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REVISION OF THE ENDEMIC SOUTHEASTERN AUSTRALIAN LIZARD GENUS *PSEUDEMOIA* (SCINCIDAE : LYGOSOMINAE)

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Summary

The type species of the genus, *Pseudemoia spenceri* (Lucas and Frost, 1894) is reviewed and *Lygosoma (Liolepisma) weekesae* Kinghorn, 1929, is placed in synonymy. A new species, *Pseudemoia palfreymani*, is described for the genus which was previously thought to be monotypic. The ecology and distribution of each species is discussed.

Introduction

Pseudemoia is the only lizard genus endemic to SE. Australia. However, the type species is poorly known, and many authors (e.g. Greer 1970) have apparently overlooked it. One of the species discussed in this paper (*P. spenceri*) is restricted to the high rainfall areas from 33°S. in New South Wales to the S. Victorian coast. The other species (*P. palfreymani* sp. nov.) is known only from Pedra Branca Rock (S. Tasmania), the southernmost and deepest-water island found on the Australian continental shelf. As seals and seabirds are the only other animals known from the island, this lizard is the southernmost terrestrial vertebrate found in Australia.

Genus **Pseudemoia** Fuhn

Pseudemoia Fuhn, I. E., 1967, *Zool. Anz.* 179: 243-247, pl. 1-2.

Type species: *Lygosoma (Emoa) spenceri* Lucas and Frost, 1894.

Fuhn (1967) differentiated this genus of skinks after examining only two specimens belonging to the type species. Fuhn's definition of the genus is basically accepted here, although examination of a large series of specimens (150) from the type species and four specimens from a new species has caused some modification.

Diagnosis. Small to moderately large skinks (snout-vent length 2·4-8·5 cm), head and body flattened, tail round. Limbs pentadactyl, well developed and overlap when adpressed. Digits not elongate, 20-28 lamellae under the fourth toe, palmar tubercles flattened. Body scales small, smooth, dorsal and lateral scales with 3-5 very faint keels, midbody scales in 37-48 rows. Lower eyelid moveable with a well developed transparent palpebral disc surrounded by small granular scales. External ear opening moderately large with 2-4 enlarged anterior lobules. A pair of supranasal scales invariably present, separated medially by the frontonasal. A small postnasal is present, normally fused to the supranasal scale in *P. spenceri* (85% of specimens examined) but free in all *P. palfreymani* specimens examined. Prefrontals enlarged but barely contact or fail to contact along the midline. Frontoparietals separate in *P. spenceri* but fused in *P. palfreymani* (cf. Fuhn 1967, always separate). Interparietal always separate. Parietals large and meet along midline.

Pseudemoia spenceri (Lucas and Frost, 1894) Pl. 5, fig. 2

Lygosoma (Emoa) spenceri Lucas, A. H. S., and Frost, C., 1894, *Proc. R. Soc. Vict.* 6: 81-82, pl. 2, figs. 1-1a. Zietz, F. R., 1920. *Rec. S. Aust. Mus.* 1: 213.

Lygosoma (Liolepisma) weekesae Kinghorn, J. R. 1929. *Proc. Linn. Soc. N.S.W.* 54: 32-33, 1 fig.

Leiolopisma weekesae Loveridge, A., 1934, *Bull. Mus. Comp. Zool.* 77: 360. Copland, S. J., 1947, *Proc. Linn. Soc. N.S.W.* 72: 69-72. Costin, A. B., 1954. *A Study of the Ecosystems of the Monaro Region of N.S.W.* Sydney, p. 97.

Ablepharus spenceri Smith, M. A., 1937. *Rec. Indian Mus.* 39: 213-234, pl. 4. Greer, A. E., 1970. *Bull. Mus. comp. Zool.* 139: 151-183.

?*Emoia spenceri* Worrell, E. R., 1963, *Reptiles of Australia*, Sydney, p. 44, 171, pl. 15.

Emoia spenceri Rawlinson, P. A., 1967, *Proc. R. Soc. Vict.* 80: 211-224, 1969, *ibid.* 82: 113-128.

Pseudemoia spenceri Fuhn, I. E., 1967, *Zool. Anz.* 179: 243-247, pl. 1-2. Fuhn, I. E., 1969, *Zeit.*

Zool. Syst. Evol. 7: 67-76, fig. 2. Coventry, A. J., 1970, *Mem. natn. Mus. Vict.* 31: 115-124. Rawlinson, P. A., 1971, *Proc. R. Soc. Vict.* 84: 37-51. Rawlinson, P. A., 1971, *Vict. Yearbook* 85: 11-36. Spellerberg, I. F., 1972, *Oecologia* 9: 23-46.

Type series of **Lygosoma (Emoa) spenceri** Lucas and Frost 1894

When describing this species, Lucas and Frost listed specimens in the collection of the National Museum of Victoria (hereafter NMV) from "Brandy Creek" and "Dandenong Ranges". These were located by Coventry (1970). One specimen (NMV D1824) which carries the label "Figured specimen 5/95" was designated lectotype and the other (NMV D3357) was designated as paralectotype. The remaining specimens used in the original description were in the private collections of Lucas and Frost who apparently dispersed them to various institutions. A specimen (now NMV D12555) labelled "Croajingolong" was found in Lucas's Melbourne University Zoology Department collection. Another labelled "Gisborne" and donated by A. M. S. Lucas (AM R3991) has been located in the Australian Museum, and there are two specimens in the British Museum of Natural History (BMNH 93.6.15.3-4; 1946. 8.15.81-82) donated by A. H. S. Lucas and labelled "Victoria". One of these BMNH specimens was listed by Fuhn as a syntype of *P. spenceri* (number quoted as BMNH 93.6.15.2; RR 1946. 8.15.81). All of the above specimens except those in the British Museum have been examined by the author.

