Tracking down the lizards from Gravenhorst's collection at the University of Wrocław: type specimens of *Callopistes maculatus* and three *Liolaemus* species rediscovered (#31711)

First submission

Editor guidance

Please submit by **29 Oct 2018** for the benefit of the authors (and your $200 publishing discount).

Structure and Criteria
Please read the 'Structure and Criteria' page for general guidance.

Raw data check
Review the raw data. Download from the materials page.

Image check
Check that figures and images have not been inappropriately manipulated.

Privacy reminder: If uploading an annotated PDF, remove identifiable information to remain anonymous.

Files
Download and review all files from the materials page.

14 Figure file(s)
1 Table file(s)

Structure and Criteria

Structure your review

The review form is divided into 5 sections. Please consider these when composing your review:

1. **BASIC REPORTING**
2. **EXPERIMENTAL DESIGN**
3. **VALIDITY OF THE FINDINGS**
4. General comments
5. Confidential notes to the editor

You can also annotate this PDF and upload it as part of your review

When ready submit online.

Editorial Criteria

Use these criteria points to structure your review. The full detailed editorial criteria is on your guidance page.

BASIC REPORTING

- Clear, unambiguous, professional English language used throughout.
- Intro & background to show context. Literature well referenced & relevant.
- Structure conforms to PeerJ standards, discipline norm, or improved for clarity.
- Figures are relevant, high quality, well labelled & described.
- Raw data supplied (see PeerJ policy).

EXPERIMENTAL DESIGN

- Original primary research within Scope of the journal.
- Research question well defined, relevant & meaningful. It is stated how the research fills an identified knowledge gap.
- Rigorous investigation performed to a high technical & ethical standard.
- Methods described with sufficient detail & information to replicate.

VALIDITY OF THE FINDINGS

- Impact and novelty not assessed. Negative/inconclusive results accepted. *Meaningful* replication encouraged where rationale & benefit to literature is clearly stated.
- Data is robust, statistically sound, & controlled.
- Speculation is welcome, but should be identified as such.
- Conclusions are well stated, linked to original research question & limited to supporting results.

Standout reviewing tips

The best reviewers use these techniques

Tip	*Example*
Support criticisms with evidence from the text or from other sources	*Smith et al (J of Methodology, 2005, V3, pp 123) have shown that the analysis you use in Lines 241-250 is not the most appropriate for this situation. Please explain why you used this method.*
Give specific suggestions on how to improve the manuscript	*Your introduction needs more detail. I suggest that you improve the description at lines 57- 86 to provide more justification for your study (specifically, you should expand upon the knowledge gap being filled).*
Comment on language and grammar issues	*The English language should be improved to ensure that an international audience can clearly understand your text. Some examples where the language could be improved include lines 23, 77, 121, 128 – the current phrasing makes comprehension difficult.*
Organize by importance of the issues, and number your points	*1. Your most important issue* *2. The next most important item* *3. …* *4. The least important points*
Please provide constructive criticism, and avoid personal opinions	*I thank you for providing the raw data, however your supplemental files need more descriptive metadata identifiers to be useful to future readers. Although your results are compelling, the data analysis should be improved in the following ways: AA, BB, CC*
Comment on strengths (as well as weaknesses) of the manuscript	*I commend the authors for their extensive data set, compiled over many years of detailed fieldwork. In addition, the manuscript is clearly written in professional, unambiguous language. If there is a weakness, it is in the statistical analysis (as I have noted above) which should be improved upon before Acceptance.*

Tracking down the lizards from Gravenhorst's collection at the University of Wrocław: type specimens of *Callopistes maculatus* and three *Liolaemus* species rediscovered

Bartosz Borczyk [1], **Tomasz Skawiński** Corresp. [1]

[1] Department of Evolutionary Biology and Conservation of Vertebrates, University of Wroclaw, Wrocław, Poland

Corresponding Author: Tomasz Skawiński
Email address: tomasz.skawinski@uwr.edu.pl

