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Islands in the sky : species diversity, evolutionary history, and patterns of endemism of the Pantepui Herpetofauna

Kok, P.J.R.

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Author: Kok, Philippe Jacques Robert

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LIZARD IN THE CLOUDS: A NEW HIGHLAND GENUS AND SPECIES
OF GYMNOPHTHALMIDAE (REPTILIA: SQUAMATA) FROM
MARINGMA TEPUI, WESTERN GUYANA

P. J. R. KOK

Abstract

A new genus is erected for *Pantepuisaurus rodriguesi* **gen. nov. sp. nov.**, collected at 2080 m elevation on Mount Maringma, a sandstone flat-topped table mountain (tepui) located in the eastern Pakaraima Mountains, at the Guyana- Brazil border. The new genus mainly differs from all other known gymnophthalmids by the following combination of characters: distinctive ear opening and moveable eyelids, limbs pentadactyl with all digits clawed, prefrontals present, interparietal and parietals forming a jagged, irregular posterior margin, three pairs of genials, second pair of genials in contact with only one infralabial, dorsal scales hexagonal, keeled, in transverse rows only, ventral scales imbricate, hexagonal, mucronate, broadly keeled, in transverse rows only, and hemipenis weakly bilobed with series of curved transverse plicae bearing mineralized spicules.

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Text and figures remain unchanged, only the format was adapted to fit the thesis layout



INTRODUCTION

The first expedition to the summit of Maringma tepui (5°13'N, 60°35'W, Figs. 1–3), one of the highest tepuis of Guyana, located about 17 km (airline) east of Mount Roraima, was conducted in 2004 by botanist David Clarke (University of North Carolina at Asheville) and collaborators, who cut a trail from the base of the mountain to its summit. In February 2006 Bruce Means (Coastal Plains Institute and Land Conservancy, Florida) reached the summit of Maringma by helicopter and collected a few frog species at the top, apparently none of them being new to science (D. Bruce Means, pers. comm.).

At the end of 2007, our team (composed of the author, and two Guyanese counterparts; helped by several Amerindian porters) sampled the area along an altitudinal transect (see Means & Savage 2007) from the surrounding uplands around the village of Philipi (5°21'N, 60°22'W, *ca.* 510 m asl) to the highest summit of Mount Maringma (*ca.* 2147 m asl), which represents a walk of roughly 40 km. We mostly followed the trail pioneered by Clarke (although many parts of it became undetectable) from the base of Maringma to its summit.

Only the very top of Maringma tepui has solid “dry” ground, and rocky outcrops are small and very limited in number. The summit vegetation (Fig. 3) consists of a mixture of the typical “tepuí meadow”, large areas of quaking peat bog, and patches of dwarf forests largely dominated by *Bonnetia roraimae* (Bonnetiaceae). Deep swampy pools are numerous and surround the tepui summit, its plateau being not completely flat but more or less stair-stepped, with a total surface of about 170ha. Climatic conditions on Maringma tepui are extreme, with great temperature fluctuation (we recorded temperature variation from 13.5 to 37.5°C during our stay on the summit between 25–30 November 2007). Freezing powerful winds, diluvian rains, and persistent mist were the usual weather conditions during our stay on the tepui.

Among the new species of amphibians and reptiles discovered during our field trip to Maringma tepui was one enigmatic lizard of the family Gymnophthalmidae from the summit of the mountain, which does not fit in any currently known gymnophthalmid genus and is described herein.

MATERIAL AND METHODS

The holotype was photographed alive before euthanization by intracardiac injection of Xylocaine. Tissue (liver) was removed and preserved in 95% ethanol before fixation of the whole individual in 10% formalin. Both specimen and tissue were deposited at the Institut Royal des Sciences Naturelles de Belgique (IRSNB), where the specimen was transferred to 70% ethanol for permanent storage.

Coordinates and elevations were acquired using a Garmin 60CSx GPS (Global Positioning System) unit and were referenced to map datum WGS84.

Scale counts were made using a Leica stereo dissecting microscope. All measurements were taken on the preserved specimen to the nearest 0.1 mm with an electronic digital caliper or to the nearest 1.0 mm with a rule. Snout-vent length (SVL) was measured from tip of snout to anterior border of cloaca; head length from tip of rostral to anterior edge of ear; trunk length is the distance between the posterior margin of forelimbs and the anterior

margin of hindlimbs. Color characteristics were obtained from field notes and color digital photographs. Sex was confirmed by the presence of hemipenes.

Taxonomy follows Pellegrino *et al.* (2001) and Rodrigues *et al.* (2005). Scale terminology and character definitions mostly follow those of Harris (1994), Kizirian (1996), and Myers & Donnelly (2008); the term *occipitals* is used to name the distinct, enlarged, scales posterior to and bordering the parietals and the interparietal.

Diagnosis mostly follows the format of Doan & Castoe (2005), Kok (2005), and Myers & Donnelly (2008) for ease of comparison.

The new genus was compared to original descriptions of gymnophthalmid genera, digital photographs of type specimens, and type museum material when available. Material studied is listed in Kok (2005); additional material examined is in the Appendix. Intergeneric comparisons were mainly based on the work of Uzzell (1969, 1973), Oftedal (1974), Hoogmoed & Avila-Pires (1992), Gorzula & Señaris (1998), MacCulloch & Lathrop (2001), Myers & Donnelly (2001, 2008), Rodrigues *et al.* (2002, 2005, 2007), and Kok (2005). Museum abbreviations are those of Frost (2008).

RESULTS

Pantepuisaurus genus novum

Type species. *Pantepuisaurus rodriguesi* species novum

Etymology. A noun in apposition, derived from “Pantepui” referring to the phytogeographic province where the type species was discovered, and the Greek *sauros* meaning “lizard”. Gender masculine.

Content. *Pantepuisaurus rodriguesi* species novum; monotypic.