Lectotype. NMV D1824. Locality: Brandy Cr., Gippsland, Vict. (Pl. 5, fig. 2). Its condition is poor because desiccated at some stage.

Description. Snout-vent length 4·1 cm. Tail (complete) 5·5 cm, 134% S-V length. Supranasals present. Small postnasal. Rostral and frontonasal in broad contact. Prefrontals narrowly separated. Frontonasal contacts anterior lorcals and excludes prefrontals from supranasals. Anterior and posterior loreals large. Frontoparietals divided. Interparietal moderately large. Parietals large and contact on midline. Nuchals enlarged, two symmetrical pairs. Temporals enlarged. Four supraoculars, second the largest. Six superciliaries (seven in Lucas and Frost). Six upper ciliaries, 13 lower ciliaries. Lower eyelid moveable, with a very large transparent palpebral disc surrounded by small granular scales. Nine upper labials, seventh enlarged and borders orbit, nine lower labials. Ear opening obvious, three slightly enlarged anterior lobules. Seven slightly enlarged preanal scales. Subdigital lamellae undivided and smooth, 20 under the fourth toe. Palmar tubercles flat, slightly rounded near base of digits. Midbody scale rows 38. Dorsal scales slightly enlarged, dorsal and lateral scales with 3-4 very faint keels. Colour of preserved specimen: Very dark brown to black above with irregular light coloured flecks. A light dorsolateral stripe passes from the nostril above the eye, over the temporal region, along the body and extends onto the tail; this line is very pronounced on the trunk. A light lateral stripe runs from the ear through the axilla to the groin. Ventral surface unmarked, off-white to light grey. Palmar surfaces light to dark grey.

Paralectotype. NMV D3357. Locality: Dandenong Ranges, Vict. Conspecific with lectotype.

Other possible syntypes examined: NMV D12555. Locality: Croajingolong, Vict. R3991 in the Australian Museum. Locality: Gisborne, Vict. Both are conspecific with the lectotype.

Type series of **Lygosoma (Liolepisma) weekesae** Kinghorn 1929

Pl. 5, fig. 3

Kinghorn listed a holotype and three paratypes from the Australian Museum. Only the holotype was listed with complete data including the registered number (AM R9745). The three paratypes were designated only by locality, collector and date of collection. All three have been located and they include a juvenile specimen (AM R563) from Mt. Kosciusko and two adults, one (AM R1860) from the Jenolan District and one (AM R6536) from Bombala in the Snowy Mts. Kinghorn mentioned in a footnote six additional specimens collected from the Jenolan district. These also have been located in the

Australian Museum and are specimens AM R9750, R9751, R26606, R26607, R26608, and R26609. All have been examined by the author.

Holotype. R9745 in the Australian Museum. Locality: Mt. Kosciusko (at c.1680 m) N.S.W. Collector: R. Helms May 1889 (Pl. 5, fig. 3). Conspecific with lectotype of *P. spenceri*. Kinghorn's description and figure of specimen inaccurate; supranasal scales present and obvious.

Paratypes. All in Australian Museum. R563 Mt. Kosciusko (at c.1680 m) N.S.W. Collector: R. Helms May 1889. R1860 Jenolan, Blue Mts. N.S.W. Collector: R. Etheridge 2 Nov. 1895. R6356 Bombala, Snowy Mts., N.S.W. No other data. All three paratypes are conspecific with lectotype of *P. spenceri*; in all supranasal scales are present and obvious.

Other specimens mentioned in description. All in Australian Museum, R9750-51, R26606-09. Jenolan District, N.S.W. Collector: H. C. Weekes 15 Feb. 1929. All six specimens are conspecific with lectotype of *P. spenceri*; in all supranasal scales are present and obvious.

Status of *Lygosoma* (*Liolepisma*) *weekesae*: This species is now placed in the synonymy of *Pseudemoia spenceri*.

Description of a series of specimens of **Pseudemoia spenceri**

In order to determine intraspecific variation in some important taxonomic characters, 150 specimens were examined in detail.

Size. Mature adults: Snout-vent length 4·1-6·5 cm, mean 5·05 cm (70 specimens). Intact tail 102-136% (mean 119%) of S-V length (20 specimens). Total length of adults with intact tails 9·5-12·6 cm, mean 11·0 cm (20 specimens). Juveniles at birth: Snout-vent length 2·4-3·0 cm, mean 2·7 cm (15 specimens). Intact tail 104-128% (mean 116%) of S-V length (8 specimens). Total length of juveniles with intact tails 5·3-6·5 cm, mean 5·9 cm (8 specimens).