Johann Ludwig Christian Gravenhorst's herpetological collection at the Museum of Natural History, University of Wrocław included numerous important specimens of amphibians and reptiles. Majority, if not entirety, of this collection was long thought to be lost. However, we were able to rediscover some type specimens of lizards. The rediscovered specimens include holotypes of liolaemids *Liolaemus conspersus* and *L. hieroglyphicus* and syntypes of teiid *Callopistes maculatus* (here, designated as the lectotype) and liolaemid *L. lineatus* (one of which is herein designated as the lectotype). Reexamination of these specimens indicates that previous synonymies proposed for *L. conspersus* and *L. hieroglyphicus* are problematic and further, more complex taxonomic work to resolve this issue is needed. Two rediscovered syntypes of *L. lineatus* differ in several scalation traits and are probably not conspecific. Type specimens of several other species of lizards from Gravenhorst's collection (liolaemids *Liolaemus marmoratus*, *L. unicolor* and two other syntypes of *L. lineatus*, leiocephalid *Leiocephalus schreibersii* and skink *Chalcides viridanus*) were not found and are probably lost.

Tracking down the lizards from Gravenhorst's collection at the University of Wrocław: type specimens of *Callopistes maculatus* and three *Liolaemus* species rediscovered

Bartosz Borczyk[1], Tomasz Skawiński[1]

[1] Department of Evolutionary Biology and Conservation of Vertebrates, Faculty of Biological Sciences, University of Wroclaw, Wrocław, Poland

Corresponding Authors:

Bartosz Borczyk[1]

Sienkiewicza 21, Wrocław, 50-335 Wrocław, Poland

Email address: bartosz.borczyk@uwr.edu.pl

Tomasz Skawiński[1]

Sienkiewicza 21, Wrocław, 50-335 Wrocław, Poland

Email address: tomasz.skawinski@uwr.edu.pl

Abstract

Johann Ludwig Christian Gravenhorst's herpetological collection at the Museum of Natural History, University of Wrocław included numerous important specimens of amphibians and reptiles. Majority, if not entirety, of this collection was long thought to be lost. However, we were able to rediscover some type specimens of lizards. The rediscovered specimens include holotypes of liolaemids *Liolaemus conspersus* and *L. hieroglyphicus* and syntypes of teiid *Callopistes maculatus* (here, designated as the lectotype) and liolaemid *L. lineatus* (one of which is herein designated as the lectotype). Reexamination of these specimens indicates that previous synonymies proposed for *L. conspersus* and *L. hieroglyphicus* are problematic and further, more complex taxonomic work to resolve this issue is needed. Two rediscovered syntypes of *L. lineatus* differ in several scalation traits and are probably not conspecific. Type specimens of several other species of lizards from Gravenhorst's collection (liolaemids *Liolaemus marmoratus*, *L. unicolor* and two other syntypes of *L. lineatus*, leiocephalid *Leiocephalus schreibersii* and skink *Chalcides viridanus*) were not found and are probably lost.

Introduction

Johann Ludwig Christian Gravenhorst (1777–1857) was the founder and the first director of the Zoological Museum at the University of Wrocław (currently Museum of Natural History). His main interests lied in entomology, particularly in beetles and, later, ichneumonid wasps (Jałoszyński & Wanat, 2014). However, like many naturalists of his time, Gravenhorst had a comprehensive knowledge on many other groups of animals as well. During his directorship at the museum (from its foundation in 1814 to Gravenhorst's death in 1857) he acquired large collections of fishes, amphibians and reptiles from around the world, and published numerous articles on the latter two groups of vertebrates (Jałoszyński & Wanat, 2014). Among them were the descriptions of several new species of reptiles (e.g., Gravenhorst, 1838; Gravenhorst, 1851). Type specimens of these forms were usually deposited in the museum in Wrocław. However, at least half of the zoological specimens and 90% of exhibits were destroyed during the World War II, particularly when the city was sieged and turned into Festung Breslau in 1945 (Wanat & Pokryszko, 2014). Identification of some presumably lost specimens after the war was hindered by the fact that – as a part of the "polonisation" of the museum, when the city became part of Poland again – original German labels were replaced by Polish ones (Wiktor, 1997). During the process, sometimes errors (e.g., misspellings) were made (Borczyk, 2013). Some of important Gravenhorst's zoological specimens were rediscovered after the war (Jałoszyński & Wanat, 2014) but it was long thought that most of or even all these type specimens of reptiles were also lost at that time (e.g., Dubois & Ohler, 2000; Etheridge & Frost, 2012). However, it turned out that some of them survived the war. First, the holotype of *Liolaemus lemniscatus*, was recently redescribed (Borczyk, 2013) and here we redescribe other type specimens of lizards that were rediscovered in the collections of the Museum of Natural History, University of Wrocław, and discuss taxonomic implications of these findings.

