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THE REPTILES OF KAPINGAMARANGI ATOLL, MICRONESIA

BY

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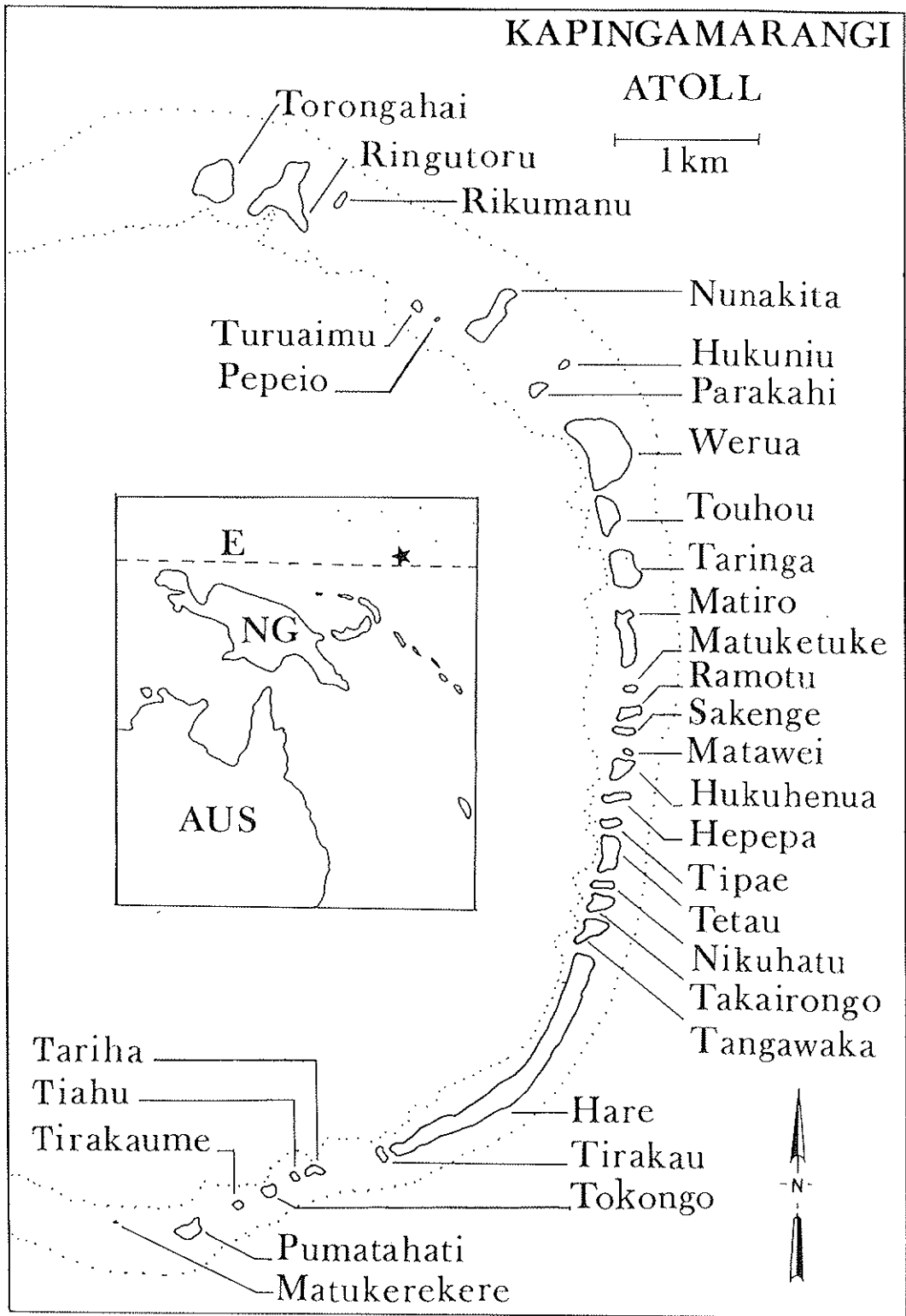


Figure 1. Location map for Kapingamarangi Atoll. AUS =Australia, NG = New Guinea, E = equator, star = Kapingamarangi.

