

## The land reptiles of Western Samoa

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Museum voucher specimens and literature records show that the land reptiles of Western Samoa comprise 14 species: – five geckos, eight skinks, and a snake. There is uncertainty about the presence of a sixth species of gecko. An identification key is provided, and known locality records are cited to give an indication of distribution within Western Samoa. Most species are common on both main islands. There are no endemic species, and beyond Western Samoa many species are widely distributed in the south-west Pacific. The exceptions are four regional endemics – the skinks *Cryptoblepharus poecilopleurus* (the Samoa group and French Polynesia), *Emoia adspersa* (Western Samoa and a few small islands from Tuvalu to Tokelau), *E. murphyi* (Western Samoa and some northern Tongan islands), and *E. samoensis* (Western and American Samoa). The zoogeography of many south Pacific reptiles is confused by two equally plausible possibilities – that they spread naturally between islands by rafting, and that they were spread accidentally or deliberately by early Polynesian seafarers.

Keywords: geckos, skinks, snakes, Western Samoa, identification, distribution, biogeography

### INTRODUCTION

Western Samoa, 1,000 km north-east of Fiji, comprises two main islands (Savai'i and 'Upolu, Fig. 1) both of which are large (each more than 1,000 km<sup>2</sup>) and high (up to 1,800 m).

The reptiles of American Samoa were recently surveyed (Amerson *et al.*, 1982). However, there appear to be no published summaries of the herpetofauna of Western Samoa other than what can be extracted from Burt and Burt (1932), and the general review of biogeography by Gibbons (1985). Isolated references to particular species of reptiles in Western Samoa are widely scattered in the periodical literature. Voucher specimens with their important collecting details are spread among numerous museums in several countries.

In this report I have brought together information to summarise the distribution and status of the land reptiles of Western Samoa.

### MATERIALS AND METHODS

I spent three weeks in Western Samoa from 25 July to 15 August 1991, visiting both 'Upolu and Savai'i to collect and identify reptiles. This field work revealed no species that had not already been reported from Western Samoa, but it added some distributional data not available to me from other sources and enabled me to confirm the identities of the species involved. In this paper, nearly all locality records based on Auckland Museum specimens, and all species notes not otherwise referenced, pertain to my own field work.

I collated literature records of reptiles in Western Samoa and wrote to museums to obtain further unpublished records based on voucher specimens. Among the museum voucher specimens cited in this paper, I have personally examined and confirmed the identity of only those in the Auckland Museum collection. For other records I have accepted the identities given in publications or in lists of specimens provided by museums. I devised a key to the

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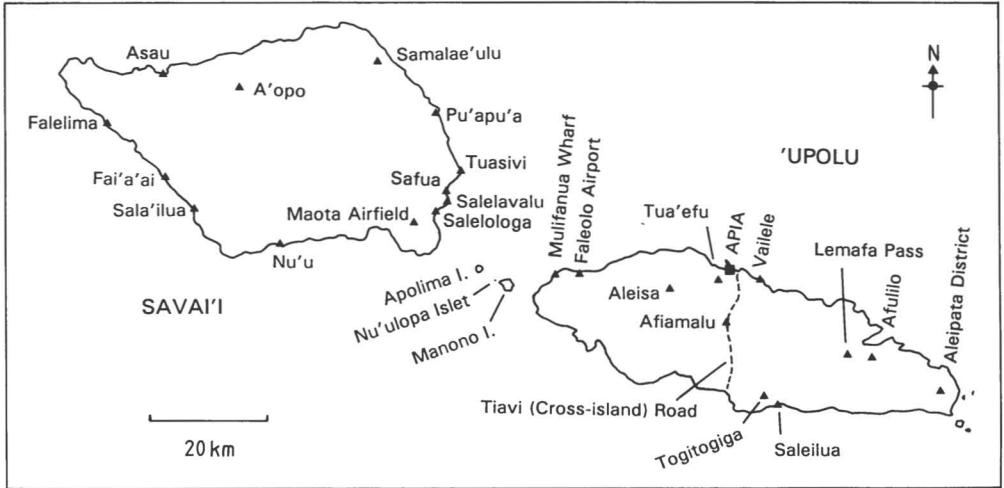


Fig. 1 – Map of Western Samoa showing place names mentioned in the text.

land reptiles of Western Samoa to assist non-specialists who may have occasion to identify further specimens in the future.

