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PO Box 3300, South Brisbane 4101, Australia
Phone 06 7 3840 7555
Fax 06 7 3846 1226
Email qmlib@qm.qld.gov.au
Website www.qm.qld.gov.au

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Current status of the genera *Karma* and *Magmellia* Wells, 2009 (Scincidae: Lygosominae: Sphenomorphini), with a morphological character to distinguish the two genera.

Glenn M. SHEA

Sydney School of Veterinary Science, B01, Faculty of Science, University of Sydney NSW 2006, Australia and Australian Museum Research Institute, Australian Museum, 1 William St, Sydney NSW 2010.

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ABSTRACT

Recognition and distinction of the scincid genera *Karma* and *Magmellia*, also cited in the literature under their respective junior synonyms *Silvascincus* and *Tumbunascincus*, have been largely based on genetic evidence, with only minor features of coloration reported to distinguish them. The monotypic *Magmellia* can be morphologically distinguished from the two species of *Karma* by the overlap pattern of the temporal scales (lower secondary temporal overlapping upper secondary temporal), a character state not previously reported for *Magmellia*. □ *Karma*, *Magmellia*, *Silvascincus*, *Tumbunascincus*, *Scincidae*, *Queensland*, *systematics*, *scalation*.

Wells (2009) erected the genera *Karma* and *Magmellia* for three species of medium-sized rainforest skinks from eastern Australia, *Lygosoma murrayi* Boulenger, 1887, *Lygosoma (Hinulia) tryoni* Longman, 1918 and *Sphenomorphus luteilateralis* Covacevich & McDonald, 1980, that had previously been considered to represent a single monophyletic species group, the *Eulamprus murrayi* group (Greer 1989; Sadlier 1998; O'Connor & Moritz 2003).

The recognition of these two genera followed broader phylogenetic analyses of sequence data by Skinner (2007) that showed that the *E. murrayi* species group, though previously considered monophyletic within a polyphyletic genus *Eulamprus* (O'Connor & Moritz 2003) was paraphyletic with respect to seven other species of elongate-bodied sphenomorphin skinks that had previously been assigned to the monotypic genera *Saiphos* and *Coggeria*, and two more speciose genera, *Coeranoscincus* and *Ophioscincus*. Of the species previously

ascribed to the *Eulamprus murrayi* species group, *murrayi* was recovered as sister to the lineage consisting of *Coeranoscincus*, *Coggeria*, *Ophioscincus* and *Saiphos*, with *luteilateralis* further distant (Skinner 2007 did not include *tryoni* in his analyses). On mitochondrial data (12S rRNA, 16SrRNA, ND4 and adjacent tRNAs), *luteilateralis* was sister to *murrayi* + the other four genera, but further distant when a nuclear intron (ATP synthetase- β subunit) was included in the analysis. Skinner *et al.* (2013) added data from three more nuclear genes (*c-mos*, LDLR and PTPN12), and recovered *luteilateralis* as sister to two clades, one of *murrayi* and *tryoni*, the other of *Coeranoscincus*, *Coggeria*, *Ophioscincus* and *Saiphos*, similar to the mitochondrial tree of Skinner (2007). An outgroup relationship of *luteilateralis* to *murrayi* + and *tryoni* was also recovered by O'Connor and Moritz (2003) using the mitochondrial 16S rRNA segment, although they did not include the elongate-bodied taxa in their analysis. Pyron *et al.* (2013), using the sequence data

from the previous studies, were unable to recover a similarly paraphyletic *Eulamprus murrayi* species group, but did again identify *luteilateralis* as the sister to *murrayi* and *tryoni*, with *Saiphos*, *Coeranoscincus*, *Coggeria* and *Ophioscincus* as a single lineage that was sister to these three species. Hence, although using different genes and/or different analyses of the data, all genetic studies agreed that *luteilateralis* was outside the sister-pair of *murrayi* and *tryoni*, disagreeing as to how far distant it was placed (i.e., whether the three species represented a monophyletic group, or a paraphyletic group).

Skinner *et al.* (2013), either overlooking the previous naming of the genera *Karma* (for *murrayi* and *tryoni*) and *Magmellia* (for *luteilateralis*) by Wells (2009), or intentionally ignoring those names, following the proposal of Kaiser *et al.* (2013) to ignore post-2000 names established by Wells in his privately-published papers, created the two generic names *Silvascincus* and *Tumbunascincus* for the same two generic concepts respectively. Most recent national and regional field guides have used the generic epithets *Karma* and *Magmellia* (Cogger 2014; Wilson 2015, 2016; Wilson & Swan 2017; Swan *et al.* 2017).

