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Taxonomy of the Sand Sliders of Western Australia's central coast (genus *Lerista*, Squamata: Scincidae): recognition of *Lerista miopus* (Günther, 1867)

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Abstract

The Dotted-Line Robust Slider, *Lerista lineopunctulata* (Duméril & Bibron, 1839), is widely distributed along the western coast of Western Australia. An investigation of diversity within this taxon showed a clear split between northern and southern populations in the vicinity of Jurien. Accordingly, *Lerista lineopunctulata* is restricted to the southern population while the northern is recognised as *Lerista miopus* (Günther, 1867). Both taxa are redescribed and diagnosed and a neotype for *L. miopus* is designated.

Key words: Dotted-Line Robust Slider, taxonomy, neotype, Australia, glacio-eustatic sea level fluctuations, species diversification

Introduction

The genus *Lerista* Bell, 1833 is a large group of Australian skinks exhibiting a wide diversity of reduced-limb conditions, from five fingers and toes to a complete absence of limbs, with many intermediate conditions. Research has shown the development of limblessness within this genus to have occurred a number of times and is an unusually plastic condition, with a variety of conditions sometimes occurring within the same species (Amey & Worthington Wilmer 2014; Skinner 2010). The value of this situation in the study of limb loss has long been recognised (Benesch & Withers 2002; Greer 1987, 1990, 1992; Lee *et al.* 2013; Skinner 2010).

The central coast of Western Australia is particularly rich in species of *Lerista*, part of a fauna specialising in its dry, sandy soils. The taxon *Lerista lineopunctulata* (Duméril & Bibron, 1839) occurs along a wide stretch of this area, from North West Cape to Lake Clifton, a linear distance of well over 1000 km. Its occurrence is determined by the current distribution of suitable habitat as well as past patterns of habitat availability wrought by climate change (Edwards *et al.* 2012; He *et al.* 2013). In this paper, we examine the genetic and morphological structure present within this species and compare it with its nearest congeners. This analysis shows that the northern and southern populations are best thought of as two distinct taxa. As *L. lineopunctulata* applies to the southern population, we resurrect the available name *Lerista miopus* (Günther, 1867) and provide a new diagnosis and redescription.

Methods

Material. Specimens of *Lerista lineopunctulata* held by the Western Australian Museum were examined, totalling 48 vouchers and 114 associated tissue samples. Collection localities are shown in Fig. 1. Morphologically similar species of *Lerista* were also examined for comparative analysis, namely: *L. allanae* (Longman, 1937), *L. bipes* (Fischer, 1882), *L. carpentariae* Greer, 1983, *L. cinerea* Greer, McDonald & Lawrie, 1983, *L. colliveri* Couper & Ingram, 1992, *L. connivens* Storr, 1971, *L. gascoynensis* Storr, 1986, *L. greeri* Storr, 1982, *L. griffini* Storr, 1982, *L.*

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hobsoni Amey, Couper and Worthington Wilmer, 2016 (in Couper, Amey & Worthington Wilmer, 2016), *L. humphriesi* Storr, 1971, *L. kalumburu* Storr, 1976, *L. karlschmidti* (Marx & Hosmer, 1959), *L. kendricki* Storr, 1991, *L. labialis* Storr, 1971, *L. macropisthopus* (Werner, 1903), *L. nichollsi* (Loveridge, 1934), *L. petersoni* Storr, 1976, *L. praepedita* (Boulenger, 1887), *L. punctatovittata* (Günther, 1867), *L. robusta* Storr, 1990, *L. rochfordensis* Amey & Couper, 2009, *L. storri* Greer, McDonald & Lawrie, 1983, *L. stylis* (Mitchell, 1955), *L. vanderduysi* Amey, Couper & Worthington Wilmer, 2016 (in Couper, Amey & Worthington Wilmer, 2016), *L. varia* Storr, 1986, *L. vittata* Greer, McDonald & Lawrie, 1983 and *L. yuna* Storr, 1991. All specimens examined are detailed in the Appendix.

Morphology. All body measurements were taken using Mitutoyo electronic calipers (± 0.01 mm). Scales were counted on the right side only of specimens examined. The total number of enlarged nuchals is given, rather than the number of pairs. Only original tails were included in the morphometric analysis (assessed by X-ray or eye). Abbreviations and definitions of body measurements are detailed in Table 1. Preoculars are here defined as the scales anterior to the eye margin contacting a loreal and the first supraciliary; presuboculars are the scales in contact with the eye margin between the preoculars and the second and third supralabials; postoculars are the scales at the posterior margin of the eye contacting the last supraciliary and the primary temporal or pretemporal; postsuboculars contact the postocular and the supralabials; the pretemporal contacts the primary temporal and the last supraocular; paravertebral count is the number of scales along the dorsum between the parietals and the posterior edge of the hindlimb, including any enlarged nuchals; supradigitals are the enlarged scales along the dorsal margin of the digit from the claw to the join with the pes. All other definitions follow Lillywhite (2008). All measurements are given to two significant figures. Where ranges are given, they are followed by the mean ± the standard deviation. All coordinates use the datum GDA94.

Genetic analysis. Genetic data were obtained from two mitochondrial (NADH dehydrogenase subunit 2 (ND2); 16S ribosomal RNA (16S)) and two nuclear (PRLR, PTPN12) genes. We include sequences for all individuals in the morphological study which had genetic material deposited at the Western Australian Museum (Table 2). Methods followed those outlined previously (Edwards *et al.* 2012; Edwards *et al.* 2015). In order to determine the relationships between *L. miopus*, *L. lineopunctulata* and other closely related *Lerista* species we supplemented these data with additional data from 16S, ND4 (NADH dehydrogenase subunit 4) and 12S ribosomal RNA (12S) from GenBank (see Table 2) for suitable outgroups identified from Skinner (2010). We also include new outgroup data for *L. varia* (WAMR119140; WAMR115093), *L. connivens* (WAMR122724), *L. praepedita* (WAMR122524), and *L. humphriesi* (WAMR116872). Genetic loci were aligned using the Muscle software (Edgar 2004), and checked by eye.

TABLE 1. Abbreviations for measurements used and their definitions.

AG	Axilla–groin (distance between posterior insertion of forelimb and anterior insertion of hindlimb).
EE	Eye–ear (distance from posterior margin of eye to anterior margin of ear).
FN	Frontonasal length (anterior point between nasals to posterior margin bordering frontal as a percentage of its width).
HL	Head length (tip of snout to posterior margin of parietals).
HW	Head width (widest point).
IW	Maximum interparietal width as a percentage of its length.
L1	Forelimb length (axilla to tip).
L2	Hindlimb length (groin to claw tip of toe).
MV	Midventral scale width (widest point of a ventral scale approximately midbody) as a percentage of paravertebral scale width (widest point of a dorsal scale approximately midbody).
MW	Midbody width (width of body measured at approximately midpoint).
NaL	Naris length (as a percentage of nasal scale length).
NC	Nasal contact (length of contact between two nasal scales as a percentage of their length).
PL	Postmental length as a percentage of its width.
SA	Snout–axilla (distance from tip of snout to anterior insertion of forelimb).
SE	Supralabial–ear (distance from posterior edge of last supralabial to anterior margin of ear).
SVL	Snout–vent length.
TL	Tail length (vent to tip).

TABLE 2. Genetic samples used in this study. Collection information in the Appendix.

REGISTRATION NO.	SPECIES	ND2	ND4	16S	12S	PRLR	PTPN12
WAMR122724	*connivens*	KY779645	EF672978d	KY779655	EF672766d	KY779690; KY779691	KY779714; KY779715
WAMR135652	*connivens*	KY779646	x	KY779656	x	KY779692; KY779693	KY779716; KY779717
WAMR116790	*gascoynensis*	x	EF672990	EF672849	EF672778	x	x
WAMR116872	*humphriesi*	KY779620	x	KY779675	EF672783	KY779681; KY779682	KY779721
WAMR116264	*kendricki*	x	EF673000	EF672859	EF672788	x	x
WAMR99638	*kennedyensis*	x	EF673001	EF672860	EF672789	x	x
WAMR112823	*lineopunctulata*	KY779626	x	KY779653	x	JQ518159; KY779685	KY779707; KY779708
WAMR112824	*lineopunctulata*	KY779629	x	x	x	KY779686; KY779687	KY779709
WAMR112853	*lineopunctulata*	KY779631	x	KY779678	x	KY779688; KY779689	KY779710
WAMR115120	*lineopunctulata*	x	x	x	x	x	x
WAMR115169	*lineopunctulata*	KY779644	EF673004c	x	EF672792c	KY779683; KY779684	x
WAMR120307	*lineopunctulata*	KY779634	x	x	x	x	x
WAMR120308	*lineopunctulata*	KY779635	x	x	x	KY779698; KY779699	KY779722
WAMR121367	*lineopunctulata*	KY779637	x	x	x	x	x
WAMR121368	*lineopunctulata*	KY779638	x	x	x		x
WAMR121369	*lineopunctulata*	KY779639	x	KY779677	x	KY779701; KY779685	KY779724
WAMR121371	*lineopunctulata*	KY779622	x	x	x	KY779702; JQ518159	KY779725
WAMR121975	*lineopunctulata*	KY779636	x	x	x	KY779700; JQ518132	KY779723
WAMR136115	*lineopunctulata*	KY779632	x	KY779651	x	JQ518159	KY779726
WAMR136116	*lineopunctulata*	KY779633	x	x	x	x	x
WAMR136132	*lineopunctulata*	KY779640	x	x	x	x	x
WAMR140542	*lineopunctulata*	KY779641	x	x	x	x	x
WAMR140543	*lineopunctulata*	KY779643	x	x	x	x	x
WAMR140740	*lineopunctulata*	KY779642	x	x	x	x	x
WAMR140901	*lineopunctulata*	x	x	x	x	x	x
WAMR140905	*lineopunctulata*	KY779623	x	x	x	x	x
WAMR141177	*lineopunctulata*	KY779621	x	KY779652	x	KY779703; KY779704	KY779727
WAMR141182	*lineopunctulata*	KY779624	x	x	x	x	x
WAMR144362	*lineopunctulata*	KY779625	x	x	x	x	x

……*continued on the next page*

TABLE 2. (Continued)