The following acronyms are used for institutional collections: AIM (Auckland Institute and Museum, New Zealand), AMNH (American Museum of Natural History, New York), AMS (Australian Museum, Sydney), BMNH (The Natural History Museum, London), CAS (California Academy of Sciences, San Francisco), FMNH (Field Museum of Natural History, Chicago), NMW (Naturhistorisches Museum Wien, Austria), SAMA (South Australian Museum, Adelaide), USNM (National Museum of Natural History, Smithsonian Institution, Washington, D.C.).

Localities in Western Samoa are spelt according to the “Islands of Samoa” map (University Press of Hawaii, 1980). Fig. 1 shows all place names mentioned in the text, except for Mt. Vaea, Vailima, Mulinu’u Point and Vaiala Beach, which are all close to Apia.

**KEY TO THE TERRESTRIAL REPTILES OF WESTERN SAMOA**

(SVL = snout-vent length)

- 1a. Limbs absent (snakes) ..... 2
- 1b. Limbs present (lizards) ..... 3
- 2a. Head wider than neck; tail more or less round in cross-section; arboreal, in forest and plantation ..... *Candoia bibroni*
- 2b. Head no wider than neck; tail laterally compressed; terrestrial, near the shore ..... *Laticauda\**
- 3a. Body scales small, granular and dull; eye large; lower eyelid immovable, eye cannot close (geckos) ..... 4
- 3b. Body scales large, flat and shiny; eye small; lower eyelid movable, eye able to close (except *Cryptoblepharus*) (skinks) ..... 9
- 4a. Digits dilated by enlarged subdigital lamellae; body lacking prominent rows of enlarged tubercles ..... 5
- 4b. Digits slender, without enlarged subdigital lamellae; enlarged tubercles in prominent longitudinal rows along body ..... *Nactus pelagicus*
- 5a. Free clawed section of digit arises at a point towards centre of digital dilation ..... 6
- 5b. Free clawed section of digit arises at edge of digital dilation ..... *Lepidodactylus lugubris*
- 6a. Subdigital lamellae divided ..... 7

- 6b. Subdigital lamellae undivided ..... *Gehyra oceanica*  
 7a. Terminal phalanx of 5th (smallest) digit free ..... 8  
 7b. Terminal phalanx of 5th digit not free ..... *Gehyra mutilata*  
 8a. 4th toe lamellae 11 or fewer; some body scales enlarged; two pairs of enlarged post-mental chin shields contact infralabials ..... *Hemidactylus frenatus*  
 8b. 4th toe lamellae 12 or more; no body scales enlarged; second pair of enlarged post-mentals excluded from infralabials by smaller scales ..... *Hemidactylus garnotii*  
 9a. Lower eyelid movable, eye able to close ..... 10  
 9b. Lower eyelid immovable, eye cannot close ..... *Cryptoblepharus poecilopleurus*  
 10a. Supranasals present; no large spot at back of head ..... 11  
 10b. Supranasals absent; large pale spot on mid-line at back of head ..... *Lipinia noctua*  
 11a. 4th (longest) toe lamellae 32 or more; mid-body scale rows fewer than 45 ..... 12  
 11b. 4th toe lamellae fewer than 32; mid-body scale rows more than 45 .....  
 ..... *Emoia adpersa*  
 12a. 4th (longest) toe lamellae thin, blade-like, at least 59; individuals small to moderate-sized (SVL up to 75 mm) ..... 13  
 12b. 4th toe lamellae rounded, fewer than 55; individuals large (SVL up to 121 mm) .....  
 ..... 15  
 13a. Vertebral stripe prominent; dorsum intensely striped; tail often blue; belly never bright green; SVL up to 57 mm ..... 14  
 13b. Vertebral stripe lacking; dorsum plain or lightly speckled; tail never blue; belly bright green in life; SVL up to 75 mm ..... *Emoia murphyi*  
 14a. Scales of vertebral stripe unfused (no median scales present); belly and underside of thighs white; tail may be pale blue-green but never bright blue ..... *Emoia cyanura*  
 14b. Few to many scales of vertebral stripe fused such that median scales occur; belly and underside of thighs dusky; tail often bright blue ..... *Emoia impar*  
 15a. Dorsum predominantly very dark brown or black, unspeckled in adults; 4th (longest) toe lamellae 32–39; mid-body scale rows 33–40 ..... *Emoia nigra*  
 15b. Dorsum predominantly pale brown, speckled in adults; 4th toe lamellae 45–54; mid-body scale rows 30–34 ..... *Emoia samoensis*

\*Note: Seasnakes of the genus *Laticauda* are partly terrestrial and lay their eggs on land. They may be found along the shore and in mangroves.