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ABSTRACT

Two species of sea turtles and eight lizards comprise the herpetofauna of Kapingamarangi Atoll; the giant Micronesian gecko (*Perochirus scutellatus*) is unknown elsewhere. The mourning gecko (*Lepidodactylus lugubris*), oceanic gecko (*Gehyra oceanica*), and azure-tailed copper-striped skink (*Emoia impar*) are the most common and widespread species, being recorded on 100%, 97%, and 87% of the 31 islands, respectively. The stump-toed gecko (*Gehyra mutilata*) and the Pacific blue-tailed skink (*Emoia caeruleocauda*), both known from only a scattering of older records from the most densely inhabited and most frequently visited islands, may be extirpated or possibly still exist locally in very small numbers. Sea turtles are rare and none was observed during the present study, but local residents indicate they were more numerous in the past.

INTRODUCTION

The herpetofauna of Kapingamarangi has not been previously surveyed systematically. Six *Emoia impar* collected by H. K. Townes in 1946 are in the National Museum of Natural History, Smithsonian Institution (USNM). Niering (1963) remarked briefly on seven species of reptiles encountered during a joint Pacific Science Board, National Academy of Science/Office of Naval Research Expedition during 22 June-31 August 1954; 83 specimens were deposited in USNM collections. At approximately the same time, the George Vanderbilt Foundation Expedition collected lizards for the California Academy of Sciences (CAS and CAS-SU) adjunct to field surveys of Pacific fishes. The interaction and degree of overlap in activities between the two expeditions on Kapingamarangi is uncertain. Robert R. Harry, the principle collector of lizards for the Vanderbilt group was acknowledged by McKee (1956) as contributing geological information for Niering's group, but he was not mentioned in any of the natural history reports presented by Niering (1956, 1963) and Wiens (1956).

One specimen each of *G. mutilata* and *G. oceanica* collected at Kapingamarangi by W. Mierina in July 1974 also are in CAS collections, and Ota et al. (1995) remarked on variation in *Lepidodactylus lugubris* collected there. Brown (1976) discussed taxonomic relationships of *Perochirus scutellatus*, which is known only from Kapingamarangi, and at

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that time only from two specimens—the holotype in the British Museum of Natural History (BMNH) and a nontype in CAS. The present study is based largely on my observations and specimens collected during 19 June-13 August 1996, along with information extracted from the literature and museum collections.

STUDY AREA

Kapingamarangi Atoll is a Polynesian outlier in southeastern Micronesia at 1° 04' N, 154° 05' E. It is about 11.2 km long (east to west) and 8-9 km wide, and with a land area of about 1.3 km² distributed among 31 low-lying, coralline islands, all at the eastern end (Fig.1). The vegetation is mainly *Cocos* (coconut) or mixed *Cocos/Artocarpus* (breadfruit) forest with a narrow and discontinuous band of coastal scrub or thicket consisting largely of *Scaevola* and *Tournefortia* shrubs. The approximately 500 islanders nearly all live on Werua and Touhou, but they utilize the other islands for cultivation (mainly *Cyrtosperma* taro) and for harvesting other plant materials for food, fuel, handicrafts, and housing construction. The vegetation has been modified over a long period of human occupation (Niering 1956, 1963; Wiens 1956).

METHODS

All 31 islands were visited both at night and in daylight, and an effort was made to obtain at least one voucher specimen of every species encountered on every island. Specimens were collected by hand, and the number collected in each habitat does not necessarily give a completely accurate measure of habitat preference as values may be skewed by differences in ease of capture. A disproportionately large number of *Emoia impar*, for example, was collected on tree trunks as the lizards were more readily captured there than on the forest floor, where they were more numerous but much more elusive. More accurate estimates of abundance were obtained during census counts recording all individuals observed.