REGISTRATION NO.	SPECIES	ND2	ND4	16S	12S	PRLR	PTPN12
WAMR144363	*lineopunctulata*	x	x	x	x	x	x
WAMR151760	*lineopunctulata*	KY779627	x	x	x	x	x
WAMR151761	*lineopunctulata*	x	x	x	x	x	x
WAMR152966	*lineopunctulata*	KY779628	x	KY779654	x	KY779685	KY779711; KY779712
WAMR152967	*lineopunctulata*	KY779630	x	x	x	x	x
WAMR113592	*miopus*	JQ517839	x	x	x	x	x
WAMR115604	*miopus*	JQ517805	x	KY779657	x	KC549114; KC549115	KC549276
WAMR115605	*miopus*	x	x	x	x	x	x
WAMR116272	*miopus*	JQ517820	x	x	x	x	x
WAMR119136	*miopus*	JQ517842	x	x	x	x	x
WAMR119262	*miopus*	x	x	x	x	x	x
WAMR119392	*miopus*	JQ517806	x	x	x	x	x
WAMR120439	*miopus*	x	x	x	x	x	x
WAMR121063	*miopus*	JQ517851	x	x	x	x	x
WAMR122458	*miopus*	JQ517848	x	x	x	x	x
WAMR122913	*miopus*	x	x	x	x	x	x
WAMR123103	*miopus*	x	x	x	x	x	x
WAMR123117	*miopus*	x	x	x	x	x	x
WAMR123120	*miopus*	JQ517844	x	x	x	x	x
WAMR123147	*miopus*	x	x	x	x	x	x
WAMR123165	*miopus*	JQ517845	x	x	x	x	x
WAMR123169	*miopus*	x	x	x	x	x	x
WAMR123175	*miopus*	JQ517846	x	x	x	x	x
WAMR123183	*miopus*	x	x	x	x	x	x
WAMR123517	*miopus*	JQ517870	x	x	x	x	x
WAMR123518	*miopus*	JQ517871	x	x	x	x	x
WAMR123519	*miopus*	JQ517870	x	KY779671	x	KC549186; KC549187	x
WAMR123520	*miopus*	x	x	x	x	x	x
WAMR123608	*miopus*	JQ517863	x	KY779668	x	x	KC549352

…..*continued on the next page*

TABLE 2. (Continued)

REGISTRATION NO.	SPECIES	ND2	ND4	16S	12S	PRLR	PTPN12
WAMR123618	*miopus*	JQ517864	x	x	x	x	x
WAMR123641	*miopus*	JQ517865	x	x	x	x	x
WAMR123652	*miopus*	JQ517863	x	x	x	x	x
WAMR123686	*miopus*	JQ517863	x	x	x	x	x
WAMR123948	*miopus*	JQ517831	x	KY779660	x	KC549204; KC549205	KC549366; KC549367
WAMR125001	*miopus*	JQ517836	x	x	x	x	x
WAMR126820	*miopus*	x	x	x	x	x	x
WAMR127121	*miopus*	JQ517813	x	x	x	x	x
WAMR127132	*miopus*	JQ517813	x	x	x	x	x
WAMR127459	*miopus*	JQ517809	x	KY779673	x	JQ518132	JQ518030; JQ518031
WAMR129791	*miopus*	JQ517824	x	x	x	x	x
WAMR131385	*miopus*	JQ517832	x	x	x	x	x
WAMR136105	*miopus*	JQ517868	x	x	x	x	x
WAMR136106	*miopus*	JQ517857	x	KY779679	x	KC549134	KC549408; KC549409
WAMR136107	*miopus*	JQ517856	x	KY779680	x	KC549244	KC549410; KC549411
WAMR136108	*miopus*	JQ517858	x	KY779667	x	KC549246	KC549412
WAMR136109	*miopus*	JQ517859	x	x	x	x	x
WAMR136110	*miopus*	JQ517860	x	x	x	x	x
WAMR136111	*miopus*	JQ517866	x	KY779672	x	KC549252	KC549418; KC549419
WAMR136112	*miopus*	JQ517866	x	x	x	x	x
WAMR136113	*miopus*	x	x	x	x	x	x
WAMR136114	*miopus*	JQ517867	x	x	x	x	x
WAMR136117	*miopus*	x	x	x	x	x	x
WAMR136118	*miopus*	JQ517814	x	x	x	x	x
WAMR136119	*miopus*	JQ517814	x	x	x	x	x
WAMR136121	*miopus*	JQ517814	x	x	x	x	x
WAMR136122	*miopus*	JQ517814	x	KY779659	x	KC549266; KC549267	KC549432
WAMR136123	*miopus*	JQ517869	x	x	x	x	x
WAMR137976	*miopus*	x	x	x	x	x	x

……*continued on the next page*

TABLE 2. (Continued)

REGISTRATION NO.	SPECIES	ND2	ND4	16S	12S	PRLR	PTPN12
WAMR141493	*miopus*	JQ517861	x	KY779665	x	KC549274; KC549275	KC549438; KC549439
WAMR141831	*miopus*	JQ517815	x	KY779661	x	KY779705;KY779706	KC549425
WAMR141832	*miopus*	JQ517807	x	KY779662	x	KC549128	KC549290; KC549291
WAMR141833	*miopus*	JQ517808	x	x	x	x	x
WAMR146387	*miopus*	JQ517821	x	x	x	x	x
WAMR146388	*miopus*	JQ517822	x	KY779664	x	JQ518132; JQ518133	JQ518051; JQ518052
WAMR146389	*miopus*	x	x	x	x	x	x
WAMR146408	*miopus*	JQ517862	x	KY779666	x	KC549130	KC549292; KC549293
WAMR146447	*miopus*	JQ517823	x	KY779663	x	JQ518053; JQ518133	JQ518053
WAMR152636	*miopus*	JQ517810	x	KY779669	x	JQ518032; JQ518131	JQ518032
WAMR152637	*miopus*	JQ517810	x	x	x	x	x
WAMR156890	*miopus*	JQ517828	x	x	x	x	x
WAMR156903	*miopus*	JQ517828	x	x	x	x	x
WAMR156921	*miopus*	JQ517828	x	KY779670	x	JQ518032; JQ518131	KC549410; KY779713
WAMR156922	*miopus*	JQ517828	x	x	x	x	x
WAMR156923	*miopus*	JQ517828	x	x	x	x	x
WAMR156962	*miopus*	JQ517843	x	KY779674	x	KC549134	KC549296; KC549297
WAMR165289	*miopus*	JQ517816	x	x	x	x	x
WAMR165299	*miopus*	JQ517817	x	KY779658	x	JQ518133	KC549428; KC549278
ABTC59787	*nichollsi*	x	EF673009	EF672868	EF672797	x	x
WAMR116826	*onsloviana*	x	EF673010	EF672869	EF672798	x	x
WAMR99637	*petersoni*	x	EF673012	EF672871	EF672800	x	x
WAMR122524	*praepedita*	JQ517936	EF673015b	KY779676	EF672803b	JQ518092	JQ518069; JQ517936
ABTC54427	*uniduo*	x	EF673027	EF672886	EF672815	x	x
WAMR115093	*varia*	KY779647	x	KY779650	x	KY779694; KY779695	KY779718
WAMR119140	*varia*	KY779648	EF673028a	KY779649	EF672816a	KY779696; KY779697	KY779719; KY779720
WAMR100846	*yuna*	x	EF673034	EF672893	EF672822	x	x

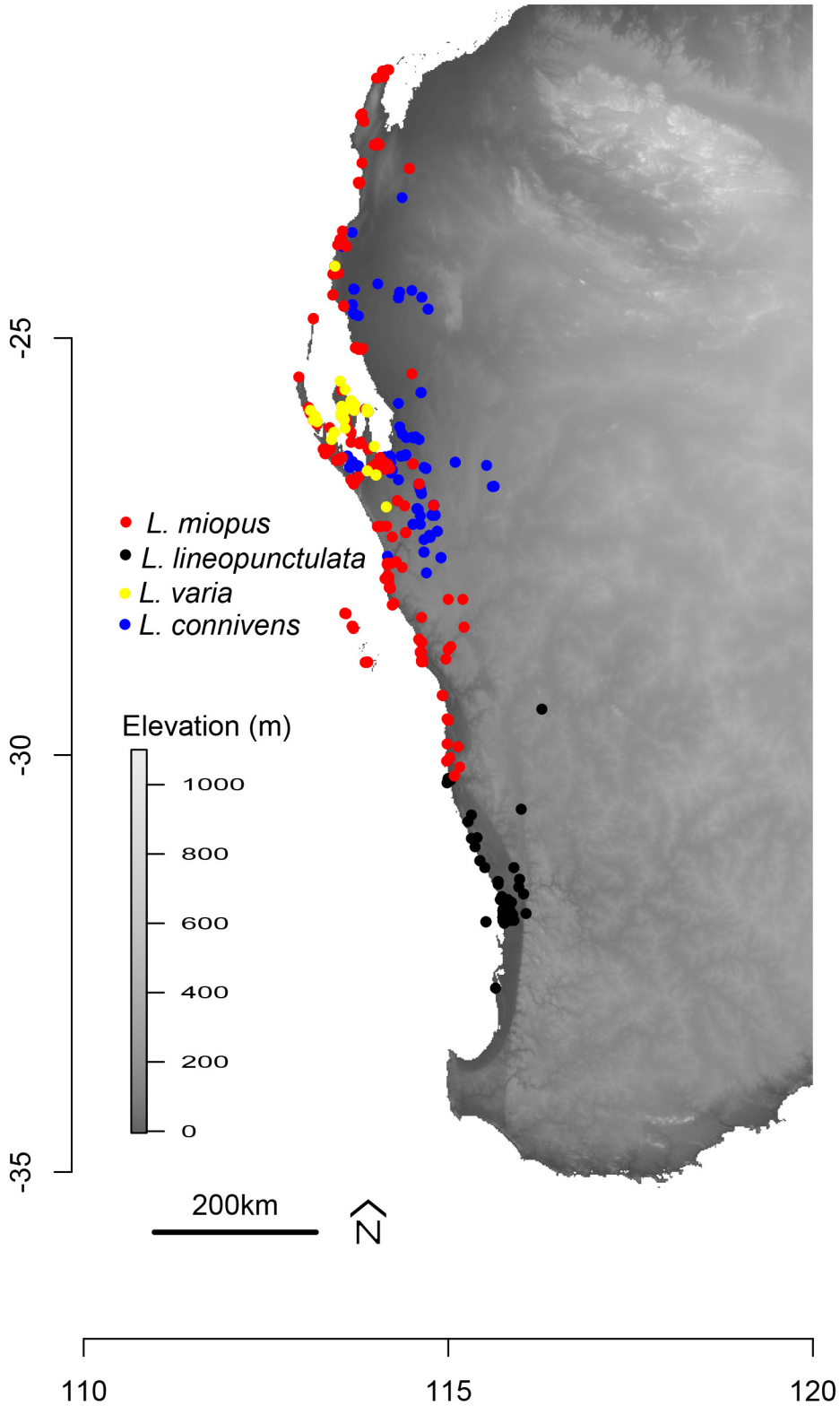

FIGURE 1. Map showing collection localities for *Lerista lineopunctulata*, *L. miopus*, *L. connivens* and *L. varia*.