## ANNOTATED SPECIES LIST

Table 1 summarises the known distribution of reptiles on the two main islands of Western Samoa and in American Samoa. An account of each species follows.

### Family Gekkonidae

STUMP-TOED GECKO *Gehyra mutilata* (Wiegmann, 1835)

**'Upolu records:** Apia (AIM H555). Cross-island Road (CAS 172212–3). Togitogiga (CAS 172183). Cattle station near Togitogiga (AIM H1416–7). Saleilua (AIM H1432–3, AIM H1435). Manono Island (BMNH 1969.531–532).

**Savai'i records:** Maota Airfield (AIM H1440–1). Asau (AIM H1449–50, AIM H1452). Safua (CAS 176437, CAS 176466–7).

**Notes:** This house gecko is widespread in south-east Asia, New Guinea and the Pacific. Specimens at CAS (e.g. CAS SU9149) show that it was present at Apia in 1902.

OCEANIC GECKO *Gehyra oceanica* (Lesson, 1828)

Fig. 2

**'Upolu records:** Apia (AIM H1410, CAS 172215). Vailima (AIM H1455–7). Cross-island Road (CAS 172214). Togitogiga (AIM H1427, CAS 172190–8). Cattle station near Togitogiga (AIM H1413–5). Coast near Togitogiga (AIM H1425, CAS 172199–202). Saleilua (AIM

Table 1 – The land reptiles of Western and American Samoa. + = voucher specimen examined by me, o = known from other records (see text)

	'Upolu	Savai'i	Am. Sam. <sup>1</sup>
<b>Family Gekkonidae</b>			
<i>Gehyra mutilata</i>	+	+	o
<i>Gehyra oceanica</i>	+	+	o
<i>Hemidactylus frenatus</i>	+	+	o
<i>Hemidactylus garnotii</i>		? <sup>2</sup>	
<i>Lepidodactylus lugubris</i>	+	+	o
<i>Nactus pelagicus</i>	o	+	o
<b>Family Scincidae</b>			
<i>Cryptoblepharus poecilopleurus</i>	+		o
<i>Emoia adspersa</i>	o	o	
<i>Emoia murphyi</i>	+	+	
<i>Emoia nigra</i>	+	o	o
<i>Emoia samoensis</i>	+	o	o
<i>Emoia impar</i>	o	+	? <sup>3</sup>
<i>Emoia cyanura</i>	+	+	? <sup>3</sup>
<i>Lipinia noctua</i>	o	+	o
<b>Family Boidae</b>			
<i>Candoia bibroni</i>	o	+	o

<sup>1</sup> American Samoan records are from Amerson *et al.* (1982), who listed *Cryptoblepharus poecilopleurus* as *Ablepharis* (sic) *boutonii*.

<sup>2</sup> The presence of this species is unconfirmed.

<sup>3</sup> Skinks of the *Emoia cyanura* complex are reported from American Samoa but specimens need to be identified as *E. cyanura* or *E. impar*. Both are likely to be present.

H1428, AIM H1430–1, AIM H1436). Mulifanua Wharf (CAS 172209–11). Near Lemafa Pass (CAS 172216).

**Savai'i records:** Maota Airfield (AIM H1445). Salelologa (CAS 176447). 10 km north of Pu'apu'a (CAS 172217–8). Tuasivi (CAS 172219–20). Asau (AIM H1448). Safua (CAS 172221–3, CAS 176414–33).

**Notes:** This gecko is widespread in Indonesia, New Guinea and the Pacific. In life, the undersides of many adults were yellow or bright yellow. Several specimens were infested with dermal mites. The fresh weights of ten of the AIM specimens with intact tails were 7.7–22.2 g.

*Gehyra oceanica* is found in forest and plantations. However, many of the specimens I collected were inside houses, on outside walls of buildings and in out-buildings such as water tanks, though these were all close to forest or plantations. The association of this species with human structures and dwellings has also been noted in Fiji (Zug, 1991), the Cook Islands (Crombie and Steadman, 1986), Tonga (Gill, 1988, 1990), and American Samoa (Amerson *et al.*, 1982).

HOUSE GECKO *Hemidactylus frenatus* Duméril and Bibron, 1836

**'Upolu records:** Apia (AIM H1411, AIM H1437, AIM H1458, CAS 172224–31). Vaiala Beach (CAS 176478). Saleilua (AIM H1429).