Daytime surveys included counts made during slow walks along measured transects, timed searches of more cryptic habitats (in leaf litter, in palm leaf axils, beneath loose bark), and opportunistic observations and collections throughout the study period. Nighttime surveys were conducted at different times between dusk and dawn and consisted largely of timed observations in different habitats using a hand-held light. Distances were estimated from an aerial photomosaic map (Pohnpei State Land Commission 1986) and place names are from Bryan (1971). The specimens were deposited in the Australian Museum (Sydney), Bernice P. Bishop Museum (Honolulu), British Museum of Natural History (London), California Academy of Sciences (San Francisco), College of Micronesia (Pohnpei), Museum of Comparative Zoology, Harvard University (Cambridge, Massachusetts), and National Museum of Natural History Smithsonian Institution (Washington, D.C.).

SPECIES ACCOUNTS

Chelonia mydas and *Eretmochelys imbricata*.—The scanty records and the anecdotes of resident islanders suggest that turtles never were very abundant on Kapingamarangi, at least in historical times. Local residents told me that both green turtles (*C. mydas*) and hawksbill turtles (*E. imbricata*) are seen occasionally, but were more numerous in the past. I saw no turtles during summer 1996. In the mid-1980s, a resident told Herring (1986) that “hawksbill turtles nest on the lagoon side of Ruguero [= Ringutoru],” and that they formerly nested on the southern end of Hare, but “too many island residents caused the turtles to discontinue nesting”; he was uncertain as to the breeding status of green turtles. Niering (1963) observed a green turtle “about 3 ft in length” that had been caught by local fishermen in summer 1954. Emory (1965), having visited Kapingamarangi in 1947 and 1950, stated “turtles...are quite rare and it is forbidden to kill them,” and turtle bones were a “rarity” in the only archaeological excavations on the atoll (Leach and Ward 1981).

Gehyra mutilata.—Niering (1963) considered the stump-toed gecko rare “around the village,” and he collected one (USNM 139799) on Werua on 25 August 1954. Another specimen (CAS 139712) was collected on Touhou by W. Mierina on 24 July 1974. These are the only records; I saw none during two months on the atoll. Possibly the few previous records represent a recent introduction that has since been extirpated or possibly continues to exist locally in extremely small numbers.

Gehyra oceanica.—Niering (1963) “frequently” encountered the oceanic gecko on *Cocos* trunks and collected it also “under debris and in the villages.” One specimen obtained by R. R. Harry either on Touhou or Werua in August 1954 and another collected by W. Mierna on Werua in July 1974 are in CAS collections. I observed *G. oceanica* on all the islands with the exception of Matukerekere (Table 1). Most of the 94 specimens I collected were in young palm leaf axils (28.8%, mainly juveniles) during the day and on tree trunks at night (24.5%, mainly adults). Both adults and juveniles were often encountered on shrubs and bushes at night, especially in *Scaevola* at the forest edge (Table 2).

Lepidodactylus lugubris.—The mourning gecko is widespread and generally common throughout Kapingamarangi. It is the only lizard recorded on all 31 islands, including diminutive Matukerekere where I collected two in the leaf axils of young *Cocos* trees. It occurs abundantly in edificarian sites as well as in all native and ornamental vegetation types. I observed it most frequently at night in coastal scrub and strand, especially on the outer edges of *Scaevola* and *Tournefortia* bushes along the upper beach zone. Ota et al. (1995) reported one hybrid *L. lugubris* x *L. moestus* among 11 *Lepidodactylus* collected by R. R. Harry in 1954, and they speculated on the likelihood of true *L. moestus* being there. But all 131 specimens of *Lepidodactylus* I collected (most of which were examined also by R. Fisher) are *L. lugubris*.

Table 1.—Distribution of lizards on Kapingamarangi Atoll, with numbers of specimens collected during summer 1996; SR = sight record only, this study.

