

The Reptiles of Nauru¹

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Abstract: Eleven species of reptiles are reported from Nauru in the first systematic treatment of the herpetofauna. Four of the species are marine; the seven others include six lizards (four geckos, two skinks) and one snake. *Gehyra mutilata* (Wiegman), *G. oceanica* (Lesson), *Pelamis platura* (Linnaeus), and *Ramphotyphlops braminus* (Daudin) are recorded on Nauru for the first time. With the exception of *Emoia arnoensis* Brown & Marshall, which is endemic to eastern Micronesia, the herpetofauna consists of species that range widely among the west-central Pacific Ocean islands. The only known record of *E. arnoensis* from Chuuk possibly is based on a misassigned locality, in which case the range of the species would be limited to the Marshall Islands, Nauru, and Kosrae. There is no evidence to suggest that habitat modification on Nauru stemming largely from more than a century of phosphate mining has reduced the number of reptile species.

LITTLE IS KNOWN of the fauna of the island republic of Nauru. The island's small size, remote location, and ecological impoverishment all doubtlessly have contributed to the paucity of zoological investigations, leaving a gap in our knowledge of the biodiversity of this area of the Pacific. Information on the reptiles is especially scanty; the herpetofauna has never been reviewed systematically. Waite's (1903) list of reptiles from Nauru included only two species (both skinks): *Lygosoma cyanurum* [= *Emoia cyanura* (Lesson)] and *L. atrocostatum* (= *E. arnoensis* Brown & Marshall). Much later, Brown (1991) described *E. arnoensis nauru* based largely on material collected by H. Cogger in 1983. In addition, Bauer and Henle (1994) included Nauru in a list of locality records for the geckos *Hemidactylus frenatus* Duméril & Bibron and *Lepidodactylus lugubris* (Duméril & Bibron), and Webb (1994) reported on the unusual occurrence of a crocodile. Reports

on sea turtles from Nauru consist only of a few passing remarks largely lacking in substantive detail. In this study I include an annotated list of all the species of reptiles recorded on Nauru, and it is based on personal observations, specimens I recently collected, data from museum specimens and catalogs, gleanings from the literature, and information provided by local residents.

Study Area

Nauru (0° 30' S, 166° 56' E) is a small (21 km²) raised atoll island in the west-central Pacific Ocean (Figure 1). It is approximately 2,100 km northeast of New Guinea; the nearest island is Banaba (= Ocean Island) 300 km to the east. The climate is equatorial; the average monthly temperature ranges from 27 to 29°C, and the average annual rainfall is 2,098 mm, with the wettest months being December to April. A narrow, coastal belt roughly 100 to 300 m wide abuts a scarp that rises to approximately 30–40 m in most areas to form the edge of a central plateau; the maximum elevation is 72 m at Command Ridge. Approximately 10,000 islanders reside mainly along the coast and in a small settlement centered about a brackish lake (Buada Lagoon) in a low area of the plateau in the southwestern part of the island. The coastal vegetation consists largely of strand, scrub, scattered coconut trees, and a variety of orna-