Scalation. Supranasals present in all 150 specimens examined. Postnasals separate from supranasals in 22 of the 150 specimens examined (15%). Upper labial scales variable. Of the 150 specimens examined:

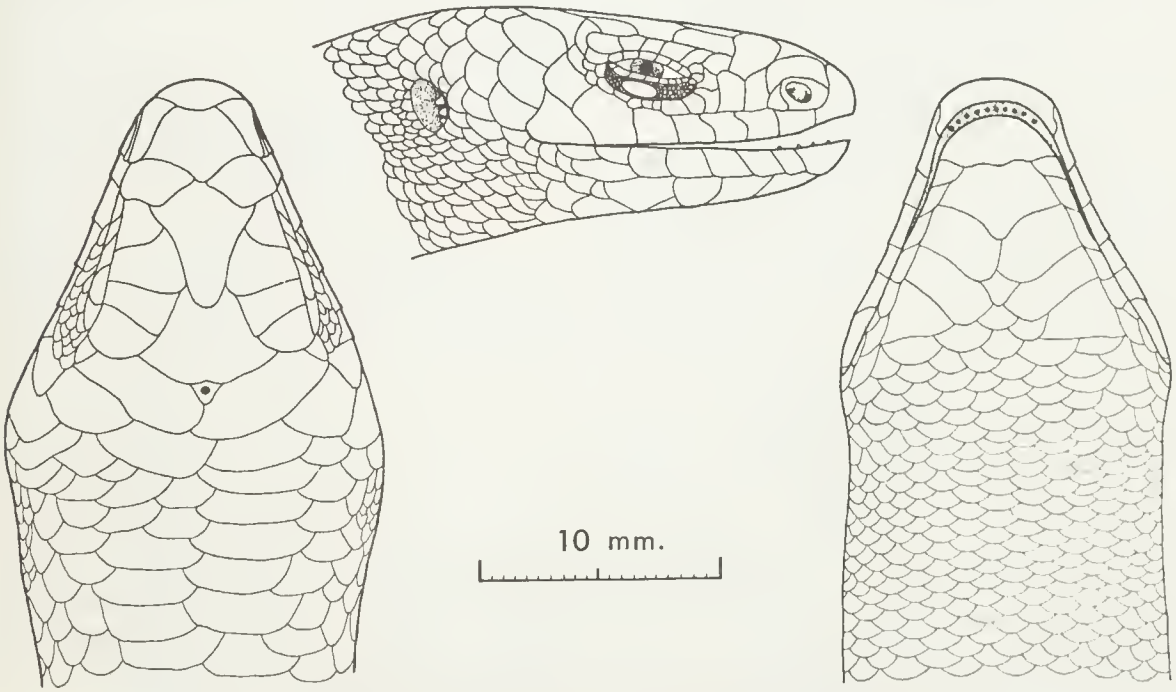

Fig. 1—Headshields of *Pseudemoia palfreymani* sp. nov. NMV D8868.

3 (2%) had 11 upper labials with 9th entering orbit.
34 (23%) had 10 upper labials with 8th entering orbit.
98 (65%) had 9 upper labials with 7th entering orbit.
15 (10%) had 8 upper labials with 6th entering orbit.

Midbody scale rows 37-48, mean 42·1, mode 43 (98 specimens).

Lamellae under the fourth toe 20-28, mean 23·6, mode 24 (98 specimens).

Colour of live specimens: Very dark brown to black above, flecked with light brown and chocolate brown spots, which may be arranged more or less in lines. Most specimens have light grey or brown dorsolateral and lateral stripes; some of these specimens also possess a wide vertebral stripe. A few specimens lack longitudinal stripes altogether. Ventral surfaces unmarked, light grey to light brown.

Other Specimens Examined. The localities and registered numbers of all other specimens of *Pseudemoia spenceri* examined are listed below. These include specimens from the author's collection (MUZD) assembled while the author was working in the Melbourne University Zoology Department, NMV specimens, and specimens in the Australian Museum, Sydney (AM).

New South Wales. (MUZD) Brady's Farm 9 km N. of Jenolan Caves (150/70, 31/71-47/71, 207/71-217/71), 12 km W. of Jenolan Caves (157/70), Tuross R. 14·5 km SSE. of Countegany (1072/65). Scammels Lookout 19·5 km SSE. of Khancoban (177/65), Sawpit Creek Kosciusko Park (17/69, 18/69), 8 km ENE. of Thredbo (400/63-411/63), Nimmitabel (403/69-409/69), Brown Mt. (97/69), 5·5 km ESE. of Brown Mt. (98/69). (NMV) Mt. Kosciusko (D16875), 3 km E. of Brown Mt. (D16875). (AM) Mt. Kosciusko 900-1500 m (R551).

Australian Capital Territory. (MUZD) Picadilly Circus, Brindabella Range (104/68), Mt. Franklin, Brindabella Range (69/64), 3 km S. of Mt. Franklin (66/64, 8/71-10/71), Mt. Ginni, Brindabella Range (16/71).

