



## A new species of *Eremiascincus* (Reptilia: Squamata: Scincidae) from the Great Sandy Desert and Pilbara Coast, Western Australia and reassignment of eight species from *Glaphyromorphus* to *Eremiascincus*

SVEN MECKE<sup>1,2,4</sup>, PAUL DOUGHTY<sup>2</sup> & STEPHEN C. DONNELLAN<sup>3</sup>

<sup>1</sup>Department of Animal Evolution and Systematics, Faculty of Biology, Philipps University Marburg, Karl-von-Frisch-Straße 8, 35043 Marburg, Germany. E-mail: Mecke@students.uni-marburg.de

<sup>2</sup>Department of Terrestrial Zoology, Western Australian Museum, 49 Kew Street, Welshpool WA 6106, Australia. E-mail: Paul.Doughty@museum.wa.gov.au

<sup>3</sup>South Australian Museum, North Terrace, Adelaide SA and Australian Centre of Evolutionary Biology and Biodiversity, University of Adelaide, Adelaide SA 5000, Australia. E-mail: Steve.Donnellan@samuseum.sa.gov.au

<sup>4</sup>Corresponding author

### Abstract

The concept of the skink lizard genus *Eremiascincus* Greer, 1979 is expanded to include eleven species [*antoniorum*, *brongersmai*, *butlerorum*, *douglasi*, *emigrans*, *fasciolatus*, *isolepis*, *richardsonii*, *musivus* **sp. nov.**, *pardalis*, *timorensis*], eight of which [*antoniorum*, *brongersmai*, *butlerorum*, *douglasi*, *emigrans*, *isolepis*, *pardalis*, *timorensis*] (comb. nov.) previously belonged to *Glaphyromorphus* Wells & Wellington, 1983. This decision is based on the results of three recent studies, which indicated that ‘*Glaphyromorphus*’ was a polyphyletic assemblage representing a morphotype within Australian sphenomorphine skinks.

In addition, we describe a new species of *Eremiascincus* based on morphological and molecular genetic evidence. The new species is distributed in coastal areas of the Pilbara region, Dampierland and the Great Sandy Desert in northwestern Western Australia. *Eremiascincus musivus* **sp. nov.** differs from regional congeners by possessing a characteristic dorsal pattern comprising numerous whitish and dark spots which align to form a diffuse reticulum, a pale vertebral stripe, more slender body and smaller body size, 52–62 paravertebral scales, scales along top of the fourth toe with oblique sutures on basal quarter to third of digit, subdigital lamellae of fourth toe undivided and feebly keeled and 10–15 plantar scales. The description of *E. musivus* **sp. nov.** brings the number of species of Australian *Eremiascincus* to seven.

**Key words:** Lacertilia, Lygosominae, taxonomy, mitochondrial DNA, *cytochrome b*.

### Zusammenfassung

Das Konzept der Skink-Gattung *Eremiascincus* Greer, 1979 wird erweitert, um elf Arten [*antoniorum*, *brongersmai*, *butlerorum*, *douglasi*, *emigrans*, *fasciolatus*, *isolepis*, *richardsonii*, *musivus* **sp. nov.**, *pardalis*, *timorensis*] zu umfassen, von denen acht [*antoniorum*, *brongersmai*, *butlerorum*, *douglasi*, *emigrans*, *isolepis*, *pardalis*, *timorensis*] (comb. nov.) bisher der Gattung *Glaphyromorphus* Wells & Wellington, 1983 angehörten. Diese Entscheidung basiert auf den Ergebnissen dreier kürzlich veröffentlichter Studien, die gezeigt haben, dass es sich bei ‘*Glaphyromorphus*’ um eine polyphyletische Gruppe handelt, die einen Morphotyp innerhalb der australischen Sphenomorphus-Skinke darstellt.

Auf der Basis morphologischer und molekulargenetischer Daten beschreiben wir außerdem eine neue Art der Gattung *Eremiascincus*. Diese neue Art stammt aus küstennahen Gegenden der Pilbara-Region, Dampierland, sowie der Great Sandy Desert im Nordwesten Westaustraliens. *Eremiascincus musivus* **sp. nov.** unterscheidet sich von verwandten Arten durch eine charakteristische dorsale Zeichnung, bestehend aus weißen und dunklen Flecken, die zu einer diffusen Netzzeichnung verschmelzen, einem hellen Vertebralstreifen, einer schlankeren Körpergestalt und einer geringeren Körpergröße, 52–62 Paravertebralschuppen, Schuppen auf der Oberseite der vierten Zehe entlang des basalen Viertels

oder Drittels mit schräg verlaufendem Rand, Subdigitallamellen ungeteilt und schwach gekielt und 10-15 plantare Schuppen. Mit der Beschreibung von *E. musivus* **sp. nov.** steigt die Zahl der aus Australien bekannten Arten auf sieben.

**Schlüsselwörter:** Lacertilia, Lygosominae, Taxonomie, mitochondriale DNA, *Cytochrom b*

## Introduction

Australian sphenomorphine skinks are a morphologically and ecologically diverse group of lygosomines and represent a dominant component of the Australian herpetofauna (Hutchinson 1993; Hutchinson & Donnellan 1993). Among the three distinct subgroups of Australian lygosomines (*Egernia*, *Eugongylus* and *Sphenomorphus* groups; Greer 1979b), the *Sphenomorphus* group is the largest, comprising 15 genera with more than 230 species (Cogger 2000; Reeder 2003; Rabosky *et al.* 2007; Skinner 2007; Wilson & Swan 2008). One of these genera, *Eremiascincus* Greer, 1979, comprises two desert-inhabiting and widespread species: *E. richardsonii* (Gray, 1845) and *E. fasciolatus* (Günther, 1875). *Eremiascincus* as recognised currently (e.g. Cogger *et al.* 1983; Greer 1979a,b, 1989; James & Losos 1991; Hutchinson 1993; Cogger 2000; Wilson & Swan 2008) is unique among Australian scincid lizards in usually possessing a simple pattern of dark crossbands in combination with low ridges on the posterior body and the base of the tail. Species boundaries within *Eremiascincus* and its relationships to other taxa, however, are poorly understood. Based on superficial morphological similarities, Greer (1979a, 1989) hypothesised *Eremiascincus* to be a relative of either *Glaphyromorphus isolepis* (Boulenger, 1887) or *G. nigricaudis* (Macleay, 1877).

*Glaphyromorphus* Wells & Wellington, 1983 as currently recognised comprises 18 small to moderate, crepuscular and nocturnal species, found in moist habitats of tropical northern and coastal southwestern Australia (14 spp), New Guinea (2 spp which also occur on the Australian mainland) and the Lesser Sunda Islands of Indonesia (4 spp). The monophyly of *Glaphyromorphus* has been in doubt since its proposal, and Greer (1989) suggested several Australian species groups reside within it.

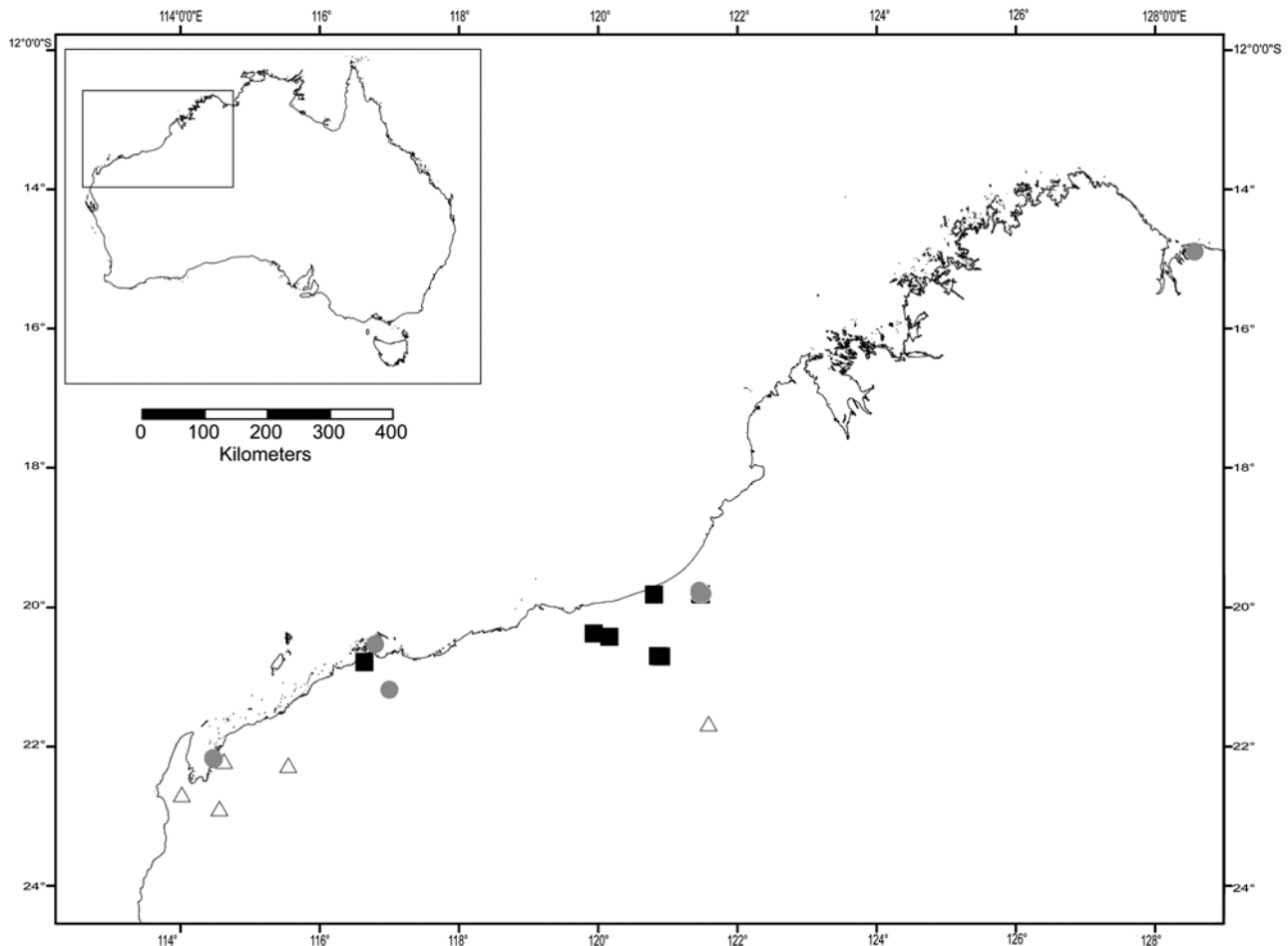
The molecular phylogenetic study of the Australian *Sphenomorphus* group by Reeder (2003) clearly indicated that *Glaphyromorphus* is polyphyletic. The combined mitochondrial structural RNA and protein-coding data (2185 bp) strongly placed *Eremiascincus* with '*Glaphyromorphus*' *isolepis* and *Hemiergus* with '*G.*' *gracilipes* (Steindachner, 1870). The relationship between *G. crassicaudis* (Duméril and Duméril, 1851) (= *G. arnhemicus* [Storr 1967]) and *Eulamprus quoyii* (Duméril and Bibron, 1839), however, was only weakly supported. Subsequent detailed molecular genetic analyses utilising both mitochondrial and nuclear sequence data (Rabosky *et al.* 2007; Skinner 2007) corroborated the polyphyly of '*Glaphyromorphus*', and show that it forms three distinct clades, each of which is more closely related to other genera than to each other, as follows: 1) *Eremiascincus* is closely related to the '*Glaphyromorphus*' *isolepis* group, 2) *Hemiergus* is closely related to '*G.*' *gracilipes* from southwestern Australia, and 3) the *Eulamprus quoyii* group is related to the remaining members of '*Glaphyromorphus*' from northern and northeastern Australia. Despite the molecular genetic evidence that '*Glaphyromorphus*' is polyphyletic, none of the previous authors amended the taxonomy.

The aims of our study were to: (i) formalise the genetic reassignment of '*Glaphyromorphus*' based on molecular genetic data from three previous phylogenetic studies (Reeder 2003; Rabosky *et al.* 2007; Skinner 2007) supplemented by our own molecular genetic and morphological data and in doing so (ii) redefine the genus *Eremiascincus* and (iii) describe a new species of *Eremiascincus* from the northern Pilbara and Dampierland of Western Australia.