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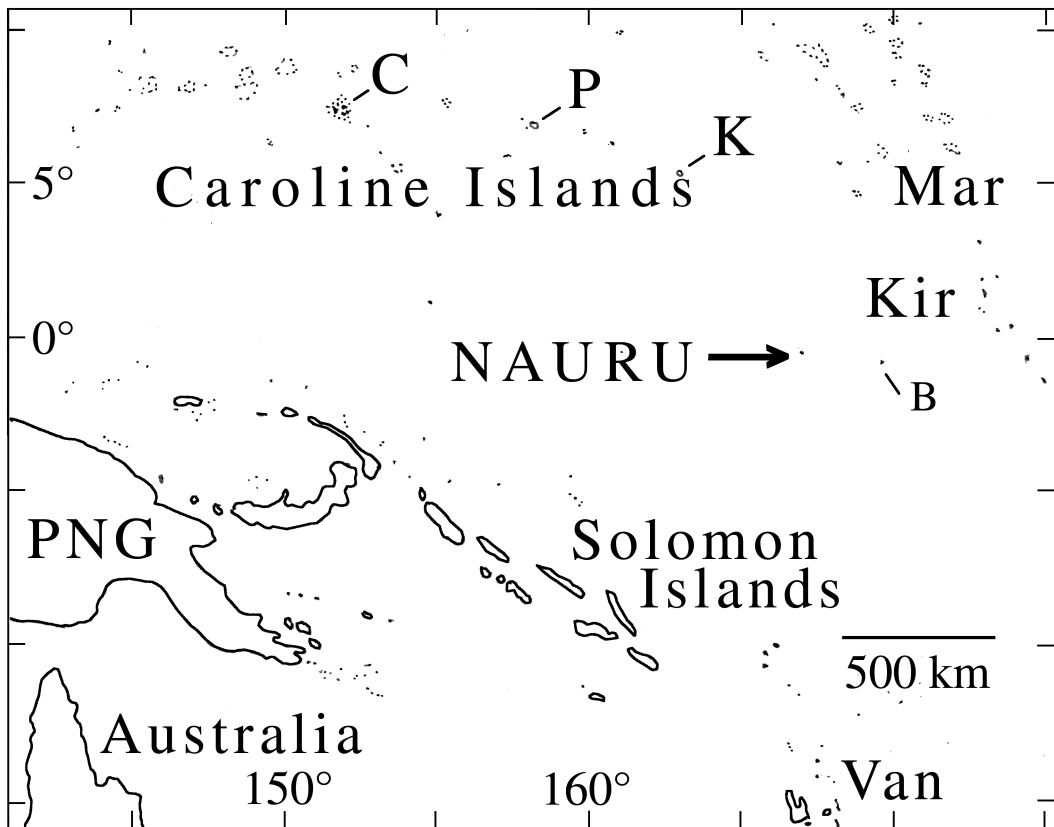


FIGURE 1. Location map for Nauru and surrounding islands: B, Banaba (= Ocean Island); C, Chuuk; K, Kosrae; Kir, Kiribati; Mar, Marshall Islands; P, Pohnpei; PNG, Papua New Guinea; Van, Vanuatu.

mentals and fruit trees. Much of the original vegetation of the central plateau was stripped away during a century of phosphate mining, leaving behind a skeletal landscape of limestone pinnacles about 4–8 m high from around which the topsoil and phosphate deposits were removed. Many areas have since regenerated to a karstic scrubland with small pockets of residual forest dominated by tomano trees, *Calophyllum inophyllum* L., and strangler fig, *Ficus prolixa* G. Forst. The most extensive remnant forest areas are on the gentler slopes of the scarp and at its base. In describing the impact of human activities on the environment of Nauru, Thaman (1992:153) stated “long habitation; almost a century of open-cast phosphate mining; continuous bombing, destruction, and displacement of

the people during World War II; rapid urbanization; and the abandonment of agriculture and subsistence activities on Nauru have arguably produced one of the most severely modified natural and cultural floras on earth.” Further descriptions of the physiognomy and vegetation of Nauru are provided by Manner et al. (1984), Thaman et al. (1994), and Morrison and Manner (2005).

MATERIALS AND METHODS

I visited Nauru during 12–25 December 2006 and 29 March–5 April 2007 to conduct surveys of birds, reptiles, butterflies, and dragonflies; the 81 specimens of reptiles collected (by hand) were fixed in 10% formalin, washed, transferred to 35% isopropanol, and

deposited in the Bishop Museum, Honolulu (BBBM); the Museum of Comparative Zoology, Harvard University (MCZ); the National Museum of Natural History, Smithsonian Institution (USNM); and the Natural History Museum, London (NHM). Terms of abundance used to appraise overall status are based largely on my visual surveys: common (at least 30, but often many more, sightings per day under optimum conditions), fairly common (approximately 10–30 encounters per day), uncommon (up to 10 per day, and unrecorded on some days), scarce (usually no more than five per day and may be unrecorded on many days), vagrant (unexpected on geographic grounds and known only from one or two records). Surveys were conducted during different times of the day under a variety of sunny and cloudy conditions but not during rain. Snout-vent length in *Emoia arnoensis* was measured with a millimeter rule to the nearest whole millimeter. Values in Table 1 are rounded to the nearest tenth resulting in some totals greater than 100%.