**Savai'i records:** Salelologa (CAS 176442–6, CAS 176448–59). Asau (AIM H1451).

**Notes:** This house gecko is found in Asia, New Guinea, northern Australia and the Pacific as well as in Africa and Mexico. Fresh weights of two AIM specimens were 2.5 g and 4.3 g.

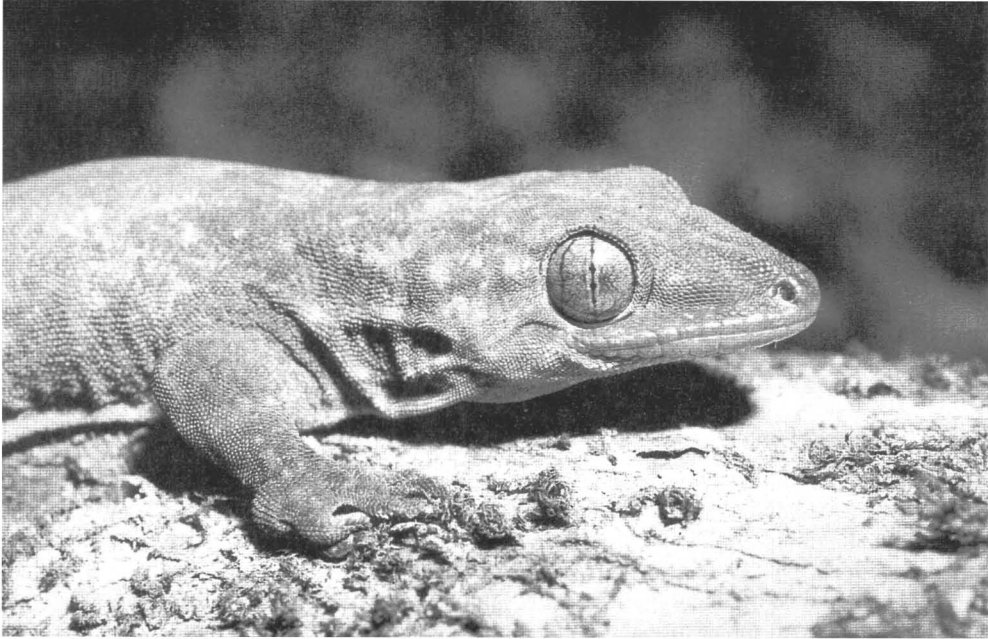


Fig. 2 – *Gehyra oceanica*, Savai'i, 1991. Photo: P. Ryan, copyright Ministry of External Relations & Trade.

**FOX GECKO** *Hemidactylus garnotii* Duméril and Bibron, 1836

**Notes:** The late J.R.H. Gibbons (pers. comm. April 1985, reported in Crombie and Steadman, 1986) stated that this species is present on Savai'i, and he believed that it had arrived in the decade before 1985. I know of no voucher specimens to confirm its addition to the Western Samoan list. The species is found in south-east Asia and the Indo-Australian archipelago. It is also known from New Caledonia, Fiji and parts of Polynesia. It may be that it was once widespread in Western Samoa, but is now rare or absent. In New Caledonia, Fiji and Hawaii the spread of *H. frenatus* has apparently caused the general decline of *H. garnotii*; Gibbons (1985) and Bauer and Vindum (1990) believed that the two species are rarely able to co-exist.

**MOURNING GECKO** *Lepidodactylus lugubris* (Duméril and Bibron, 1836)

**'Upolu records:** Apia (AIM H557, AIM H579, AIM H1409, AIM H1412). Togitogiga (CAS 172184–9). Cattle station near Togitogiga (AIM H1418–24). Coast near Togitogiga (AIM H1426, CAS 172178–81). Saleilua (AIM H1434). Apolima Island (BMNH 1969.538–540). Manono Island (BMNH 1969.537).

**Savai'i records:** Maota Airfield (AIM H1438–9, AIM H1442–4, AIM H1446). Salelologa (CAS 176460). Safua (CAS 176434–6).

**Notes:** This house gecko is widely distributed in the tropics, from Indian Ocean islands across Asia and the Pacific to central America. Specimens at CAS (e.g. CAS SU9159) show that it was present at Apia in 1902. Another specimen from Apia was registered in 1923 (BMNH 1923.12.3.4). The species was recorded at Aleipata, 'Upolu, in 1938 (Higgins, 1943).