Diagnosis. An elongate gymnophthalmid (known SVL in male 58.3 mm) with a long tail (1.6x SVL) and the unique following combination of characters: (1) distinctive ear opening and moveable eyelids, (2) limbs pentadactyl with all digits clawed, (3) nasal scales separated by a single frontonasal, (4) prefrontals present, (5) frontoparietals, parietals and interparietal present, (6) parietals and interparietal longer than wide, (7) interparietal and parietals forming a jagged, irregular posterior margin, (8) occipitals present, (9) three pairs of genials, second pair in contact with only one infralabial, (10) enlarged median pairs of gulars, (11) dorsal scales hexagonal, keeled, in transverse rows only, (12) ventral scales imbricate, hexagonal, mucronate, broadly keeled, in transverse rows only, (13) tongue anterodorsally covered by oblique, anteriorly converging plicae, posterodorsally covered by large scalelike papillae (14) hemipenis weakly bilobed with series of curved transverse plicae bearing mineralized spicules.

Pantepuisaurus differs from members of Alopoglossinae in having the tongue anterodorsally covered by oblique plicae and posterodorsally covered by large scalelike papillae (entirely covered by oblique plicae in Alopoglossinae), the interparietal and the parietals forming a jagged, irregular line (straight posterior margin), and in having ventral scales in transverse rows only (in transverse and longitudinal rows in Alopoglossinae);

from members of Gymnophthalminae in having hands pentadactyl with the first finger clawed (first finger absent, reduced and/or clawless in Gymnophthalminae); from Rhachisaurinae in having external ear openings (absent in Rhachisaurinae). Within Cercosaurinae (*sensu* Pellegrino *et al.* 2001 and Rodrigues *et al.* 2005), *Pantepuisaurus* differs from all genera except *Ecpleopus* and *Leposoma* of the *scincoides* group in having hexagonal, mucronate ventral scales arranged in transverse rows only. *Pantepuisaurus* is readily distinguished from *Ecpleopus* (characters of *Ecpleopus* in parentheses) notably by the presence of a broad keel on ventrals (absent), quadrangular gular scales (mucronate), complete superciliary series (incomplete), and the presence of femoral pores in males (absent). *Pantepuisaurus* is quickly separated from *Leposoma* of the *scincoides* group (characters of *Leposoma* in parentheses) in having quadrangular gular scales (mucronate), by the absence of distinct striations on head scales (present), the interparietal and the parietals forming a jagged, irregular line (round posterior margin), and the presence of occipitals (absent). Two additional gymnophthalmid genera, *Adercosaurus* and *Kaieteurosaurus*, have not been assigned to any subfamily yet, but might be related each other and with *Pantepuisaurus*. *Pantepuisaurus* is immediately distinguished from *Adercosaurus* (characters of *Adercosaurus* in parentheses) in having imbricate, hexagonal, mucronate, broadly keeled ventral scales in transverse rows only (smooth, in transverse and longitudinal rows), in having a highly reduced fourth infralabial (not reduced) and the second pair of genials partly separated from the infralabials and in contact with one infralabial only (not separated from the infralabials, in contact with two infralabials), in lacking oblique plicae at the rear of the tongue, which is posteriorly covered by large scalelike papillae (rear of tongue covered by oblique plicae), and in having mineralized spicules on hemipenes' plicae (absent). *Pantepuisaurus* is most similar to *Kaieteurosaurus* in having hexagonal, mucronate ventral scales arranged in transverse rows only, but it is readily distinguished from it (characters of *Kaieteurosaurus* in parentheses) by the presence of prefrontal scales (absent), three pairs of genials (two), in having a highly reduced fourth infralabial (not reduced) and the second pair of genials partly separated from the infralabials and in contact with one infralabial only (not separated from the infralabials, in contact with two infralabials), the common suture of the interparietal and parietals forming a jagged, irregular line (more or less straight posterior margin), an entire nasal (divided), and the aspect of the ventral scales that are much less lanceolate and mucronate than in *Kaieteurosaurus*. It should be emphasized here that *Kaieteurosaurus* also has broad “keels” on ventral scales (*i.e.* the central part of the scale is broadly elevated), a character that was only noticed while closely comparing the two genera. This character is not conspicuous in all *Kaieteurosaurus* specimens and is mostly noticeable on anteriormost and posteriormost ventral scales. In *Kaieteurosaurus* the significant lateral extension of the flat “keel” gives a lanceolate, smooth, “unkeeled” aspect to the ventral scales as described by Kok (2005), while the keel is more prominent and conspicuous in *Pantepuisaurus*. Figure 4 schematically illustrates the difference in the aspect of the broad keel on ventral scales between *Pantepuisaurus* and *Kaieteurosaurus*. A summary of main diagnostic characters for *Pantepuisaurus*, *Adercosaurus* and *Kaieteurosaurus* is in Table 1.

Distribution. The genus is currently known only from the type locality, the summit of Maringma tepui in Guyana (Fig. 1).

Taxonomic comments. No less than eight new gymnophthalmid genera have been described (Myers & Donnelly 2001, Doan & Castoe 2005, Kok 2005, Rodrigues *et al.* 2005, 2007, Rodrigues & Maranhão dos Santos 2008) since the molecular-based phylogenetic hypothesis of Pellegrino *et al.* (2001), who demonstrated the monophyly of Gymnophthalmidae. Some higher-level taxonomic changes are still in debate (see Castoe *et al.* 2004, Rodrigues *et al.* 2007) and refinement of higher-level taxonomy of gymnophthalmids is still necessary.

Morphologically, the new genus shows some similarities with *Adercosaurus* and *Kaieteurosaurus*. Giving the low number of specimens available, any speculation on the relationships between *Adercosaurus* (known only from the holotype), *Kaieteurosaurus* (known only from three specimens), and *Pantepuisaurus* (known only from the holotype) seems premature. More specimens of these three genera are clearly needed to elucidate relationships between them. However, preliminary molecular analysis and comparisons do indicate affinities between *Pantepuisaurus* and *Kaieteurosaurus* (unfortunately, molecular data on *Adercosaurus* are not available), but reveal significant genetic divergences between these two genera that give further support to the erection of a new genus. Molecular analysis also suggests assignment of *Pantepuisaurus* and *Kaieteurosaurus* to the tribe Ecleopini (Cercosaurinae) (M. T. Rodrigues, pers. comm.).