Island	Species ^a							
	G.m.	G.o.	L.l.	P.a.	P.s.	E.c.	E.i.	L.n.
Torongahai		2	1		28		2	2
Ringuturo		4	6				2	2
Rikumano		1	1				2	
Turuaimu		2	1	10	1			
Pepeio		SR	1		6			
Nunakita		2	4	23	2		2	1
Hukuniu		1	2		13		1	
Parakahi		1	2	10	16		2	
Werua	+ ^b	12	9	+ ^c		+ ^d	13	2
Touhou		4	6	1 ^e			1	
Taringa		8	2	1	4		2	1
Matiro		6	3	12	45		1	3
Matuketuke		1	11				1	
Ramotu		3	4				2	1
Sakenge		3	3		4		1	
Matawei		3	4		1			
Hukuhenua		5	1		SR		1	2
Hepepa		1	1				1	
Tipae		1	3		2		1	
Tetau		1	3		3		3	SR
Nikuhatu		1	9		1		1	1
Takairongo		1	1		12		2	
Tangawaka		4	5		5		3	1
Hare		19	25		2		6	14
Tirakau		2	6		1		1	
Tariha		1	2				1	
Tiahu		1	1				1	
Tokongo		2	3				1	
Tirakaume		1	2				2	
Pumatahati		1	7				2	
Matukerekere			2					

^a G. m. = *Gehyra mutilata*, G. o. = *Gehyra oceanica*, L. l. = *Lepidodactylus lugubris*, P. a. = *Perochirus ateles*, P. s. = *Perochirus scutellatus*, E. c. = *Emoia caeruleocauda*, E. i. = *Emoia impar*, L. n. = *Lipinia noctua*.

^b Recorded in 1954 and 1974 (see text), but not observed during summer 1996.

^c Fifteen specimens collected in summer 1954 are the only records.

^d One specimen collected in 1954 is the only record.

^e One specimen collected in 1954 and another during 1996 (in coconuts apparently brought in from another island) are the only records.

Perochirus ateles.—The Micronesian gecko is less common than its much larger congener *P. scutellatus*, being found on only seven of 31 islands, all in the northern half of the chain to as far south as Matiro. R. R. Harry collected 15 on Werua and one on Touhou, and Niering collected one each on Torongahai and Ringutoru. I saw none on Werua and the only one I saw on Touhou was in a cut bunch of coconuts probably brought in from another island. Of the 56 specimens I collected, 37 (66%) were in palm leaf axils and the others were roughly evenly distributed among shrubs and bushes at night and under loose, flaking bark on standing trees during the day (Table 2); none was seen exposed in daylight. *P. ateles* occurs syntopically with *P. scutellatus*; both were collected together on the same shrubs, tree trunks, and palm leaf axils. How *P. ateles* and juvenile *P. scutellatus* partition food resources is uncertain, though adults doubtless utilize differently sized food items as snout-vent length among the largest *P. ateles* averages about 70 mm (based on measurements of only four specimens, but observations of many others), whereas adult male *P. scutellatus* average 116.5 mm and females 98.4 mm (Buden 1998), and *P. ateles* is nocturnal, whereas *P. scutellatus* is predominately diurnal.

Perochirus scutellatus.—The giant Micronesian gecko is known only from Kapingamarangi Atoll. I observed it on 18 of 31 islands, and with encounter rates as high as 150 per hour and 25 per tree. It is primarily diurnal and arboreal with a predilection for *Guettarda* trunks. It is the largest lizard on the atoll; adult males weigh as much as 60 g and measure up to 132 mm in snout-vent length, and males average nearly twice the body mass of females. These and other facets of morphology and ecology are discussed at greater length elsewhere (Buden 1998).

Emoia caeruleocauda.—The only record of the Pacific blue-tailed skink is one specimen (CAS-SU 25633) collected on Touhou by the George Vanderbilt Foundation Expedition on 1 August 1954. It may have been a recent introduction possibly in cargo from Pohnpei. There is no corroborating evidence to suggest a viable population now or formerly.