Many species, including all named by Gravenhorst (except *L. lemniscatus*) were synonymised by Boulenger (1885). He did not discuss his nomenclatural decisions but they were later accepted,

even if only tentatively, by Etheridge & Espinoza (2000), Etheridge & Frost (2012), Pincheira-Donoso, Scolaro & Sura (2008) and Abdala & Quinteros (2014). However, some other species regarded as junior synonyms by Boulenger (1885), such as *L. oxycephalus* and *L. inconspicuus*, were later revived from synonymy (Troncoso-Palacios & Garin, 2013), which warrants careful re-examination and comparisons of such historical specimens.

Material & Methods

We focused on describing morphological characters used by previous authors (Ortiz, 1981; Laurent, 1992; Lobo, 2001; Lobo, 2005; Troncoso-Palacios and Garin, 2013; Troncoso-Palacios et al., 2015) and considered to be taxonomically informative. Identification and nomenclature of scales follows Etheridge (2000) for liolaemids and Harvey, Ugueto & Gutberlet Jr (2012) for teiid *Callopistes maculatus*. Colour pattern description follows the terminology given in Lobo & Espinoza (1999). Whenever possible, measurements were taken using a digital caliper to the nearest 0.1 mm.

A small amount of muscle tissue was taken from *Liolaemus conspersus*, *L. hieroglyphicus* (both specimens of *L. lineatus* and the "mysterious specimen" were in too poor condition) and two *Chalcides viridanus* specimens in attempt to extract DNA. Unfortunately, these attempts were unsuccessful, so all descriptions and taxonomic assessments were made entirely based on morphology.

The electronic version of this article in Portable Document Format (PDF) will represent a published work according to the International Commission on Zoological Nomenclature (ICZN), and hence the nomenclatural acts contained in the electronic version are effectively published under that Code from the electronic edition alone. This published work has been registered in ZooBank, the online registration system for the ICZN. The ZooBank LSIDs (Life Science Identifiers) can be resolved and the associated information viewed through any standard web browser by appending the LSID to the prefix http://zoobank.org/. The LSID for this publication is: urn:lsid:zoobank.org:pub:3CDA8E5A-30C8-4847-B4A4-C644595361FC. The online version of this work is archived and available from the following digital repositories: PeerJ, PubMed Central and CLOCKSS.

Abbreviations: MNHUW (UWZM) – Museum of Natural History, University of Wrocław; SMF – Senckenberg Forschungsinstitut und Naturmuseum Frankfurt, SVL – snout-vent length.

Results & Discussion

Liolaemus conspersus

This species was described by Gravenhorst (1838) on the basis of a single individual from Cauquenes Province in Chile. It was synonymised with *Ptychodeira Fitzingeri* (currently *Liolaemus fitzingeri*) by Fitzinger (1843) and with *L. nigromaculatus* by Boulenger (1885). However, Hellmich (1934) was unsure about the synonymy of *L. conspersus* with *L.*

nigromaculatus. Holotype of this species survived the war and was rediscovered during our inspections.

Redescription of the holotype. It is a large and robust lizard (MNHUW 1321; Fig. 1). The specimen is in relatively good condition, only the left posterior margin of the mouth is damaged (Fig. 2). Also, the left side of the head is much more flattened than the right one. The teeth are highly worn but the posterior ones are tricuspid.