A more “conservative” attitude would have been to accommodate the new species in an already known monotypic genus sharing some morphological similarities (*i.e.* *Adercosaurus* or *Kaieteurosaurus*). However this would have given rise to two important problems: (1) assignment of the new species to either of these two genera would have been arbitrary and poorly supported because the new species differs from both of them in a combination of important characteristics currently used to diagnose gymnophthalmid genera (*e.g.* condition of the posterior margin of the interparietal and parietals, condition of ventral scales, number of genials, presence of prefrontals, hemipenial morphology, tongue morphology) (2) because the new species differs from these two genera in morphological characteristics used to separate other genera (especially in the tribe Ecleopini), placing the new species in one of them would have rendered the taxonomic status of these and other genera dubious by suggesting that these characters are variable intragenerically (thus making taxonomy of the group more complicated instead of simplifying it). One could suggest that *Kaieteurosaurus* is a synonym of *Adercosaurus*, however this is not supported by any evidence, these two genera being differentiated on the basis of many important diagnostic characters (see Kok 2005).



Figure 1. Area map of Mount Maringma showing the type locality of *Pantepuisaurus rodriguesi* **gen. nov. sp. nov.** (red dot). Coordinates and boundary with Brazil are approximate and based on the available map (note that there is a substantial difference in the country boundary between this map and that shown in Google Earth). Maps elaborated after “Roraima Sheet 40 SE” published by the Survey Department of Guyana, 1972, and a radar image of South America by NASA/JPL/NIMA available at <http://photojournal.jpl.nasa.gov/catalog/PIA03388>.

Pantepuisaurus rodriguesi species novum

Figs. 5–9

Holotype. IRSNB 2650 (field number PK 2044), an adult male collected by Paul Benjamin, Philippe J. R. Kok and Claudius Perry, 28 November 2007 at 14h55, summit plateau of Mount Maringma, Cuyuni-Mazaruni District, Guyana (05° 12' 57"N, 060° 35' 07"W, 2080 m).

Etymology. The specific epithet is a noun in the genitive case, honoring Brazilian herpetologist Miguel Trefaut Rodrigues (Universidade de São Paulo, São Paulo, Brazil) for his huge contribution to the knowledge of the family Gymnophthalmidae using both morphological and molecular approaches.

Diagnosis. In addition to the generic characteristics, the new species is also characterized by the following features: four supraoculars; 15 smooth temporal scales; scales around midbody 32; dorsal scales sharply keeled, in 33 transverse rows; ventral scales in 20

transverse rows; trunk length 2.6x length of forelimb; dorsum and flanks completely black, iris red.

Description of the Holotype. An adult male 58.3 mm SVL. Head length 19% SVL, 1.38x head width, head width 1.45x head height. Head slightly wider than neck, temporal region not distinctly swollen, neck approximately as wide as anterior body. Snout blunt. Body oval in transverse section, slightly depressed, slightly wider than high. Tail complete, 93.3 mm, 1.60x SVL, circular in cross-section, tapering toward the tip. Limbs well-developed, forelimbs 19% SVL, hindlimbs 29% SVL. Limbs pentadactyl, all fingers and toes with terminal claw. Limbs short, not overlapping when adpressed along the body. Distance between forelimbs and hindlimbs (trunk length) = 29.2 mm, 50% SVL, 2.6x forelimbs (Fig. 5).

Tongue lanceolate, anterodorsally covered by oblique (chevron-shaped), anteriorly converging plicae, posterodorsally covered by large scalelike papillae; tip bifid, smooth; one pair of infralingual plicae after fork. Anterior teeth conical, most of posterior ones bicuspid, a few of them tricuspid.

Rostral roughly hexagonal, twice as wide as high, visible from above, in broad contact with frontonasal. Frontonasal single, heptagonal, laterally in contact with nasal and loreal, not in contact with first supraocular. Prefrontals roughly pentagonal, as broad as long, with a moderately long medial suture, laterally in broad contact with first supraocular and the loreal, touching the anterior point of the second supraocular on the right, separated from it by first supraocular-frontal contact on the left. Frontal hexagonal, 1.4x as long as wide, anteriorly as wide as posteriorly, laterally markedly concave; frontal laterally in contact over the entire length of second supraocular, touching the first supraocular on the left, separated from it by prefrontal-second supraocular contact on the right, in contact with third supraocular. Frontoparietals pentagonal, 1.3x as long as wide with moderately long medial suture; each frontoparietal in contact with frontal, distinctly separated from second supraocular by frontal-third supraocular contact, in broad contact with third supraocular, parietal and interparietal, and narrow contact with the fourth supraocular. Interparietal heptagonal, posteriorly projecting, 1.7x as long as wide, with parallel sides, distinctly longer than parietals. Interparietal and parietals form a jagged, irregular, posterior margin. A row of five smooth occipitals of various shapes, shorter and wider than dorsal neck scales, the central smallest. Four supraoculars, first smallest, about 3/4 of the fourth; second and third larger, subequal. Five superciliaries, first much larger than the others, with a short incomplete suture running dorsad from ciliaries on the right side and a similar very short suture on the left side; second and third smallest, subequal, fourth distinctly larger, about twice the size of the fifth (Fig. 6).