## Materials and methods

### Molecular genetic analyses

We obtained nucleotide sequences of the mitochondrial *cytochrome b* (*cytb*) gene from 65 lizards (see Appendix 1 for details of specimens examined and Fig. 1). In the appendices and type lists, the superscript ‘<sup>M</sup>’ after a specimen number indicates that it was used for molecular analysis only, the superscript ‘<sup>m</sup>’ after a specimen number indicates that it was included in the molecular genetic and morphological analysis. Samples were selected based on the findings of Skinner (2007) and Rabosky *et al.* (2007) to include members of *Hemiergis* and the three groups of ‘*Glaphyromorphus*’, and samples of *Eremiascincus* and the ‘*G. isolepis* clade that represent the geographic and morphological variation in northwestern Australia. Sequences of two outgroups were obtained from GenBank—*Sphenomorphus fasciatus* AF373234 and *Lerista bougainvilli* AF020031.



**FIGURE 1.** Map showing the collection locations of *E. fasciolatus* (open triangles), *E. isolepis* (shaded circles), and *E. musivus* sp. nov. (solid squares) examined for molecular genetic analysis.

DNA was extracted from tissue samples with a Gentra Puregene kit (Qiagen). An approximately 900 bp section of the *cytb* gene was amplified using PCR and directly sequenced with the primers L14910 and MVZ16 (Moritz *et al.* 1992; de Queiroz *et al.* 2002), using the following protocols. Each PCR was carried out in a volume of 25 µl with a final concentration of 1X GeneAmp PCR Gold buffer, 2–4 mM MgCl<sub>2</sub>, 200 µM of each dNTP, 0.2 µM of each primer and 1 U of AmpliTaq Gold DNA polymerase (Applied Biosystems, Foster City, CA, USA). Amplifications consisted of an initial denaturation step of 94°C for 9 min, followed by 34 cycles of PCR with the following temperature profile: denaturation at 94°C for 45 s, annealing at 55°C for 45 s, and extension at 72°C for 1 min, with an additional final extension at 72°C for 6 min. PCR products were purified using an UltraClean PCR clean-up DNA purification kit (Mo Bio Laboratories Inc., CA) before cycle-sequencing using the BigDye Terminator v3.1 cycle-sequencing kit (Applied Biosystems). The cycling protocol consisted of 25 cycles of denaturation at 96°C for 30 s, annealing at 50°C for 15 s, and extension at 60°C for 4 min. All sequence products were electrophoresed on an Applied Biosystems 3700 DNA sequencer.

Phylogenetic tree-building algorithms were based on both maximum parsimony (MP) and Neighbour-joining (NJ) implemented in PAUP\* version 4b7 (Swofford 1999). Heuristic searches, with the ACCTRAN option, were used with 100 randomised taxon input orders for MP analyses. The HKY85 model of nucleotide substitution was used to generate the distance matrix for the NJ analysis. MP and NJ trees were tested for robustness using 1000 non-parametric bootstrap pseudoreplicates.

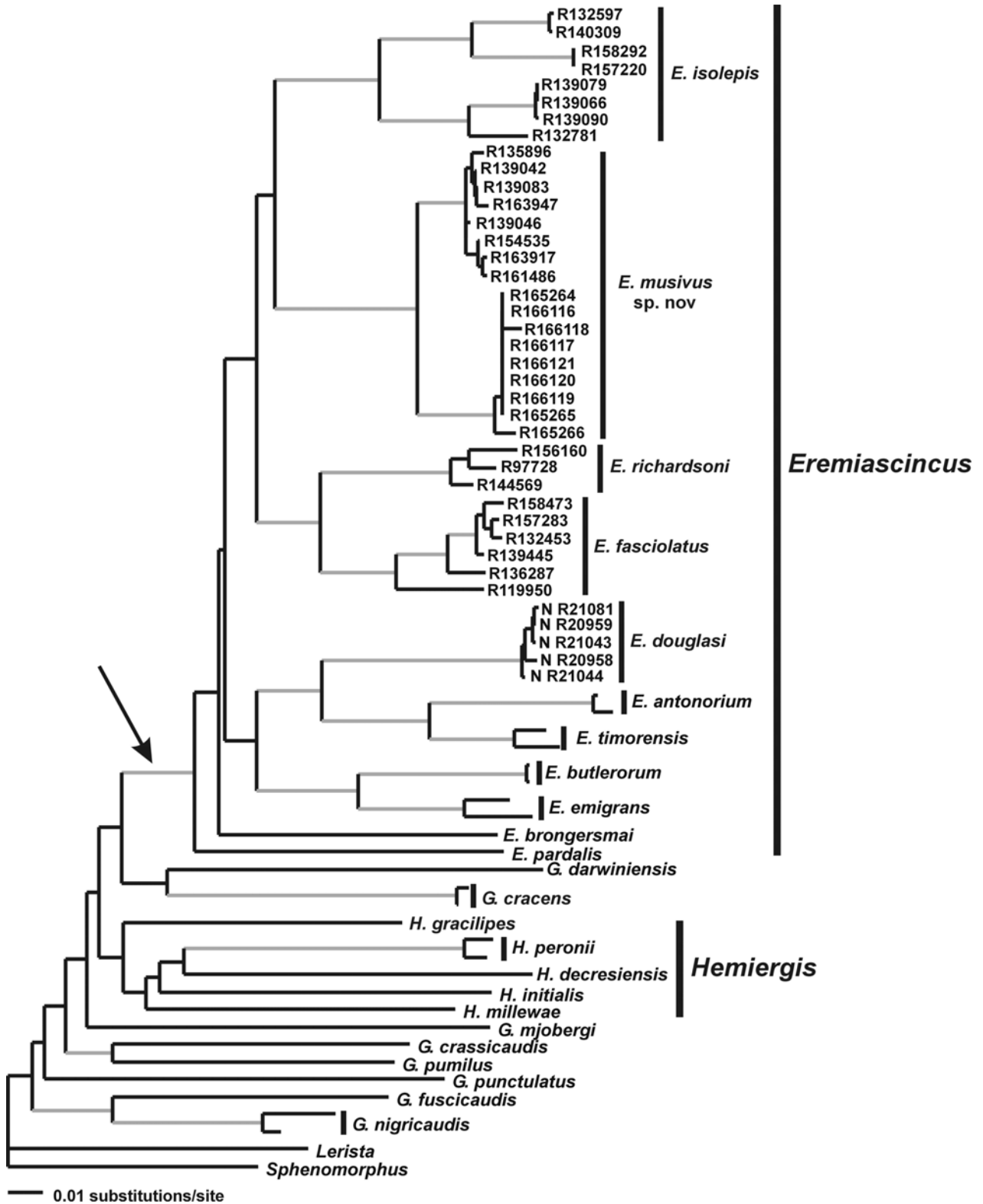
#### Morphological analyses

Appendix 1 lists the specimens examined. Most specimens used in the molecular genetic studies were included in the morphological analyses.

Sample sizes for the four groups of lizards examined morphologically for the species description are given in Table 2. Well-preserved specimens that conformed to the set of character states defined by these genotyped specimens and were from the same area were regarded as conspecific. Juveniles were not included in the morphometric and squamational analyses but were used to quantify variation in *E. musivus* **sp. nov.** Table 1 presents the meristic characters, their abbreviations and how they were measured or counted. Paravertebrals, supralabials, infralabials, subdigital lamellae on the fourth toe and supracilaries were counted on the left side of specimens examined. Only original tails were included in the morphometric analysis. All body measurements were taken using electronic callipers. Sex and maturity were assessed by examination of the reproductive tracts or by everted hemipenes of males. Adult size range was determined by the intraspecific size range of females having enlarged follicles. We also calculated the following ratios: Tail%/SVL, TrunkL/SVL, ArmL/SVL, LegL/SVL, ArmL/LegL, HeadL1/SVL, HeadL2/SVL, HeadW/HeadL1, SnoutL/HeadL1, SnoutL/HeadL2 and HeadD/HeadW.

**TABLE 1.** Meristic characters and their abbreviations used in this study.

Character	Description
SVL	Snout-vent length
TrunkL	Trunk length from axilla to groin
TL	Tail length of original tails from vent to tip
ArmL	Foreleg length from axilla to tip of fourth finger, excluding claw
LegL	Hindleg length from groin to tip of fourth toe, excluding claw
AxillaEar	Axilla to posterior margin of the ear
HeadL1	Head length from tip of snout to anterior margin of the ear
HeadL2	Head length from tip of snout to posterior margin of parietals
HeadW	Head width, measured level with centre of the ear opening
HeadD	Head depth, measured level with centre of the eye
SnoutL	Snout length from tip of snout to anterior margin of orbit
FootL	Foot length from base of foot to tip of 4th toe, excluding claw
Toe3L	Length of third toe
Toe4L	Length of fourth toe
EarL	Ear length at centre
EarH	Ear height at centre
EarArea	Area of the ear opening
MBSR	Number of midbody scale rows, counted midway between axilla and groin
PVS	Paravertebral scales, counted in one line from the posterior margin of the parietals to the beginning of the hindlegs
SupraLab	Number of supralabial scales
InfraLab	Number of infralabial scales, ending with the last small scale in contact with the posterior margin of the last upper labial
4TLam	Number of enlarged subdigital lamellae on fourth toe, counted from toe junction to base of claw
SupCil	Number of supracilaries, beginning with the scale adjoining the prefrontal and loreal, and ending with the scale still contacting cilaries and last supraocular



**FIGURE 2.** Neighbour-joining tree of mitochondrial *cytochrome b* nucleotide sequences from *Eremiascincus* and selected outgroups. Branches in grey had NJ and MP non-parametric bootstrap proportions  $\geq 70\%$ . (R prefix: WAM; N prefix: NTM.). Arrow indicates the clade that includes all members of *Eremiascincus* and the ‘G’. *isolepis* species-group.

## Results and discussion

### Molecular genetic analyses

As three previous studies have established that '*Glaphyromorphus*' is polyphyletic and that it comprises three groups each more closely related to other genera (Reeder 2003; Rabosky *et al.* 2007; Skinner 2007), we sought to establish more thoroughly the species content of one of the groups, namely the group that includes the '*G.* *isolepis*' species-group and *Eremiascincus*. Thus, we included all described members of the '*G.* *isolepis*' species-group, viz.: the Australian taxa '*G.* *brongersmai*' (Storr, 1972), '*G.* *isolepis*', '*G.* *douglasi*' (Storr, 1967), '*G.* *pardalis*' (Macleay, 1877), the Sunda Shelf taxa '*G.* *antoniorum*' (Smith, 1927), '*G.* *butlerorum*', Aplin, How & Boeadi, 1993, '*G.* *emigrans*', (Lidth de Jeude, 1895) '*G.* *timorensis*' Greer, 1990, and *Eremiascincus fasciolatus* and *E. richardsonii*.

The aligned *cytochrome b* dataset comprised 65 sequences of 753 bp length. Translation of the sequences did not reveal any premature stop or nonsense codons. Twenty-four equally most parsimonious trees were found with a length of 1919 steps. Fig. 2 shows the NJ tree of *cytb* nucleotide sequences from *Eremiascincus*, '*Glaphyromorphus*' and *Hemiergus*, and non-parametric MP and NJ bootstrap proportions. Branches with bootstrap proportions greater than 70% for both MP and NJ were regarded as strongly supported. The NJ tree was similar to the strict consensus of the equally most parsimonious MP trees, only differing in the arrangement of some branches that did not receive strong support from both MP and NJ bootstrapping.

Fig. 2 shows a strongly supported clade that includes all of the taxa assigned to *Eremiascincus* and the '*G.* *isolepis*' species-group. Furthermore we have identified strong evidence for a new species in this clade (Fig. 2—*E. musivus* **sp. nov.**). *Eremiascincus musivus* **sp. nov.** is a well-supported clade that is separated from all of the described taxa in the *Eremiascincus* and the '*G.* *isolepis*' species-group clade. It is genetically as distinctive as any of the other described members of the *Eremiascincus* and the '*G.* *isolepis*' species-group clade. We provide further evidence for its status as a distinct species based on a morphological assessment presented below and then formally describe this species. We refer this taxon to *Eremiascincus* in the generic discussion, which we present first.