Interparietal scale large (slightly smaller than the parietals), subtriangular, with slightly concave right and slightly convex left margins. It contacts six scales. Frontal scale single, approximately dumbbell-shaped, with straight anterior margin and posterior margin forming an obtuse angle. Five scales separate rostral from the frontal and seven scales separate it from the interparietal. Rostral contacts nasal at a point. Nostrils directed laterally on the right side and dorso-laterally on the left (probably due to distortion of the specimen). Nasal separated from the canthal by one scale, contacts eight scales. Eight scales between the external nares. There are four flat and long supralabials, the fourth one is located below the eye and has an oblique posterior border. Four loreals, one of them contacts the subocular. One row of lorilabials between supralabials and loreals. Six infralabials present, the second one contacts four scales (including two other infralabials). There are five enlarged postmental scales (chinshields) on the right side, on the left there are only four scales but the second one clearly originated by fusion of two scales. Second postmentals are separated from each other by two gular scales. Anteriormost gulars slightly elongated and juxtaposed, others are wider than long and imbricate. Temporal scales with varying shapes: some are subtriangular, some quadrungular, some pentagonal and some hexagonal. All are juxtaposed and unkeeled.

About 73 dorsal scales between occiput and the anterior surface of thighs. There are 115 ventral scales between mental scale and vent and 77 scales around the midbody. Most of the ventrals are quadrangular and juxtaposed or subimbricate, some are pentagonal. Lateral neck scales rounded or lanceolate, strongly keeled, while lateral neck scales are small and bead-like. Dorsal scales larger than dorsal neck scales but otherwise very similar (Fig. 3A). Interstitial granules present between dorsals. Postaxial surface of the forelimbs is covered by relatively large, rounded, imbricate scales. Arm scales lightly keeled or unkeeled, while forearm scales are strongly keeled. Preaxial surface of the arm is covered by much smaller, more rounded or bead-like, slightly imbricate scales. There are 22 infradigital lamellae on the right third finger and 22 on the left one. Dorsal thigh scales rounded or lanceolate, imbricate and keeled. Lateral thigh scales much smaller, rounded or bead-like. Shank scales relatively large, rounded or lanceolate, very lightly keeled or unkeeled. Postaxial scales on the proximal part of the shank are small, round and slightly imbricate. Both dorsal and ventral foot scales are rounded or lanceolate and strongly keeled. No femoral and anal pores are visible (Fig. 3B). There are 31 infradigital lamellae on the left fourth toe and 30 on the right one (see Table 1 for morphometric data on this and other redescribed lizards).

Dorsal colouration light grey, with the tail being slightly more yellowish. No difference in background colour between vertebral and paravertebral fields. Vertebral, dorso- or ventrolateral stripes absent. Numerous dark spots or short stripes are faintly visible on almost the entire dorsum and limbs. They are much better visible on the dorsal and lateral aspects of the head. No

antehumeral spot can be unambiguously identified. Several darker longitudinal stripes are faintly visible on the throat. Apart from that, ventral colouration is uniformly grey-yellowish.

Discussion. *Liolaemus conspersus* is the only species described by Gravenhorst (1838), which subsequent synonimisation by Boulenger (1885) was later put to doubt (Hellmich, 1934), even if most authors accepted it (Etheridge & Espinoza, 2000; Pincheira-Donoso, Scolaro & Sura, 2008). *Liolaemus nigromaculatus*, its presumed senior synonym, and several closely related species, together belonging to the *nigromaculatus* species group, were redescribed and diagnosed in recent years (Troncoso-Palacios & Garin, 2013; Troncoso-Palacios et al., 2015). While the diagnosis of the whole group is difficult to establish (Troncoso-Palacios & Garin, 2013), it seems that *L. conspersus* differs from most of its members in at least several characters. Nasal and rostral scales contact at a point in *L. conspersus*, which differentiates it from *L. nigromaculatus*, *L. atacamensis*, *L. kuhlmanni*, *L. silvai* and *L. zapallarensis*, in which these scales are separated. The second postmental scales are separated by two scales – a condition that is present only in some *L. atacamensis* individuals (6 of 15, i.e. 40%, in the sample of Troncoso-Palacios et al., 2015), while in others these scales are separated by just one scale or are in contact. Interstitial granules between dorsal scales are present, as in some *L. nigromaculatus* and *L. atacamensis* but not in *L. silvai* and *L. zapallarensis*. *Liolaemus conspersus* has significantly more scales around the midbody than any of the lizards named above – 77, while in the others the range is 48–62 (Troncoso-Palacios & Garin, 2013; Troncoso-Palacios et al., 2015). Holotype of *L. conspersus* is also larger than all individuals of *L. atacamensis*, *L. kuhlmanni*, *L. silvai* and *L. nigromaculatus* examined by Troncoso-Palacios & Garin (2013) and Troncoso-Palacios et al. (2015), although only slightly in the case of the latter species. However, it should also be noted that the method and time of fixation and preservation of the specimen (which are impossible to compare between *L. conspersus* and specimens studied by Troncoso-Palacios et al., 2015) might have an effect on its body measurements, especially SVL (Vervust, Van Dongen & Van Damme, 2009).