Victoria. (MUZD) 9 km SSW. of Cowombat Plain (242/69), 1·5 km NW. of Mt. Cobberas (223/69, 225/69, 230/69), 13 km W. of Mt. Cobberas (62/69-66/69), Native Dog Plain, 7 km SW. of Mt. Cobberas (61/69), 13·5 km W. of Omeo (277/63), Mt. Delegate (246/65-251/65, 281/65-283/65, 303/65, 304/65, 324/65-327/65, 330/65-332/65), 9·5 km NE. of Mt. Ellery (211/70), Bindaree Hut, 9·5 km W. of Mt. Howitt (310/64), Delegate R. 9 km SW. of Bendock (207/65, 208/65, 258/65), Wilhelmina Falls 6·5 km SE. of Murrindindi (236/70), Mt. Bowen E. Gippsland (9/72-10/72), Murrindindi Falls 13 km SE. of Murrindindi (326/68, 327/68), Yea Rock Lookout (215/69), Lake Mountain (352/63), Kalatha Camp (323/68), 14·5 km E. of Marysville (447/63), Mt. St. Leonard (324/68-325/68), Kalorama (204/68, 178/69), 14·5 km NE. of Loch Valley Camp (241/66, 248/66-266/66, 338/66-343/66, 382/66, 507/66, 149/67-161/67), 13 km NE. of Loch Valley Camp (270/66), 12 km NE. of Loch Valley Camp (770/65, 777/65-788/65), Mt. Baw Baw (376/68), Forrest, Otway Ranges (447/66), Mt. Sabine, Otway Ranges (168/69). (NMV) 9·5 km NE. of Mt. Ellery, E. Gippsland (D14158-610), Mt. Nowa Nowa (D13790-812), Mt. Baw Baw (D9603), 4 km SW. of Mt. Baw Baw (D13556-65, D13582), 5 km SW. of Mt. Baw Baw (D13586), 10·5 km S. of Kel Junction, Noojee Rd. (D16869-71), 3 km S. of Pennysaddle, Noojee Rd. (D16872-74), Loch Valley Camp (D14864-68), Springvale (D5535), Bunyip, Gippsland Rd. (D2482), Narracan (D1607), Meeniyan (D937), Barwon Downs, Otway Ranges (D993), Gellibrand R., Gellibrand (D13396-7, D18020-1), Mt. Sabine, Otway Ranges (D13621-30), Victoria (D1092, D1359, D1746, D4228, D936-9), No data (D4192).

Specimens observed. The localities of specimens observed during field work, but not collected, are listed below.

N.S.W. 8 km NE. of Kybean (1), 5km E. of Guthega Power Station (1), 5 km ENE. of Thredbo (1), 3 km E. of Brown Mt. (5).

A.C.T. 10 km SSE. of Bulls Head, Brindabella Ranges (3).

Vict. Mt. Wills (1), 8 km WNW. of Cobungra (7), Dargo High Plains (5), 18 km SSW. of Eildon (2), 14·5 km NE. of Mt. Ellery (1), Mt. Nowa Nowa (4), 10·5 km S. of Kel Junction, Noojee Rd. (6), Tarra Valley, S. Gippsland (1).

Distribution

Highlands of SE. N.S.W. and E. Vict. (from the Jenolan area, Blue Mountains, to Lake Mountain) with isolates in the Gisborne area and Otway Ranges, Vict. (Fig. 2a).

Habitat

Found only in regions of high rainfall (more than 75 cm per year). Populations within these regions are restricted to dead trees or rocky outcrops in montane wet sclerophyll forests and rocky outcrops in subalpine woodlands. The exposed surfaces of the trees or rocks are used for basking and foraging sites during activity, while crevices are used for shelters when inactive.

Ecology

From field observations *P. spenceri* is known to be a highly active insectivorous skink. During activity, specimens continually move over exposed sunlit and shaded surfaces seeking insects. They pause on sunlit surfaces only for brief basking periods to elevate body temperature. This thermoregulatory behaviour pattern classifies them as shuttling heliotherms (Rawlinson in press). *P. spenceri* is the most agile reptile found in the cool and cold temperate zones of SE. Australia. It is mainly arboreal, and specimens have been observed on the trunks of tall dead trees 50-75 m above ground level. The densest populations are found on large fire killed or fire damaged trees in burnt regenerating montane forests. These populations are able to survive on tall dead trees even after the regenerating forest below has formed a dense canopy excluding the species from ground level habitats, because the projecting trees still provide basking and foraging sites and shelter.

Two large dens of hibernating lizards were located in rocky subalpine woodlands on 3 May 1966. The dens were both under large dry overhanging granite exfoliation sheets that faced in a N. direction. It was not possible to accurately count the number of specimens in each den, for most specimens fell from the rock when exposed and were lost in the dense undergrowth. However, it is estimated that there were about 20 specimens in the first den and over 50 in the second.

Laboratory measurements of the thermal tolerances of *P. spenceri* have been made from continuous recordings of body temperatures (Table 1). The "Normal Activity Range" i.e. the "Voluntary Minimum" to the "Voluntary Maximum" body temperatures (Brattstrom