AIM H1426 was found among pandanus foliage in a coastal forest reserve many kilometres from human habitations. This adaptation of *Lepidodactylus lugubris* to vegetated sites away from villages, has also been reported in the Cook Islands (Crombie and Steadman, 1986), Tonga (Gill, 1988, 1990), and American Samoa (Amerson *et al.*, 1982).

I recorded the identity of geckos on the inside and outside walls of four houses or groups of houses at Apia and Togitogiga ('Upolu), and at Maota and Asau (Savai'i). Three or four species co-existed at each site. *Lepidodactylus lugubris* and *Gehyra oceanica* inhabited all four sites, along with *Hemidactylus frenatus* (at one site), *Gehyra mutilata* (two sites) or both (one site).

PACIFIC SLENDER-TOED GECKO *Nactus pelagicus* (Girard, 1857)

**'Upolu records:** Apia (CAS SU6687–8). Near Togitogiga (CAS 171907–10).

**Savai'i records:** Maota Airfield (AIM H1447). Inland from Asau (AIM H1453–4).

**Notes:** This gecko is found in New Guinea, the Cape York Peninsula of Australia and islands of the western Pacific. The AIM specimens were found in plantation areas and cut-over forest.

### Family Scincidae

SNAKE-EYED SKINK *Cryptoblepharus poecilopleurus* (Wiegmann, 1834)

**'Upolu records:** Mulinu'u Point (AIM H1374–82). Vaiala Beach (CAS 172232–43). Manono Island (e.g. BMNH 1969.599, determined by I. Ineich in 1989, C. McCarthy, pers. comm. 1992).

**Savai'i records:** None known to me.

**Notes:** This small skink is known from the Samoan group and French Polynesia, with other species of the genus inhabiting Fiji and Tonga (Zug, 1991). The fresh weights of six AIM specimens with intact tails were 1.2–1.5 g.

MICRONESIAN SKINK *Emoia adspersa* (Steindachner, 1870)

**'Upolu records:** BMNH 1926.3.20.1 ("Upolu Island", C. McCarthy, pers. comm. 1992). AMS R110122 (Brown, 1991). SAMA 24229 (Schwaner and Brown, 1984).

**Savai'i records:** AMNH 29012 (Burt and Burt, 1932). AMNH 29023 (Schwaner and Brown, 1984). FMNH 39206 (Brown, 1991). Falelima (Higgins, 1943).

**Notes:** Brown (1991) also cited two specimens from "Samoa", the holotype (NMW 16623) and BMNH 94.10.5.6 (*sic*, listed in the BMNH register as 74.10.5.6). This skink is known in Western Samoa from very few voucher specimens. It otherwise exists on only four small islands to the north-west and north-east of the Samoa group: Swains and Nukunono Islands (Tokelau group), Pukapuka Island (Danger group) and Funafuti Island (Tuvalu) (Brown, 1991). Brown (1991) placed it in a species group with *E. lawesii* of American Samoa and Niue.

MURPHY'S SKINK *Emoia murphyi* Burt, 1930

**'Upolu records:** Apia (BMNH 1924.12.6.5, 1926.3.20.2). Aleisa (BMNH 1969.634). Mulifanua Wharf (CAS 172208). Togitogiga (AIM H1390). Manono Island (BMNH 1969.551).

**Savai'i records:** Sala'ilua (type locality, holotype AMNH 41740, see Burt, 1930). Falelima (Higgins, 1943). Asau (AIM H1407). Safua (CAS 176463–5, 176475–6). Salelavalu (CAS 176468–71). Near Salelavalu (CAS 176441, 176463). Seen by me in 1991 at Maota Airfield.

**Notes:** Brown (1991: 57) gives "Niatapu" and "Matapu" Islands as Samoan localities. One is presumably a mis-spelling of the other, but I can find neither on modern maps. This skink is known only from Western Samoa and three areas of northern Tonga – Niuafu'ou, Niuatoputapu and the Vava'u group (Gill and Rinke, 1990). [In Brown (1991), p. 57, "Niaufou" seems to be a mis-spelling of "Niuafu'ou", and "Vaseau" and "Varau" are probably errors for "Vava'u".] Brown (1991) put *E. murphyi* in a subgroup with six other species, all found further west in Fiji, Vanuatu and the Loyalty Islands. This species is diurnal and arboreal. I saw it in coconut plantations and gardens basking on tree trunks or on the outer walls of houses. AIM H1390 and H1407 have snout-vent lengths of 58 mm and 64 mm (preserved) and had fresh weights