### Generic revision

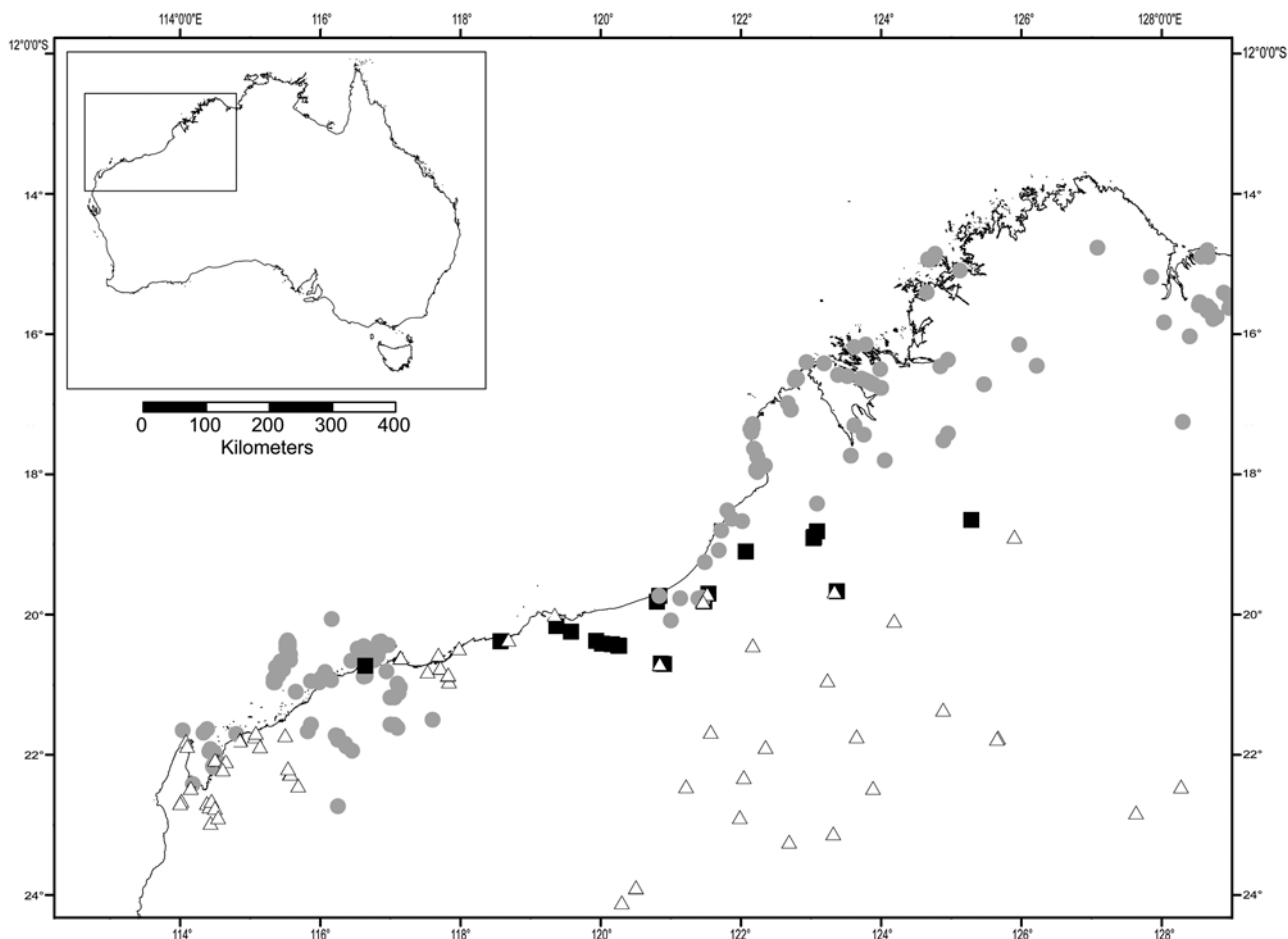
The combination of three previously published studies (Reeder 2003; Rabosky *et al.* 2007; Skinner 2007) shows that '*Glaphyromorphus*' falls into three clades each with affinities with other major clades: 1) '*G.* *gracilipes*' with *Hemiergus*, 2) '*Glaphyromorphus*' mainly with attenuate bodies from northeastern Australia and New Guinea related to the *Eulamprus quoyii* group, and 3) the '*G.* *isolepis*' species-group with *Eremiascincus*. Our study provides further definition on the content of the third group through our comprehensive inclusion of all named members of *Eremiascincus* and the '*G.* *isolepis*' species-group.

The first clade comprises '*G.* *gracilipes*' from southwestern Western Australia and *Hemiergus* Wagler, 1830, a poorly defined group of cryptozoic and fossorial small slender skinks distributed across southern Australia. The taxonomy of this group would better indicate the evolutionary affinities of '*G.* *gracilipes*' if it were to be reassigned to *Hemiergus*. Choquenot & Greer (1989) and Greer (1989) already suggested that '*G.* *gracilipes*' was a close, primitive relative of *Hemiergus* on morphological grounds.

We transfer '*G.* *gracilipes*' to *Hemiergus* on the basis of the following comparison of characters. Like members of *Hemiergus*, *H. gracilipes* is a medium-sized, slender, terrestrial smooth-scaled skink, with a long, fragile tail (up to 190% of SVL) and short, weak limbs, which fail to meet when adpressed. Like most members of *Hemiergus* (except *H. decresiensis* [Cuvier, 1829]), *H. gracilipes* has a low number of MBSR (19–22) and an increased number of presacral vertebrae (34–37; other *Hemiergus*: range 34–39). There is some overlap in the characters stated above with some elongated members of *Glaphyromorphus*. However, *H. gracilipes* differs from all members of *Glaphyromorphus* and all members of *Eremiascincus* (see paragraph below, Clade 3) in having a bright yellow chest and belly, turning yellow-green under the tail (rare among skinks). With this colouration pattern *H. gracilipes* conforms with all species of *Hemiergus*, which have bright yellow to orange venters. In addition, *H. gracilipes* and other *Hemiergus* are viviparous and exclusively occur

in shrub and woodlands of temperate southern Australia. The phalangeal formula for the manus and pes (2.3.4.5.3/2.3.4.5.4), the absence of a transparent disc in the lower eyelid (present in other *Hemiernis*) and the presence of a large ear-opening (ear aperture almost always absent in *Hemiernis*), however, indicate that *H. gracilipes* is a primitive, plesiomorphic member of *Hemiernis*. The phalangeal formula 2.3.4.5.3/2.3.4.5.4 is considered primitive for all lepidosaurs (e.g. Romer 1956, Greer, 1987) and movable opaque eyelids and large external ear openings also represent primitive characteristics among scincid lizards, while a “window”, or translucent disc in the lower eyelid and an auricular depression are considered derived character states (e.g. Greer 1989, 2002, Pianka & Vitt 2003). Therefore *H. gracilipes* is presumably most likely a close relative of *H. millewae* Coventry, 1976, with which it shares pentadactyl limbs, a similar phalangeal configuration (2.3.4.4.3/2.3.4.5.4 in *H. millewae*) and the presence of an ear opening (tympanum exposed in *H. millewae*).

The second clade contains taxa predominantly from northeastern Australia and extra-liminally from southern New Guinea, viz.: *G. cracens* (Greer, 1985), *G. crassicaudis*, *G. fuscicaudis* (Greer, 1979c), *G. mjobergi* (Lönnberg & Andersson, 1915), *G. pumilus* (Macleay, 1877), and *G. punctulatus* (Peters, 1871) and one species from Arnhem Land and the Kimberley region, namely *G. darwiniensis* (Storr, 1967). Since *G. nigricaudis* has not been a part of any recent published phylogenetic molecular genetic study so far, we have included this taxon in the present study (Fig. 2), which demonstrates that it is a close relative of *G. fuscicaudis* as proposed by Greer (1979, 1989). The generic name *Glaphyromorphus* applies to this group of species because *G. punctulatus* is the type species of *Glaphyromorphus* by original designation.



**FIGURE 3.** Map showing the distribution of *E. fasciolatus* (open triangles), *E. isolepis* (shaded circles), and *E. musivus* sp. nov. (solid squares) based on vouchered museum specimens.

The third clade includes members of the ‘*G.* *isolepis*’ species-group (Greer 1989, 1990), namely ‘*G.* *brongersmai*’, ‘*G.* *isolepis*’, ‘*G.* *douglasi*’, ‘*G.* *pardalis*’, as well as the two species of *Eremiascincus* (*E.*

*fasciolatus*, *E. richardsonii*) and the new species (*E. musivus* **sp. nov.**) we describe herein. In addition, the Indonesian species '*G.* *antoniorum*', '*G.* *butlerorum*', '*G.* *emigrans*' and '*G.* *timorensis*', which had been placed in the '*G.* *isolepis*' species-group by Greer (1990) on morphological evidence, belong to this major clade. *Mawsoniascincus* Wells & Wellington, 1985, which included some Australian members of the '*G.* *isolepis*' species-group, is an available generic name. However, there is no compelling morphological or molecular evidence to retain it, and it also loses priority to *Eremiascincus* of which *E. richardsonii* is the type species and thus is placed in synonymy with *Eremiascincus*.

We herein transfer all mentioned members of the '*G.* *isolepis*' species-group to *Eremiascincus*, based on molecular genetic and morphological data which suggest that '*Glaphyromorphus*' as proposed by Wells & Wellington, and subsequently used by other authors (e.g. Greer 1989; Storr *et al.* 1999; Cogger 2000; Wilson & Swan 2008), is not monophyletic. The previous concept of '*Glaphyromorphus*' only represents a morphotype, as several morphological examinations have suggested (Greer 1989, 1990). As a consequence of the expansion of the genus *Eremiascincus*, the morphological characteristics of ridges on the tail (and sometimes dorsum) and the presence of dark crossbands on a yellowish background (Greer 1979a) are no longer useful for diagnosing the genus, as no species of the former '*G.* *isolepis*' species-group possesses these characters.

Our concept of a revised *Eremiascincus* is a geographically widespread genus within the Australian lygosomine skinks and difficult to define traditionally, due to a lack of identified synapomorphies. Consequently, we provide a generic diagnosis based on a combination of traits.

## Family Scincidae Gray, 1825

### Subfamily Lygosominae Mittelman, 1952

#### *Eremiascincus* Greer, 1979

**Type species**—*Hinulia richardsonii* Gray, 1845, by original designation (Greer 1979a).

**Content.** *Eremiascincus*, erected by Greer (1979a) to contain only two species (*E. fasciolatus* and *E. richardsonii*), is expanded to include the following species, formerly belonging to '*Glaphyromorphus*': *E. antoniorum* (Smith, 1926), comb. nov., *E. brongersmai* (Storr, 1972) comb. nov., *E. butlerorum* (Aplin, How & Boeadi, 1993), comb. nov., *E. emigrans* (Lidth de Jeude, 1895) comb. nov., *E. douglasi* (Storr, 1967) comb. nov., *E. isolepis* (Boulenger, 1887) comb. nov., *E. pardalis* (Macleay, 1877) comb. nov., and *E. timorensis* (Greer, 1990) comb. nov.

**Diagnosis.** The expanded *Eremiascincus* comprises small to medium-sized (SVL 44–125 mm) lygosomine skinks, which can be slender to robust; diurnal, crepuscular or nocturnal; terrestrial, fossorial or litter dwelling. No synapomorphy is known for this group, but it can be diagnosed by the following combination of characters: parietal shields in contact behind the interparietal; prefrontals large, in contact or narrowly separated; supranasals absent and nasals undivided; frontoparietals paired; frontal much longer than prefrontals; SupraLab 6–8; 1 or 2 InfraLab in contact with postmental scale; lower eyelid movable, scaly; small or missing auricular granules (when present usually 4–5); SupCil 6–10; supraoculars 4; 4TLam 15–30; usually more than 24 MBSR; dorsal and caudal scales smooth or keeled, head scales smooth; limbs well developed, meeting or overlapping when adpressed (exceptions are *E. pardalis* from the woodlands and monsoon forests of Queensland and *E. butlerorum* from Sumba Island, Indonesia); fingers and toes 5; tail usually much longer than SVL; ear opening prominent; colour pattern variable, composed of either distinct crossbands, a reticulum, numerous spots or dashes and can include a dark lateral zone. All species are oviparous, but *E. pardalis* has been reported as egg laying (Greer & Parker 1974) and live-bearing (Rankin 1978).