	<i>Adercosaurus</i>	<i>Kaieteurosaurus</i>	<i>Pantepuisaurus</i> gen. nov.
Condition of the posterior margin of the interparietal and parietals	Interparietal distinctly projecting beyond parietals, posterior margin of parietals and interparietal forming a jagged irregular line	Interparietal and parietals of approximately similar length, forming a more or less straight posterior margin	Interparietal distinctly projecting beyond parietals, posterior margin of parietals and interparietal forming a jagged irregular line
Condition of the ventral scales	Quadrangular, smooth, slightly imbricate, in transverse and longitudinal rows	Lanceolate, broadly keeled (keel most conspicuous on anteriormost and posteriormost ventrals), strongly imbricate, in transverse rows only	Mucronate, broadly keeled, strongly imbricate, in transverse rows only
Presence of prefrontals	Yes	No	Yes
Number of pairs of genials	3	2	3
Second pair of genials in contact with two	Yes	Yes	No
Tongue morphology	Covered by oblique, anteriorly converging plicae, interrupted by a midsection of imbricate scalelike papillae (rear of tongue covered by plicae)	Anterodorsally covered by oblique, anteriorly converging plicae, posterodorsally covered by large imbricate scalelike papillae (rear of tongue covered by plicae)	Anterodorsally covered by oblique, anteriorly converging plicae, posterodorsally covered by large imbricate scalelike papillae (rear of tongue covered by papillae)
Hemipenial morphology	Bilobed with series of curved transverse plicae lacking mineralized spicules	Unknown	Bilobed with series of curved transverse plicae bearing mineralized spicules

Table 1. Summary of main diagnostic characters for *Pantepuisaurus* gen. nov. and two possibly related genera (*Adercosaurus* and *Kaieteurosaurus*). The diagnostic characters are those currently used to separate genera in the tribe Ecleopini [*sensu* Pellegrino *et al.* (2001); Ecleopininae *sensu* Castoe *et al.* (2004)]. Based on Myers & Donnelly (2001), Kok (2005) and the present paper.



Figure 2. Maringma tepui, view of the mountain from the east (20 November 2007).

Nasal entire, with two short divisions running ventrad from naris to supralabial on the left side, these two short divisions are incomplete, running from the first supralabial, on the right side; naris just below centre, directed laterally. Loreal quadrangular, slightly anteriorly inclined, in contact with nasal, frenocular, one preocular, first superciliary, first supraocular, prefrontal and frontonasal, separated from supralabials by frenocular-nasal contact. Two small preoculars between first superciliary and first subocular. Frenocular roughly quadrangular, longer than wide, about half-size the loreal, in contact with first supralabial. Four suboculars. Two postoculars, the lower smallest. Seven supralabials on both sides, fifth highest, fourth below middle of the eye; a very short, inconspicuous division on the first supralabial on the right side (running ventrad from nasal); suture between second and third supralabials in contact with first subocular, suture between first and second supralabials in contact with frenocular (Fig. 6).

Upper eyelid with three ciliaries on both sides, second very large, apparently resulting from the fusion of several smaller scales. Ocular recess with median row of three scales separating median ciliary from superciliaries. Lower eyelid with a semi-transparent, slightly pigmented, palpebral disc of two long vertical palpebral scales (Fig. 6).

Temporal region with 15 irregularly shaped, juxtaposed, smooth scales on both sides. Temporals arranged in four oblique rows. Ear opening moderately large, vertically semi-circular with a straight posterior margin, bordered by a few small, juxtaposed, smooth scales. Auditory meatus moderately deep, tympanum mostly transparent, slightly pigmented (Fig. 6).

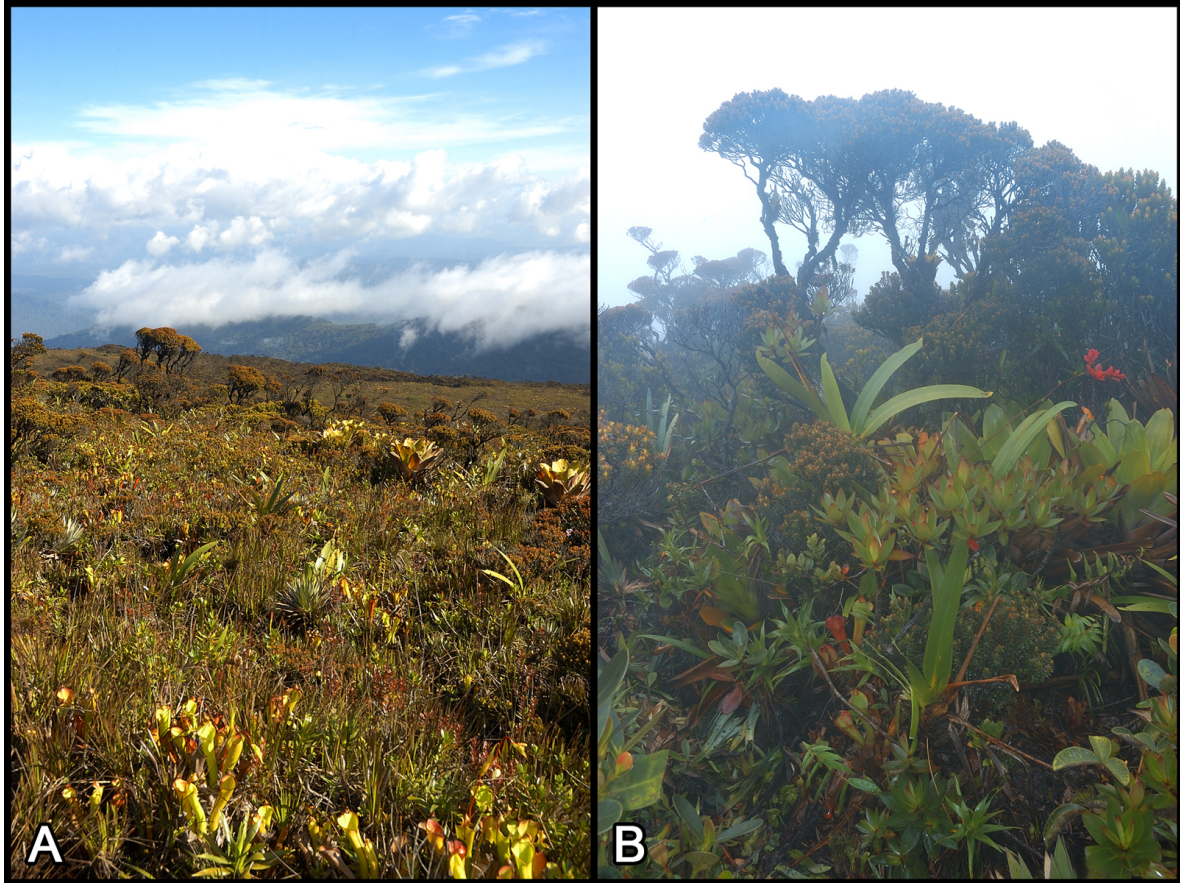


Figure 3. Vegetation on the summit plateau of Maringma tepui. A: Habitat of *Pantepuisaurus rodriguezi* **gen. nov.** **sp. nov.**, the typical tepui meadow, consisting of very dense low vegetation with plants mainly in the families Bonnetiaceae, Bromeliaceae, Clusiaceae, Orchidaceae, Rapateaceae, Sarraceniaceae and Xyridaceae; view from the summit plateau of the mountain, looking to the south (25 November 2007). B: Dense vegetation and *Bonnetia roraimae* (Bonnetiaceae) in the mist on the very top of the tepui (26 November 2007).