RESULTS

CROCODILES

Crocodylus cf. *porosus* Schneider

A “small” and presumably young crocodile first observed by swimmers at a beach on Nauru on 18 September 1994 was captured and brought to the local police station where it was observed by many people (Webb 1994:13); the specimen was not saved. Webb (1994) indicated that the animal was photographed, but no photograph was examined by him nor by any other members of the Crocodile Specialist Group in Australia (C. Manolis, pers. comm.). The nearest population of crocodiles, and the most likely source of the Nauru record, is *C. porosus* in the Solomon Islands, over 1,000 km to the southwest.

TURTLES

Cheloniidae

Chelonia mydas Linnaeus and *Eretmochelys imbricata* Linnaeus

There are no well-documented specimen records of turtles on Nauru. Several reports that mention turtles in passing lack substan-

tive detail, but some refer to at least two species, the green turtle, *Chelonia mydas*, and the hawksbill turtle, *Eretmochelys imbricata*. Hambruch (1915:197), for example, included “grünen schildkröte” (green turtle) and “echte schildkröte” (true turtle? = hawksbill?) in a list of animals recorded on Nauru; his accompanying illustrations (Hambruch 1915: figs. 281 and 282) are unidentifiable as to species. Ernest Stephen was marooned on Nauru sometime during the 1870s at the age of 14 and spent most of his life on the island. In his recollections of Nauruan customs and beliefs (written around 1902 or 1903; Wedgwood in Stephen 1936), he remarked that “turtles rarely visit the island; [and that] at first the natives would not eat them, for they thought that they were spirits of their departed” (Stephen 1936:57). Thaman and Hassall (1998:24) stated that “both the hawksbill and green turtles ... are occasionally present ... [and that] some beaches were reportedly once nesting areas although this is no longer the case.” In addition, Fiji Customs reported the importation of a small amount of worked tortoiseshell [presumably from *E. imbricata*] from Nauru in 1978 (Groombridge and Luxmoore 1989). I saw no turtles on Nauru, but several residents told me that turtles occasionally visited the island, and that one had been captured not too long before as it was crossing the circumferential road; the species was unidentified.

LIZARDS

Geckos

Gehyra mutilata (Weigmann)

The stump-toed or mutilating gecko occurs naturally from India and Sri Lanka through Southeast Asia to China, Papua New Guinea, and the Indo-Australian archipelago (Lever 2003). It is widespread in the Pacific (McCoy 1980, Zug 1991). The absence of allozyme protein variation between the Pacific Basin populations and those in the ancestral home of the species in southern Asia supports a hypothesis of a relatively recent and probable human-assisted dispersal into Oceania (Fisher 1997). *Gehyra mutilata* is scarce on Nauru; one collected under flaking bark of a *Calophyllum* tree in a small patch of forest on 17

TABLE 1

Distribution by Habitat of 51 Specimens of Four Species of Geckos Collected on Nauru in December 2006 and March–April 2007

Species	Night ^a			Day ^b
	Edificarian	<i>Scaevola</i> Shrubs	Tree Trunks	Under Bark
<i>Gebyra mutilata</i>			1 (50.0%)	1 (50.0%)
<i>Gebyra oceanica</i>	7 (46.7%)		1 (6.7%)	7 (46.7%)
<i>Hemidactylus frenatus</i>	7 (43.8%)		5 (31.3%)	4 (25.0%)
<i>Lepidodactylus lugubris</i>	8 (44.4%)	1 (5.6%)	6 (33.3%)	3 (16.7%)

^a Search effort: edificarian, 75 min; *Scaevola* shrubs (on beach and central plateau), 70 min; tree trunks, 90 min.

^b Untimed.

December and another on a tree trunk at night in the Buada Lagoon settlement on 18 December 2006 are the only records. It was the only gecko not encountered in edificarian habitats, including buildings, walls, and other such structures constructed by humans (Table 1), but is usually found in such habits elsewhere in Micronesia (pers. obs.).