It is also worth noting that the phylogeny and taxonomic content of the *nigromaculatus* group are not well established. Mitochondrial DNA analysis by Troncoso-Palacios et al. (2015) indicates that all these species are closely related but Panzera et al. (2017), on the basis of analyses using 541 ultra-conserved elements and 44 protein-coding genes, suggest that *L. atacamensis* is only distantly related to other named species, even though it is morphologically most similar to *L. nigromaculatus* (Troncoso-Palacios & Garin, 2013).

Liolaemus hieroglyphicus

Gravenhorst (1838) described this species on the basis of a single individual from Cauquenes Province in Chile. It was synonymised with *Ptychodeira signifera* (currently *Liolaemus signifer*) by Fitzinger (1843), with *L. olivaceus* (currently regarded as synonym of *L. chiliensis*; Pincheira-Donoso & Núñez, 2005) by Tschudi (1845) and with *L. lemniscatus* by Boulenger (1885). Unfortunately, this specimen was not illustrated by Gravenhorst (1838). However, we think that an unlabelled specimen found in the collection is the missing holotype. Our assertion is based on the following reasons: 1) Gravenhorst (1838) stated that 5/6 of the holotype tail is regenerated; comparable part of the tail is regenerated in the rediscovered specimen; 2) there is an indentation around the neck, which was also noted by Gravenhorst (1838) for *L. hieroglyphicus* (also for *L.*

unicolor which is, however, clearly different from the specimen described herein); 3) the individual is of similar size and colour to those reported originally by Gravenhorst (1838).

Immediately after *L. hieroglyphicus*, Gravenhorst (1838) described also a "variety", which he apparently regarded as intermediate between *L. hieroglyphicus* and *L. lemniscatus*. However, it is unclear whether he intended this form to be a variety of the former species (this is position taken by Tschudi, 1845) or regarded it as a taxon of yet unclear taxonomic position. It was based on a smaller individual than the type of *L. hieroglyphicus*. We were not able to locate this specimen. Regardless of these uncertainties, the surviving specimen of *L. hieroglyphicus* is the only type specimen of the type variety and thus can be regarded as the holotype of that species.

Redescription of the holotype. The specimen (MNHUW 1322) is in very good condition (Figs. 4–5). There are no visible damages, except the indentation around the neck (which was already present at the time of Gravenhorst's work); even colour pattern apparently close to the original is preserved.

Interparietal scale hexagonal but with rounded margins, contacts six scales and is much smaller than parietals. Interparietal is separated by seven scales (at the midline) from the rostral. Frontal scale hexagonal but with nearly straight anterior margin, is separated from the rostral by five scales. Rostral and nasal in broad contact. Nasal separated from canthal by one scale. Two pairs of internasals, first one in medial contact, second pair separated by one scale. Posteriorly, they contact two large, hexagonal frontonasals, also separated medially by one scale. Four supralabials, the fourth one is located below the eye and has an upturned posterior margin. One row of lorilabials separates supralabials from loreals. Loreal region concave, contains four loreals. Temporal scales polygonal, some with rounded posterior margin, juxtaposed or slightly imbricate, not keeled. Three enlarged supraoculars, with the first one being the largest. Seven supraciliaries. Four infralabials present, the second one contacts four scales, including two other infralabials. Four pairs of enlarged postmental scales (chinshields). The first pair in contact, the second pair separated by two scales. Most gulars oval, slightly imbricate.

Nuchal and dorsal scales imbricate, keeled and lanceolate with mucrons (some rounded without mucrons). There are 56 scales around the midbody. Only the tail scales lack keel. Ventral scales round, juxtaposed or only minimally imbricate. Lateral scales similar to ventral scales, only around the limbs they are much smaller, round or bead-like. Forelimb scales round or lanceolate, imbricate, only some on the postaxial surface are lightly keeled. Posterior surface of the arms covered by round, granular, slightly imbricate scales. There are 15 infradigital lamellae on the right third finger and 16 on the left one. Scales on the hindlimbs are very similar to those on the venter. Only on the foot they are much smaller and quadrungular rather than round. There are 22 infradigital lamellae on both the left and the right fourth toes.