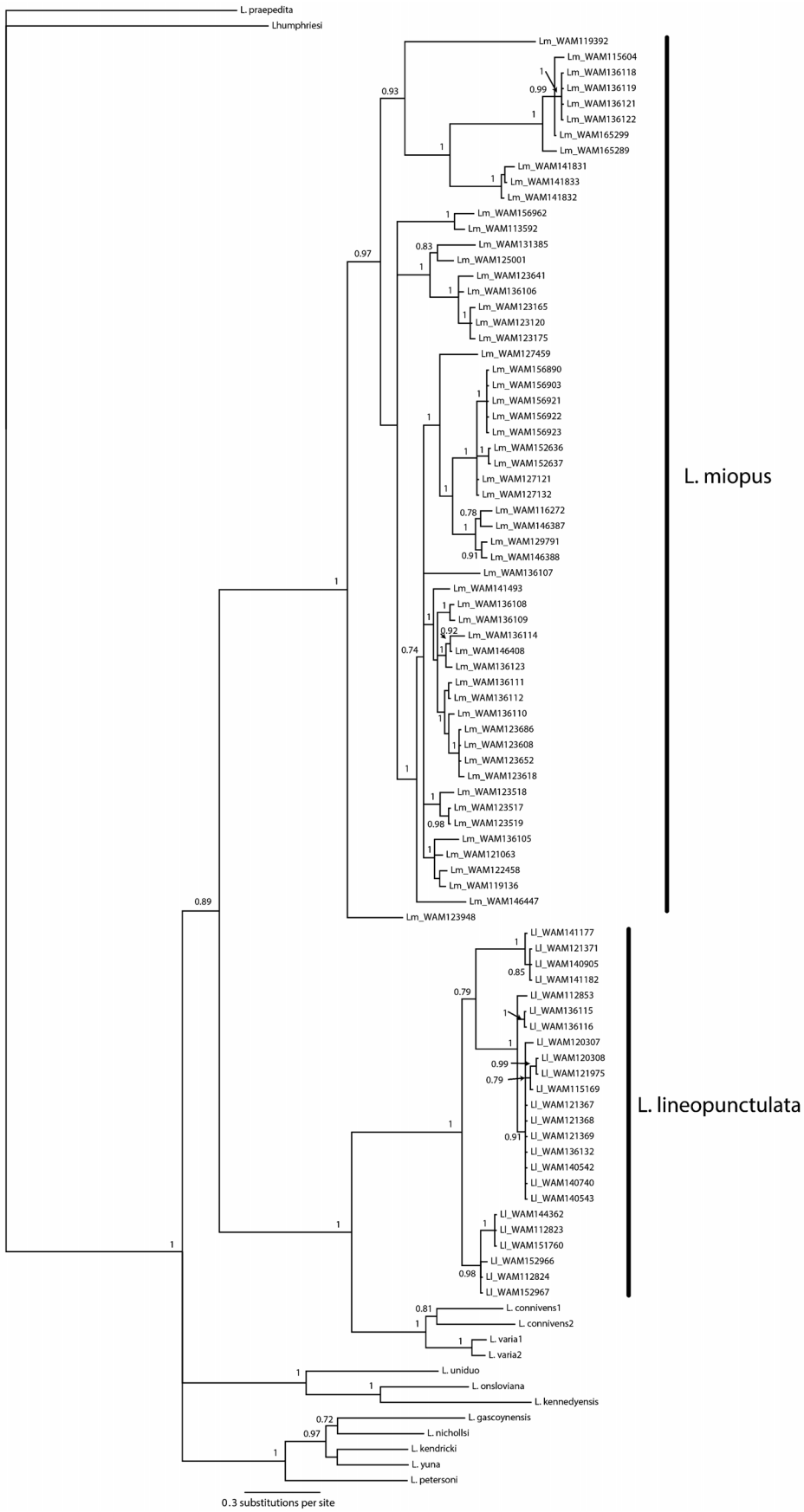

FIGURE 2. Bayesian phylogenetic tree inferred from concatenated, partitioned analysis of four mitochondrial DNA genes showing the paraphyly of *L. lineopunctulata* and the relationships between these clades and closely related *Lerista* species. Posterior probabilities for each node is shown if above 0.50.

Mitochondrial loci (ND2, 16S, ND4 and 12S) were concatenated and run in a partitioned analysis using Partition Finder2 (Lanfear *et al.* 2016) with the best scheme identified using corrected Akaike Information Criterion (AICc), greedy search algorithm and branch lengths linked. The best scheme partitioned these data into four subsets, the first included 12S, 16S and non-coding regions of ND2 (model GTR+I+ϒ), the second including first codon positions for ND2 and ND4 (model K81UF+I+ϒ), the third including second codon positions for ND2 and ND4 (model GTR+I+ϒ), the last including third codon positions for ND2 and ND4 (model GTR+I+ϒ). Phylogenetic analyses of this concatenated dataset was analysed using the above partitioning scheme using MrBayes v3.2 (Huelsenbeck & Ronquist 2001) and run for 10 million generations sampling every 1000 and discarding the first 25% as burnin. To complement this we also ran a species tree analysis including all mtDNA and phased nuclear loci using *BEAST v1.6.1 (Drummond & Rambaut 2007) for 50 million generations with 10% burnin discarded using default settings and individual models of evolution inferred for each locus allowing each to vary independently. The model of molecular evolution for each gene locus was determined using jModelTest v2.1.4 (Darriba *et al.* 2012). Two distinct models of molecular evolution fit the data, the GTR+I+ϒ model (ND2, 16S and PRLR), and the HKY+ϒ (ND4, 12S and PTPN12; Table 2). Stationarity of this analysis was checked using TRACER v1.6 (Rambaut *et al.* 2014) and the median species tree was calculated with TreeAnnotator v1.6.1.

Results

Genetic analysis. We find strong genetic support for the paraphyly of *L. lineopunctulata* from both mtDNA (Fig. 2) and species tree (Fig. 3) analyses. Both suggest that *L. lineopunctulata sensu stricto* (posterior probability mtDNA = 1.0) is more closely related to a clade containing *L. varia* and *L. connivens* (posterior probability mtDNA = 1.0, species tree = 0.97), while individuals from the northern population—aligned with the name *L. miopus*—form a strongly supported clade (posterior probability mtDNA = 1.0) whose most recent common ancestor is likely the ancestor of *L. lineopunctulata, L. varia* and *L. connivens* combined (posterior probability mtDNA = 0.94, species tree = 0.90). Relationships vary only slightly between the mtDNA tree, species tree and those inferred by Skinner (2010), however the species contained in the major clades remain the same.

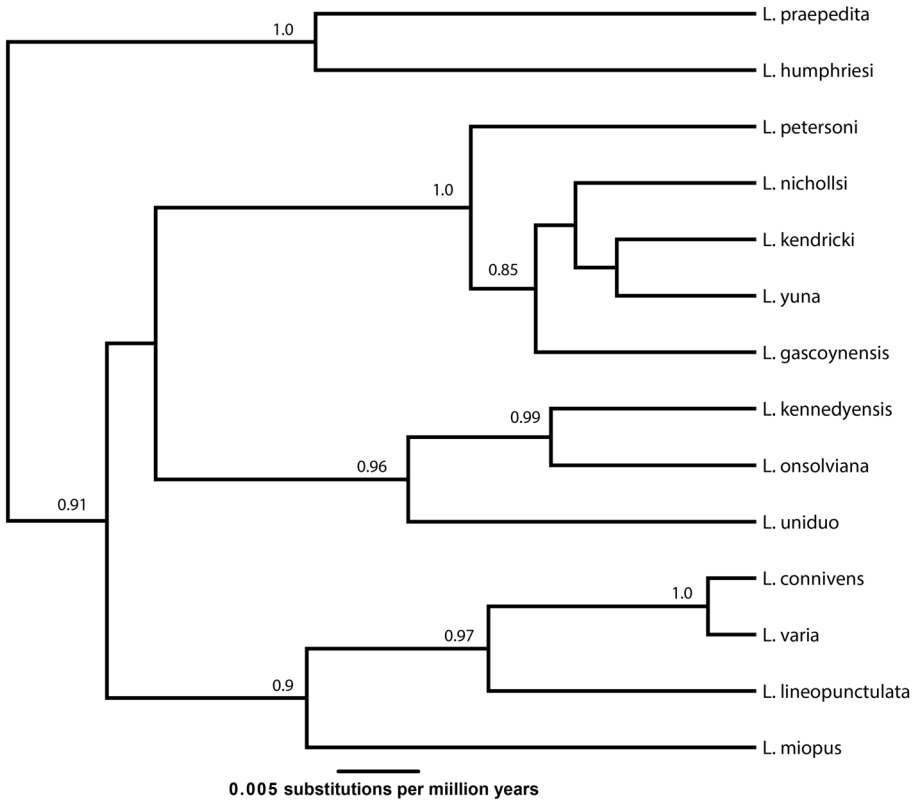

FIGURE 3. Species tree analysis of *L. lineopunctulata* clades shows the paraphyly of this species with respect to closely related *Lerista* species. Posterior probability support for each node is shown only if above 0.50.

Systematics

Synonyms of *Lerista lineopunctulata* (Duméril & Bibron, 1839) and assignment of northern populations to *Lerista miopus* (Günther, 1867). *Rhodona punctata* Gray, 1839 (type locality 'Australia'), was placed in synonymy of *L. lineopunctulata* by H. G. Cogger in Cogger *et al.* (1983). Although it was published before *Brachystopus lineopunctulatus* Duméril & Bibron, 1839, Cogger *et al.* considered *R. punctata* to be a junior homonym of *Lacerta punctata* Linnaeus, 1758 and therefore unavailable. Duméril & Bibron (1839) recognised the close similarity between *R. punctata* and their *B. lineopunctulatus*, stating that were it not for the widely different localities (Australia vs. the Cape of Good Hope), they would believe them to be the same. Unfortunately, the African locality was in error and they were in fact describing the same taxon (Cogger *et al.* 1983). Gray's description of the genus *Rhodona* states the taxon to have the following limb arrangement: 'the front ones rudimentary, short, small, conical, undivided, ending in a simple claw, hinder small, weak, with a distinct knee, and ending in two very unequal clawed toes'. This description immediately precedes the description of *R. punctata*, which is the only species assigned to the genus described. Images of the syntypes lodged at the British Museum, kindly supplied by H. G. Cogger, show a group of five lizards with distinctly visible forelimb stumps and two toes on the hindlimb. Although the image available to us of the *Brachystopus lineopunctulatus* type (Fig. 4, again supplied by H. G. Cogger) does not show the forelimbs clearly, the colour pattern is again of distinct, heavy longitudinal lines along the dorsum. The type of *Ronia catenulata* Gray, 1841 is lost (Cogger *et al.* 1983). This species was described from material with a locality only of 'Western Australia', and hence cannot be assigned to the northern or southern population with certainty. However, the generic description of *Ronia* Gray, 1841, of which *R. catenulata* is the only species, gives 'The front limbs very small, rudimentary, undivided; the hinder limbs moderately developed, ending in two very unequal toes, with distinct claws.' The combination of a distinct forelimb, a hindlimb with two toes and a bold colour pattern, shared by these specimens, suggests strongly that all three names can be assigned to the southern population, and consequently, that *L. lineopunctulata* is the appropriate name for this population by chronological priority.

