, *Guettarda*, *Barringtonia*, and *Calophyllum*. It was the only gecko seen regularly on the ground, in coral rubble on the upper beach zone. Few geckos of any species were seen on the highly fissured, rugose trunks of *Tournefortia*, one of the most common trees at the forest edge.

The skinks were active only during daylight and apparently retreated to cover at night at which time I saw only one, an *Emoia boettgeri* asleep on the leaf of a small tree. Both *E. boettgeri* and *E. impar* were found chiefly in forest, being most numerous where patches of sunlight filtered through the canopy. *E. boettgeri* was almost always on the ground, but *E. impar* was also common in low vegetation (about 1 m high), especially among sunlit ferns, and occasionally higher on tree trunks. *E. cyanura* was the most numerous and often the only lizard in open, sparsely vegetated sand-strand. It occurred also in forest syntopically with its sibling congener *E. impar*, but seemed less inclined to climb. *E. jakati*, like *E. cyanura*, had a predilection for more open sites, especially grassy or weedy areas, and it was almost always on the ground. The few examples of *Eugongylus albofasciolatus* I saw all were in or near dense cover in forest or forest edge, and all were on the ground. *Lamprolepis smaragdina* was the most arboreal skink, being seen most frequently 2–5 m high on the trunks of *Cocos* trees, occasionally on shrubs, vines, and ferns, and rarely on the ground. The monitor lizard, *Varanus indicus*, occurred everywhere on Urak, from forest to beach, in trees and on the ground.

To what extent the natural vegetation of these islands has been altered since their initial colonization by aboriginals is unknown. The strand and scrub habitats probably have been least affected, but the forests have been periodically cleared or groomed for cultivation of *Cocos*, breadfruit, and other crops, and they were long maintained to maximize copra production. In recent decades, however, *Cocos* regeneration has been largely by natural reproduction with few deliberate plantings (I. John and S. Jerry, pers. comm.). The impact of human activity presently is greatest on the two settled islands, Kalap on Mokil and Pingelap Island, where ornamentals are common in the settlements and the forest areas are well-groomed and more park-like than on the uninhabited islands. No vertebrates are known to have been extirpated in the past, but recent work elsewhere in the Pacific (Steadman 1989, 1992, Steadman & Intoh 1994) suggests that bird extinctions followed the arrival of aboriginal man. The populations of the present assemblage of vertebrates on Mokil and Pingelap do not appear to be endangered by current levels of human activity.

#### Acknowledgments

I thank R. Crombie and G. Rodda for sharing unpublished information on distributions of reptiles in the Caroline Islands, and I am especially grateful to I. John and S. Jerry, Chief Magistrates of Mokil and Pingelap, respectively for their help during my visits, and to the people of Mokil and Pingelap for their many kindnesses and courtesies. I thank A. Edward for general information on

the atolls, for initiating contacts with the magistrates, and for assistance in transporting supplies and equipment on Pohnpei, and I appreciate the constructive comments and criticisms provided by C. Lobban, D. Stinson, and two anonymous reviewers. Funding for this project was provided in part by a Pacific Island Network grant.

### References

- Army Map Service. 1946. Mokil Atoll NW. AMS series W 846, sheet 6141 1 NW, scale 1:25,000. United States Army, Washington, D.C.
- Baker, R. H. 1951. The avifauna of Micronesia, its origin, evolution, and distribution. University of Kansas Publications Museum of Natural History 3:1-359.
- Bentzen, C. 1949. Land and livelihood on Mokil, an atoll in the eastern Carolines, part 2. Coordinated Investigations of Micronesian Anthropology CIMA Report No. 25, Pacific Science Board, National Research Council, Washington, D.C. 188 p.
- Engbring, J. & R. P. Owen. 1981. New bird records for Micronesia. *Micronesica* 17:186-192.
- Engbring, J., F. L. Ramsey & V. J. Wildman. 1990. Micronesian forest bird surveys, the federated states: Pohnpei, Kosrae, Chuuk, and Yap. United States Fish and Wildlife Service, Department of the Interior, Washington, D.C. 312 p.
- Glassman, S. F. 1953. New plant records from the eastern Caroline Islands, with a comparative study of the native plant names. *Pacific Science* 7:291-311.
- Hayes, F. E. 1986. Migratory shorebird populations at Kosrae, Eastern Caroline Islands. *'Elepaio* 46:107-109.
- Hurd, J. N. 1977. A history and some traditions of Pingelap, an atoll in the eastern Caroline Islands. Master's Thesis, University of Hawaii. 146 p.
- Marshall, J. T., Jr. 1957. Atolls visited during the first year of the Pacific Islands Rat Ecology Project. *Atoll Research Bulletin* 56:1-11.
- Murphy, R. E. 1948. Geographic studies in the easternmost Carolines. Coordinated Investigations of Micronesian Anthropology CIMA Report No. 5. B. P. Bishop Museum, Honolulu. 146 p.
- Pohnpei State Office of Budget, Planning and Statistics. 1988. Pohnpei State Statistics Yearbook—1988. Pohnpei State Government, Kolonia, Pohnpei. 209 p.
- Pohnpei State Office of Budget, Planning and Statistics. 1992. Pohnpei State Statistics Yearbook—1992. Pohnpei State Government, Kolonia, Pohnpei. 174 p.
- Pratt, H. D., P. L. Bruner & D. G. Berrett. 1987. *A Field Guide to the Birds of Hawaii and the Tropical Pacific*. Princeton University Press, Princeton, New Jersey. 409 p.
- Pritchard, P. C. H. 1981. Marine turtles of Micronesia. *In* K. A. Bjorndahl (ed.), *Biology and Conservation of Sea Turtles*, pp. 263-274. Smithsonian Institution Press, Washington, D.C.

- Pyle, P. & J. Engbring. 1985. Checklist of the birds of Micronesia. *'Elepaio* 46:57-68.
- Soucie, E. A. 1983. Atoll agriculture for secondary schools. The Foundation to Promote Economic Agriculture and Community Endeavors. New York. 243 p.
- Steadman, D. W. 1989. Extinction of birds in eastern Polynesia: a review of the record, and comparisons with other Pacific island groups. *Journal of the Archaeological Society* 16:177-205.
- Steadman, D. W. 1992. Extinct and extirpated birds from Rota, Mariana Islands. *Micronesica* 25:75-84.
- Steadman, D. W. & M. Intoh. 1994. Biogeography and prehistoric exploitation of birds from Fais Island, Yap State, Federated States of Micronesia. *Pacific Science* 48:116-135.
- Stinson, D. W., J. D. Reichel, R. J. Craig & D. T. Aldan. 1991. New and unusual bird records from the Northern Mariana Islands, 1988-1990. *Micronesica* 24:261-271.
- United States Hydrographic Office. 1945. North Pacific Ocean, Islands of the Caroline Group. 2nd ed. scale 1:50,000. United States Hydrographic Office, Washington, D.C.
- Weckler, J. E. 1949. Land and livelihood on Mokil, part 1. Coordinated Investigations in Micronesian Anthropology CIMA Report No. 11, Pacific Science Board, National Research Council, Washington, D.C. 147 p.
- Wiles, G. J., R. E. Beck, Jr., C. M. Avenengo, P. J. Conry & J. A. Savidge. 1987. New bird records for Guam, Yap, Saipan, and Tinian. *'Elepaio* 47:37-41.
- Yamashina, Y. 1940. Some additions to the "List of the birds of Micronesia." *Tori* 10:673-679.

Received 14 Feb. 1994, revised 30 Nov.