Differentiation of *Eremiascincus* from *Glaphyromorphus* is possible with the exception of a few problematic species. Members of *Eremiascincus* usually share a higher number of MBSR than most *Glaphyromorphus*: *Eremiascincus* (> 24 MBSR) is separated from the elongated, slender *G. cracens* (20–22 MBSR), *G. crassicaudis* (20–22 MBSR), *G. darwiniensis* (20–22 MBSR), *G. mjobergi* (22 MBSR) and *G. punctulatus* (18–20 MBSR). Furthermore, these species have very short, widely separated limbs when adpressed, a condition rare among members of *Eremiascincus*. The exceptions are *G. fuscicaudis* and *G. nigricaudis* and both taxa may represent a basal lineage within *Glaphyromorphus* (Greer 1979c, 1989). The presence of an ectopterygoid process, a small strut of bone in the secondary palate (Greer 1979a, 1989) might be of taxonomic importance as well, but seems to be absent in some populations of *E. fasciolatus* and *E. richardsonii* (Greer 1979a). However, this character is not present in any member of *Glaphyromorphus*.

Little more is known about the relationships of the elongated, short-limbed *G. clandestinus* Hoskin & Couper, 2004 from Mt. Elliot in northeastern Queensland. In their description of *G. clandestinus*, the authors compared that species with four subgroups of ‘*Glaphyromorphus*’ suggested by Greer (1989), a concept we have not followed here. Morphological similarities with one of these groups (*G. cracens*, *G. darwiniensis*, ‘*G. gracilipes*’) were apparent (Hoskin & Couper 2004) based on two soft tissue and two osteological characters and superficial similarities with *G. punctulatus* were indicated. We leave *G. clandestinus* as a member of *Glaphyromorphus* until further evidence becomes available.

## Species description

Figure 2 shows a strongly supported clade that includes all of the taxa assigned to the *E. isolepis* species-group, *E. fasciolatus* and *E. richardsonii*. Within this clade, several major sub-clades are apparent that correspond to recognised species and an additional sub-clade (*E. musivus* **sp. nov.**) that is as divergent from its sister sub-clade (*E. isolepis*) as are many other sister species pairs, e.g. *E. butlerorum*/*E. emigrans*, *E. fasciolatus*/*E. richardsonii*.

Table 2 presents a morphological summary for some of the meristics analysed. Among the four examined groups both sexes were similar in size. There were differences in body size among taxa, with *E. musivus* **sp. nov.** being the smallest taxon. The two populations of *E. isolepis* showed only small differences in body size, while *E. fasciolatus* was much larger, reaching a maximum body size of about 76 mm SVL. Similar patterns existed for other characters, with *E. fasciolatus* having larger values for limb lengths and head size than other taxa. The desert-inhabiting *E. musivus* **sp. nov.** and *E. fasciolatus* had shorter tails than the *E. isolepis* populations. Another difference among taxa was the size of the ear aperture, a character used here for the first time to reveal differences within this scincid group. In *E. musivus* **sp. nov.** the ear opening was smaller than in other taxa. In contrast, the non-fossorial populations of *E. isolepis* had the largest ear openings of all taxa examined. The number of MBSR overlapped among the groups. However, *E. fasciolatus* had the highest number of MBSR on average and showed a similar range for this characteristic as *E. musivus* **sp. nov.** The latter two taxa differed apparently in the number of PVS, with *E. musivus* **sp. nov.** having 52–62 and *E. fasciolatus* having 59–69. Interestingly, the two populations of *E. isolepis* showed differences in MBSR and most notably in the number of PVS with the Kimberley individuals having a wider range for this character. The measured ratios revealed the following differences among taxa: *E. musivus* **sp. nov.** had a relatively longer and higher head than the remaining groups. The two groups of *E. isolepis* had relatively wider heads and *E. fasciolatus* a longer snout. However, there was wide overlap among the four taxa for most of the morphological characters and relatively few characters were included in the diagnosis presented below.

In addition to the meristic and morphological differences among the taxa presented above, there were consistent differences in the scalation along the top of the fourth toe, the subdigital lamellae and plantar scales and colouration patterns which are useful to distinguish *Eremiascincus* taxa. We present details of variation in these traits in the “Comparison with other Western Australian species” section below.

***Eremiascincus musivus* sp. nov.**

Mosaic desert skink (German—Mosaik-Wüstenskink)

Figures 4–6

**Holotype.** WAM R165266<sup>m</sup> (M). Type locality: 20 km ENE Karratha at 20°47'10"S, 116°38'29"E. Collected by Roy Teale on 31 October 2005.

**Paratypes** (WAM prefixes excluded). R70927 (M)—46.5 km WSW Gorda Tower, 18°53'30"S, 123°02'30"E; R139046<sup>m</sup> (M)—Mandora 19°48'30"S, 121°27'50"E; R139083<sup>m</sup> (F)—Mandora, 19°48'44"S, 121°28'25"E; R163962 (F)—27 km NE Warrawagine Homestead, 20°47'17"S, 120°54'04"E; R165264<sup>m</sup> (M) and R165265<sup>m</sup> (F)—20 km ENE Karratha, 20°47'10"S, 116°38'29"E; R165833 (M)—10 km W Port Hedland, 20°22'47"S, 118°34'06"E; R166120<sup>m</sup> (M)—Dampier area, 20°46'49"S, 116°38'25"E; R166117<sup>m</sup> (M), R166119<sup>m</sup> (M), R166121<sup>m</sup> (F)—Dampier area, 20°46'48"S, 116°38'26"E.

**TABLE 2.** Summary of characters and ratios measured for *Eremiascincus* from Western Australia. Sample sizes are listed in column headings, unless noted for individual characters below. Mean±SD (range). For a key to the variables see Table. 1

Character	<i>E. musivus</i> sp. nov. N = 27	<i>E. fasciolatus</i> N = 35	<i>E. isolepis</i> "Pilbara" N = 25	<i>E. isolepis</i> "Kimberley" N = 31
SVL	Females (N = 10): 52.6±3.1 (48.3–56.9) Males (N = 17): 51.3±4.6 (43.9–59.2)	Females (N = 15): 65.6±5.8 (57.5–75.6) Males (N=20): 67.7±4.3 (58.5–73.9)	Females (N = 11): 57.3±2.9 (52.9–61.6) Males (N = 14): 59.5±3.8 (50.0–64.1)	Females (N = 12): 58.7±4.0 (52.5–64.4) Males (N = 19): 59.1±5.0 (49.6–67.4)
TrunkL	Females (N = 10): 27.7±2.7 (24.9–32.8) Males (N = 17): 26.0±3.4 (19.1–31.2)	Females (N = 15) 35.9±3.3 (31.4–42.8) Males (N=20) 36.2±3.4 (28.8–43.9)	Females (N = 11) 32.6±3.2 (28.6–39.8) Males (N = 14) 33.4± 2.9 (28.4–38.0)	Females (N = 12) 33.0±3.0 (28.1–37.5) Males (N = 19) 32.4±3.3 (27.5–37.5)
TailL	69.6±5.2 (58.7–79.0) N = 11	76.8±5.2 (69.0–86.0) N = 10	97.7±7.0 (86.2–107.0) N = 7	92.1±6.6 (86.0–105.7) N = 8
ArmL	14.9±0.8 (13.5–16.3)	18.4±1.2 (15.9–20.0)	13.7±0.6 (12.6–14.6)	12.5±0.7 (11.1–14.0)
LegL	21.1± 1.0 (19.1–23.1)	25.8±1.7 (22.5–29.2)	19.9±0.8 (18.2–21.1)	19.0±1.1 (16.6–21.5)
AxillaEar	9.9±1.1 (7.7–12.4)	12.3±1.2 (10.5–14.8)	10.3±0.9 (8.3–12.0)	10.9±1.1 (16.6–21.5)
HeadL 1	11.0±0.6 (10.0–12.0)	12.9±0.9 (10.9–14.3)	10.8±0.6 (9.8–11.9)	10.7±0.7 (9.5–12.2)
HeadL 2	10.3±0.6 (9.1–11.3)	12.0±0.9 (10.3–13.5)	10.1±0.4 (9.4–10.9)	10.1±0.6 (9.1–11.6)
HeadW	6.9±0.6 (5.6–8.1)	8.0±0.7 (6.4–9.2)	7.0±0.5 (6.3–8.1) N = 24	7.2±0.7 (5.8–8.7)
HeadD	4.9±0.4 (4.3–5.7)	5.6±0.5 (4.7–6.4)	4.8±4.0 (4.1–5.9)	4.8±0.5 (4.1–6.2)
SnoutL	4.6 ±0.4 (3.9–5.5)	5.6±0.5 (4.8–6.5)	4.4±0.3 (3.8–5.0)	4.4±0.4 (3.7–5.2)
FootL	9.0 ±0.6 (7.8–10.2)	11.0±0.8 (9.2–12.6)	8.5±0.5 (7.3–9.4)	8.0±0.4 (7.1–8.7)
Toe3L	4.6±0.4 (3.8–5.5)	5.5±0.4 (5.0–6.4)	4.3±0.2 (3.8–4.6)	4.0±0.3 (3.3–4.7)
Toe4L	6.3±0.4 (5.6–7.1)	7.8±0.5 (6.7–8.9)	5.9±0.2 (5.5–6.4)	5.6±0.3 (4.8–6.1)
EarL	0.8±0.1 (0.6–1.1) N = 26	0.9±0.2 (0.6–1.3) N = 32	1.1±0.2 (0.9–1.9)	1.0±0.2 (0.6–1.7)
EarH	0.8±0.2 (0.6–1.2) N = 26	0.9±0.2 (0.6–1.3) N=32	1.2±0.2 (0.9–1.9)	1.1±0.2 (0.7–1.5)
EarArea	0.5±0.1 (0.3–0.8) N = 26	0.7±0.2 (0.3–1.3) N = 32	1.0±0.4 (0.6–2.8)	0.8±0.3 (0.4–1.9)
MBSR	30.5±1.2 (29–34) N = 26	32.4±1.1 (30–35)	29.7±1.0 (28–32)	27.5±1.4 (25–30)
PVS	56.3±2.4 (52–62)	65.1±2.8 (59–69)	62.0±2.0 (59–66)	58.0±2.9 (54–67)
SupraLab	7.0±0.2 (6–7)	7.0±0.3 (6–8)	7.0±0.0 (7)	7.0±0.0 (7)

continued next page

InfraLab	6.0±0.3 (5–7)	6.3±0.5 (6–8)	5.8±0.4 (5–6)	5.9±0.4 (5–7)
4TLam	21.9±2.1 (18–26)	24.0±2.2 (20–29)	24.6±1.5 (22–27)	21.7±2.3 (18–29)
SupCil	8.4±0.7 (7–10)	8.2±0.5 (7–9)	8.0±0.2 (7–8)	7.9±0.3 (7–8)
Tail%SVL	135±11.5 (108.1–150.5) N = 11	121.4±7.2 (111.2–113.4)	170.5±5.8 (162.1–175) N = 6	158.6±5.7 (151.2–169)
ArmL/SVL	0.29±0.02 (0.25–0.31)	0.28±0.01 (0.25–0.30)	0.24±0.01 (0.22–0.27)	0.21±0.01 (0.19–0.25)
LegL/SVL	0.41±0.02 (0.38–0.45)	0.39±0.02 (0.33–0.43)	0.34±0.02 (0.32–0.39)	0.32±0.02 (0.29–0.36)
HeadL1/SVL	0.21±0.01 (0.20–0.23)	0.19±0.01 (0.18–0.21)	0.19±0.01 (0.17–0.20)	0.18±0.01 (0.17–0.20)
HeadL2/SVL	0.20±0.01 (0.19–0.22)	0.18±0.01 (0.16–0.20)	0.17±0.01 (0.16–0.20)	0.17±0.01 (0.16–0.19)
HeadW/ HeadL1	0.62±0.03 (0.54–0.68)	0.62±0.03 (0.57–0.66)	0.65±0.03 (0.59–0.70) N = 24	0.68±0.04 (0.58–0.76)
SnoutL/ HeadL1	0.42±0.03 (0.38–0.53)	0.43±0.02 (0.40–0.48)	0.41±0.02 (0.37–0.49)	0.41±0.02 (0.38–0.41)
SnoutL/ HeadL2	0.45±0.03 (0.41–0.54)	0.47±0.02 (0.43–0.51)	0.44±0.03 (0.40–0.52)	0.44±0.02 (0.39–0.50)
HeadH/ HeadW	0.72±0.05 (0.63–0.81)	0.70±0.04 (0.61–0.83)	0.68±0.04 (0.58–0.77) N = 24	0.67±0.04 (0.57–0.75)
ArmL/LegL	0.70±0.02 (0.66–0.76)	0.71±0.02 (0.66–0.76)	0.69±0.02 (0.63–0.73)	0.66±0.02 (0.61–0.72)
TrunkL/SVL	0.51±0.03 (0.42–0.58)	0.54±0.02 (0.49–0.59)	0.57±0.04 (0.53–0.75)	0.55±0.02 (0.51–0.60)