The description of *Soridia miopus* Günther, 1867 gives 'No free fore limbs, but there is a short longitudinal groove, in the upper end of which a minute tubercle (the first indication of an external limb) is visible; hind limb as long as the head, terminating in a single longish toe.' This limb arrangement is typical of the northern population and not known in *L. lineopunctulata sensu stricto*. The type locality (Champion Bay, WA, approximately 28° 46' S 114° 36' E) places it well within the range of the northern population. This is also the case with *Lygosoma bipes concolor* Werner, 1910 (from Denham, WA, approximately 25° 55' S 113° 32' E). The description of this taxon cites "die anscheinend kürzeren Gliedmaâen sind anscheinend genügende Unterschiede von *L. bipes*." [the shorter limbs diagnose it from *L. bipes*]. As *L. bipes* (Fischer, 1882) has no forelimbs, it can be assumed this is also the case with *L. b. concolor*. We have examined the type of *L. (R.) nigriceps* Glauert, 1962 (WAMR14039) and it conforms well with the morphology of *L. miopus* and was collected within this taxon's known distribution (Vlaming Head, 21° 48' S 114° 06' E).

Designation of a neotype for *Soridia miopus* Günther, 1867. The holotype for *S. miopus* is purported to be at the British Museum of Natural History, registered as 1946.8.15.60 (see Fig. 5). It was originally registered in 1864 as 64.7.22.2 and then re-registered in 1946 after retrieval from safe storage during World War II (G. Shea, pers. comm.). This specimen was examined by H.G. Cogger in 1970, who concluded that it cannot be the type for *Soridia miopus* on the basis of comparing the type description with its actual appearance. Specifically, the specimen is half the length given in the description, has two toes on the hindlimb (vs. one), no forelimbs (vs. "a minute tubercle") and has a broad black lateral band (vs. simply "four very indistinct stripes of minute blackish dots along the dorsal series of scales"). In addition, Boulenger gives a very similar description (as *Lygosoma miopus*) to Günther in his *Catalogue Of The Lizards Of The British Museum* (1887), suggesting strongly that both authors examined a different specimen to the one currently identified as the type. Cogger identified the specimen in 1970 as *Lerista bipes*. It was for these reasons that Cogger *et al.* (1983) considered the whereabouts of the true type of *S. miopus* as unknown, and it does not seem to have been located in the years since (P. Campbell, BMNH, pers. comm.). Therefore, to stabilise nomenclature we nominate a neotype collected from the type locality and held at the Western Australian Museum, WAMR136122.

FIGURE 4. MNHP1246, holotype of *Brachystopus lineopunctulatus* Duméril and Bibron, 1839. Photo by H. G. Cogger.

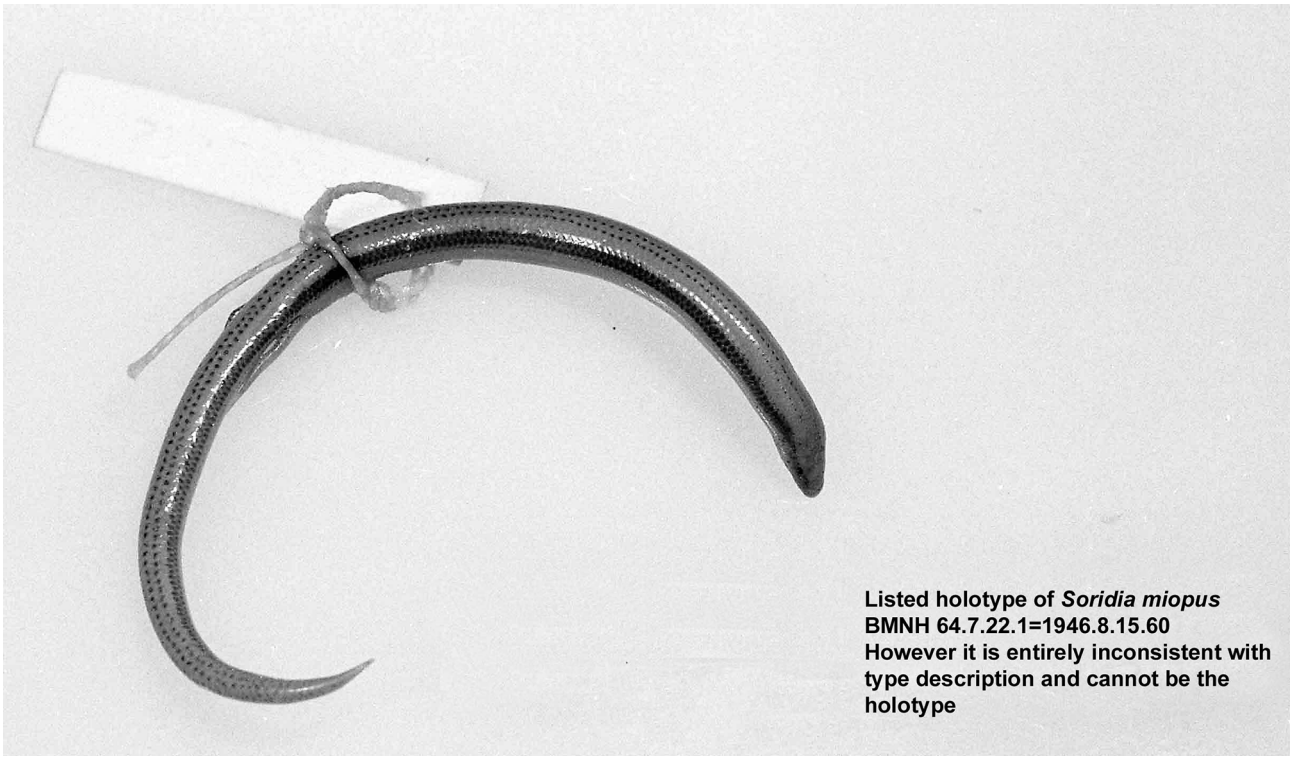

FIGURE 5. Purported type of *Soridia miopus* Günther, 1867, BMNH1946.8.15.60. Photo by H.G. Cogger.

REDESCRIPTION OF *LERISTA LINEOPUNCTULATA*

***Lerista lineopunctulata* (Duméril & Bibron, 1839)**
(Figs. 4 and 6)

Synonyms
Rhodona punctata Gray, 1839 (non *Lacerta punctata* Linnaeus, 1758)
Brachystopus lineopunctulatus Duméril & Bibron, 1839
Ronia catenulata Gray, 1841

Holotype. MNHP1246, Australia. Lodged at Muséum National d'Histoire Naturelle, Paris, France.

Diagnosis. A species of *Lerista* with forelimb only a short stump (L1 = 0.7–1.2% SVL), two digits on a relatively short hindlimb (L2 <14% SVL), fused frontoparietals, four or five supraciliaries and a free eyelid (vs. fused into a transparent spectacle).

Comparisons. Only three other species of *Lerista*, *L. connivens*, *L. miopus* and *L. varia*, have the combination of forelimb with a nubbin or stump, two digits on the hindlimb, free eyelid and interparietal fused to the frontoparietals. *Lerista lineopunctulata* differs from *L. connivens* in a more developed forelimb (a stump 0.7–1.2% SVL vs. usually a depression only or a nubbin no more than 0.6% SVL), a reduced hindlimb (up to 14% SVL vs. 13–23% SVL, 7–10 subdigital lamellae on longest toe, homologous to digit IV, see Greer (1987, 1990) vs. 11–14, 5–7 supradigital scales on longest toe vs. 8–11), more supraciliaries (5 vs. 4) and colour pattern (brown-grey dorsally with lines of dark brown spots, pattern fading laterally vs. two irregular lines of dark brown enclosing a paler brown vertebral stripe and a solid dark brown upper lateral stripe). From *L. miopus*, it differs in a more developed forelimb (a stump 0.7–1.2% SVL vs. usually a depression only or a nubbin no more than 0.7% SVL) and more distinct colour pattern (lines of dark brown spots vs. often so indistinct as to appear patternless). From *L. varia*, it differs in a more developed forelimb (a stump 0.7–1.2% SVL vs. usually a depression only or a nubbin no more than 0.4% SVL), a reduced hindlimb (up to 14% SVL vs. 13–24% SVL, 5–7 supradigitals on the longest toe vs. 8–10), more paravertebrals (76–88 vs. 63–73) and a generally bolder colour pattern (usually brown-grey with lines of dark brown spots dorsally vs. usually 2–4 indistinct lines of dark brown spots).

FIGURE 6. *Lerista lineopunctulata sensu stricto* in life. Specimen from Lancelin, Western Australia, not vouchered, identified using Storr *et al.* (1981). Photo by S. Wilson.

Variation. Sample size is 15 unless otherwise noted: SVL = 69–94 mm (85 ± 7 mm), HL = 8–11% SVL (10 ± 1%), HW = 63–77% HL (69 ± 3%), SE = 20–29% HL (24 ± 2%), eyelid free, EE = 50–60% HL (53 ± 2%), ear minute, SA = 19–25% SVL (22 ± 2%), AG = 68–76% SVL (73 ± 2%), MW 6–10% SVL (8 ± 1%), L1 a short stump, 0.7–1.2% SVL (1.0 ± 0.2%), L2 = 8–14% SVL (10 ± 1%), TL = 74–77% SVL (n = 2). Hindlimb usually with two clawed toes (n = 65), rarely a single clawed toe (n = 7).

Midbody scale rows 20, NC = 0–38% (24 ± 12), NaL = 14–33% (25 ± 5%), FN = 48–70% (63 ± 6%), three supraoculars, five supraciliaries (n = 13), rarely four (n = 2), first supraciliary contacts preocular, loreal, prefrontal, first supraocular and second supraciliary (sometimes fails to contact loreal, n = 1, sometimes contacts frontal, n = 2); frontal contacts interparietal, first and second supraoculars, prefrontal and frontonasal (sometimes also first supraciliary, n = 2); frontoparietals fused to interparietal, IW = 111–151% (131 ± 12%), two loreals (rarely single, n = 1), prefrontal contacts both loreals, frontonasal, frontal, first supraocular and first supraciliary (rarely, fails to contact first supraocular, n = 3); single (n = 3) or two (n = 12) preoculars, single presubocular, 5–7 palpebrals (mode = 6), single postocular, single postsubocular, six supralabials, fourth supralabial entering eye, two postsupralabials, six infralabials, two infralabials contacting postmental, four (n = 4) or five (n = 11) scales between last infralabial and ear, single pretemporal, temporal contacts fifth and sixth supralabials, postocular, pretemporal, second temporal and postsupralabial (rarely, fails to contact postocular, n = 1, sometimes contacts parietal, n = 5); PL = 58–75% (65 ± 5%), three rows of enlarged chin shields, 2–5 nuchals (mode = 3), 76–88 paravertebrals (mode = 80), MV = 51–86% (63 ± 8%), two enlarged preanals, 57–77 body scales between limbs when adpressed (mode = 65), hindlimb 11–19 body scales in length (mode = 13), 7–10 subdigital lamellae under the longest toe (mode = 7), 5–7 supradigitals (mode = 6), 69–71 subcaudals (n = 2).