Dorsal background colouration almost uniformly grey. There are numerous short (usually two-three scales long) brown stripes extending from the occiput to the preserved part of the tail, resembling a dotted line running along the spine. Similar stripes are also present on the temporal region. Numerous small brown spots occur on almost entire pileus (usually several on a single scale), supralabials and infralabials. Paravertebral fields covered by many brown spots (usually one-two scales long and two-four scales wide). Whitish dorso- and ventrolateral lines present.

Between them, lateral fields also covered by brown-black spots, less numerous but larger than paravertebral spots. Whole ventral body part uniformly whitish.

Discussion. Holotype of *L. hieroglyphicus* shows many similarities to *L. lemniscatus*, with which it was synonymised (Boulenger, 1885). It is of similar size (SVL), has similar distance between axilla and groin and number of scales around the midbody (Martinez et al., 2011). It shares several traits of scalation with *L. lemniscatus* holotype (Borczyk, 2013), such as hexagonal interparietal, much smaller than the parietals; presence of three enlarged supraorbitals, of which the first one is the largest; contact between nasal and rostral; separation of nasal and canthal by one scale; dorsal scales being keeled, mucronate and imbricate. However, these two specimens differ significantly in the scalation of the anterior part of the pileus. In *L. lemniscatus*, there are no single median scales, while in *L. hieroglyphicus* two such scales are present, separating second pair of internasals and both frontonasals. Also, lateral neck scales in the former species are lanceolate, keeled and imbricate, while in the latter they are granular and unkeeled, being more similar to those in *L. pseudolemniscatus* (Troncoso-Palacios, 2011). *Liolaemus hieroglyphicus* has fewer infradigital lamellae on the fourth toe than *L. lemniscatus* specimens studied by Martinez et al. (2011) but more than the holotype of that species (Borczyk, 2013).

Liolaemus lemniscatus

Holotype of this species (MNHUW [= UWZM] Re 0027) survived the war and was recently redescribed (Borczyk, 2013).

Liolaemus lineatus

Gravenhorst (1838) distinguished four varieties of this species (one main and three "subvarieties" – "Hauptart" and "Abarten" in German). Although the exact number of specimens he had studied is not stated in his article, this suggests that he had at least four specimens in his collection; indeed, four individuals are illustrated – two of the main variety and one specimen each of the second and third varieties. First variety was not illustrated, so probably its type and only specimen was not present in Gravenhorst's collection. This is supported by the survey of two museum catalogues which survived the war – in the first one, four specimens of *L. lineatus* are listed (later updated to two specimens), while in the second one, three specimens are listed (Fig. 6). It is thus possible that some of these lizards were lost even before the war.

All specimens of *L. lineatus* were collected in Valparaíso in Chile. First and second varieties were synonymised with *L. olivaceus* (currently considered synonym of *L. chiliensis*; Pincheira-Donoso & Núñez, 2005) by Fitzinger (1843), while the third variety was synonymised with *L. chiliensis*. Boulenger (1885) synonymised this species with *L. nitidus*. Two individuals, belonging to the second and the third varieties, were rediscovered but the specimen representing the unillustrated first variety and both specimens of the main variety are probably lost. Both rediscovered specimens were dried and in very poor condition – however, rehydration in 0.5% Na_3PO_4 improved their condition and allowed us to describe many taxonomically informative characters.