The diagnoses of the two genera by both Wells (2009) and Skinner *et al.* (2013) were extremely limited. Comparison of the generic diagnoses of *Karma* and *Magmellia* by Wells (2009) reveals that they were putatively distinguished by number of midbody scales (28–36 *vs* 36–42), and relative limb length (for *Magmellia*, “well-developed pentadactyl limbs, that strongly overlap when addressed (much more so than in *Concinnia* or *Karma*)”). The remaining character states presented are the same for both genera. However, of these purported characters, the number of midbody scales is non-diagnostic, as *Karma tryoni* has 38–42 midbody scales (Sadlier 1998), and covers the range of variation observed in *Magmellia*. The claim of differences in limb length between the genera is not supported, nor are there any observations in the literature for *M. luteilateralis*. I have some data on hindlimb length for *M. luteilateralis* (hindlimb length/ snout-vent length 38.5–45.3%, mean = 41.6%, n = 10), which shows almost complete

overlap with *K. murrayi* (34.3–43.3%, mean = 38.7%, n = 13) and *K. tryoni* (36.5–44.6%, mean = 40.7%, n = 14) as provided by Sadlier (1998). Wells (2009) did not specifically justify recognising two genera from within what he had previously considered in the same paper to be a single species group.

Similarly, the diagnoses of both *Silvascincus* and *Tumbunascincus* by Skinner *et al.* (2013) cite two shared scalation synapomorphies reported by previous authors (Greer 1989; Sadlier 1998; O’Connor & Moritz 2003; Wells 2009) for the entire *murrayi* species group within *Eulamprus* in its former broad sense: the postmental scale contacting only a single infralabial on each side, and the third pair of chin shields separated by five scales, together with a third character (visceral fat bodies absent) that is true of most Australian members of the Sphenomorphini (Greer 1986), being present only in *Concinnia* and *Gnypetoscincus* (I confirm they are also present in *Nangura*, which has been recovered on genetic grounds as part of *Concinnia* (O’Connor & Moritz 2003; Skinner *et al.* 2007; 2013; Pyron *et al.*, 2013)). Hence, these three characters do not distinguish *Silvascincus* and *Tumbunascincus* from each other. A fourth diagnostic character cited for *Silvascincus*, “pale to bright yellow ventral colouration” lacked any contrasting character state for *Tumbunascincus*, and the fourth diagnostic character for *Tumbunascincus* “lateral surfaces between forelimb and hind limb bright orange with small white spots”, lacked any contrasting character state for *Silvascincus*.

While the description of *Sphenomorphus luteilateralis* by Covacevich and McDonald (1980) reports the ventral colour of preserved species as white, and a white venter is also mentioned by Wilson and Knowles (1988) and Cogger (2014), live individuals have yellow to orange bellies, more yellow in females, more orange in males and approaching the orange lateral colour (S. Eipper, pers. comm., individuals from near Mt Dalrymple). A photograph of an unsexed individual also shows a pale yellow belly (E. Budd, pers. comm.). This character therefore cannot be used as to distinguish between these two genera. The lateral colour pattern for

Magmellia (= *Tumbunascincus*) is very similar to that of *Karma* (= *Silvoascincus*): both consist of numerous tiny, dark-edged pale flecks (white to blue-white) on a darker ground colour, and both possess a dark supra-axillary blotch. The main difference is in the ground colour of the flanks – more orange/yellow in *Magmellia*, and more grey/blue in *Karma*, although *K. murrayi* also possesses larger yellow spots on the dark ground.

Despite the lack of any obvious differences between the genera in the literature, there is one scalational character, not previously mentioned for either genus, that does distinguish them. In both species of *Karma* (bilaterally in 142/145 *K. murrayi* examined, and unilaterally in the other three individuals; bilaterally in all nine *K. tryoni*), the lower secondary temporal is overlapped by the upper secondary temporal, as in most skinks. However, in *Magmellia luteilateralis*, the lower secondary temporal typically overlaps the upper secondary temporal (Fig. 1). Of 24 specimens of this species examined, this state is present bilaterally in 20, and unilaterally in the remaining four. The character state is also visible in photographs of live individuals by Wilson and Knowles (1988), Ehmann (1992), Fyfe (2008), Cogger (2014), Wilson (2015), and Wilson and Swan (2017).