Colour pattern. Brown to grey, with black lines of spots or dashes, sometimes indistinct, inner lines usually heavier than lateral lines. Head with black edging and markings. Labial scales white with black edging. Belly and throat immaculate whitish. Limbs brown above, whitish below. Tail similar pattern to the body but often a yellowish wash with the pattern heavier but less distinct. Pattern much less regular on regrown tails. Colour pattern in preservative little different except that the black markings tend to fade to dark brown and overall colour becomes browner with length of time in preservative.

Distribution. Coast and coastal islands of Western Australia, from Favorite Island (30° 17' S) south to Lake Clifton (32° 48' S). See Fig. 1. All museum records are within 70 km of the coast, with the exception of WAMR29281. This specimen was collected in 1966 supposedly at Perenjori (29° 27' S 116° 17' E), ~120 km inland and well north of any other *L. lineopunctulata* record but within the latitudinal range of *L. miopus*. This record is most likely in error.

REDESCRIPTION OF *LERISTA MIOPUS*

***Lerista miopus* (Günther, 1867)**
Figs. 7 and 8

Synonyms
Soridia miopus Günther, 1867
Lygosoma bipes concolor Werner, 1910
Lygosoma (Rhodona) nigriceps Glauert, 1962

Holotype. From Champion Bay, Western Australia. Reported to be lodged at the British Museum of Natural History, London, but actual whereabouts unknown (Cogger *et al.* 1983).

Neotype (designated herein). WAMR136122, Strickland St, Geraldton, Western Australia (28° 46' S 114° 37' E), collected 1 Oct. 1998. See Fig. 7.

Diagnosis. A species of *Lerista* with forelimb either absent (represented by a depression) or a nubbin (<0.7% SVL), one or two digits on a relatively short hindlimb (<14% SVL), fused frontoparietals, four or five supraciliaries and a free eyelid (vs. fused into a transparent spectacle).

Comparisons. Only three other species of *Lerista*, *L. connivens*, *L. lineopunctulata* and *L. varia*, have the combination of forelimb a nubbin or stump, two clawed digits on the hindlimb, free eyelid and interparietal fused to the frontoparietals. From *L. connivens*, *L. miopus* differs in a reduced hindlimb (6–14% SVL vs. 13–23%, 3–10 lamellae beneath longest toe vs. 11–14, 2–7 supradigitals above longest toe vs. 8–11, 63–89 scales between

adpressed limbs vs. 50–60), more supraciliaries (five vs. four) and colour pattern (brown-grey dorsally with or without indistinct dark brown spots, pattern fading laterally vs. a broad, dark brown vertebral zone with 2 lines of dark brown spots and a thick, dark brown upper lateral band). From *L. lineopunctulata*, it differs in a reduced forelimb (usually a depression only or a nubbin no more than 0.7% SVL vs. a stump 0.7–1.2% SVL) and less distinct colour pattern (indistinct lines or reticulations vs. lines of dark brown spots dorsally). From *L. varia*, it differs in a reduced hindlimb (6–14% SVL vs. 13–24%, 2–7 supradigitals above largest digit vs. 8–10, 63–89 scales between limbs when adpressed vs. 43–61) and more paravertebrals (73–97 vs. 63–73).

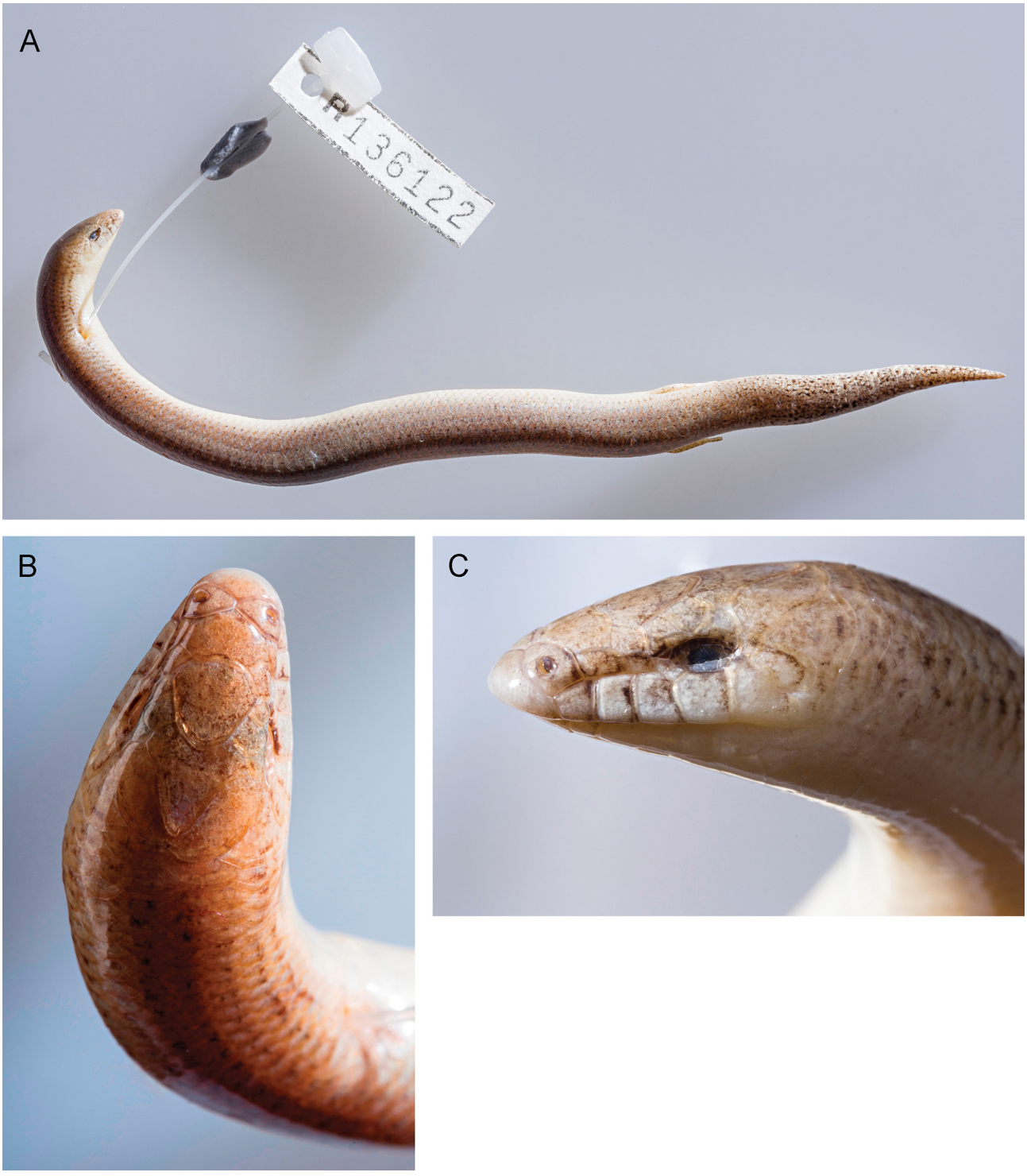

FIGURE 7. WAMR136122, neotype of *Lerista miopus* (Günther, 1867). A. Whole specimen; B. Lateral head view; C. Dorsal head view. Photo by P. Waddington.

Description of neotype WAMR136122. SVL = 86 mm, HL = 8 mm (9% SVL), HW = 6 mm (60% HL), SE = 1 mm (17% HL), eyelid free, EE = 4 mm (45% HL), ear minute, SA = 18 mm (21% SVL), AG = 64 mm (74% SVL), MW = 7 mm (8% SVL), L1 a depression only, L2 = 9 mm (11% SVL), TL = 36 mm (42% SVL, regrown). Hindlimb with a single clawed toe.

Midbody scale rows 20, NC = 27%, NaL = 33%, FN = 63%, three supraoculars, five (right side) or six supraciliaries (left side), first supraciliary contacts preocular, loreal, prefrontal, first supraocular and second supraciliary; frontal contacts interparietal, first and second supraoculars, prefrontal and frontonasal; frontoparietals fused to interparietal, IW = 116%, two loreals, prefrontal contacts both loreals, frontonasal, frontal, first supraocular and first supraciliary, two preoculars, single presubocular, six palpebrals, single postocular, single postsubocular, six supralabials, fourth supralabial entering eye, two postsupralabials, six infralabials, two infralabials contacting postmental, four scales between last infralabial and ear, single pretemporal, temporal contacts fifth and sixth supralabials, postocular, pretemporal, parietal, second temporal and postsupralabial; PL = 75%, three rows of enlarged chin shields, four nuchals, 83 paravertebrals, MV = 72%, two enlarged preanals, hindlimb digit damaged (tip missing on both sides) so no measurements taken, 51 subcaudals (but tail regrown).

Colour pattern (in preservative). Pale grey with very indistinct dark brown spots. Dark edging on head scales almost absent. Belly and throat immaculate cream. Limbs brown above, cream to yellow below. Tail similar pattern to the body but with heavy dark brown flecking.

Variation. Sample size is 33 unless otherwise noted: SVL = 43–106 mm (83 ± 14 mm), HL = 8–14% SVL (10 ± 1%), HW = 26–70% HL (59 ± 11%), SE = 13–26% HL (21 ± 3%), eyelid free, EE = 43–57% HL (50 ± 3%), ear minute, SA = 18–27% SVL (22 ± 2%), AG = 68–80% SVL (75 ± 3%), MW = 7–11% SVL (8 ± 1%), L1 a depression (n = 16) or nubbin (n = 17) up to 0.7% SVL (0.2 ± 0.2%), L2 = 6–14% SVL (9 ± 2%), TL = 87–91% SVL (89 ± 1%, n = 6). Hindlimb with a single (n = 58) or two (n = 88) clawed toes.

FIGURE 8. *Lerista miopus* in life. Specimen from Tamala Stn, Western Australia, not vouchered, identified using Storr *et al.* (1981). Photo by S. Wilson.