Gebyra oceanica (Lesson)

The oceanic gecko is widespread in the Pacific and is common on Nauru. It was observed in edificarian and ruderal habitats as well as in remnant forest and often in small colonies occupying a building or a single tree. Seven were collected from the outside walls of a house and adjacent buildings in Nibok District, all within a 15-min span shortly after sunset on 13 December.

Hemidactylus frenatus Duméril & Bibron

Native to Asia, the house gecko has colonized much of Oceania since World War II, often outcompeting or otherwise displacing other species (Hunsaker 1966, Petren et al. 1993, Case et al. 1994). It is common on Nauru, especially on the cement walls of buildings, where it was regularly observed feeding on insects drawn to lights. It was frequently encountered also on tree trunks in the settlements as well as in more remote areas of the island. The time of its introduction to Nauru is unknown. The earliest specimen record I found is USNM 200470, collected by R. V. Wood on 18 April 1976 and accompanied by the annotation that the species was “common

everywhere in forest,” which indicates that it was already well established. The record mentioned in Bauer and Henle (1994) is based on this specimen (A. Bauer, pers. comm.).

Lepidodactylus lugubris (Duméril & Bibron)

The mourning gecko is widespread in the Pacific (Gibbons 1985). It is common on Nauru, being especially numerous in edificarian habitats and less frequently encountered in forest patches on tree trunks at night and under flaking bark during the day. Bauer and Henle (1994) and Bauer (pers. comm.) recorded it first on Nauru based on a specimen in the Australian Museum (AMS R-7109). The collector and collection date are unknown, but the specimen was presented by A. H. S. Lucas and registered into the AMS collection in 1919 and could have been collected any time before that date (R. Sadlier, pers. comm.).

Skinks

Emoia arnoensis Brown & Marshall

The Arno Atoll skink is endemic to eastern Micronesia: the nominate form in the Marshall Islands and eastern Caroline Islands, and *E. a. nauru* on Nauru. Cogger (in Brown 1991) found *E. a. nauru* only in a small forest of *Ficus* trees and in the dense surrounding shrub growth, and mainly on the aerial roots of trees. I saw no more than 20 during a total of 3 weeks on Nauru and no more than six in one day. They were most frequently encountered on cement and stone walls that were bordered by dense thickets of shrubs, vines,

and weeds alongside a road in a semiresidential area on the southwestern rim of the plateau. Others were seen among limestone pinnacles, on aerial roots of *Ficus* trees, and on the trunks of fallen trees throughout the island. The majority of those I encountered were extremely wary and typically sought refuge in abundantly available holes in the ground, or rock faces, which were always close by. In contrast, N. and B. Vander Velde (pers. comm.) stated that examples of the nominate subspecies they encountered in the Marshall Islands were readily approached and could be easily captured by hand.

In snout-vent length, the 23 adults of the nominate subspecies from the Caroline and Marshall islands that Brown (1991) examined ranged from 73.0 to 85.5 mm, and the 13 *E. a. nauru* ranged from 69.8 to 91.0 mm. The six specimens I collected on Nauru are larger than any reported by Brown (1991) and ranged from 92 to 101 mm (ave. 95.2 mm). Most of the others I saw were of similar size, with only two or three that might have been considered juveniles.

Emoia cyanura (Lesson)

This is the most common lizard on Nauru, being especially numerous in the coastal belt, along stone walls, and in leaf litter under shady forest trees. On two separate occasions, individuals I observed foraging along the waterline at the beach ran into tide pools at my approach and swam several meters to the opposite side.

SNAKES

Sea snakes

Pelamis platura (Linnaeus)

The yellow-bellied sea snake is the most widely distributed of all sea snakes, ranging from the east coast of Africa through the Indian and Pacific oceans to the west coast of the Americas (Pickwell and Culotta 1980, Heatwole 1999). It is pelagic and seldom encountered along shorelines. Collection data for the only two (and previously unreported) records for Nauru are incomplete. One fluid-preserved specimen in the Nauru Hospital laboratory was said by current hospital staff to have been found in driftwood that

was washing ashore sometime during the early to mid-1990s. Several islanders, including hospital staff, told me of another sea snake (presumably another *P. platura*) that was found on or near the shore approximately 2–3 yr before but was not saved.