Greer and Shea (2003) called attention to the importance of this character in sphenomorphin skinks. Among the other genera related to *Magmellia* (based on the genetic analyses of Skinner *et al.* 2013), the lower secondary temporal scale overlaps the upper secondary temporal scale only in *Coeranoscincus reticulatus* and *Coggeria naufragus* among the ingroup taxa (lower secondary temporal overlapped by upper secondary temporal in *Saiphos*, *Ophioscincus* and *Coeranoscincus frontalis*; Greer 1983; Greer & Cogger 1985; Couper *et al.* 1996), while in the first outgroup, (*Nangura* (*Gnypetoscincus* (*Concinnia*))), it is present in *C. martini* and *C. frerei*, but not in *C. brachysoma*, *C. sokosoma*, *C. tenuis* or *C. tigrina* (Greer 1992; pers. obs. for *C. tigrina*). *Nangura* and *Gnypetoscincus* have multiple small temporal scales (Greer 1989; Covacevich *et al.* 1993), and the homologies of these are uncertain. *Concinnia amplus*, a species of

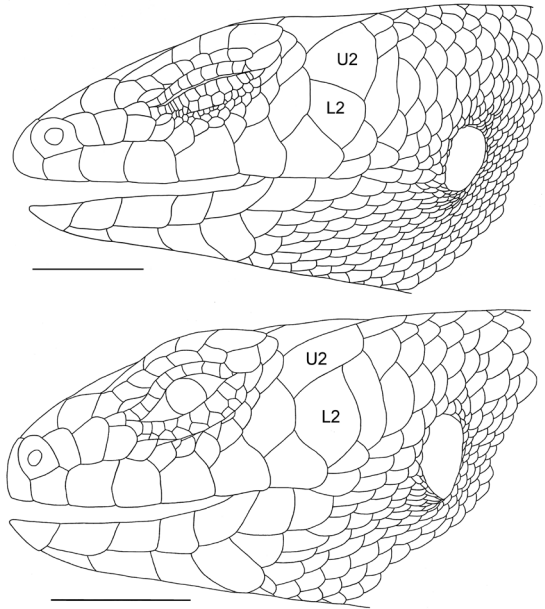


FIG. 1. Lateral views of heads of *Magmellia luteilateralis* (Australian Museum R113928) (top) and *Karma murrayi* (Australian Museum R6485, holotype of the synonym *Lygosoma* (*Hinulia*) *tenuis intermedius*) (bottom). Scale bars = 5 mm. The lower and upper secondary temporal scales are indicated by L2 and U2 respectively.

uncertain affinities to the other *Concinnia* species, with its position with respect to *Gnypetoscincus* and *Nangura* varying in different genetic analyses (Skinner 2007; Skinner *et al.* 2013) also shows fragmentation and duplication of the temporal scalation, but each secondary temporal overlaps the one below it (Shea pers. obs.).

Greer and Shea (2003) considered the character state of the lower secondary temporal scale overlapping the upper secondary temporal to be apomorphic within the Sphenomorphini, but it has evolved multiple times within that tribe, and given its occurrence in multiple species and genera closely related to *Karma* and *Magmellia*, it is not possible to definitively assign polarity to the character state in *Magmellia*. It does, however, serve as a morphological diagnostic character to differentiate the genus from *Karma*.

I also make a correction to the previous literature on these species. Covacevich and McDonald

(1980) report *M. luteilateralis* as having the fifth supralabial below the centre of the eye and contacting the eye – it is the fourth supralabial (of the six present in both *Karma* and *Magmellia*) that is in this position.

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- Concinnia tigrina*: R2267, R3981, R16980, R20776, R54801, R59959, R111601, R118638, R128554, R174489.
- Karma murrayi*: R6485 (holotype of *Lygosoma (Hinulia) tenuis intermedius*, a synonym of *K. murrayi*), R328, R4990, R6469-70, R6472-74, R6484, R7079, R60865 (paratypes of *Lygosoma (Hinulia) tenuis intermedius*); R137730, R137738-39, R137744, R137748, R137751, R137755, R137766, R137772, R137784-86, R137796-97, R137864, R138305, R138975, R139028, R139057, R139060, R139064-65, R139089, R139222, R139340, R139361, R139489, R139495, R139541, R139543-45, R139632-33, R139668, R139670, R139673, R139720-22, R139727, R139730, R139743, R139757-58, R139784-85, R141537, R141578-79, R141580, R141583-84, R141654, R141658, R141683-84, R142153, R142168, R142173, R142195, R142235, R142328, R142341, R142393, R142411, R142443, R142445, R142447, R142455, R142474, R146106, R148847, R148390-91, R148982-83, R151289, R151785-88, R151791-93, R151797-802, R151860-61, R151904, R151932-33, R151991-2000, R152272-78, R153782, R153792-95, R153804, R153807, R153850, R161359, R161372, R161379, R161846, R172237, R178181-82, R178186, R178191-93, R178230.
- Karma tryoni*: R18704, R85917, R151789-90, R151794-96, R151803-04.
- Magmellia luteilateralis*: R47497, R47763-70, R47855-56, R47841-43 (paratypes); R113923-29, R113950, R114019, R114035.
- Nangura spinosa*: R153027.