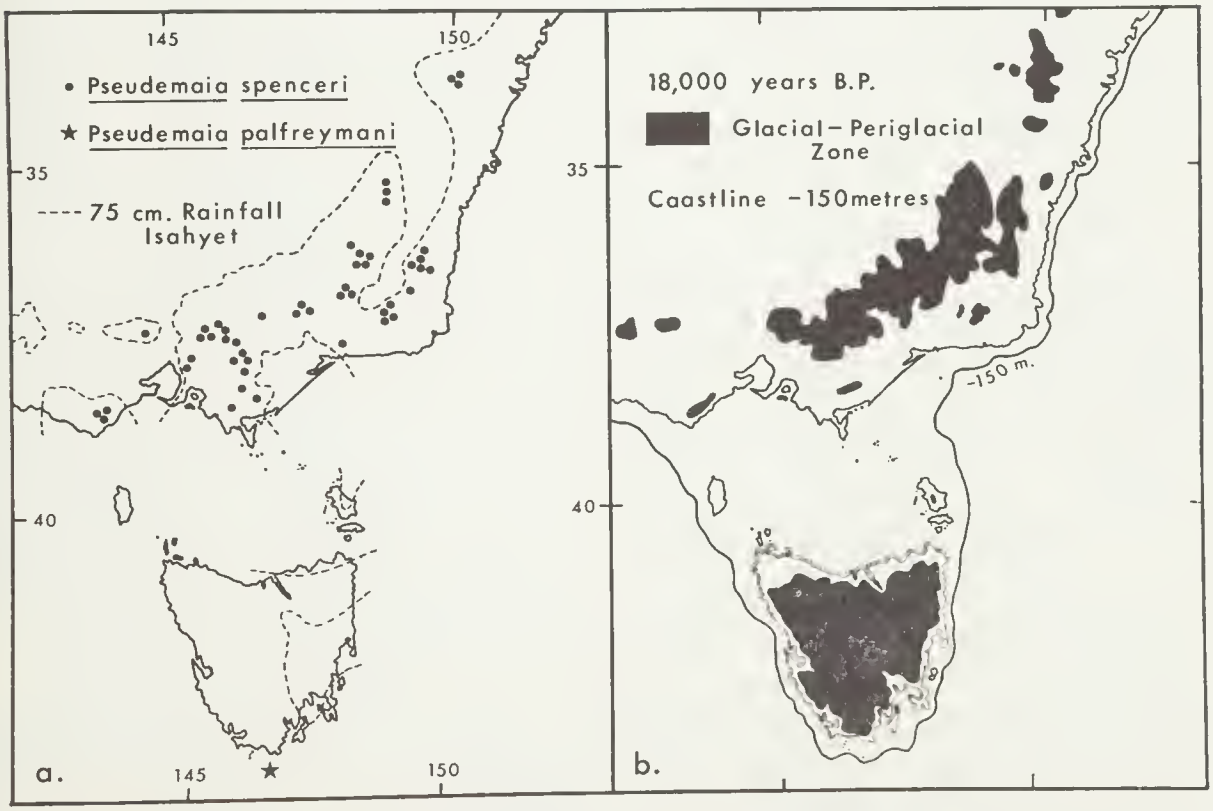

Fig. 2—(a) Distribution of *Pseudemoia spenceri* and *Pseudemoia palfreymani* sp. nov. in SE. Australia, and position of the 75 cm rainfall isohyet.
(b) Map of SE. Australia showing approximate extent of glacial and periglacial zones and coastline (–150 m contour) 18,000 years B.P. during the Late Wisconsin glacial phase.

1965) was determined by placing instrumented animals in a photothermal gradient (15-50°C) and allowing them to thermoregulate while body temperature was recorded. Specimens in the gradient mirrored their thermoregulatory behaviour in the field i.e. shuttled continuously from under the radiant heat lamps to shaded cool areas and back. From body temperature measurements made at one minute intervals on 12 specimens (1,106 observations) it was determined that the "Mean Preferred" body temperature was 31·9°C, while the "Voluntary Minimum" and "Voluntary Maximum" body temperatures were 25·3°C and 40·3°C respectively (Table 1). The histogram of frequency of body temperatures maintained during activity (1°C class intervals, range 20-42°C) is skewed towards the high temperature end of the scale. The mode lies at 36°C, and no temperature interval has more than 9% of the observations. This result reflects the shuttling method of thermoregulation, and the consequent rapid fluctuation in body temperature as the lizard moves rapidly to and from the basking site.

Spellerberg (1972) determined the "Critical Maximum" and "Critical Minimum" body temperatures. These are the temperatures at which locomotory ability is lost as measured by the loss of the righting reflex. The "Critical Minimum" is 2°C and the "Critical Maximum" is 41·9°C. Thus *P. spenceri* has wide thermal tolerances (cf. comparative table in Brattstrom 1965). It tolerates large fluctuations in body temperature during voluntary activity, the mean normal activity range for specimens tested was 15°C (25·3°-40·3°C), the absolute range was 22°C (20°-42°C), and specimens are capable of co-ordinated movements over a very wide range of body temtures, a mean range of 39·9°C (2°-41·9°C), and an absolute range of 41°C (1·5°-42·5°C). Other striking features of the thermal tolerances of *P. spenceri* are the voluntary maximum and critical maximum body temperatures which are higher than any other SE. Australian skinks.

TABLE 1
Thermal tolerances of **Pseudemoia spenceri**

Body Temperature Value	Number of Observations	Mean °C	Range °C
Critical Minimum Temperature	8	2·0	1·5- 2·8
Voluntary Minimum Temperature	12	25·3	20·0-31·9
Mean Preferred Temperature	1106	31·9	--
Voluntary Maximum Temperature	12	40·3	39·1-42·0
Critical Maximum Temperature	8	41·9	41·3-42·5

Reproduction

P. spenceri is a live-bearing skink. There is no trace of eggshells around developing embryos, so it is assumed the species is fully viviparous (i.e. placental). Pregnant females kept under observation in the laboratory produced litters 4-27 Feb. Of 29 pregnant females examined, 8 had one embryo, 16 had two embryos and 5 had three embryos, the mean number of offspring being 1·9.