Blind snakes

Ramphotyphlops braminus (Daudin)

The Brahminy blind snake, native to Southeast Asia, is considered “the most successful disperser in the snake world ... [and] the most probable [dispersal] mechanism is in the root balls of ornamental (more recently) or food (historically) plants transported by humans” (Crombie and Pregill 1999:66). It is established in tropical and subtropical regions worldwide, including various Pacific islands (Gibbons 1985). The flattened, mummified remains of a Brahminy blind snake I found approximately 150 m east of the Odn Aiwo Hotel, on the road to Buada Lagoon, 31 March 2007, is the only record for Nauru. The specimen (MCZ R-185647) is in very poor condition but identifiable on the basis of size, coloration, and scutellation (20 scale rows and shape of rostral, with ca. 330 mid-dorsal scales); identification was confirmed by Van Wallach (Museum of Comparative Zoology, Harvard University). Two resident islanders told me of seeing what are almost certainly (based on their descriptions) additional examples of this species, referring to small, shiny black, wormlike animals, with a pointed or spine-tipped tail.

DISCUSSION

With the exception of the occasional yellow-bellied sea snake (*Pelamis platura*), at least two species of sea turtles, and a vagrant crocodile (*Crocodylus* cf. *porosus*), all of which are marine, the herpetofauna of Nauru consists of six species of lizards (four geckos, two skinks) and one blind snake, *Ramphotyphlops braminus* (Table 2). The crocodile represents an unusual extralimital record. The only other extralimital records, and presumed examples of long-distance dispersal of salt water crocodiles in Micronesia, include one *C. porosus* adult captured in Pohnpei on 21 March 1971

TABLE 2
Summary of Status of Reptiles on Nauru and in
Surrounding Waters

Species	Status ^a
Crocodyles	
<i>Crocodylus</i> cf. <i>porosus</i>	V
Turtles	
<i>Chelonia mydas</i>	S?
<i>Eretmochelys imbricata</i>	S?
Geckos	
<i>Gehyra mutilata</i>	S
<i>Gehyra oceanica</i>	FC
<i>Hemidactylus frenatus</i>	C
<i>Lepidodactylus lugubris</i>	C
Skinks	
<i>Emoia arnoensis</i>	S
<i>Emoia cyanura</i>	C
Snakes	
<i>Pelamis platura</i>	V
<i>Ramphotyphlops braminus</i>	?

^a C, common; FC, fairly common; UC, uncommon; S, scarce; V, vagrant.

(Allen 1974) and another near Ailinglaplap Atoll in the Marshall Islands in October 2004 (Manolis 2005; N. Vander Velde, pers. comm.). The nearest population of crocodiles is roughly 1,500 km and 2,000 km to the south and southwest (in the Papua New Guinea/Solomon Islands region) of Pohnpei and the Marshall Islands, respectively.

Amphibians do not occur on Nauru, although the hospital laboratory has two fluid-preserved cane toads, *Bufo marinus* (Linnaeus). These are without accompanying data but were said by hospital staff to have been found at the airport in cargo arriving on a flight from Saipan or Kosrae sometime around the mid-1990s.

The blind snake is known definitely from only one salvaged road-killed specimen but is probably more numerous than the single record indicates; its cryptic habits make assessment difficult. Five of the six species of lizards on Nauru are widespread in Oceania. The four geckos live to different degrees commensally with humans, and all may have reached Nauru with human assistance. Fisher (1997) presented molecular evidence supporting a hypothesis of natural dispersal of *Gehyra oceanica* in the southern Pacific but not

to the exclusion of human-assisted transport. Three of the geckos are common, but *Gehyra mutilata* is scarce; its low numbers are possibly due to a negative impact of the presence of *Hemidactylus frenatus* (see, for example, Budden [2007] and references cited therein). Of the two species of skinks on Nauru, *Emoia cyanura* has a very broad distribution in the Pacific and has been recorded on more different island groups in the Pacific Basin than any other skink (Adler et al. 1995). *Emoia arnoensis*, on the other hand, is the only reptile on Nauru that has a relatively limited distribution, being endemic to eastern Micronesia and with an endemic subspecies on Nauru. Both *E. cyanura* and *E. arnoensis* are the only species mentioned in the first report of reptiles on Nauru (Waite 1903).