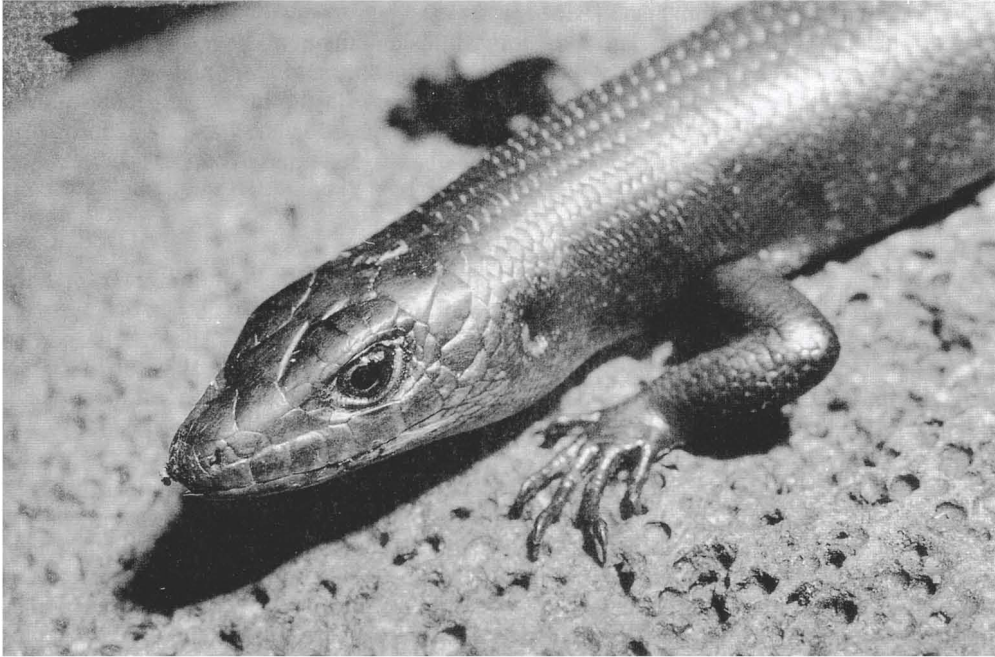


Fig. 3 – *Emoia nigra*, Savai'i, 1991. Photo: P. Ryan, copyright Ministry of External Relations & Trade.

of 3.0 g and 4.2 g (respectively). In life the undersurfaces are bright green, but this fades to blue or yellow after preservation.

PACIFIC BLACK SKINK *Emoia nigra* (Jacquinot and Guichenot, 1853) Fig. 3

**'Upolu records:** Apia (CAS SU6709–17, CAS 158988). Togitogiga (AIM H1386, AIM H1389, CAS 172207). Near Faleolo Airport (CAS 172182). Mt. Vaea (CAS 176480).

**Savai'i records:** Maota Airfield (CAS 176472). Seen by me in 1991 at Maota Airfield and Asau.

**Notes:** This large skink is known from the Solomon Islands, Vanuatu, Fiji, Samoa and northern Tonga. The fresh weights of the two AIM specimens were 20.3 g and 24.9 g.

SAMOAN SKINK *Emoia samoensis* (A. Duméril, 1851)

**'Upolu records:** Aleipata (Higgins, 1943). Apia and vicinity (CAS 158981–2, CAS 158984–7). Mt. Vaea (AIM H1408, CAS 176481). Togitogiga (CAS 172177).

**Savai'i records:** Sala'ilua (AMNH 41738, AMNH 41741; Burt and Burt, 1932; B.A. Brown, pers. comm. 1991). Seen by me in 1991 in logged forest inland from Nu'u and inland from Asau.

**Notes:** This large skink is restricted to Western Samoa and American Samoa. It is a morphologically close allopatric relative of *E. trossula* of Fiji, Rotuma, Tonga and Rarotonga (Brown, 1991). Brown (1991) put *E. samoensis*, *E. trossula* and *E. sanfordi* of Vanuatu in the same subgroup. My subjective feeling was that *Emoia samoensis* tends to be a forest species in Western Samoa whereas its same-sized congener *E. nigra* is an inhabitant of forest edges, plantations and open areas. The fresh weight of the AIM specimen was 17.8 g.

DUSKY-BELLIED SKINK *Emoia impar* (Werner, 1898)

**'Upolu records:** Apia (BMNH 1969.592, 1969.594). Manono Island (BMNH 1924.12.6.4, 1969.608, 1969.611). These BMNH specimens were determined by I. Ineich in 1989 (C. McCarthy, pers. comm. 1992).