Mental trapezoidal, its posterior edge almost straight, slightly concave. Postmental large, heptagonal, laterally in contact with first and second infralabials. Three pairs of large genials, first two pairs in contact with each other medially. First pair in lateral contact with second and third infralabials; second pair in lateral contact with third infralabial only, separated from fourth and fifth infralabials by a large sublabial scale, medial suture of second pair slightly longer than that of first pair; third pair in lateral contact with fifth infralabial, separated medially by two small scales. A pair of enlarged postgenials separated medially by scales of varying sizes and widely separated from infralabials. Seven infralabials on the right side, six on the left side, fourth scale highly reduced on both sides. One row of imbricate, smooth pregulars with rounded posterior margins. Five rows of gulars, four of them with two transversely enlarged scales. Collar row with seven scales, central one distinctly larger, others decreasing in size laterally, forming a slightly scalloped margin. Gular fold distinct, concealing one row of very small scales (Figs. 6, 7B).

Head scales with numerous small pits, especially concentrated on rostral, frontonasal, supraoculars, and lateral head scales, also present on ventral head scales, and body and limbs scales. Scales on nape posterior to occipitals longer than wide, with a broad, flat keel, mucronate, in transverse rows, grading posteriorly into dorsal body scales. Sides of neck

with medium-sized, roughly subequal, smooth, juxtaposed scales in about eight oblique rows, not distinctly decreasing in size posteriorly but interrupted by a row of smaller scales 2/3 the way before arm insertion, which weakly form annuli with nape and gular scales.

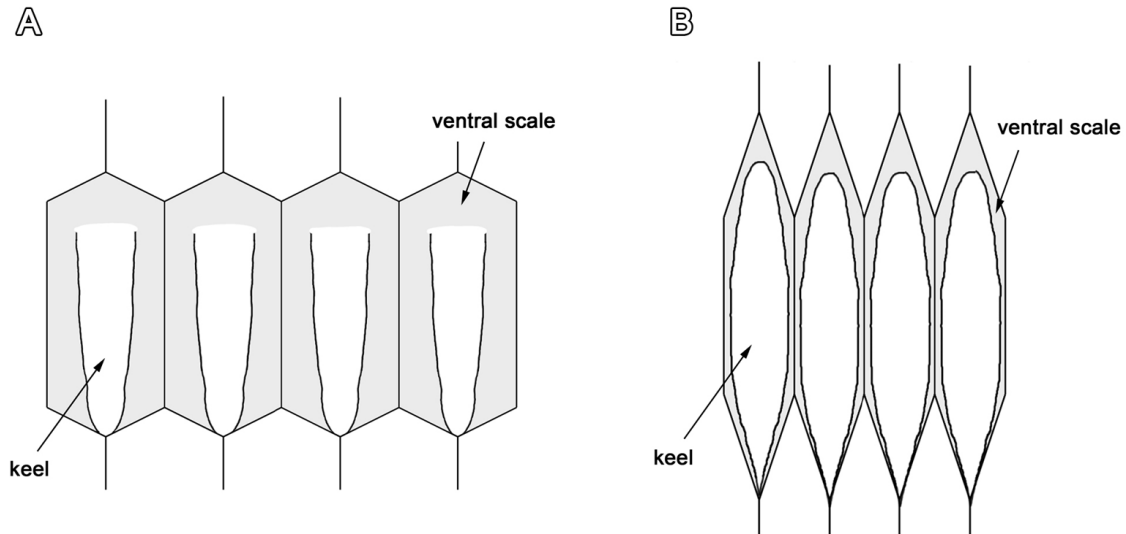


Figure 4. Schematic illustration of the ventral scale condition in *Pantepuisaurus* **gen. nov.** and *Kaieteurosaurus*. A: Four posterior ventral scales of *Pantepuisaurus rodriguessi* **gen. nov. sp. nov.** showing the broad keel (in white). B: Four posterior ventral scales of *Kaieteurosaurus hindsi* showing the broad keel (in white) that significantly extends laterally giving an aspect of smooth unkeeled lanceolate ventrals. Drawings are not at scale.

Dorsals imbricate, pentagonal, some appearing hexagonal because of imbrication, elongate, sharply keeled, mucronate, except very few isolated scales. Dorsal scales in transverse rows only, 33 rows between the interparietal and the posterior edge of hindlimbs (including row of occipitals). Middorsal scales not distinctly narrower than adjacent dorsals. A zone of small juxtaposed scales before arm insertion. Flank scales similar to, but slightly narrower than, dorsal scales, most of flank scales are not mucronate but have a straight or slightly rounded posterior margin; no abrupt demarcation between dorsals and laterals. Lateral scales becoming slightly smaller just before leg insertion. No row of ventrolateral scales (see Myers & Donnelly 2008) can be detected; some very small, longitudinally oval or rounded scales intercalated in the interstitial skin between the transverse rows of lateral; these small scales are more conspicuous along the first anterior third of flank and before leg insertion. All transverse rows of dorsals correspond to one row of laterals, except at midbody on the right side where one transverse row of dorsals corresponds to two rows of laterals, and before leg insertion and after arm insertion.