Lygosoma (*Liolepisma*) *weekesae* is recorded above as a synonym of *P. spenceri*. Weekes (1929, 1935) described in detail the placentation of a species which was identified by Kinghorn as *L.* (*L.*) *weekesae*. However, Weekes's specimens could not have all been *P. spenceri*, for she records pregnant females carried from 3-7 embryos (cf. *P. spenceri* 1-3). The present author considers the specimens Weekes worked on belong to an undescribed species of *Leiolopisma* which occurs with *P. spenceri* in the Jenolan area (and in all other *P. spenceri* localities). In this species females carry 1-7 embryos (mean 3), and the author has previously referred to the species as *Leiolopisma weekesae*? (Rawlinson 1967, 1969, 1971a,b). It should be stressed again that all specimens used in the description of *L.* (*L.*) *weekesae* (which immediately precedes Weekes's paper) have been located, and all are conspecific with *P. spenceri*.

Pseudemoia palfreymani, sp. nov.
Pl. 5, fig. 1, Fig. 1

Holotype. NMV D8868. Locality: Pedra Blanca (= Pedra Branca) Island, off S. coast of Tasmania. Latitude 43° 52′ S, longitude 146° 59′ E. Collector: A. E. Palfurman (= Palfreyman). Date of acquisition: 30 Aug. 1956. Date of collection: Jan. 1956. External

condition good, internal preservation poor, and sex cannot be established.

Description. Snout-vent length 8·5 cm. Tail incomplete. Supranasals present and large. Small postnasal. Rostral and frontonasal in broad contact. Prefrontals narrowly separated. Prefrontals contact supranasals and exclude frontonasals from anterior loreals. Anterior and posterior loreals large. Frontoparietals fused. Interparietal separate, small. Parietals large and contact on midline. Nuchals enlarged, but no symmetrical pairs. Temporals enlarged. Four supraoculars, second the largest. Six upper ciliaries, eight lower ciliaries. Lower eyelid moveable with a large transparent palpebral disc surrounded by small granular scales. Seven upper labials, fifth enlarged and borders orbit; seven lower labials. Ear opening obvious, three slightly enlarged anterior lobules. Eight slightly enlarged preanal scales. Subdigital lamellae undivided and smooth, 22 under the fourth toe. Palmar tubercules flat, slightly rounded near base of digits. Midbody scale rows 39. Dorsal scales slightly enlarged, dorsal and lateral scales with 3-5 very faint keels.

Preserved specimen black above with pattern of irregular grey and brown flecks. A thin light coloured dorsolateral stripe arises above the eye and passes over the temporal region, along the body, and extends onto the tail where it is broken up. Ventral surface unmarked, mid-grey. Palmar surfaces dark grey.

Paratype. C106 Tasmanian Museum, Hobart (Old number Xa42) from Arve Valley, Tasm. Coll. Jan. 1957 (Locality and year of collection presumed to be in error; see below). External condition good, internal preservation poor.

Description. As for holotype except: Snout-vent length 4·5 cm. Tail incomplete. Frontonasal contacts anterior loreals and excludes prefrontals from supranasals. One pair of enlarged symmetrical nuchals. Seven superciliaries. Eight lower labials. Eleven slightly enlarged preanal scales. Twenty-two subdigital lamellae under the fourth toe. Midbody scale rows 38. Colour as holotype except dark brown above and pattern better developed.

Paratype. C285 Tasmanian Museum, Hobart (Old number Xa44) from Pedra Blanca (= Pedra Branca) Rock, S. Tasm. Collector A. E. Palfreyman Jan. 1957 (Year of collection presumed to be in error). Condition poor as specimen has desiccated at some stage.

Description. As for holotype except: Snout-vent length 8·2 cm. Tail (complete) 9·8 cm, 120% of S-V length. Frontonasal contacts anterior loreals and excludes prefrontals from supranasals. One pair of enlarged symmetrical nuchals. Two slightly enlarged anterior lobules in ear opening. Ten slightly enlarged preanal scales. Twenty-one subdigital lamellae under the fourth toe. Midbody scale rows 40. Dorsal and lateral surfaces mid-brown, heavily marked by light grey and light brown flecks. Dorsolateral stripe absent.

Additional specimen. NMV D8869. Locality, collector and date of collection as for holotype. Decapitated so not included in the type series. Snout-vent length unknown. Tail (complete) 10·2 cm. Nine slightly enlarged preanal scales. Twenty-one subdigital lamellae under the fourth toe. Midbody scale rows 39. Colour as for holotype.

Comment

Pedra Branca Is. is the deepest-water and southernmost island on the Australian continental shelf (Rawlinson in press). Mr. A. E. Palfreyman and Mr. M. Forster made the first recorded landing on 6 April 1947 (Fowler 1947, Sharland 1947). During this visit both Fowler and Sharland record that Mr. Palfreyman saw ". . . at least 25 lizards, each about 9 inches long . . ." on the W. side. Mr Palfreyman re-visited the island in January 1956 and (pers. comm.) "collected six lizards . . . 3 lizards were sent to the Museum in Victoria and the others were given to the Hobart Museum". Only four of these specimens could be located, the two listed above from the National Museum of Victoria (D8868, D8869) and the two from the Tasmanian Museum (C106, C285). Data with the NMV specimens is accurate except the name of the collector was misspelt. Data with the Tasmanian Museum specimens is inaccurate; TM

C106 has the old number Xa42, TM C285 has the old number Xa44, and it appears likely that the third specimen donated was Xa43. Both specimens are registered as collected in 1957, and the locality given to TM C106 in the new register is "Arve Valley, Tasmania". Only two of the specimens (NMV D8868, TM C106) are in reasonable condition. In view of the extreme difficulty involved in collecting more specimens (Fowler 1947) and the importance of the record to biogeographers and ecologists, it was decided to describe the new species using the material available. The species is named in honour of Mr. A. E. Palfreyman without whose interest and efforts the species would have remained unknown.