Emoia impar.—Niering (1963) recorded *Emoia impar* under *E. cyanura* and considered it "the most abundant vertebrate" on the atoll. The 59 azure-tailed copper-striped skinks collected on Touhou and Werua islands by R. R. Harry on 23 July 1954 are CAS-SU 25639-25697; 59 others collected on Ringutoru and Werua by Niering during June-August 1954 are USNM 139823-139875, and the six collected by H. K. Townes on Hare on 3 August 1946 are USNM 123912-123917. I recorded *E. impar* on 27 of the 31 islands and with encounter rates averaging 75/km and 84/hr, and ranging from 5-15/hr on the smaller islands to as high as 289/hr on Ringutoru and 222/hr on Hare. The only islands where I did not see *E. impar* are Turuaimu, Pepeio, Matawei, and Matukerekere, all being less than 1 hectare in area and among the smallest islands on the atoll. This species is most numerous in patches of sunlight on the forest floor, less common on tree trunks (occurring mainly 1-2 m high on breadfruit trees), and occasionally low on ground cover and understory plants. The number of specimens collected on trees is disproportionate to occurrence as lizards were more easily captured on tree trunks than on the ground.

Table 2.—Habitat distribution (percent frequency) of lizards collected on Kapingamarangi Atoll during summer 1996; D = daytime, N = night.

Habitat	Species ^a					
	G.o.	L.i.	P.a.	P.s.	E.i.	L.n.
Tree trunks (D/N)	24.5	0.8		73.6	31.0	32.3
Under loose bark (D)	9.6	9.2	16.1	0.7	1.7	32.3
Inside logs and stumps (D)	2.1	0.8				3.2
Palm-leaf axils (D)	28.8	11.5	66.1	11.8		12.9
Shrubs and bushes (N)	20.2	74.8	17.9	13.9		
Taro pits (N)	8.5	1.5				
Forest floor (D)					63.8	12.9
Grassy areas (D)					3.5	
Edificarian sites (D/N)	6.4	1.5				6.5
Total specimens collected	94	131	56	136	58	31

^a G.o. = *Gehyra oceanica*, L.i. = *Lepidodactylus lugubris*, P.a. = *Perochirus ateles*, P.s. = *Perochirus scutellatus*, E.i. = *Emoia impar*, L.n. = *Lipinia noctua*.

Table 3.—Encounter rates (individuals per hour) of lizards in three habitats on Kapingamarangi Atoll during summer 1996.

Species	Habitat and survey time		
	Palm-leaf axils ^a 8.9 h	<i>Scaevola</i> shrubs ^b 6.7 h	Forest floor ^{a,c} 6.8 h
<i>Gehyra oceanica</i>	16.1	1.2	0
<i>Lepidodactylus lugubris</i>	1.6	10.5	0
<i>Perochirus ateles</i>	5.2	0.6	0
<i>Perochirus scutellatus</i>	2.6	3.1	0
<i>Emoia impar</i>	0	0	84.2
<i>Lipinia noctua</i>	0.9	0	0

^a Surveyed in daylight.

^b Surveyed at night.

^c Including ground cover.

Lipinia noctua.—Niering (1963) recorded only two examples of the moth skink on Kapingamarangi during summer 1954—"one specimen was collected on a small coconut and the other in a native house," both at unspecified sites, but they are almost certainly USNM 139876 from Hare and 139877 from Werua. I found *L. noctua* widespread on 12 different islands between Torongahai and Hare, but none on the seven southernmost islands (Table 1). With the exception of one in leaf litter at dusk, all of my sightings were in daylight (0750-1730), about 45% were exposed on tree trunks (mainly *Artocarpus*) and on the forest floor, the remainder being under loose bark, in palm leaf axils, or under manmade objects (Table 2). The pale yellow nuchal spot, very conspicuous in the field, accounted for many initial sightings at distances of 5-10 m.