Ventrals imbricate, broadly keeled, longer than wide, mucronate except very few isolated scales, in transverse rows only (Fig. 7A). Most transverse rows of ventrals correspond to a transverse row of laterals and of dorsals (exceptions occur at midbody). Twenty transverse rows between collar and preanal plate, 32 scales around midbody. Preanal plate consisting of six scales, one anterior, five posterior scales, most lateral posterior scales narrow, distinctly smaller than adjacent scales (Fig. 8). Four preanal pores. Four femoral pores on the right side, three on the left side, each femoral pore between three scales.

Scales on tail keeled, not mucronate (except proximally), slightly imbricate, roughly rectangular, as long as dorsal scales, in transverse rows only, in uninterrupted annuli. Pigmented subcaudal scales keeled, slightly imbricate, slightly mucronate, roughly rectangular, in transverse rows only.

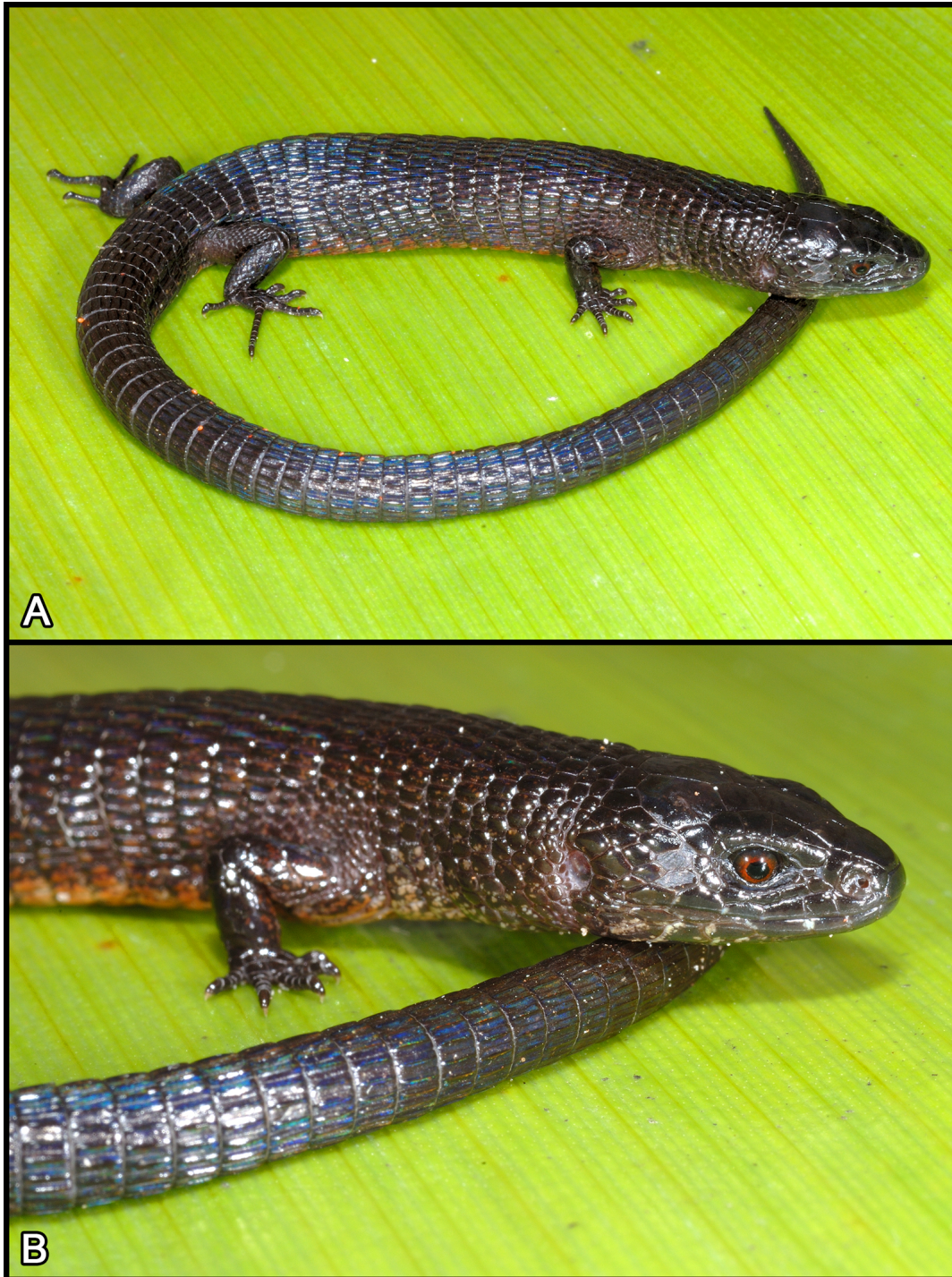


Figure 5. *Pantepuisaurus rodriguessi* **gen. nov. sp. nov.**, male holotype (IRSNB 2650), 58.3 mm SVL. A: Dorsolateral view. B: Detail of head and neck region.