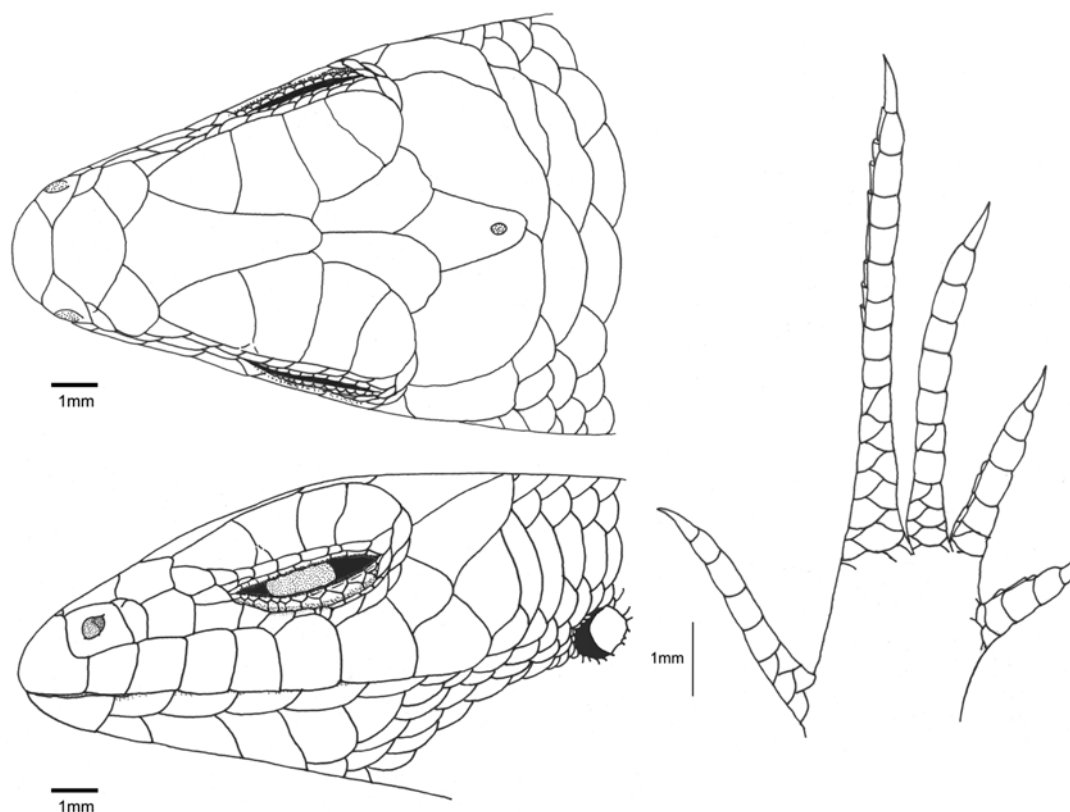
Diagnosis. A small, slender *Eremiascincus* (maximum SVL 59.2 mm), distinguished from other members of the genus by the following combination of characters: ground colour reddish to yellowish brown with a characteristic, consistent dorsal pattern of numerous whitish and dark spots often aligning to form short streaks in an irregular, diffuse reticulum; the presence of a pale vertebral stripe running from the neck to the base of tail (occasionally extending to tail); narrow, wavy, dark bands on the tail (~ 35), which are divided medially and interspaces between these dark bands, which consist of dark-edged pale scales in a single row; homogenous, smooth scales on the dorsum and tail; scales along the top of fourth toe with oblique sutures on basal quarter to third of digit, followed by single rows of scales with transverse sutures; 4TLam undivided and only feebly keeled; plantar scales 10–15; small circular ear opening; MBSR 29–34, PVS 52–62; SupraLab usually 7; 3 chin shields and 1 median chin shield.

Description. Body proportions. Head moderate, barely distinct from neck (Figs. 4, 6); external ear opening prominent, small and circular, about one-third size of eye; tympanum sunk, hardly visible; snout rounded in profile; body slender, with well-developed, overlapping, pentadactyl limbs; SVL 43.9–59.2 mm, 4.4–4.9 times HeadL1; TrunkL ~ 41–55% of SVL; ArmL ~ 25–31% of SVL and LegL ~ 38–45% of SVL; forelegs reaching the eye when adpressed; hindlimbs long, reaching beyond the middle of axilla-groin when adpressed, digits moderately long and slender; finger length: 4>3>2>5>1; toe length 4>3>5>2>1; claws strong with long sharp tip; tail round in cross-section with a very gradual taper to its pointed tip; unregenerated TailL 108–150% of SVL.

Scalation. Head scales smooth; rostral trilobed, wider than high, its part visible in dorsal view distinctly narrower than the frontonasal; nasals widely separated by the prefrontal, slightly longer than high and in broad contact with frontonasal scale; nostril positioned medially in nasal; frontonasal usually 1.4 times wider than long, laterally contacting anterior loreal; supranasals absent and nasals undivided; prefrontals large, pentagonal and separated by a medial scale; frontal shield elongate, nearly two times as long as wide, much longer and narrower than prefrontal region, in contact with frontonasal shield; supraoculars 4, first 2 on each side contacting frontal, first one usually in contact with 3 SupCil; frontoparietals paired, in contact with second, third and fourth supraoculars; interparietal 1.3–1.6 times longer than wide; about half the size of frontal, as long as frontoparietals, with light pineal organ visible in posterior lobe; parietals meeting behind interparietal, each in contact with fourth supraocular, frontoparietal, interparietal, upper secondary temporal and 1 or 2 pretemporal scales; nuchals 0–2 on each side; loreals 2; anterior loreal twice as high as long,

touching frontal and prefrontal; posterior loreal larger, slightly higher than long; preoculars 2, upper smallest; SupCil 7–10 (usually 8), in a continuous row, first largest, contacting prefrontal and first supraocular; last large and projecting medially between last supraocular and first pretemporal; presuboculars 2, second higher than long; postsuboculars usually 3; pretemporals 2, upper larger, lower vertical and about three times as high as long; lower eyelid movable and scaly; temporals 3, primary temporal 1, quadrangular and oblique; secondary temporals 2, upper secondary much longer than wide and broadly in contact with parietal, lower secondary larger than last labial shield, overlapped by posterior margin of primary temporal and in contact with vertically arranged, narrow scales posteriorly; SupraLab 6 or 7 (usually 7), fourth or fifth (usually fifth) in subocular position, slightly higher than long, last two largest, usually smaller than lower secondary temporal, last SupraLab separated from ear by 4 or 5 scales occupying a space equalling its length; postsupralabials 2; InfraLab 5–7, usually only the first infralabial in contact with postmental scale; mental shield large, wider than rostral, followed by postmental and 3 pairs of enlarged chin shields; first scale in contact, second scale separated by a single median chin shield; anterior margin of ear aperture with small granules or rudimentary lobules (4 or 5).

Body scales imbricate, 4-sided, regular and arranged in parallel longitudinal rows; dorsal scales homogeneous, smooth, polished; scales in median dorsal rows as wide as long; lateral scales smallest; 29–34 MBSR; PVS 52–62, not enlarged; limbs with smooth cycloid scales in parallel longitudinal rows; subdigital lamellae of fourth toe 18–26, feebly keeled, undivided (except basal 1–4); multiple rows of scales with oblique sutures covering the top on at least basal quarter of fourth toe, followed by scales with transverse sutures in single rows (Fig. 4); relatively small plantar scales, rounded in dorsal view, slightly raised and pointed in profile ( $12.9 \pm 1.2$ , counted in a line drawn between the basal lamella of third toe and lower imbricate scales of hindlimb,  $N = 25$ ); caudal scales larger than dorsals, two times wider than long, without ridges; a median ventral series of enlarged subcaudal scales; 4 enlarged preanal scales, median preanal scales largest, overlapping outer; 3 or 4 postanal transverse rows of smaller scales.



**FIGURE 4.** Drawings of head and dorsal scalation of the digits of the pes (left side) of holotype of *Eremiascincus musivus* sp. nov., WAM R165266.



**FIGURE 5.** Dorsum (A) and flank (B) of preserved holotype of *Eremiascincus musivus* **sp. nov.**, (WAM R165266). Total length = 138.2mm. Photograph—R. Heitzmann.

Colouration (Figs. 5, 6). In life, dorsum light yellowish or orange brown, with whitish and dark brown spots aggregated to form a diffuse reticulum; a pale vertebral stripe runs from the back of head to the base of tail; sides generally spotted with larger pale dashes; limbs yellowish or greyish brown without any pattern; tail with dark, narrow bands, which are divided medially; interspaces between bands consist of one row of dark-edged scales; some head scales with dark spots or lines, e.g. margins of supraoculars and parietals; occasionally with a dark line at the anterior border of the eye opening in subocular position; labial shields whitish, sutures edged light greyish-brown; venter, including chin and throat uniform whitish-grey to cream; plantar scales and digital lamellae slightly darker pigmented.

In preserved specimens, the colour and pattern of the dorsum and the tail is subdued; the ground colour varies from light yellowish brown to dark greyish brown; nonetheless, the typical mosaic-like dorsal colour pattern and the dark bands covering the tail remain evident; a pale vertebral stripe was evident in 89% of specimens examined (N = 27); the head scales usually show dark markings and the labial shields are edged with darker colour. The colour of the venter becomes yellowish-white.

Variation. Juveniles show the same, characteristic colour pattern. Colour variation shows some local minor individual variation, but relatively little geographic variation. Some specimens collected near Mandora (e.g. WAM R139042, R139046, R139083, R162974) differ in the intensity of dark brown or black spots and some lack darker pigments on the dorsum. In other respects (e.g. caudal colour pattern, squamation of the digits) these specimens are typical of *E. musivus*.



**FIGURE 6.** *Eremiascincus musivus* **sp. nov.** in life (paratype, adult male, WAM R166117) from Dampier area, WA. Note the mosaic-like colour pattern on the dorsum, the pale dashes on the flanks and the diffuse banding of the tail. Photograph—G. Harold.



**FIGURE 7.** Habitat of *E. musivus* **sp. nov.** 20km ENE Karratha, Pilbara coast, northern Western Australia. Sloping dune with buffel grass vegetation on red siliceous sand. Both the holotype (WAM R165266) and two paratypes (WAM R165264–5) were collected from this site. Photograph—Biota Environmental Sciences Pty Ltd.

**Details of holotype.** (WAM R156266): SVL—59.2 mm; TrunkL—31.2 mm; TailL—79 mm; ArmL—15.9 mm; LegL—22.2 mm; AxillaEar—10.8 mm; HeadL1—11.8 mm; HeadL2—11 mm; HeadW—7.5 mm; HeadH—5.2 mm; SnoutL—4.9 mm; FootL—9 mm; Toe3L—4.5 mm; Toe4L—6.1 mm; EarL—0.9 mm; EarH—1.1 mm; MBSR—29; PVS—52; SupLab—7; InfraLab—6; 4TLam—21; SupCil—9; Nuchals—1; Prefrontals separated.

**Distribution.** This species has been found in desert habitats, buffel- and spinifex grassland and low shrub land of the Pilbara Coast, Dampierland and the Great Sandy Desert of Western Australia, where it is sympatric with *E. fasciolatus*, *E. richardsonii* and *E. isolepis* (Fig. 3). The area of distribution extends from the Dampier area (21°S; 116°E) along the coast to Mandora (ca. 19–20°S; 121°E). Although most specimens of *E. musivus* have been collected in coastal areas of the Pilbara region and Dampierland, the species' distribution extends to the northern parts of the Great Sandy Desert (19°S; 123°E) with the easternmost record from the St. George Ranges (18°S; 125°E). The new species likely ranges over much of the northern Great Sandy Desert. However, the coastal area of distribution of *E. musivus* appears to be unique among lizards reported from that area.