First specimen (Gravenhorst's second variety). Relatively large and robust lizard of stout appearance (MNHUW 1323; Figs. 7–8). The specimen is damaged on the right side of the venter, where scales are missing. The teeth are highly worn but it appears that the anterior teeth are conical while the posterior ones are multicusped. At least one tooth is visible on the left pterygoid and at least one on the right one. The interparietal scale is pentagonal, elongated posteriorly, smaller than parietals. It contacts six scales and is separated by nine scales from the rostral. Frontal scale single, large, pentagonal, with almost straight anterior and right margins and slightly concave left margin. It is separated by seven scales from the rostral. Internarial region fragmented asymmetrically into six scales. Nasal scale contacts seven scales; it is in broad contact with rostral and is separated by one scale from the canthal. A roughly rhomboidal scale located between prefrontals and frontonasals. There is also a single median scale between anterior parts of frontonasals. Three enlarged supraoculars, with the first one being the largest and the second one – the smallest. Four supralabials present, with the fourth one located below the eye and having an upturned posterior border. Loreal region concave, contains six (seven on the left side) scales two of which contact the subocular on the right side (three on the left). It is separated from supralabials by one row of lorilabials. Six infralabials visible on the right side but only five on the left. There are three pairs of enlarged postmental scales (chinshields); the first one is in contact, the second one is separated medially by two scales. Temporal scales are round or lanceolate, keeled and imbricate. A small patch of much smaller, oval and juxtaposed scales covers posterior border of the auditory meatus.

Dorsal scales large, imbricate, strongly keeled and mucronate. Tail scales form numerous annuli, visible particularly from the ventral side. Ventral tail scales have smaller mucrons. Ventral scales (including gulars) also relatively large, lanceolate or rounded (particularly gulars), imbricate, not keeled. Posterior part of thighs covered by much smaller, oval, juxtaposed scales. No femoral and preanal pores are visible. There are 19 infradigital lamellae on the right third finger (17 on the left one) and 25 on the right fourth toe (25 on the left one).

Colour of the head and dorsum blue-grey. Numerous darker spots visible on the lateral side of the head, they cover the background colour on the pileus.Ventral body part almost uniformly white-yellow, with the throat covered by several faintly visible darker longitudinal stripes.

Second specimen (Gravenhorst's third variety). This specimen is much smaller than the previous one (MNHUW 1323 – catalogued under the same number as the other syntype; Figs. 9–10). It has a small damage on the venter. The interparietal is hexagonal, expanded posteriorly and smaller than the parietals. It contacts six scales. Frontal scale paired; the right one is hexagonal and elongated, while the left one is shorter and has more rounded margins. Five scales separate rostral and frontal scales and seven separate rostral and interparietal. Internarial region fragmented into six scales, with one scale at the midline. Posteriorly to postrostrals, there are three scales, arranged in a midline row and separating frontonasals from each other. Nasal scale pentagonal, contacts six scales and is separated both from the canthal and the rostral by one scale. Three enlarged supraoculars, with the first one being the largest. Loreal region slightly concave, contains six scales, three of which contact the subocular. Five supralabials present; the fourth one is located below the eye and has an upturned posterior margin. One row of lorilabials separate them from the loreals. Five infralabials. Three pairs of enlarged postmental scales (chinshields) present, the first pair in median contact, the second one separated by two scales.

Temporal scales imbricate, rounded or lanceolate, keeled (only the smallest lack keel). Ventral and posterior borders of auditory meatus covered by very small, lanceolate, unkeeled scales.

Dorsal and ventral scalation is very similar to that in the previous specimen – dorsal scales are imbricate, lanceolate (only the anteriormost nuchal scales are rounded), keeled and mucronate (although the mucrons are slightly smaller), while the ventrals are large, flat, rounded (gulars and ventral neck scales) or lanceolate, imbricate and unkeeled. No femoral and preanal pores can be observed. There are 18 infradigital lamellae on the right third finger (18 on the left one) and 25 on the right fourth toe (26 on the left one).