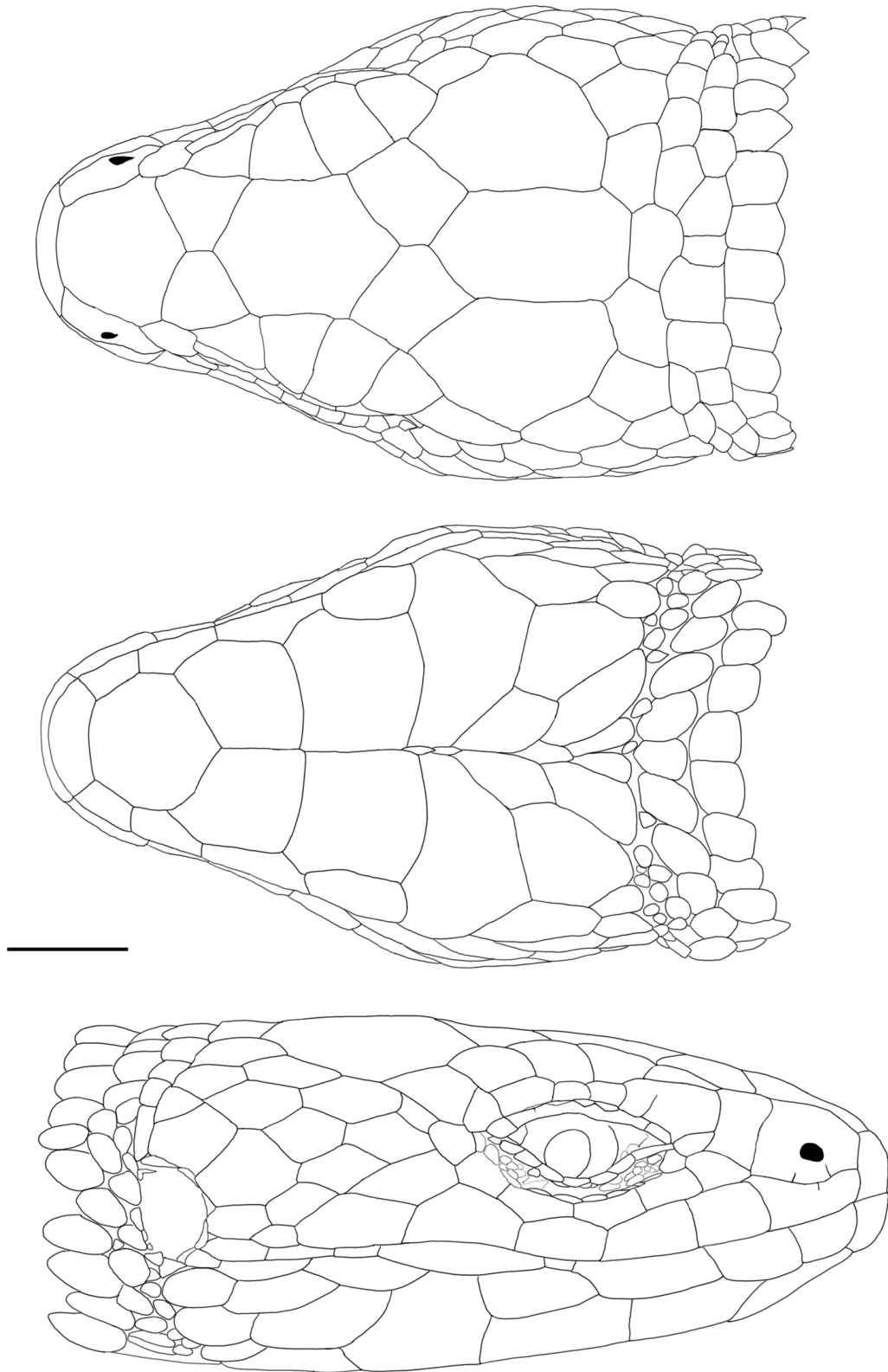


Figure 6. *Pantepuisaurus rodrighesi* **gen. nov. sp. nov.**, male holotype (IRSNB 2650), 58.3 mm SVL. Dorsal, ventral, and lateral views of head. Scale bar is 2 mm.



Figure 7. *Pantepuisaurus rodriguezi* gen. nov. sp. nov., male holotype (IRSNB 2650), 58.3 mm SVL. A: Ventral view. B: Detail of the gular region.

Dorsal surfaces of upper and lower arms with smooth, variably polygonal scales, ventral surface of upper arms with small, juxtapsed scales, ventral surface of lower arms with scales similar to those on dorsal surface, except at the base of hands where scales are juxtapsed and distinctly smaller. Thighs with a row of enlarged, smooth, roughly hexagonal scales on anterior surface, bordered ventrally by two rows of smaller polygonal scales diminishing in size ventrad (scales of first row smooth, scales of second row broadly keeled); bordered dorsally by 2–3 rows of keeled scales diminishing in size dorsad, grading into small, smooth (but with many very small asperities and pits that give a rugose aspect), slightly granular, juxtapsed scales, which cover posterodorsal and posterior surfaces of thighs; these scales increase in size ventrally. Shanks ventrally and posteriorly with large, smooth, polygonal, imbricate scales. Scales on upper and anterior surfaces of shanks slightly smaller, imbricate, rugose (see above), and strongly keeled.

Dorsal surface of hands and digits with imbricate, smooth scales, dorsal surface of feet with imbricate, broadly keeled scales, except a few anterodorsally; palm and soles covered

with small, smooth, slightly protuberant, juxtaposed, polygonal scales. Two enlarged, subequal, thenar scales on inner margin of palm below pollex, each with produced inner edge, similar scales occur at the base of Toes I and III–IV; two slightly enlarged hypothenar scales on outer margin of palm. Subdigital lamellae divided basally and single on distal halves on most digits.



Figure 8. *Pantepuisaurus rodriguessi* **gen. nov. sp. nov.**, male holotype (IRSNB 2650), 58.3 mm SVL. Detail of perianal region.

Subdigital lamellae as follows (Roman numbers indicate digits, Arabic numbers indicate paired or single lamellae on left/right; lower unguual sheath scale is omitted from the counts): hands **I** 4/4, **II** 7/7, **III** 9/9, **IV** 10/11, **V** 6/7; feet **I** 5/5, **II** 8/8, **III** 11/10, **IV** 16/16, **V** 9/8.

Color of Holotype in life. Dorsal and lateral surfaces completely black; closer examination shows that black scales on body and neck are peppered with brown or reddish brown. Upper surface of head black. Tympanum light pink. Arms, legs and tail black. Iris red (Fig. 5). Tongue dark gray in its anterior two-thirds, whitish with gray flecks on its posterior third. Palms and soles black. Underside of head and throat black with irregular light gray markings; venter orangish brown, ventral scales peppered with black; underside of upper legs black; underside of lower legs black with irregular orangish brown markings; underside of tail black, except proximally where some scales are white (Figs. 7–8).

Color of Holotype in preservative. After four months in 70% ethanol, the holotype became very dark brown, the light gray markings on the underside of head and chest are

white; venter is whitish peppered with dark gray; tympanum is transparent, no other noticeable change.