Habitat preferences, reproduction and behaviour. The new species is abundant in microhabitats with both loose and hard soil with dense to scattered spinifex (*Triodia*) and buffel grass (*Chenchrus*) cover and low shrubs (Fig. 7). Some specimens were collected on dunes and sandridges with orange to red siliceous sand. Individuals of *E. musivus* have also been observed in low woodlands of *Eucalyptus*, *Grevillea* and *Acacia*. Some morphological characters, however, such as a small circular ear opening, indicate that the species presumably is fossorial (see also Greer 2002). Examination of gut contents indicated that individuals feed on invertebrates and small lizards. Cannibalism also occurs, as a preserved specimen had a smaller conspecific in its gut.

*Eremiascincus musivus* matures at a SVL of approximately 49 mm. Females are oviparous and vitellogenesis begins in spring, between September and October, based on the presence of enlarged follicles during this period. The appearance of enlarged testes in males coincides with the appearance of follicles in females. Oviposition presumably takes place until late summer. One female collected in mid-February contained three shelled oviducal eggs that were ~ 6 mm in diameter. The timing of reproduction in *E. musivus* appears to be similar to that recorded for other congeners inhabiting the Australian arid zones (James *et al.* 1991). Like its congeners, the new species is most likely crepuscular or nocturnal, and one specimen was collected at night on a road. However, little is known about the ecology of the species at present.

**Comparisons with other Western Australian species.** *Eremiascincus musivus* is distinguished from the sympatric congeners *E. isolepis* and the allopatric *E. brongersmai* by scales along the top of the fourth toe in multiple rows with oblique sutures along basal quarter or third of digit, followed by more than five single scales with transverse sutures (only distal 1–3 scales in *E. isolepis* and *E. brongersmai* have transverse sutures), 4TLam undivided along almost entire digit and only feebly keeled, while at least divided along basal quarter of digit and strongly keeled or callused in both other taxa, a slightly depressed snout and a small circular ear opening. The new species also differs from the larger, sympatric *E. richardsonii* in having undivided subdigital lamellae and a small circular ear opening. In addition, *E. richardsonii* has a dorsal pattern consisting of sharply defined, dark brown bands across the body instead of numerous pale and dark spots, divided, dark callused subdigital lamellae, a large subcircular or elliptical ear aperture and is furthermore characterised in usually having four chin- and two median chin shields (96% of *E. richardsonii* examined for this study had four chin shields on both sides of the head and 80% had two median chin shields; N = 25). *E. isolepis* usually has a heavily speckled dark brown lateral zone and speckled hindlimbs, both of which are absent in *E. musivus*. The larger *E. brongersmai* has a sharply defined solid dark dorsolateral streak at the anterior part of the body, dark spots on the limbs, which align longitudinally and 6 SupraLab instead of 7. Both *E. isolepis* and *E. brongersmai* also share a colour pattern in which dark banding on the tail is absent. The new species differs from the sympatric *E. fasciolatus* by fewer PVS (52–62 versus 59–69), a lower number of plantar scales ( $12.9 \pm 1.2$ , range 10–15 in *E. musivus*, N = 25 versus  $16.0 \pm 0.9$ , range 14–18 in *E. fasciolatus*, N = 20); smooth supracaudal scales instead of keeled scales, scales along the top of the fourth toe

in multiple rows with oblique sutures along basal quarter or third of digit (instead of single rows with transverse sutures along almost entire digit) and smaller body size. *Eremiascincus musivus* shows some morphological similarities with *E. fasciolatus*. The two species are desert inhabiting and show similar morphological and ecological characteristics. The fingers and toes of both taxa are covered with a higher number of single rows of scales than in the more mesic taxa and the lamellae are undivided and only feebly keeled, which may reduce contact with the sandy ground. The snout is somewhat depressed and the ear opening is small and almost circular. However, *E. fasciolatus* lacks an obvious dorsal colouration of dark and pale blotches and a pale vertebral stripe. In addition, the dark bands on the tail are more sharply defined and perfectly transverse in *E. fasciolatus*, while medially divided and more diffuse in *E. musivus*. In *E. musivus*, the sides are spotted with white dashes and the sutures between the supralabials are edged with light greyish or reddish-brown, in contrast to *E. fasciolatus*. The new species has a smaller mean adult SVL than *E. fasciolatus* and *E. isolepis*, both in males and females and a relatively longer tail than *E. fasciolatus* (Table 2).

**Etymology.** The specific epithet (from Latin, meaning ‘tessellated’) refers to the unique dorsal colour pattern formed by numerous whitish and dark spots. Used as a noun in apposition.

## Acknowledgments

The CERF funded Taxonomic Research Information Network and Pilbara Iron supported the molecular genetic analyses. We thank Ralph Foster, Terry Bertozzi, Duncan Taylor and Leanne Wheaton (SAMA) for the sequencing, Ross Sadlier (AMS), Patrick Couper (QM), and Mark Hutchinson (SAMA) for supplying samples; Benlui Heitzmann (photographer), Greg Harold and Dan Kamien (Biota Environmental Consultants) for the photographs; Claire Stevenson (WAM) for the maps; Peter Kendrick (Department of Environment and Conservation) and Greg Harold, Dan Kamien and Roy Teale (Biota Environmental Consultants) for details of habitat and specimen collection; Glenn Shea (University of Sydney) for useful comments on terminology; Glenn Shea, Brad Maryan (WAM) and a reviewer for critical comments on the manuscript.

## References

- Aplin K.P., How, R.A. & Boeadi (1993) A new species of the *Glaphyromorphus isolepis* species-group (Lacertilia Scincidae) From Sumba Island, Indonesia. *Records of the Western Australian Museum*, 16, 235–242.
- Boulenger, G.A. (1887) *Catalogue of the lizards in the British Museum (Nat. Hist.) III. Lacertidae, Gerrhosauridae, Scincidae, Anelytropsidae, Dibamidae, Chamaeleontidae*. London, 575 pp.
- Choquentot, D. & Greer, A.E. (1989) Intra-populational and interspecific variation in digital limb bones and presacral vertebrae of the genus *Hemiergus* (Lacertilia, Scincidae). *Journal of Herpetology*, 23, 274–281.
- Cogger, H., Cameron, E.E. & Cogger, H.M. (1983) Scincidae. In: Walton, D.W. (Eds.), *Zoological Catalogue of Australia. Vol. 1. Amphibia and Reptilia*. Netley, South Australia, Griffin Press Ltd., 135–193.
- Cogger, H.G. (2000) *Reptiles and amphibians of Australia* (6<sup>th</sup> edition). Ralph Curtis Publishing, Sanibel Island, Florida, 808 pp.
- Cuvier, G. J. L. N. F. D. (1829). *Le Règne Animal Distribué, d'après son Organisation, pur servir de base à l'Histoire naturelle des Animaux et d'introduction à l'Anatomie Comparée. Vol. 2. Les Reptiles*. Déterville, Paris, i-xvi, 406pp.
- Coventry, A.J. (1976) A new species of *Hemiergus* (Scincidae: Lygosominae) from Victoria. *Memoirs of the National Museum. Victoria*, 37, 23–26.
- de Queiroz, A., Lawson, R. & Lemos-Espinal, J.A. (2002) Phylogenetic relationships of North American garter snakes (*Thamnophis*) based on four mitochondrial genes: how much DNA sequence is enough? *Molecular Phylogenetics and Evolution* 22, 315–329.
- Duméril, A.M.C. & Bibron, G. (1839). *Erpétologie Générale ou Histoire Naturelle Complète des Reptiles*. Vol.5. Roret/Fain et Thunot, Paris, 871 pp.
- Duméril, A.M.C. & Duméril, A.H.A. (1851) *Catalogue méthodique de la collection des reptiles du Muséum d'Histoire Naturelle de Paris*. Gide et Baudry/Roret, Paris, 224 pp.
- Gray, J.E. (1845) *Catalogue of the specimens of lizards in the collection of the British Museum*. Trustees of the British Museum/Edward Newman, London: xxvii + 289 pp.



- Greer, A.E. & Parker, F. (1974) The *fasciatus* species group of *Sphenomorphus* (Lacertilia: Scincidae): notes on eight previously described species and descriptions of three new species. *Papua and New Guinea Scientific Society Proceedings*, 25, 31–61.
- Greer, A.E. (1979a) *Eremiascincus*, a new generic name for some Australian sand swimming skinks (Lacertilia: Scincidae). *Records of the Australian Museum*, 32, 321–338.
- Greer, A.E. (1979b) A phylogenetic subdivision of Australian skinks. *Records of the Australian Museum*, 32, 339–371.
- Greer, A.E. (1979c) A new *Sphenomorphus* (Lacertilia: Scincidae) from the rainforests of northeastern Queensland. *Records of the Australian Museum*, 32, 373–382.
- Greer, A.E. (1985) A new species of *Sphenomorphus* from northeastern Queensland. *Journal of Herpetology*, 19, 469–473.
- Greer, A.E. (1987). Limb reduction in the lizard genus *Lerista*. 1. Variation in the number of phalanges and presacral vertebrae. *Journal of Herpetology* 21(4), 267–276.
- Greer, A.E. (1989) *The biology and evolution of Australian lizards*. Surrey Beatty and Sons, Chipping Norton, NSW, 264 pp.
- Greer A.E. (1990) The *Glaphyromorphus isolepis* species group (Lacertilia: Scincidae): diagnosis of the taxon and description of a new species from Timor. *Journal of Herpetology*, 24, 372–377.
- Greer A.E. (2002). The Loss of the External Ear Opening in Scincid Lizards. *Journal of Herpetology*, 36(4), 544–555.
- Günther, A. (1867) Additions to the knowledge of Australian reptiles and fishes. *Annals and Magazine of Natural History*, 20(3), 45–57.
- Günther, A. (1875) A list of the saurians of Australia and New Zealand. In: Richardson, J., and J. E. Gray (Eds.), *The zoology of the voyage of H.M.S. Erebus and Terror, under the command of Captain Sir James Clark Ross, during the years 1839 to 1843. By authority of the Lords Commissioners of the Admiralty*. Vol. 2., Rept E. W. Janson, London, pp. 9–19.
- Hoskin, C.J. & Couper P.J. (2004) A new species of *Glaphyromorphus* (Reptilia: Scincidae) from Mt Elliot, northeastern Queensland. *Australian Journal of Zoology* 52, 183–190.
- Hutchinson, M.N. & Donnellan, S.C. (1993) Biogeography and phylogeny of the Squamata. In: Glasby, C.J., Ross, G.J.B. and Beesley, P.L. (Eds.), *Fauna of Australia. Vol. 2A. Amphibia and Reptilia*. Australian Government Publishing Service, Canberra, ACT, Australia, pp. 210–220.
- Hutchinson, M.N. (1993) Family Scincidae. In: Glasby, C.J., Ross, G.J.B. and Beesley, P.L. (Eds.), *Fauna of Australia. Vol. 2A. Amphibia and Reptilia*. Australian Government Publishing Service, Canberra, ACT, Australia, pp. 261–279.
- James, C.D. & Losos, J.B. (1991) Diet and reproductive biology of the Australian sand-swimming lizards, *Eremiascincus* (Scincidae). *Wildlife Research*, 18, 641–654.
- Lidith de Jeude, T.W. van. (1895) Reptiles from Timor and the neighbouring islands. *Notes from the Leyden Museum*, 16, 119–127.
- Lönnerberg, E. & Andersson, G.L. (1915) Results of Dr. E. Mjöberg's Swedish scientific expeditions to Australia 1910–1913. VII. Reptiles collected in northern Queensland. *Kungliga Svenska Vetenskapsakademies Handlingar*, 52(7), 1–9.
- Macleay, W. (1877) The lizards of the “Chevert” Expedition. *Proceedings of the Linnean Society of New South Wales*, 2, 60–69; 97–104.
- Moritz, C., Schneider, C.J. & Wake, D.B. (1992) Evolutionary relationships within the *Ensatina eschscholtzi* complex confirm the ring species interpretation. *Systematic Zoology* 41, 273–291.
- Peters, W.C.H. (1871) Über einige Arten der herpetologischen Sammlung des Berliner zoologischen Museums. *Monatsberichte der Preussischen Akademie der Wissenschaften zu Berlin*, 1871, 644–652.
- Pianka, E.R. & Vitt, L.J. 2003. *Lizards - Windows to the Evolution of Diversity*. University of California Press, Berkeley, 347 pp.
- Rabosky, D.L., Donnellan, S.C., Talaba, A.L. & Lovette, I.J. (2007) Exceptional among-lineage variation in diversification rates during the radiation of Australia's largest vertebrate clade. *Proceedings of the Royal Society of London*, B 274, 2915–2923.
- Rankin, P.R. (1978) Notes on the biology of the skink *Sphenomorphus pardalis* (Macleay) including a captive breeding record. *Herpetofauna* (Sydney), 10, 4–7.
- Reeder, T.W. (2003) A phylogeny of the Australian *Sphenomorphus* group (Scincidae: Squamata) and the phylogenetic placement of the crocodile skinks (*Tribolonotus*): A Bayesian approaches to assessing congruence and obtaining confidence in maximum likelihood inferred relationships. *Molecular Phylogenetics and Evolution*, 27, 384–397.
- Romer, A.S. (1956). *Osteology of the Reptilia*. Chicago University Press, Chicago, 793 pp.
- Skinner, A. (2007) Phylogenetic relationships and rate of early diversification of Australian *Sphenomorphus* group scincids (Scincoidea, Squamata). *Biological Journal of the Linnean Society*, 92, 347–366.
- Smith, M.A. (1927) Contribution to the herpetology of the Indo-Australian Region. *Proceedings of the Royal Society of London*, 1, 199–225.
- Steindachner, F. (1870) Herpetologische Notizen (II). Reptilien gesammelt während einer Reise in Sengambien.