**Savai'i records:** Inland from Asau (AIM H1404–5).

**Notes:** The complicated nomenclatural history of this and the next species was reviewed by Ineich and Zug (1991). The recently-discovered sibling species *Emoia pheonura*, described by Ineich (1987), becomes *E. cyanura*, while *E. cyanura* in the restricted sense of Ineich (1987) now becomes *E. impar*. Both species are widespread in the Pacific. Records of *E. cyanura* in the broader pre-1987 sense have to be disregarded unless voucher specimens can be checked.

WHITE-BELLIED SKINK *Emoia cyanura* (Lesson, 1826)

**'Upolu records:** Apia (AIM H580, AIM H1385, AIM H1391). Mulinu'u Point (AIM H1383–4). Tua'efu (*e.g.* BMNH 1969.585). Afiamalu (BMNH 1969.609). Coast near Togitogiga (AIM H1387–8). Manono Island (*e.g.* BMNH 1969.556). Apolima Island (*e.g.* BMNH 1969.564). The BMNH specimens were determined by I. Ineich in 1989 (C. McCarthy, pers. comm. 1992).

**Savai'i records:** Maota Airfield (AIM H1392–3, AIM H1397). Asau (AIM H1398–9). Inland from Asau (AIM H1400–3).

**Notes:** In Western Samoa I found this small skink in grassy and rocky areas near the shore, in suburban gardens and in cut-over forest. The fresh weights of three AIM specimens with intact tails were 1.5–2.4 g. *Emoia impar* is said to favour more shaded habitats than *E. cyanura* (Ineich and Zug, 1991). All 11 specimens that I collected in open areas were indeed *E. cyanura*. The only two specimens of *E. impar* that I obtained (AIM H1404–5) were found in forest, but there were *E. cyanura* (AIM H1400–3) under the same stones.

MOTH SKINK *Lipinia noctua* (Lesson, 1826)

**'Upolu records:** Aleipata (Higgins, 1943). Apia (BMNH 1969.590, CAS SU6682–4). Apolima Island (BMNH 1969.564, 1969.566). Manono Island (BMNH 1969.597, 1969.602, 1969.613). Nu'ulopa Islet (BMNH 1969.614). The BMNH specimens were determined by I. Ineich in 1989 (C. McCarthy, pers. comm. 1992).

**Savai'i records:** Pu'apu'a (AIM H1394–6).

**Notes:** This small skink is known from the Moluccas, New Guinea and tropical Oceania. The AIM specimens were found in cut-over forest.

## Family Boidae

PACIFIC BOA *Candoia bibroni* (Duméril and Bibron, 1844)

**'Upolu records:** Vaialele (BMNH 1926.3.20.3). Specimens have recently been seen at the site of the hydro-electric project, Afulilo (S. Brown, pers. comm. July 1991).

**Savai'i records:** Samalae'ulu (BMNH 1924.12.6.8). Fai'a'ai (BMNH 1926.3.20.4). Sala'ilua (AMNH 41742–3; Burt and Burt, 1932). Falelima, November 1939 (Higgins, 1943). Near Salelavalu, August 1990 (CAS 176438–9). Near A'opo, April 1992 (AIM H1467).

**Notes:** This snake has been recorded from the Bismarck Archipelago, Solomon Islands, Vanuatu, Fiji, Rotuma, Tokelau and the Samoan group. In American Samoa it is known only from Ta'u Island (Amerson *et al.*, 1982). The CAS specimens were collected in plantations. The AIM specimen was collected at about 760 m above sea level. One of the two specimens cited by Higgins (1943) was 725 mm in total length; the AIM specimen is 1135 mm long.

In Western Samoa, I heard it suggested that plantation owners introduced Pacific Boas to control rats. The species is at its eastern limit in the Samoa area and in some morphological characters, Western Samoan boas are more similar to those from the Solomon Islands and Vanuatu than to those from Fiji (McDowell, 1979). This puzzling trend would be easily explained if snakes had been introduced to Samoa from a population west of Fiji. Large-scale copra plantations were first planned and developed in Western Samoa during the 1870s (Davidson, 1967: 58). It is therefore of interest to establish when the species was first recorded in Western Samoa.



Specimens of *Candoia bibroni* were collected from both Savai'i and 'Upolu by the United States Exploring Expedition of 1838–1842 (Girard, 1858), and appeared to be less common in Samoa than in Fiji. Other specimens collected last century are BMNH 74.7.13.41–44 (“coast of Savai'i”, registered in 1874) and BMNH 75.2.6.45–47 (“Samoa islands”, registered in 1875). It therefore seems unlikely that this snake was introduced to Western Samoa by Europeans. However, it may have been introduced from the west even earlier by Polynesians, either accidentally or deliberately (see below).