Midbody scale rows 18–22 (mode = 20), NC = 9–41% (24 ± 7%), NaL = 21–36% (27 ± 4%), FN = 51–69% (60 ± 4%), three supraoculars, usually five (n = 25), sometimes four (n = 8) supraciliaries, first supraciliary contacts preocular, loreal, prefrontal, first supraocular and second supraciliary (sometimes contacts frontal, n = 7); frontal contacts interparietal, first and second supraoculars, prefrontal and frontonasal; frontoparietals fused to

interparietal, IW = 92–133% (118 ± 9%), two loreals, prefrontal contacts both loreals, frontonasal, frontal, first supraocular and first supraciliary, single (n = 7) or two (n = 25) preoculars, single presubocular, 5–7 palpebrals (mode = 6), single postocular (rarely two, n = 2), single postsubocular, six supralabials, fourth supralabial entering eye, two postsupralabials, six infralabials, two infralabials contacting postmental, 4–6 scales between last infralabial and ear (mode = 4), single pretemporal, temporal contacts fifth and sixth supralabials, postocular, pretemporal, parietal, second temporal and postsupralabial (sometimes fails to contact postocular, n = 3, sometimes fails to contact parietal, n = 9); PL = 57–79% (64 ± 5%), three rows of enlarged chin shields, 2–6 nuchals (mode = 4), 73–97 paravertebrals (mode = 82), MV = 57–95% (72 ± 9%), two enlarged preanals, 63–89 body scales between limbs when adpressed (mode = 70), hindlimb 11–20 body scales in length (mode = 13), 3–10 subdigital lamellae under the longest toe (mode = 8), 2–7 supradigitals (mode = 6), 73–83 subcaudals (average = 74, n = 3).

Colour pattern. Brown to grey, usually with very indistinct lines of black spots. Often spots are so indistinct as to appear patternless, while some individuals (3 of 31 examined), were as boldly marked as *L. lineopunctulata s.s.* These three individuals were collected well within the range of *L. miopus* and otherwise conformed well morphologically. Head with black edging and markings. Labial scales white with black edging. Belly and throat immaculate whitish. Limbs brown above, whitish below. Tail similar pattern to the body but the pattern is heavier, although less distinct and there is often a yellowish wash. Colour pattern in preservative little different except that the black markings tend to fade to dark brown and overall colour becomes browner with length of time in preservative.

Distribution. Coast and coastal islands of Western Australia, from Point Murat (21° 47' S) to north-east of Jurien Bay (30° 15' S). See Fig. 1. One specimen is considerably further east of all other records at Walyahmoming Rock (WARM98752; 30° 40' S 118° 45' E), although there is reason to doubt the accuracy of this record (P. Doughty pers. comm.).

Sympatry with *Lerista lineopunctulata*. The distribution of *L. miopus* and *L. lineopunctulata* appear to be very close to each other, with specimens assigned morphologically to *L. miopus* only 8 km from *L. lineopunctulata* specimens at Jurien Bay. Specimens from this area can be assigned confidently to either taxa but genetic information for them was lacking. A closer study of this apparently near contact between the two could be rewarding.

Reproduction. Sex was determined in 36 specimens opportunistically, either through observation of everted hemipenes or previous dissection. There were ten females and 26 males in this sample. The smallest sexually mature male measured 60 mm SVL, the smallest female 63 mm. The largest specimen measured (106 mm SVL) was male, the largest female 97 mm. No consistent differences between the sexes were observed in any morphological character measured.

Data on the reproductive cycle that could be opportunistically collected without further dissection are presented in Table 3. In summary, reproductive individuals were found in spring, not summer or autumn. One female in late vitellogenesis had a developing clutch of four follicles. A gravid female had ova measuring 5.33 mm diameter, but the date of collection of this individual is unknown.

TABLE 3. Reproductive data collected opportunistically for *Lerista miopus*.

Month	Male	Female
November	Testes enlarged, n = 2	Non-vitellogenic, largest ovum 2.18 mm diameter, n = 1
December	Testes enlarged, n = 2	Late vitellogenic, largest ovum 4.44 mm diameter, n = 2
January	Testes non-reproductive, n = 2	
March	Testes non-reproductive, n = 1	Non-vitellogenic, largest ovum 1.31 mm diameter, n = 3
April		Non-vitellogenic, largest ovum 1.21 mm diameter, n = 1
May	Testes non-reproductive, n = 3	Non-vitellogenic, largest ovum 1.35 mm diameter, n = 2

Discussion

In both species, two toes on the hindlimb was the more common condition than a single toe, although the single-toed condition occurred more frequently in *L. miopus* (40% vs. 10% in *L. lineopunctulata s.s.*). In both species,

single-toed specimens were geographically proximate to each other, in a situation perhaps analogous to *L. kalumburu*, where a geographically-defined population of two-toed individuals was found to be conspecific with surrounding three-toed populations (Amey & Worthington Wilmer 2014). In *L. miopus*, they were found in coastal habitats, whereas in *L. lineopunctulata s.s.*, they were only found in two suburbs of Perth, City Beach and Trigg Beach. The significance of this coastal affinity is unknown, as is the functional significance of differing toe arrangements (although see Benesch & Withers 2002). Once again, the inadvisability of relying on the single morphological character of limb arrangement in *Lerista* for making taxonomic judgements is illustrated (Amey & Worthington Wilmer 2014).

We show that *L. lineopunctulata* is more closely related to the short-range endemics *L. connivens* and *L. varia* found in the vicinity of Shark Bay, each of which are also sympatric with *L. miopus* (Fig. 1). The dynamic history of the Western Australian coast has long been invoked to explain the high levels of diversity along the southwest coasts. Glacio-eustatic fluctuations in sea levels, beginning in the early Pleistocene through to the present, resulted in the recession of the Indian Ocean that exposed vast areas of coastal sands, expanding coastal habitats along southern Western Australia during glacial maxima (Dodson 2001; Hocking *et al.* 1987). During interglacial periods, coastal habitats contracted to resemble current distributions. For reptiles, complex diversity patterns are most extreme in the many *Lerista* species found in the mid-western coast which display extreme levels of incipient species, with multiple short range endemics such as *L. lineopunctulata* and *L. miopus*. Sea level change (He *et al.* 2013) and high levels of soil diversity (Edwards *et al.* 2012) have both been implicated as factors explaining genetic divergence in *Lerista* species in this system, but limited evidence exists to explain broader patterns of diversification in this genus beyond their morphological labiality (Skinner 2010), which may vary considerably within species (Amey & Worthington Wilmer 2014). The limited dispersal abilities, specific soil requirements, and highly adapted morphologies displayed by *Lerista* species may make them predisposed to diversification, explaining the high levels of diversity seen in particularly dynamic habitats such as the south-western Australian west coast.

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APPENDIX. Material examined.

ABTC = Australian Biological Tissue Collection, South Australian Museum, QMJ = Queensland Museum , WAMR = Western Australian Museum. Specimens examined morphologically are highlighted in bold, those used for the genetic analysis are underlined.

Lerista allanae **(n = 8): QMJ6180** (Clermont area, Queensland, holotype), **QMJ6040**, **QMJ6179**, **QMJ6238**, **QMJ6308**, **QMJ6429–430** (Clermont area, Queensland, paratypes), **QMJ12232** (Clermont, Queensland).

Lerista bipes **(n = 6): QMJ48492** (Naccowlah Station, 36 km WNW Jackson, Queensland 27° 34' S 142° 03' E), **QMJ48493** (Chookoo, 30 km WSW Jackson, Queensland, 27° 35' S 141° 54' E), **QMJ48533** (Naccowlah, 36 km WNW Jackson, Queensland 27° 34' S 142° 03' E), **QMJ54320** (Scull Ck, en route to Legune Station, Queensland, 15° 15' S 129° 23' E), **QMJ89536** (Simpson Desert National Park, Queensland, 24° 06' 06" S 138° 12' 21" E), **WAMR169888** (Point Salvation, 7–8 km WNW, Western Australia, 28° 14' S 123° 36' E).

Lerista carpentariae **(n = 1): NTMR19149** (Red Point, Marchinbar I, Northern Territory, 11° 17' S 136° 35' E).

Lerista cinerea **(n = 4)*:* QMJ40097** (Warrawee Station, 60 km SE Charters Towers, Queensland, 20° 24' S 146° 40' E, holotype), **QMJ40094**, **QMJ40096** (Warrawee Stn, 60 km SE Charters Towers, Queensland, 20° 24' S 146° 40' E, paratype), **QMJ42453** (Mt Cooper Station, via Charters Towers, Queensland, 20° 31' S 146° 47' E).

Lerista colliveri **(n = 20): QMJ16181** (Hughenden, Queensland, 20° 51' S 144° 12' E, holotype), **QMJ16182** (Hughenden, Queensland, 20° 51' S 144° 12' E, paratype), **QMJ33123** (Harvey Range, Mingela, Queensland, 19° 41' S 146° 20' E, paratype), **QMJ33124** (Fanning River Station, ~1.5 km from homestead, Queensland, 19° 44' 30" S 146° 26' 30" E, paratype), **QMJ33125–33126** (Toomba Station, Queensland, 19° 58' S 145° 34' E, paratype), **QMJ33127** (Fanning River Station, 1.5km from homestead, Queensland, 19° 44' 30" S 146° 26' 30" E, paratype), **QMJ33128** (Battery Station, Queensland, 19° 26' S 145° 51' E, paratype), **QMJ45648** (Dunraven Station, ~80 km NW Hughenden at Stewart Ck, Queensland, 20° 30' S 143° 55' E, paratype), **QMJ46266–46267** (Mingela Range, Fanning River Station, Queensland, 19° 44' 30" S 146° 27' 30" E, paratype), **QMJ16183** (Hughenden, Queensland, 20° 51' S 144° 12' E), **QMJ59904** (Charters Towers, NW at Toomba Station on Great Basalt Wall, Queensland, 19° 58' 05" S 145° 34' 50" E), **QMJ59905** (Charters Towers area, ~25 km at Burdekin Downs Station, Queensland, 19° 51' 50" S 146° 15' 45" E), **QMJ61264–61265** (Fanning Caves, Queensland, 19° 48' 30" S 146° 28' 30" E), **QMJ61266**, **QMJ61270** (Fanning Caves, Doline Ridge, Queensland, 19° 49' 30" S 146° 27' 30" E), **QMJ84524**, **QMJ84550** (Toomba, Queensland, 19° 58' 04" S 145° 34' 49" E).

Lerista connivens **(n = 11): WAMR25777** (Salutation I, Western Australia, 26° 32' S 113° 46' E, holotype), **WAMR92472** (Hamelin homestead, 12 km SW, Western Australia, 26° 29' 19" S 114° 05' 46" E), **WAMR120758** (no data), **WAMR122724** (Mardathuna homestead, 8 km NW, Western Australia, 24° 25' 44" S 114° 30' 00"E), **WAMR122973**, **WAMR123054** (Woodleigh Station, Western Australia, 26° 11' 30" S 114° 30' 33" E), **WAMR123709** (Boolathana homestead, Western Australia, 24° 24' 47" S 113° 42' 24" E), **WAMR124982** (Nerren Nerren homestead, Western Australia, 27° 07' 23" S 114° 46' 41" E), **WAMR127889** (Boologooro Station, Western Australia, 24° 21' S 114° 02' E), **WAMR135652** (Nerren Nerren, 31 km SSE, Western Australia, 27° 23' 26" S 114° 45' 10" E), **WAMR136310** (Muggon Station, Western Australia, 26° 46' 44" S 115° 37' 40" E).