Distribution

Known only from Pedra Branca Is. 26 km S. of mainland Tasmania (Fig. 2a). It is surrounded by water over 128 m deep. *P. palfreymani* may also occur on adjacent S. Tasmanian islands (e.g. Mewstone Rock) but it is considered most unlikely that the species will be found on the Tasmanian mainland.

Habitat

Pedra Branca Is. is an isolated wave-swept rock composed of Precambrian sandstone and barely reaching 55 m above sealevel (Fowler 1947, Ritchie 1969). The rock lacks vegetation, but is the site of large breeding colonies of Australian Gannets, *Sula serrator*, and Australian Fur Seals, *Arctocephalus doriferus* (Fowler 1947, Sharland 1947). It is assumed that *P. palfreymani* uses exposed rock surfaces for basking sites during activity, and rocky crevices for shelter when inactive.

Ecology

Unknown. *P. palfreymani* probably is a shuttling heliotherm like *P. spenceri*. In the absence of terrestrial vegetation, it appears that the lizard would live off the bird colony by scavenging in the same way as the *Leiolopisma* skinks found on similar islands in the Chatham Group, New Zealand (McCann 1955).

Reproduction

Unknown. In view of the habitat, *P. palfreymani* is most unlikely to be oviparous and the species is assumed to be completely viviparous like its near relative *P. spenceri*.

Relationships of the genus **Pseudemoia**

When figuring the palatal bone structure of *Morethia lineoocellata*, Fuhn (1969) put forward the idea that if the palatal structure of *P. spenceri* was similar, *Pseudemoia* might prove to be congeneric with *Morethia*. The skull of *P. spenceri* has been examined and the palatal bone complex is essentially the same as *M. lineoocellata*, but Fuhn's idea of a close relationship between *Pseudemoia* and *Morethia* must be rejected. In all *Morethia* species (Smyth 1972, Storr 1972) the lower eyelid consists of a transparent disc fused to the eye surface, the interparietal and frontoparietals are fused into a single scale, and midbody scale row counts never exceed 34, and range as low as 24. Also *Morethia* species are all oviparous and inhabit warm, dry habitats across S. Australia; they do not enter the cool or cold temperate areas (Rawlinson 1971).

Pseudemoia only differs from the large genus *Leiolopisma* (sensu Greer 1970) in the possession of supranasal scales and there are several easily distinguishable groups within this latter genus. One of these, the "alpha Australian South Pacific Group" of *Leiolopisma* skinks (Greer and Parker 1968) have exactly the same palatal bone structure as *P. spenceri* (and *Morethia*) and all species are truly viviparous. Within this "alpha" group are two groups, viz. species with low midbody scale counts (20-32, e.g. *L. entrecasteauxii* and *L. metallica* in Australia, *L. aenenm* and *L. zelandica* in New Zealand) and species with high midbody scale counts (38-66, e.g. *L. ocellata* and *L. pretiosa* in Tasmania and most of the New Zealand *Leiolopisma* spp.). The high scale count "alpha" *Leiolopisma* species are the closest relatives of *Pseudemoia*, and in some *L. ocellata* specimens there are partially separated supranasal or postnasal scales. Further taxonomic work will probably place these *Leiolopisma* species in the genus *Pseudemoia*.

Biogeography

Pseudemoia belongs to a group of skinks

("alpha" *Leiolopisma*) which has radiated widely into the cool temperate regions of the S. Pacific area during the Quaternary. *P. spenceri* and *P. palfreymani* are the only species in this group with supranasal scales and they are undoubtedly closely related. They represent an ancestral stock which probably reached Tasmania in the Illinoian or Early Wisconsin glacial phase when sea level fell to more than minus 80 m connecting Australia for the first time (Rawlinson in press).

The explanation of the present distribution patterns of *P. spenceri* and *P. palfreymani* lie in the climatic and sealevel changes of the Late Wisconsin glacial phase and the postglacial phase (Rawlinson, in press). The Late Wisconsin glacial phase lasted from about 40,000-10,000 yr B.P. and it was apparently the most intense of all the Quaternary glaciations in SE. Australia. At the peak of the glaciation 20,000-18,000 yr B.P., the sea lay at minus 132-150 m (Fig. 2b) and for the first time Pedra Branca Is. and adjacent rock outcrops would have been connected to mainland Tasmania, *P. palfreymani* probably then moved into the area. During the Late Wisconsin the glacial and periglacial zones would have been extensive in Tasmania (Fig. 2b). These zones lack terrestrial ecosystems so the distribution of *P. palfreymani* would have been largely coastal and probably restricted to S. Tasmanian rock outcrops. When sealevel rose isolating Pedra Branca 18,000 yr B.P., the glacial phase was still in full force, and the species did not successfully re-establish itself in Tasmania, perhaps because it was entirely dependent on seabird colonies and these were restricted.