## DISCUSSION

All the land reptiles of Western Samoa seem to be common and widespread except for *Emoia adpersa* and *Candoia bibroni*. However, the relative scarcity of these species in museum collections probably means only that they are hard to find in the field. The absence of records of *Cryptoblepharus* from Savai'i (Table 1) is probably an artefact of limited collecting. It is probably common there in suitable sites.

Western Samoan land reptiles can be divided conveniently into three biogeographic groups, the recently-introduced human commensals, the cosmopolitan south-west Pacific species, and the regional endemics.

### Recent introductions

*Gehyra mutilata* and both species of *Hemidactylus*, all of which are widespread in Asia, are so closely associated with human habitations that they almost certainly reached most Polynesian islands, including Western Samoa, as stowaways on sailing ships, motorised ships or aircraft after the appearance of Europeans in the Pacific. Voucher specimens cited above show that *G. mutilata* has been present in Apia since at least 1902. *Hemidactylus frenatus* is probably an even more recent arrival. It was not collected in Fiji, for example, before 1980 (Zug, 1991).

### Cosmopolitan species

There are several cosmopolitan reptiles of Polynesia that are not obvious recent arrivals like those above. Among the Western Samoan herpetofauna these species are: *Gehyra oceanica*, *Lepidodactylus lugubris*, *Nactus pelagicus*, *Emoia nigra*, *E. impar*, *E. cyanura*, *Lipinia noctua* and *Candoia bibroni*. They undoubtedly spread from west to east across the south Pacific but their zoogeography is confused by two explanations of the mode of spread that I regard as equally plausible.

(1) The older-established view is that they dispersed across the Pacific by natural means, most notably rafting between islands. Many species are pre-adapted for such dispersal by characteristics like parthenogenesis and the laying of hard-shelled, water-retentive eggs. Gibbons (1985) supported this explanation and discussed it fully. Zug (1991) considered all the lizards listed above (except *L. lugubris*) to have reached Fiji by natural means, *i.e.* without human assistance.

(2) A recently-advanced alternative hypothesis is that the dispersal of these species in the Pacific was mediated accidentally or deliberately by the Polynesian seafarers who spread eastwards from Asia by sea-going canoes during the past few thousand years. This notion was discussed in detail by Crombie and Steadman (1986) with respect to Cook Island lizards, and restated by Beckon (1992) in relation to *G. oceanica*. Geckos, skinks and the Pacific Boa are candidates for accidental dispersal because one imagines that they or their eggs (in the case of the lizards) could easily get caught up in the cargo and provisions loaded aboard a large canoe. In addition, the larger species may have been deliberately carried by canoe and released on islands because they are big enough to eat.

The second explanation is supported by the morphological homogeneity of *Lipinia noctua* on Pacific islands, and the high level of histocompatibility in *Lepidodactylus lugubris* from different islands (see references in Crombie and Steadman, 1986). However, the status of *L. lugubris* is complicated by the recent discovery in French Polynesia of morphologically

distinct unisexual clones, a bisexual group and hybrids (Ineich, 1988). Whether these forms are present on other Pacific islands, and if so what might be their biogeographic implications, have yet to be worked out.

### Regional endemics

The species endemic to restricted parts of Polynesia are those most likely to have natural distributions unaffected by human assistance. Even then certainty remains elusive. If a species is present on more than one island, then dispersal between islands may have been aided by humans. Furthermore, humans may have eliminated a species from other islands on which it once lived, particularly if the species is large and therefore edible. Pregill and Dye (1989) showed that a giant iguana (*Brachylophus* sp.) once lived on the Ha'apai group, Tonga, but was eliminated by Polynesians.

On the present understanding, Western Samoa has no endemic reptiles. The closest to it are the four skinks with restricted distributions that include Western Samoa – *Cryptoblepharus poecilopleurus*, *Emoia adspersa*, *E. murphyi* and *E. samoensis*. These are the species most likely to have reached Western Samoa before the Polynesian colonisation. However, for the reasons discussed above we do not know whether these distributions are true. For example, *E. murphyi* may be a Western Samoan endemic that owes its presence in northern Tonga to human assistance. Or, at the other extreme, it may have been naturally distributed even more widely – say on Niue – and eliminated from there by Polynesians.

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