*Sitzungsberichten der Kaiserlichen Akademie der Wissenschaften in Wien*, 62, 326–348.

- Storr, G.M. (1967) The genus *Sphenomorphus* (Lacertilia, Scincidae) in Western Australia and the Northern Territory. *Journal of the Royal Society of Western Australia*, 50, 10–20.
- Storr, G.M. (1972) Revisionary notes on the *Sphenomorphus isolepis* complex (Lacertilia, Scincidae). *Zoologische Mededelingen*, 47, 1–5.
- Storr, G.M. (1974) Revision of the *Sphenomorphus richardsonii* species-group (Lacertilia: Scincidae). *Records of the Western Australian Museum*, 3, 66–70.
- Storr, G.M., Smith, L.A. & Johnstone, R.E. (1999) *Lizards of Western Australia. I Skinks*. Western Australian Museum, WA, Australia, 291 pp.
- Wagler, J.G. (1830). *Natürliches System der Amphibien, mit vorangehender Classification der Säugetiere und Vögel. Ein Beitrag zur vergleichenden Zoologie*. Cotta'sche Buchhandlung, München, Stuttgart und Tübingen, 354 pp.
- Wells, R.W. & Wellington, C.R. (1983) A synopsis of the class Reptilia in Australia. *Australian Journal of Herpetology* 1(3–4), 95–96.
- Wells, R.W. & Wellington, C.R. (1985) A classification of the Amphibia and Reptilia of Australia. *Australian Journal of Herpetology*, Supplementary Series (1), 33.
- Wilson, S.K. & Swan, G. (2008). *A complete guide to reptiles of Australia*. Reed New Holland: Sydney, NSW, 480 pp.

**APPENDIX 1.** Specimens examined for morphological and molecular genetic analysis.

<sup>M</sup> —used for molecular analysis only, <sup>m</sup> —used for morphological and molecular analyses, unmarked voucher examined for morphology only. All vouchers are from the Western Australian Museum (WAM) unless indicated otherwise: AMS—Australian Museum, Sydney; NTM—Northern Territory Art Gallery and Museum, Darwin; QM—Queensland Museum, Brisbane; SAMA—South Australian Museum, Adelaide. (M)—Male, (F)—Female.

*Eremiascincus antoniorum*. R106432<sup>M</sup> (unsexed), R106465<sup>M</sup> (unsexed), R106500 (M), R106547 (M), R106603 (M), R106609 (M), R106614 (F), R106617 (M), R106662 (M), R106775 (F), R107384 (M), R107388 (M)—Nenas, Timor, 9°33'00"S, 124°13'00"E; R106783 (F)—Lelofui, Timor, 9°32'00"S, 124°14'00"E.

*Eremiascincus brongersmai*. R27879 (M), R34707 (F) (**Holotype**)—Kalumburu, 14°18'00"S, 126°38'00"E; R77112 (M), R77131 (M)—Mitchell Plateau, 14°52'05"S, 125°49'45"E; R77217 (F)—Camp Creek, Mitchell Plateau, 14°49'00"S, 125°50'00"E; R77365 (M)—Mitchell Plateau, 14°53'00"S, 125°47'00"E; R77374 (M), R77377 (M)—Mitchell Plateau, 14°52'00"S, 125°49'00"E; R77420 (F)—Mitchell Plateau, 14°52'00"S, 125°49'00"E; R138136 (M)—Kalumburu, 14°18'00"S, 126°39'00"E; R163567<sup>m</sup> (M)—Anjo Peninsula, 14°05'13"S, 126°26'30"E.

*Eremiascincus butlerorum*. R101829<sup>m</sup> (F) (**Holotype**), R101860<sup>m</sup> (F), R101908 (F)—Ngallu, Sumba Island - 10°06'30"S, 120°41'30"E.

*Eremiascincus douglasi*. NTM R20958-9<sup>M</sup> (unsexed), 21043-4<sup>M</sup> (unsexed)—Black Point, NT; NTM R21081<sup>M</sup> (unsexed)—Smith Point; R23288 (F)—56km SE Darwin, 12°45'00"S, 131°06'00"E; R23296 (M)—Berry Springs, 12°42'00"S, 130°58'00"E; R23446 (M) (**Holotype**)—East Point, Darwin, 12°25'00"S, 130°49'00"E; R23447 (F)—Darwin, 12°27'00"S, 130°50'00"E; R23582 (F)—12 min SE Darwin, 12°45'00"S, 131°06'00"E; R23618 (M), R23619-20 (F)—Howard Springs, 12°27'00"S, 131°03'00"E; R23754 (M)—27km E Darwin, 12°31'00"S, 131°02'00"E.

*Eremiascincus emigrans*. R101894 (M), R101895<sup>M</sup> (unsexed), R101896 (F), R101897<sup>m</sup> (M), R101898 (F), R101990 (F)—Ngallu, Sumba Island, 10°06'30"S, 120°41'30"E.

*Eremiascincus fasciolatus*. R61420 (F)—Vlaming Head, 21°48'00"S, 114°06'00"E; R119950<sup>m</sup> (F)—Nifty Mine Site, ca. 40km E Woodie Woodie Mine, 21°40'00"S, 121°35'00"E; R132453<sup>m</sup> (F), R132454 (M)—2km W Bullara, 22°41'00"S, 114°01'00"E; R134384 (M)—Lake Mackay, 22°26'47"S, 128°17'33"E; R136287<sup>m</sup> (M)—Muggon Station, 26°49'08"S, 115°32'06"E; R139445<sup>m</sup> (M)—Cane River, 22°15'55"S, 115°35'19"E; R156823 (F), R156824 (M), R156825 (M)—Port Hedland area, 20°21'15"S, 118°42'04"E; R157283<sup>m</sup> (M)—Yanrey Station, 22°12'24"S, 114°37'22"E; R158473<sup>m</sup> (F)—Giralia Station, 22°53'13"S, 114°33'26"E; R160001 (F)—12km S Whim Creek Hotel, 20°56'59"S, 117°50'59"E; R161696 (F)—43km NNW Goldsworthy, 19°59'54"S, 119°21'31"E; R163374 (F)—Neale Junction Nature Reserve, 28°06'09"S, 125°57'31"E; R1163375 (F)—Neale Junction Nature Reserve, 28°21'26"S, 125°47'23"E; R163378 (M)—Neale Junction Nature Reserve, 28°18'09"S, 125°48'58"E; R164168-69 (M)—Salt Creek Mine, 20°45'04"S, 117°43'42"E; R164259 (F), R164295 (M)—Mina Mina Clutterbuck Hills, Gibson Desert, 24°31'02"S, 126°13'04"E; R164333 (M)—Cape Lambert, 20°36'27"S, 117°09'40"E; R164333 (M)—Cape Lambert, 20°34'04"S, 117°42'00"E; R166370 (M), R166371 (F), R166372 (M), R166373 (F)—5.3km SSE Pungkulpirri, 24°42'26"S, 128°45'37"E; R166374 (M), R166375-76(F), R166378-80 (M)—18.5km ENE Blackstone, 25°55'50"S, 128°27'09"E; R166630 (F)—Mons Cupri Mine, 20°51'26"S, 117°50'03"E; R166643 (M)—Mons Cupri Mine, 20°50'59"S, 117°50'22"E.

*Eremiascincus isolepis* (**Pilbara**). R45075 (M)—10min N Tambrey, 21°30'00"S, 117°36'00"E; R61566 (F)—Myaree

Pool Maitland River, 20°53'00"S, 116°37'00"E; R76419 (F)—7km NW Cooya, 21°07'00"S, 117°07'00"E; R83218 (F)—41km SE Karratha, 20°59'00"S, 117°06'00"E; R84843 (M), R84844 (F)—Dampier area, 20°33'00"S, 116°42'00"E; R102603 (M)—Millstream, 21°34'41"S, 117°03'54"E; R110549-51 (M)—2.1km NNE Millstream, 21°34'38"S, 117°03'44"E; R110552-54 (M)—2.6km NNE Millstream, 21°34'16"S, 117°03'22"E; R110820 (F)—27.4km Pannawonica, 21°52'38"S, 116°22'08"E; R110875 (F)—51.7km W Pannawonica, 21°39'49"S, 115°49'09"E; R113231 (F), R113262 (M)—Junction of Jimmawurrada Creek, 21°44'00"S, 116°15'00"E; R132597<sup>m</sup> (F)—Burrup Peninsula, 20°31'54"S, 116°47'41"E; R135278-79 (F), R135280 (M)—Cape Lambert, 20°48'36"S, 116°56'31"E; R139169 (F)—Burrup Peninsula, 20°39'00"S, 116°46'00"E; R 140309<sup>M</sup> (unsexed)—Millstream-Chichester National Park, 21°10'53"S, 117°03'28"E; R140371 (M)—Millstream-Chichester National Park, 21°10'53"S, 117°03'28"E; R157220<sup>M</sup> (unsexed)—Hope Island, 22°10'00"S, 114°28'28"E; R158292<sup>M</sup> (F)—Yanrey Station, 22°10'44"S, 114°28'46"E; R164562 (M)—11km ESE Mt. Dempster, 21°50'34"S, 116°21'11"E; R170676 (M)—11km SW Pannawonica, 21°43'12"S, 116°13'10"E.

***Eremiascincus isolepis* (Kimberley)**. R20330 (F)—Derby, 17°18'00"S, 123°37'00"E; R51209 (M)—Kimbolton Spring, 16°38'00"S, 123°43'00"E; R54154 (F)—Logues Spring Edgar Ranges, 18°25'00"S, 123°05'00"E; R58599 (F)—Oobagooma HS, 16°46'00"S, 124°00'00"E; R59002 (F)—Anna Plains HS, 19°15'00"S, 121°29'00"E; R70535 (M)—7.5km E Mt North, 17°31'00"S, 124°53'00"E; R83894 (M)—Calder River, 7km Mt Dalglish, 16°22'00"S, 124°57'00"E; R87359 (M)—Cable Beach Broome, 17°56'00"S, 122°13'00"E; R100460 (F)—Point Springs, 15°24'30"S, 128°53'00"E; R101360 (F)—Kunnunurra, 15°46'00"S, 128°44'00"E; R113323 (M)—Frazier Downs, 18°48'00"S, 121°43'00"E; R114237-38 (M)—Cape Leveque, 16°24'00"S, 122°56'00"E; R115761 (F)—18km ENE Knob Hill, 14°48'20"S, 128°39'00"E; R119509 (M)—Mirima National Park, 15°45'16"S, 128°47'06"E; R126047 (M)—ca. 30km ENE Point Spring Yard, 15°21'40"S, 129°07'48"E; R132781<sup>m</sup> (M) Carlton Hill, 14°53'45"S, 128°33'55"E; R139054-55 (M)—Mandora, Fern Swamp, 19°46'06"S, 121°23'34"E; R139061 (M), R139066<sup>m</sup> (F). R139079<sup>m</sup> (F)—Mandora, 19°47'52"S, 121°26'52"E; R139082 (M)—Mandora, 19°47'52"S, 121°26'53"E; R139090<sup>m</sup> (F)—Mandora, 19°45'16"S, 121°26'59"E; R139116 (M)—Mandora, 19°47'50"S, 121°26'57"E; R141501 (F)—Port Smith, 18°30'50"S, 121°48'23"E; R145892 (F)—Kingston Rest, 16°02'00"S, 128°24'00"E; R146028 (M)—Kimbolton Homestead, 16°41'14"S, 123°50'09"E; R146036 (M)—Kimbolton Homestead, 16°41'12"S, 123°50'09"E; R164598 (M)—Broome area, 17°57'00"S, 122°13'00"E; R164599 (M)—Broome area, 17°52'36"S, 122°20'23"E.