Lerista gascoynensis **(n = 2): WAMR55971** (Gascoyne Junction, 16 km S, Western Australia, 25° 10' S 115° 12' E, holotype), WAMR116790 (Gascoyne Junction, 20 km S, Western Australia, 25° 13' S 115° 10' E).

Lerista greeri **(n = 1): WAMR23005** (Derby, 8 km SSE, Western Australia, 17° 22' S 123° 40' E, holotype).

Lerista griffini **(n = 1): WAMR75543** (Kununurra, Western Australia, 15° 47' S 128° 44' E, holotype).

Lerista hobsoni **(n = 7): QMJ40098–40099** (Battery Station, 90 km NNW Charters Towers, Queensland, 19° 29' S 145° 39' E, paratypes), **QMJ40100** (Charters Towers, 83 km NNW, Queensland, 19° 33' S 145° 42' E, paratype), **QMJ69486** (Pentland, Queensland, 20° 32' S 145° 24' E, paratype), **QMJ74899** (Gregory Range, Queensland, 19° 53' 30" S 144° 14' 30" E, paratype), **QMJ84653–84654** (Myola Station, Queensland, 20° 04' 21" S 145° 28' 02" E, paratypes).

Lerista humphries**i (n = 2): WAMR34048** (Gee Gie Outcamp, 34 km NNW Murchison House, Western Australia, 27° 21' S 114° 09' E, holotype), WAMR116872 (Carrollgouda Well, Western Australia, 27° 24' S 114° 18' E*).*

Lerista kalumburu **(n = 26): WAMR27915** (Kalumburu, Western Australia, 14° 18' S 126° 38' E, holotype), **WAMR99203**, **WAMR99208–210**, **WAMR100188–89**, (Face Point, Carson Escarpment, 2.5 km N, Western Australia, 14° 50' 20" S 126° 49' 10" E), **WAMR113949** (Carson Escarpment, Western Australia, 14° 51' S 126° 49' E), **WAMR113983** (Carson Escarpment, Western Australia, 15° 21' S 126° 37' E), **WAMR129938–39** (Kalumburu, 10 km N, Western Australia, 14° 12' S 126° 38' E), **WAMR131660** (Kalumburu area, Western Australia, 14° 12' 37" S 126° 38' 43" E), **WAMR151647** (Mary I, Western Australia, 13° 59' 00" S 126° 22' 45" E), **WAMR151860**, **WAMR151885–86**, **WAMR151998** (Sir Graham Moore I, Western Australia, 13° 53' S 126° 34' E), **WAMR165945** (Truscott, Western Australia, 14° 05' 11" S 126° 26' 48" E), **WAMR166151–52** (Doongan Station, Western Australia, 15° 18' 25" S 126° 09' 31" E), **WAMR166153–54** (Theda Station, Cypress Valley, Western Australia, 14° 48' 22" S 126° 30' 27" E), **WAMR168457** (Sir Graham Moore I, Western Australia, 13° 53' S 126° 34' E), **WAMR171600** (Mary I, Western Australia, 13° 59' 00" S 126° 22' 45" E), **WAMR172346** (Theda Station, Western Australia, 14° 50' S 126° 16' E), **WAMR172358** (Theda Station, Western Australia, 14° 47' S 126° 30' E).

Lerista karlschmidti **(n = 8): CHMN97957** (Woodstock, ~37 km S Townsville, Queensland 19° 36' S 146° 50' E, holotype), **CHMN97958** (Woodstock, ~37 km S Townsville 19° 36' S 146° 50' E, paratype), **NTMR20996** (Goyder River Area, Arnhem Land, Northern Territory, 12° 38' S 134° 49' E), **QMJ84188** (Maningrida airstrip, Northern Territory, 12° 05' 42" S 134° 14' 16" E), **QMJ82492–95** (Maningrida, Northern Territory, 12° 02' 33" S 134° 14' 00" E).

Lerista kendricki **(n = 2): WAMR93887** (Hamelin homestead, 15 km SW, Western Australia, 26° 32' S 114° 05' E, holotype), WARM116264 (Kalbarri, 22 km S, Western Australia, 27° 51' S 114° 10' E).

***Lerista kennedyensis* (n = 1):** WAMR99638 (Merlinleigh homestead, Western Australia, 24° 19' S 115° 11' E).
***Lerista labialis* (n = 1): WAMR22647** (Poonda, Western Australia, 22° 53' S 119° 42' E, holotype).

***Lerista lineopunctulata* (n = 30): WAMR7607** (Moora, Western Australia, 30° 39' S 116° 00' E), **WAMR29281** (Perenjori, Western Australia, 29° 27' S 116° 17' E), **WAMR112823** (Favorite I, Western Australia, 30° 17' S 115° 00' E), WAMR112824 (Boullanger I, Western Australia, 30° 19' S 115° 00' E), WAMR112853 (Lake Clifton, Western Australia, 32° 47' 40" S 115° 38' 53" E), WAMR115120 (Bold Park, Western Australia, 31° 56' 00" S 115° 46' 13" E), WAMR115169 (Kings Park, Western Australia, 31° 59' S 115° 51' E), WAMR120307–08 (Mount Claremont, Western Australia, 31° 59' S 115° 47' E), WAMR121367–68, **WAMR121369** (City Beach, Perth, Western Australia, 31° 56' S 115° 46' E), **WAMR121371** (Lancelin I, Western Australia, 31° 00' S 115° 19' E), WAMR121975 (Bold Park, Western Australia, 31° 57' 11" S 115° 45' 50" E), WAMR136115–16 (Trigg Beach, Western Australia, 31° 52' S 115° 46' E), **WAMR13132** (City Beach, Western Australia, 31° 56' S 115° 46' E), **WAMR140542–43**, WAMR14070 (Bold Park, Western Australia, 31° 56' S 115° 45' E), WAMR140901 (City Beach, Perth, Western Australia, 31° 56' S 115° 46' E), WAMR140905 (Cataby, 15 km WNW, Western Australia, 30° 43' 10" S 115° 19' 01" E), WAMR141177 (Lancelin, ~15 km NNE, Western Australia, 30° 47' 57" S 115° 16' 16" E), **WAMR141182** (Lancelin, ~15 km NNE, Western Australia, 30° 59' 31" S 115° 23' 43" E), **WAMR144362**, WAMR144363, 151760–61 (Favorite I, Western Australia, 30° 17' S 115° 00' E), WAMR151760–61 (Favorite I, Western Australia, 30° 17' S 115° 00' E) **WAMR152966**, WAMR152967 (Boullanger I, Western Australia, 30° 19' S 115° 00' E).

***Lerista macropisthopus galea* (n = 1): WAMR83228** (Galena, 8 km S, Western Australia, 27° 53' S 114° 42' E, holotype).

***Lerista macropisthopus macropisthopus* (n =1): WAMR144586** (Mount Jackson, Western Australia, 30° 15' 22" S 119° 16' 27" E).

***Lerista miopus* (n = 84): WAMR136122** (Strickland St, Geraldton, Western Australia, 28° 46' S 114° 37' E, neotype), **WAMR14039** (Vlaming Head, Western Australia, 21° 48' S 114° 06' E, holotype of *L. (R.) nigriceps*), **WAMR30481** (Jurien Bay, 8 km NE, Western Australia, 30° 15' S 115° 05' E), **WAMR46586** (Jurien, 8 km NE, Western Australia, 30° 15' S 115° 05' E), **WAMR72904** (Cliff Head, 4 km S, Western Australia, 29° 34' S 114° 59' E), **WAMR73095** (Coolimba, 16 km E, Western Australia, 29° 54' S 115° 08' E), **WAMR73115** (Coolimba, Western Australia, 29° 52' S 114° 59' E), **WAMR88768–69** (Dongara, 25 km S, Western Australia, 29° 35' S 115° 00' E), **WAMR98752** (Walyahmoning Rock, 3.5 km S, Walyahmoning Rock Nature Reserve, Western Australia, 30° 40' S 118° 45' E), **WAMR113592** (Two Miles Well, Dirk Hartog I, Western Australia, 26° 02' S 113° 12' E), **WAMR115604–05** (Webberton, Geraldton, Western Australia, 28° 46' S 114° 37' E), **WAMR116272** (Kalbarri, 22 km S, Western Australia, 27° 51' S 114° 10' E), **WAMR119136** (Nilemah Outstation, 2 km SE, Western Australia, 26° 26' S 114° 04' E), **WAMR119262** (Karloo, Geraldton, Western Australia, 28° 46' S 114° 37' E), **WAMR120439** (Carnarvon, 40 km SSE, Western Australia, 25° 08' 03" S 113° 48' 20" E), **WAMR121063** (Hamelin homestead, 24 km WSW, Western Australia, 26° 31' 21" S 114° 00' 09" E), WAMR122458 (Hamelin homestead, 26 km WSW, Western Australia, 26° 32' 47" S 113° 57' 48" E), WAMR122913 (Cape Cuvier, 9 km E, Western Australia, 24° 13' 23" S 113° 29' 29" E), WAMR123103 (Carnarvon, 40 km SSE, Western Australia, 25° 08' 03" S 113° 48' 20" E), WAMR123117 (Carnarvon, 40 km SSE, 25° 08' 03" S 113° 48' 20" E), WAMR123120, WAMR123147 (Carnarvon, 37 km SSE, Western Australia, 25° 06' 56" S 113° 43' 45" E), WAMR123165 (Carnarvon, 40 km SSE, Western Australia, 25° 07' 33" S 113° 49' 22" E), WAMR123169, WAMR123175 (Carnarvon, 38 km SSE, Western Australia, 25° 07' 54" S 113° 46' 05" E), WAMR123183 (Carnarvon, 37 km SSE, Western Australia, 25° 06' 56" S 113° 43' 45" E), WAMR123517–520 (Kalbarri, 53 km NNW, Western Australia, 27° 15' 33" S 114° 04' 03" E), WAMR123608, WAMR123618 (Peron homestead, near, Western Australia, 25° 50' 20" S 113° 36' 23" E), WAMR123641 (Peron homestead, 3 km NW, Western Australia, 25° 49' 14" S 113° 32' 21" E), WAMR123652 (Peron homestead, 4 km S, Western Australia, 25° 52' 31" S 113° 33' 01" E), WAMR123686 (Denham, 7 km SSE, Western Australia, 25° 58' 32" S 113° 34' 15" E), WAMR123948 (Point Murat, 12 km N Exmouth, Western Australia, 21° 47' S 114° 11' E), WAMR125001, **WAMR126820** (Cape Cuvier, 6 km NNE, Western Australia, 24° 11' 35" S 113° 27' 19" E), WAMR127121, WAMR127132 (North I, Western Australia, 28° 18' S 113° 35' E), WAMR127459 (East Yuna Nature Reserve, Western Australia, 28° 28' S 115° 13' E), **WAMR128562–63** (Lesueur National Park, Western Australia, 30° 02' 02" S 115° 01' 08" E), **WAMR128564** (Lesueur National Park, Western Australia, 30° 08' 40" S 115° 09' 25" E), **WAMR128565** (Lesueur National Park, Western Australia, 30° 04' 23" S 114° 58' 38" E), WAMR129791 (Kalbarri, 22 km S, Western Australia, 27° 53' 52" S 114° 10' 01" E), WAMR131385 (Bullara homestead, 4 km W, Western Australia, 22° 41' S 113° 59' E), **WAMR136105** (Peron Peninsula, Shark Bay, Western Australia, 25° 59' S 113° 36' E), **WAMR136106** (Shark Bay, Western Australia, 26° 34' S 114° 00' E), WAMR136107 (Kalbarri National Park, Western Australia, 27° 42' S 114°24' E), WAMR136108, **WAMR136109** (Edel Land, Shark Bay, Western Australia, 26° 28' S 113° 28' E), WAMR136110–14 (False Entrance Well, Western Australia, 26° 23' S 113° 19' E), **WAMR136117–19**, **WAMR136121** (Strickland St, Geraldton,