Emoia arnoensis has a limited distribution in eastern Micronesia, where it is possibly confined to the Marshall Islands, Nauru, and Kosrae; I consider the single record from Chuuk as questionable. Brown (1991) recorded the nominate subspecies in the Marshall Islands only on Arno Atoll, whence he examined 16 specimens collected mainly by Ross Kiester, who recorded it on 15 of the 33 islands that he surveyed in 1968 (Kiester 1983). Elsewhere in the Marshalls, Gressitt (1961) recorded it on Jaluit Atoll, and a specimen that Brown reported as from Lae Atoll in the Caroline Islands (USNM 132258) was collected on Lae Islet, Lae Atoll, in the Marshall Islands by R. Fosberg in 1952 (G. Zug, pers. comm.). In addition, a juvenile *E. cf. arnoensis* collected on Maloelap Atoll by Nancy Vander Velde on 11 April 2006 is in the Bishop Museum (BPBM 23974).

Emoia arnoensis has been recorded in the Caroline Islands only on Kosrae and Rug Island (Brown 1991). I saw it on Kosrae occasionally, usually on the forest floor and in rocky areas near streams, during June and July 2002. The Rug Island record is based on one specimen (CAS-SU 7541) collected by A. P. Lundin, undated but cataloged (in Stanford University collections) in 1938. Rug [= also Ruc or Ruk] is an old and disused name for Chuuk Islands (formerly Truk) and, in some usage, may refer specifically to Fefan (= Fefen) Island. Kiester (1983) remarked

that he did not encounter *E. arnoensis* in Chuuk, and I did not observe it during several hours on Fefan in June 2003 and for about an hour in July 2007 nor on any of the other Chuuk Lagoon islands that I visited occasionally over the past several years. Inasmuch as the specimen was examined by Brown, it is unlikely to be a misidentified dark (melanistic) form of *Lamprolepis smaragdina*. Black or nearly black *L. smaragdina* have been recorded on several of the low coralline islands of Chuuk (Kepler 1994), and I have observed several also on Fefan and other high islands in the lagoon. The CAS herpetological collection contains no other specimens collected by Lundin, but the CAS fish collection has specimens that Lundin collected from both Chuuk (Rug I.) and Kosrae (D. Catania, pers. comm.). Possibly Lundin's specimen of *E. arnoensis* may be mislabeled as to locality and may have originated from Kosrae, not Rug. *Emoia arnoensis* ranges from the Marshall Islands and Nauru westward to Kosrae, then apparently skips Pohnpei, and is known from Chuuk only from the Lundin record. A search of Stanford University archives produced no additional information on the specimen or on A. P. Lundin (P. White, pers. comm.). The status of *E. arnoensis* on Chuuk is somewhat equivocal, and the record is in need of confirmation.

To what extent the more than 100 yr of continuing habitat degradation, largely by mining operations, has affected the number of reptile species present on Nauru is uncertain because adequate baseline studies are lacking. However, there is no evidence to indicate that the herpetofauna was any richer in premining times than it is now. The earliest report on the reptiles, which dates back to the very early stages of mining, includes only two species of skinks (Waite 1903). However, among the species of lizards that are widely distributed in Micronesia (including small, low-lying atolls of the Caroline Islands and Marshall Islands) and that are unknown from Nauru are *Lepidodactylus moestus* (Peters), *Nactus pelagicus* (Girard), *Perocbirus ateles* (Duméril), *Emoia boettgeri* (Sternfeld), *E. caeruleocauda* (De Vis), *E. impar* (Werner), *E. jakati* (Kopstein), *Eugongylus albofasciolatus*

(Günther), *Lamprolepis smaragdina* (Lesson), and *Lipinia noctua* (Lesson). Most, if not all, of these can be found in habitats considerably altered by human activity (pers. obs.). Additional surveys may reveal the presence of some of these species on Nauru. Alternatively, their absence may be real and the especially meager herpetofauna likely a combined attribute of small island size and distance from potential source areas.

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