DISCUSSION

Eight species of lizards (5 geckos, 3 skinks) and two species of sea turtles are known from Kapingamarangi Atoll. *Gehyra oceanica*, *Lepidodactylus lugubris*, and *Emoia impar* rank highest in incidence, being recorded on at least 27 (87%) of the 31 islands, and usually being common to very common wherever they occur. *L. lugubris* is the only species recorded on all the islands, and *G. oceanica* is absent only on Matukerekere, the most remote and diminutive island. *G. mutilata* was observed in 1954 and 1974, and *Emoia caeruleocauda* is known from only one specimen collected in 1954. The records for both species are confined to the Touhou-Werua area and possibly represent relatively recent introductions that had not spread beyond the colonization site and have since been extirpated, or possibly they continue to exist in very small numbers (none was seen during June-August 1996). Excluding both *G. mutilata* and *E. caeruleocauda*, *Perochirus ateles* has the most restricted distribution among lizards on Kapingamarangi, being found on only six islands, and all between Turuaimu and Matiro in the northern part of the chain. Competition does not appear to be a limiting factor in this case as *P. ateles* occurs syntopically with all three other gecko species on five of the six islands—*P. scutellatus* being absent on Touhou, where *P. ateles* is rare if it still occurs.

All six lizard species observed during summer 1996 occurred in *Cocos* forest, but only *Lepidodactylus lugubris* and *Gehyra oceanica* also were seen frequently on buildings and other man-made structures. The two skinks (*Emoia impar*, *Lipinia noctua*) also occurred in edificarian habitats but were relatively more numerous outside the settlements and in the forest—*E. impar* being largely on the forest floor and *L. noctua* mainly beneath loose bark, and less frequently, on tree trunks.

Perochirus scutellatus is a large, predominately diurnal and presumably insectivorous tree trunk species that appears to occupy a niche utilized by the green tree skink (*Lamprolepis smaragdina*) on other Pohnpei State atolls I have studied, including Pohnpei and its lagoon islands, as well as Ant, Pakin, Mokil, and Pingelap atolls. *P. scutellatus* is known only from Kapingamarangi Atoll. In view of its limited geographic range, despite relatively high population density on some islands, this species should be considered rare and endangered or threatened, and its status should be factored into assessments of any projects that would modify habitat on islands where it occurs. *P. scutellatus* does not appear to be adversely affected by traditional agroforestry and small-

scale cultivation, but its absence or scarcity in edificarian habitats and in the vicinity of human habitation suggests it is sensitive and vulnerable to habitat change.

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LITERATURE CITED

- Brown, W. C. 1976. Review of the genus *Perochirus* (Gekkonidae). Occasional Papers of the California Academy of Science 126:1-14.
- Buden, D. W. 1998. Morphological variation and distributional ecology of the giant Micronesian gecko (*Perochirus scutellatus*) of Kapingamarangi Atoll. Pacific Science 52:250-258.
- Bryan, E. H., Jr. 1971. Guide to place names in the Trust Territory of the Pacific Islands. Pacific Science Information Center, B. P. Bishop Museum. Honolulu. unpagged.
- Emory, K. P. 1965. Kapingamarangi, social and religious life of a Polynesian Atoll. B. P. Bishop Museum Buletin 228:1-357.
- Herring, T. L. 1986. A guide to sea turtle conservation. [unpublished report on file at Pohnpei Marine Resources Division, Kolonia, Pohnpei, Federated States of Micronesia]. 36p.
- McKee, E. D. 1956. Geology of Kapingamarangi Atoll, Caroline Islands. Atoll Research Bulletin 50:1-38.
- Niering, W. A. 1956. Bioecology of Kapingamarangi Atoll, Caroline Islands: terrestrial aspects. Atoll Research Bulletin 49:1-32.
- Niering, W. A. 1963. Terrestrial ecology of Kapingamarangi Atoll. Ecological Monographs 33:131-160.
- Ota, H., R. N. Fisher, I. Ineich, and T. J. Case. 1995. Geckos of the genus *Lepidodactylus* (Squamata: Reptilia) in Micronesia: description of a new species and reevaluation of the status of *Gecko moestus* Peters, 1867. Copeia 1995:183-195.
- Pohnpei State Land Commission (1986). Kapingamarangi Atoll, scale 1: 15,000. Pohnpei State Land Commission, Federated States of Micronesia, Kolonia, Pohnpei.
- Wiens, H. J. 1956. The geography of Kapingamarangi Atoll in the Eastern Carolines. Atoll Research Bulletin 48:1-86.