Western Australia, 28° 46' S 114° 37' E), WAMR136123 (Edel Land, Shark Bay, Western Australia, 26° 20' S 113° 23' E), WAMR137976 (Coral Bay, Western Australia, 21° 53' S 114° 01' E), WAMR141493 (Faure I, Western Australia, 25° 51' 15" S 113° 51' 45" E), WAMR141831–33 (Port Denison, 5 km SSE, Western Australia, 29° 17' 12" S 114° 55' 28" E), WAMR146387–88 (Kalbarri, 32 km S, Western Australia, 28° 00' 01" S 114° 12' 19" E), **WAMR146389** (Wagoe Beach, Western Australia, 27° 53' 05" S 114° 07' 57" E), WAMR146408 (Tamala Station, Western Australia, 26° 42' S 113° 40' E), WAMR146447 (Kalbarri, 20 km S, Western Australia, 27° 52' S 114° 11' E), WAMR152636, **WAMR152637** (Gun I, Western Australia, 28° 53' 18" S 113° 51' 40" E), **WAMR156890** (West Wallabi I, Western Australia, 28° 27' 21" S 113° 41' 02" E), WAMR156903, WAMR156921–22 (West Wallabi I, Western Australia, 28° 27' 38" S 113° 41' 10" E), WAMR156923 (West Wallabi I, Western Australia, 28° 27' 24" S 113° 41' 04" E), WAMR156962 (Dirk Hartog I, Western Australia, 26° 00' S 113° 12' E), WAMR165289, WAMR165299 (Cape Burney, Western Australia, 28° 51' 06" S 114° 38' 24" E).

Lerista nichollsi **(n = 2):** ABTC59787 (Kalli homestead, 10.9 km E, Western Australia, 26° 55' S 117° 13' E), **WAMR152989** (Walga Rock, Western Australia, 27° 23' 55" S 117° 28' 15" E).

Lerista onlsoviana **(n= 1):** WAMR116826 (Onlsow, Western Australia, 21° 38' S 115° 07' E).

Lerista petersoni **(n = 2): WAMR46197** (Yinnietharra, Western Australia, 24° 39' S 116° 09' E, holotype), WAMR99637 (Merlinleigh homestead, 0.5 km S, Western Australia, 24° 19' S 115° 11' E).

Lerista praepedita **(n = 2):** WAMR122524 (Hamelin homestead, 26 km WSW 26° 32' 47" S 113° 57' 48" E), **WAMR128871** (Lesueur National Park, Western Australia, 30° 08' 40" S 115° 09' 25" E).

Lerista punctatovittata **(n = 8): QMJ64818** (Taroom, 6 km N, Queensland, 25° 36' S 149° 46' E), **QMJ76874** (State Forest 161, Condamine, Queensland 26° 58' 07" S 150° 17' 42" E), **QMJ77729** (Darling Downs, near Brymaroo, Queensland, 27° 11' 13" S 151° 33' 53" E), **QMJ78726** (Welford National Park, Queensland, 25° 08' 44" S 143° 16' 14" E), **QMJ89479** (Bendee Downs homestead, Queensland, 28° 03' 54" S 146° 33' 54" E), **QMJ91082** (Hairy-nosed Hwy, Epping Forest National Park, NW Clermont, Queensland, 22° 21' 09" S 146° 41' 29" E), **QMJ91782**, **QMJ91802** (Welford National Park, Queensland, 25° 10' 18" S 143° 20' 05" E).

Lerista robusta **(n = 1): WAMR100992** (Egans Bore, 50 km W Cherrabun, Western Australia, 18° 56' S 125° 04' E, holotype).

Lerista rochfordensis **(n = 5): QMJ84790** (Rochford Scrub, Queensland, 20° 06' 49" S 146° 37' 03" E, holotype), **QMJ85002** (Rochford Scrub, Queensland, 20° 07' 01" S 146° 37' 49" E, paratype), **QMJ85007** (Rochford Scrub, Queensland, 20° 07' 05" S 146° 37' 43" E, paratype), **QMJ44385–86** (Boori Station, border with Amity, Queensland, 20° 07' 24" S 146° 38' 34" E, paratypes).

Lerista storri **(n = 12): QMJ39480** (Springfield Station, near railway crossing, Queensland, 17° 56' 50" S 144° 24' 25" E, holotype), **QMJ39481** (Springfield Station, near railway crossing, Queensland, 17° 56' 50" S 144° 24' 25" E, paratype), **CHNM97741** (Woodstock, ~37 km S Townsville, Queensland, 19° 36' S 146° 50' E), **QMJ60109–112** (Sellheim Scrub, ~20 km E Charters Towers, Queensland, 20° 01' 30" S 146° 24' 45" E), **QMJ74236** (Bulleringa National Park via Mt Surprise, Queensland, 17° 39' S 143° 44' E), **QMJ82292** (Torrens Creek, 13 km W, Queensland, 20° 48' 09" S 144° 53' 50" E), **QMJ85022** (Almaden-Mount Surprise railway line, Queensland, 17° 56' 55" S 144° 24' 28" E), **QMJ87270** (Almaden, Queensland, 17° 23' 24" S 144° 39' 39" E), **QMJ88492** (Bletchington Park, 40 km S Charters Towers, Quensland, 20° 27' 24" S 146° 13' 38" E).

Lerista stylis **(n = 1): QMJ76493** (Gove Town Common, Northern Territory, 12° 11' S 136° 46' E).

Lerista uniuduo **(n =1):** ABTC54427 (One Tree Point, near Carnarvon, Western Australia, 24° 53' S 113° 40' E).

Lerista vanderduysi **(n = 15): QMJ77459** (Blackbraes National Park, between Hughenden and Mt Garnet, Queensland, 19° 32' 54" S 143° 56' 27" E, paratype), **QMJ77548** (Blackbraes National Park, between Hughenden and Mt Garnet 19° 33' 07" S 143° 58' 20" E, paratype), **QMJ79057** (Blackbraes National Park, 180 km NE Hughenden, Queensland, 19° 33' 58" S 143° 59' 28" E, holotype), **QMJJ79058–060** (Blackbraes National Park, 180 km NE Hughenden, Queensland, 19° 35' 14" S 144° 01' 00" E, paratypes), **QMJ80715** (Blackbraes National Park, Gorge Creek Rd, Queensland 19° 35' 13" S 144° 01' E, paratype), **QMJ81773** (Blackbraes National Park, Queensland 19° 35' 14" S 144° 01' E, paratype), **QMJ82299** (Kidston Dam, Queensland 19° 02' 08" S 144° 07' 16" E, paratype), **QMJ88148–150** (Gilberton, Queensland, 19° 12' 28" S 143° 39' 58" E,

paratypes), **QMJ91729** (Blackbraes National Park, Queensland, 19° 33’ 58" S 143° 59' 28" E, paratype), **QMJJ91730–31** (Blackbraes National Park, Queensland, 19° 35' 14" S 144° 01' 00’ E, paratypes).

Lerista varia **(n = 12): WAMR81341** (Denham, Western Australia, 25° 55' S 113° 32' E, holotype), **WAMR103954** (Edel Land, Western Australia, 26° 08' S 113° 26' E), **WAMR104253** (Faure I, Western Australia, 25° 53' S 113° 54' E), **WAMR113649** (Dirk Hartog I, Western Australia, 26° 00' S 113° 12' E), **WAMR115093** (Shark Bay, Western Australia, 26° 18' S 113° 59' E), **WAMR119140** (Dubaut Ck, Shark Bay, Western Australia, 25° 52' 00" S 113° 42' 30" E), **WAMR120812** (Peron homestead, near, Western Australia, 25° 50' 20" S 113° 36' 23" E), **WAMR121072** (Denham, 7 km SSE, Western Australia, 25° 58' 32" S 113° 34' 15" E), **WAMR123605** (Peron homestead, near, Western Australia. 25° 50' 20" S 113° 36' 23" E), **WAMR123661** (Peron homestead, 40 km S, Western Australia, 25° 52' 31" S 113° 33' 01" E), **WAMR123688** (Denham, 7 km SSE, Western Australia, 25° 58' 32" S 113° 34' 15" E), **WAMR126716** (Peron homestead, 40 km S, Western Australia, 25° 52' 31" S 113° 33' 01" E).

Lerista vittata **(n = 13): QMJ40102** (St Pauls Scrub, Mount Cooper Station, 90 km SE Charters Towers, Queensland, 20° 31' 30" S 146° 55' E, holotype), **QMJ40101**, **QMJ40103** (St Pauls Scrub, Mount Cooper Station, 90 km SE Charters Towers, Queensland, 20° 31' 30" S 146° 55' E, paratypes), **QMJ40104** (St Pauls Scrub, Mount Cooper Station, 90 km SE Charters Towers, Queensland, 20° 31' 48" S 146° 55' E, paratype), **QMJ42446–451** (St Pauls Scrub, Mount Cooper Station, 90 km SE Charters Towers, Queensland, 20° 32' S 146° 55' E), **QMJ50748–750** (St Pauls Scrub, Mount Cooper Station, 90 km SE Charters Towers, Queensland, 20° 31' S 146° 55' E).

Lerista yuna **(n =2): WAMR97214** (East Yuna Reserve, Western Australia, 28° 28' S 115° 13' E, holotype), WAMR100846 (East Yuna Reserve, Western Australia, 28° 28' S 115° 13' E).