Hemipenis. The hemipenes of the holotype were everted in the field. The left organ was subsequently removed, sent to and prepared by Pedro Nunes (Universidade de São Paulo, São Paulo, Brazil), currently working on a PhD thesis on the hemipenial morphology in the family Gymnophthalmidae. The hemipenis was inflated with blue petroleum jelly and the spicules were stained with Alizarin Red (Fig. 9). The left hemipenis is 6.9 mm long, with a greatest width of 4.5 mm. The organ is weakly bilobed, with each of the short divisions terminating in 2–3 protuberances. Sulcus spermaticus medial, broad, poorly defined. Asulcate surface with a conspicuous series of 15–18 curved transverse plicae (tissue ridges) encircling the side of the organ and terminating laterally on the sulcate surface, most plicae being laterally shortly interrupted by a narrow nude space. A wide nude space between the *ca.* 8–9 distal plicae on the asulcate surface. All plicae bear mineralized spicules; plicae located on the proximal part of the hemipenis bear a single spicule, the number of spicules is increasing from the proximal part towards the tip resulting in plicae bearing a series of several uniform spicules interrupted by a larger central one (Fig. 9).

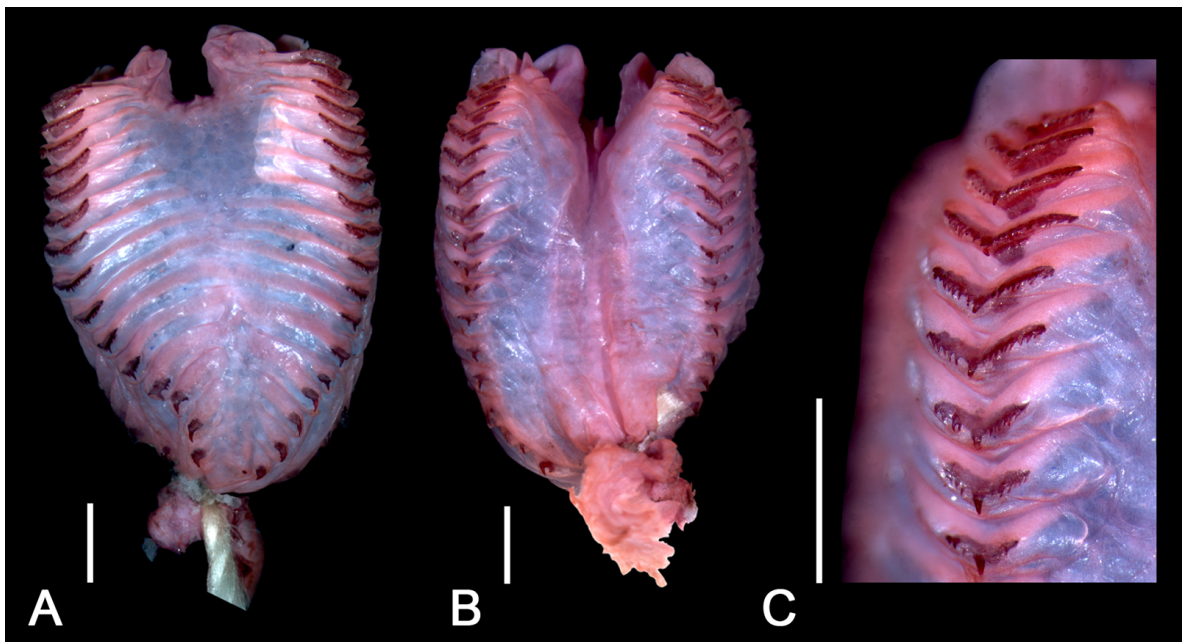


Figure 9. Everted hemipenis of the holotype of *Pantepuisaurus rodriguesi* **gen. nov. sp. nov.**, (IRSNB 2650, left organ). A: Asulcate view. B: Sulcate view. C: Detail of mineralized spicules showing series of similar spicules interrupted by one enlarged central spicule. Scale bar is 1 mm. Photographs by Pedro Nunes.

Distribution and ecology. The species is currently known only from the type locality, the summit of Maringma tepui in Guyana (Fig. 1). The only specimen available was collected in the afternoon (14h55), during a sunny spell, in a sunny spot, on the ground, among dense vegetation (Fig. 3). No other specimen was observed. The only other lizard species recorded from the summit of Mount Maringma is *Arthrosaura hoogmoedi* Kok, 2008.

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APPENDIX. ADDITIONAL COMPARATIVE MATERIAL EXAMINED

Arthrosaura guianensis.— Guyana: *Potaro-Siparuni*: Kaieteur National Park, Tukeit trail, ca. 420 m asl (05° 11'N, 059° 28'W) (IRSNB 17342-3).

Arthrosaura testigenis.— Venezuela: *Bolívar*: Altiplanicie sur Terekyurén-tepui, base de Los Testigos, 1800 m asl (05° 52'N, 062° 03'W) [MHNLS 10730, holotype (digital photographs)].

Kaieteurosaurus hindsii.— Guyana: *Potaro-Siparuni*: Kaieteur National Park, Tukeit trail, ca. 420 m asl (05° 11'N, 059° 28'W) [IRSNB 2628 (holotype), IRSNB 17322-3].

Riolama leucosticta.— Venezuela: *Bolívar*: Ilu-tepui, 2500 m asl (05° 25'N, 061° 02'W) [USNM 284483 (digital photographs)]; Mt. Roraima, 8600ft [BM 1946.8.2.8 (holotype, formerly 1899.3.25.4)]; summit of Mount Roraima, near boundary marker for Venezuela, Guyana and Brazil, ca. 2600 m asl (05° 25' 08"N, 060° 44' 07"W) [USNM 284484-5 (digital photographs)].

Riolama luridiventrís.— Venezuela: *Amazonas*: Municipio Atabapo, Cumbre del Cerro Marahuaca, Parque Nacional Duida-Marahuaca, 2480 m asl [ULABG 4584, holotype (digital photographs)].

Riolama uzzelli.— Venezuela: *Amazonas*: Cumbre del Cerro Marahuaca, 1850 m asl [MHNLS 12855, paratype (digital photographs)].