During the Late Wisconsin, Tasmania was joined to Australia for about 9,750 yrs from 22,500-12,750 yr B.P. At this time *P. spenceri* must have had a restricted distribution on the Australian mainland for it did not reach the Bass Strait islands or Tasmania. The species has successfully invaded S. Victoria adjacent to Bass Strait in postglacial times, and it is now found in montane wet sclerophyll forests or subalpine woodlands in most high rainfall areas (Fig. 2a). Why the species should have been restricted in a colder period is not immediately apparent, for it presently occupies the altitudinal zones which would have been below the periglacial zone, and these would have been more extensive in the glacial phase. The best interpretation is that at the height of the glacial phase when Australia was connected to Tasmania (22,500-12,750 yr B.P.) the climate was more arid and *P. spenceri* was very restricted. Only after 12,750 yr B.P. (essentially in postglacial times) did the climate become wet enough to allow the S. expansion of *P. spenceri* into areas adjacent to the old landbridge.

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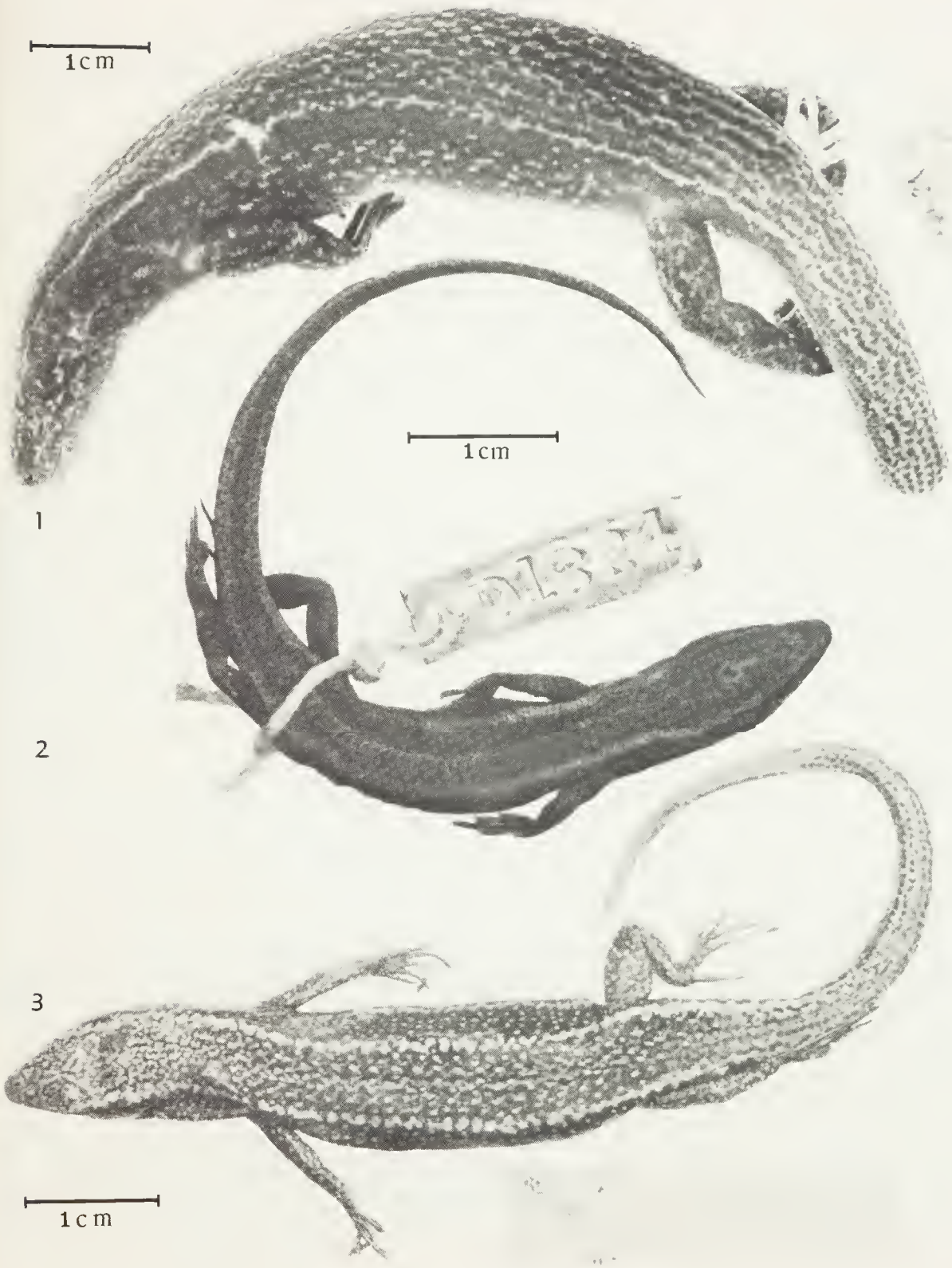
Explanation of Plate 5

Fig. 1—Holotype of *Pseudemoia palfreymani* sp. nov. NMV D8868

Fig. 2—(Left) Lectotype of *Lygosoma* (*Emoa*) *spenceri* NMV D1824

Fig. 3—(Right) Holotype of *Lygosoma* (*Liolepisma*) *weekesae* AM R9745

Footnote: Since the above was written the author has been able to examine the two syntypes of *Pseudemoia spenceri* in the British Museum of Natural History, London. These specimens, BMNH 93.6.15.3-4; RR 1946.8.15.81-82 from "Victoria" were presented by A. H. Lucas and were clearly registered and labelled as syntypes; both are conspecific with the lectotype of *P. spenceri* NMV D1824.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