***Eremiascincus musivus* sp. nov.** R70915 (M)—48km WSW Gorda Tower, 18°54'30"S, 123°02'00"E; R70925 (F)—46.5km WSW Gorda Tower, 18°53'30"S, 123°02'30"E; R 70934 (M)—40km WSW Gorda Tower, 18°48'50"S, 123°05'00"E; R 88624 (F), R88625 (M)—55km S Anna Plains, 19°42'00"S, 121°32'00"E; R135896<sup>m</sup> (F)—10km SSW Mandora, 19°49'00"S, 120°48'00"E; R139042<sup>m</sup> (M)—Mandora, 19°48'30"S, 121°27'50"E; R139095 (M)—Mandora, 19°48'44"S, 121°28'25"E; R154535<sup>m</sup> (F)—Goldsworthy-Shay Gap Road, 20°26'16"S, 120°09'33"E; R162974 (M), R162976 (M)—Mandora Station, 19°44'00"S, 120°50'00"E; R163913 (F), R163917<sup>m</sup> (M), R163938 (M)—43km E Goldsworthy, 20°22'25"S, 119°55'57"E; R163962 (F)—27km NE Warrawagine, 20°42'17"S, 120°54'04"E; R166116<sup>m</sup> (M)—Dampier area, 20°46'48"S, 116°38'26"E. **Juveniles** (unsexed). R161486<sup>m</sup>—23km NE Warrawagine Homestead, 20°41'54"S, 120°51'23"E; R163947<sup>m</sup>—27km NE Warrawagine Homestead, 20°42'17"S, 120°54'04"E; R166118<sup>m</sup>—Dampier area, 20°46'49"S, 116°38'26"E.

***Eremiascincus pardalis***. QM J62428<sup>M</sup>—Wakooka Outstation, Qld.

***Eremiascincus richardsonii***. R97728<sup>m</sup> (F)—Curbur, 31°16'00"S, 115°56'00"E; R103906 (M)—31km NNW Coolgardie 30°42'00"S, 121°04'00"E; R102773 (M)—Little Sandy Desert, 24°34'30"S, 120°18'28"E; R110102 (M), R110134 (F)—Mt Florance Homestead, 21°47'00"S, 117°52'00"E; R110756 (F)—Jimblebar East, 23°27'27"S, 120°19'21"E; R120128 (M)—119.9km ENE Laverton, 27°55'00"S, 123°15'00"E; R135365 (M)—Mt. Brockman, 22°17'22"S, 117°16'23"E; R136450 (M)—Yuinmery Homestead, 28°34'00"S, 119°01'00"E; R136671 (M)—Lake Mason Station, 27°42'51"S, 119°36'16"E; R 138112 (M)—Plumridge Lake Nature Reserve, 29°69'00"S, 125°17'00"E; R139310 (F)—Old Meentheena Homestead, 21°15'59"S, 120°27'19"E; R144569<sup>m</sup> (F)—Mt. Jackson, 30°14'59"S, 119°14'19"E; R151414 (F)—Bulga Downs Station, 28°39'59"S, 119°54'29"E; R153973 (M)—Bindoon Military Training Area, 31°10'58"S, 116°18'26"E; R154526 (M)—Goldsworthy-Shay Gap Road, 20°20'43"S, 119°43'25"E; R154562 (M)—Wheellarra Hill, 23°23'22"S, 120°09'41"E; R156160<sup>m</sup> (M)—Waldburg Station, 24°45'00"S, 117°22'00"E; R156843 (M)—Mungilli Outstation, 25°14'57"S, 124°17'53"E; R156844 (M)—31km NNW Empress Spring, 26°33'47"S, 124°13'38"E; R163152 (F)—Lake Maitland, 27°07'02"S, 121°03'26"E; R164117 (M)—250km NNW Newman, 20°31'00"S, 119°02'00"E; R165711 (F)—Jack Hills, 26°02'42"S, 117°14'24"E; R165725 (F)—21.8km W Lake Way, 26°58'52"S, 120°41'00"E; R165786 (F)—Barrow Island, 20°48'00"S, 115°23'00"E.

***Eremiascincus timorensis***. R106466<sup>m</sup> (M), R106477 (F), R106495 (F), R106496 (M), R106499 (F), R106605<sup>m</sup> (F), R106675 (F), R107400 (F), R107402 (F), R107403 (M), R107406 (M)—Timor, Indonesia, 9°33'00"S, 124°13'00"E.

***Glaphyromorphus cracens***. SAMAR55805<sup>M</sup>, 55812<sup>M</sup>—35km E Mt Surprise on Gulf Developmental Road.

***Glaphyromorphus crassicaudis***. NTM R19119<sup>M</sup>—Raragala Island; R24889-91 (F), R24893-94 (M), R24980 (M)

- (**Neotype**), R24985 (F), R24994 (F), R24995 (F)—Yirrkala, 12°15'00"S, 136°52'00"E.
- Glaphyromorphus darwiniensis***. NTM R21755<sup>M</sup> Litchfield National Park, NT; R23624 (F) (Holotype)—Howard Springs, 24km E Darwin, 12°28'00"S, 131°03'00"E; R24000 (M)—Snake Creek, 11km N Adelaide River, 13°10'00"S, 131°06'00"E; R113955-57 (F)—Darwin, 12°27'00"S, 130°50'00"E; R129940 (M)—10km N Kalumburu, 1412'00"S, 126°38'00"E.
- Glaphyromorphus fuscicaudis***. QM J60623<sup>M</sup> Mt Hartley, Qld.
- Glaphyromorphus mjobergi***. QM J48381<sup>M</sup> Majors Mount, Qld.
- Glaphyromorphus nigricaudis***. SAMA R55840<sup>M</sup> 25km N Mossman, Qld; QM J51110<sup>M</sup> Cape Flattery, Qld; R57633 (M)—Papua New Guinea, collection locality unknown.
- Glaphyromorphus pumilus***. AMS R94572<sup>M</sup> near Mareeba, Qld.
- Glaphyromorphus punctulatus***. AMS R115264<sup>M</sup> Mt Morgan, Qld; R55500-04 (F), R55505 (M), R55506 (F)—Townsville, 19°15'00"S, 146°48'00"E.
- Hemiergus decresiensis***. SAMA R54053<sup>M</sup> 7km SW Port Pirie; R24746 (M)—Alexandra, 37°12'00"S, 145°43'00"E; R27276-77 (M)—Mannum, 34°55'00"S, 139°18'00"E; R27279 (F), R27280 (M)—Mannum, 34°55'00"S, 139°12'00"E; R27296 (F), R27297-98 (M)—Mt. Lofty, 34°57'00"S, 138°43'00"E; R61611 (M), 61612 (F), 61213 (M)—Sherbrooke Forest Park, 37°50'00"S, 145°20'00"E; R101428 (M)—Horsnell Gully, 34°56'00"S, 138°43'00"E.
- Hemiergus gracilipes***. SAMA R23027<sup>M</sup> 18km W Denmark; R116935-36 (F)—Capel, 33°37'00"S, 115°38'00"E; R119725 (M)—Hamel, - 32°53'00"S, 115°59'00"E; R129639 (F)—Lake Jasper, 34°22'40"S, 115°38'14"E; R129675 (M)—Denmark, 34°51'00"S, 117°21'00"E; R131277 (M)—Big Swamp, 33°19'00"S, 115°37'00"E; R144183 (F)—Collie, 33°22'03"S, 116°13'49"E; R144367-68 (M)—Walpole, 34°56'16"S, 116°56'55"E; R163139 (M)—Albany, 35°03'07"S, 117°45'57"E; R163410 (F), R163141 (M)—Albany, 35°03'05"S, 117°45'38"E.
- Hemiergus initialis***. SAMA R54278<sup>M</sup> 30km N Ceduna SA; R89480 (M)—Gordon Inlet, 34°17'00"S, 119°28'00"E; R93116 (F)—Mt. Cooke, 32°25'00"S, 116°18'00"E; R100553 (M)—Darling Range, 31°46'00"S, 116°07'00"E; R121362-64 (F)—Bungendore Park, 32°11'00"S, 116°02'00"E; R126348 (M)—Aurora Range, 30°20'41"S, 119°40'42"E; R126382 (M)—Aurora Range, 30°18'17"S, 119°42'54"E; R144233 (M)—Bandalup Hill, 33°39'42"S, 120°23'43"E; R144709 (F)—Bungalbin Hill, 30°21'00"S, 119°42'00"E; R151115 (F)—Eyre Bird Observatory, 32°13'28"S, 126°18'10"E; R154216 (F)—Kundip, 33°40'44"S, 120°11'27"E; R154218-19 (F), R154439 (F) , R154440 (M)—Kundip, 33°41'16"S, 120°11'52"E; R156275 (F)—Holt Rock, 32°25'14"S, 119°43'45"E; R156625 (M), R156629-30 (F)—Roleystone, 32°07'00"S, 116°04'00"E; R157871 (M)—Balladonia Roadhouse, 32°07'15"S, 123°09'58"E; R157879 (M), R157880-81 (F) - Balladonia Roadhouse, 32°11'50"S, 123°11'09"E; R157904-05 (F)—Balladonia Roadhouse, 32°22'45"S, 123°40'05"E; R157926 (F)—Balladonia Roadhouse, 32°15'23"S, 123°11'06"E.
- Hemiergus millewae***. SAMA R37963<sup>M</sup> 2.5km NW Iron Chieftain SA; R112660 (M), R112661 (F)—Buningonia Spring, 31°20'30"S, 123°37'00"E; R112662-64 (M)—Buningonia Spring, 31°26'20"S, 123°32'10"E.
- Hemiergus peronii***. SAMA R54690<sup>M</sup> Point Jarrold SA, SAMA R21723<sup>M</sup> East Franklin Island SA, R90251 (F)—Crusoe Island, 34°59'10"S, 117°25'40"E; R100556 (F)—Donnybrook, 33°32'00"S, 115°56'00"E; R103718 (F)—NW of Nannup, 33°59'00"S, 115°45'00"E; R106085 (F)—Bridgetown, 33°58'00"S, 116°08'00"E; R106288 (M)—Crossing Rock, 34°46'59"S, 119°52'50"E; R113286 (F), R113331 (F), 113334 (F), 113342-43 (F) R113345-46 (F), R113349 (F), R113353 (F), R113357 (M), R113358 (F), 113360-62 (F),—Margaret River, 33°59'00"S, 115°07'00"E; R115319 (F)—Manjimup, 34°18'00"S, 34°18'00"S; R140924 (F)—Peak Eleanora, 33°10'00"S, 121°16'00"E; R154201 (F)—Kundip, 33°41'02"S, 120°12'14"E; R154202-03 (M) R154204-07 (F)—Kundip, 33°40'19"S, 120°12'00"E.
- Hemiergus quadrilineata***. R82992 (F)—Scarborough, 31°53'00"S, 115°46'00"E; R90960 (F)—Bold Park, 31°56'33"S, 115°46'13"E; R115080 (F), R115081 (M)—Bold Park, 31°56'00"S, 115°46'00"E; R115754 (F)—Bold Park, 31°56'00"S, 115°46'13"E; R115838 (M)—Swanbourne, 31°58'00"S, 115°46'00"E; R115855-58 (F)—Bold Park, 31°56'00"S, 115°46'13"E; R115862 (F)—Bold Park, 31°57'00"S, 115°45'00"E; 118855 (F), 119248 (F)—Bold Park, 31°56'00"S, 115°46'00"E; R119964-66 (F), R119967 (M)—Wembley, 31°56'00"S, 115°48'00"E; R119971 (M), R119972 (F)—Mandurah, 32°32'00"S, 115°43'00"E; R120296 (M)—Wembley, 31°56'00"S, 115°48'00"E; R121190 (M), R121191 (F), R121192 (M), R121192 (F)—Bold Park, 31°56'00"S, 115°47'00"E; R146417 (M)—Ballajura, 31°53'00"S, 115°57'00"E; R146865 (F)—Australind, 33°17'00"S, 115°42'00"E; R156334 (M)—Australind, 33°16'50"S, 115°43'18"E.