Discussion. *Liolaemus nitidus* has long been regarded as a taxon with its relationships difficult to establish (Pincheira-Donoso & Núñez, 2005). Most recent morphological studies agree on its affinities to *L. robertmertensi* and *L. chiliensis* (Lobo, 2001; Lobo, 2005; Pincheira-Donoso & Núñez, 2005; Quinteros, 2013). However, its phylogenetic position in molecular analyses is highly variable (Troncoso-Palacios et al., 2015; Panzera et al., 2017; Portelli & Quinteros, 2018), strongly depending not only on the taxon sampling and markers used but also on the computational method employed (compare Figs. 3–4 in Portelli & Quinteros, 2018). However, it was always only distantly related to both *L. robertmertensi* and *L. chiliensis* (which were also distantly related to each other) in analyses conducted by Troncoso-Palacios et al. (2015) and Portelli & Quinteros (2018). Thus, it is difficult to evaluate potential synonymy based only on the morphological characters. The matters are further complicated by the fact that *L. nitidus* is probably a paraphyletic species, with some of its lineages being more closely related to some lineages of *L. monticola* (which probably is also paraphyletic; Torres-Pérez et al., 2017). The larger specimen of *L. lineatus* (Gravenhorst's second variety) is indeed similar to *L. nitidus* in its large size, robustness, presence of lanceolate, keeled and mucronate dorsal scales and imbricate and keeled temporal scales (Pincheira-Donoso & Núñez, 2005). Thus, currently there seems to be no reason to disprove its synonymy with *L. nitidus* (Boulenger, 1885). However, the second surviving specimen (Gravenhorst's third variety) differs from the first one (and from *L. nitidus*; Pincheira-Donoso & Núñez, 2005) in several characters that have been regarded as taxonomically informative such as presence of two frontal scales rather than one (also, with different shape in comparison to *L. nitidus*) and contact between nasal and rostral scales. It is possible that this specimen represents different lineage of *L. nitidus* but without molecular data it is currently impossible to evaluate. However, its synonymy with *L. nitidus* is doubtful. It is more similar to *L. chiliensis* (species with which it was synonymised by Fitzinger, 1843) in having a subdivided frontal scale. However, it differs from that species in presence of contact between rostral and nasal scales (Pincheira-Donoso & Núñez, 2005).

Because of the differences between those two specimens and the fact that the first specimen (second variety) is more similar to members of the type variety in scalation of the pileus (the only trait that can be compared), we designate it as the lectotype of *L. lineatus*. The second specimen (third variety) thus becomes the paralectotype, at least until its taxonomic status (potential conspecificity with the lectotype) is resolved.

Liolaemus marmoratus

Gravenhorst (1838) described this species on the basis of a single individual from Cauquenes Province in Chile. It was synonymised with *L. nitidus* by Boulenger (1885). The name *Liolaemus marmoratus* was also coined by Burmeister (1861) for the species of an Argentinean lioalemid. However, as it is homonymous with that coined by Gravenhorst (1838), it was later replaced by *Liolaemus pseudoanomalus* Cei, 1981. We were not able to find the type of *L. marmoratus* and regard it as most probably lost.

Liolaemus unicolor

This species was described on the basis of a single individual collected in the Cauquenes Province, in the Andean foothills, near the hot springs, about 20 German miles (150 kilometres) south of St. Jago (Santiago), Chile. It was synonymised with *L. nitidus* by Boulenger (1885). Unfortunately, it was unillustrated and we were not able to find any specimen unambiguously matching Gravenhorst's (1838) description. Thus, we regard this specimen as most probably lost (but see the "Mysterious specimen" section below).

"Mysterious specimen"

We found a very poorly preserved, dry specimen of liolaemid lizard labelled as "*Liolaemus* sp. (?)" (MNHUW uncatalogued; Fig. 11). Most of the lizard body is scaleless. Fortunately, however, scales on the pileus are sufficiently well preserved to allow us to determine that this lizard is not one of the specimens illustrated by Gravenhorst (1838). Thus, it definitely does not represent the main variety of *L. lineatus* and *L. marmoratus*. It also differs from the illustrated individuals of *L. oxycephalus* and *L. nitidus*. Generally, however, it resembles *L. nitidus* in having imbricate, strongly keeled and mucronate anterior dorsal and lateral scales. Interparietal is pentagonal and slightly asymmetric, contacts with five scales and is smaller than parietals. Frontal scale roughly quadrangular, with nearly straight anterior margin and asymmetric posterior margin, slightly wider anteriorly. Fourth supralabial is located below the eye, has an oblique posterior margin and does not contact subocular. Supraorbital semicircles complete on both sides. Three enlarged supraoculars, with the first one being the largest. Temporal scales lanceolate and imbricate, probably keeled. Scales covering limbs are imbricate and some of them have mucrons. Unfortunately, they are too poorly preserved to determine whether they were keeled. It is unlikely that this specimen represents the unillustrated first variety of *L. lineatus* (see discussion above) but it could be the lost specimen of *L. unicolor*, which was also synonymised with *L. nitidus*. Gravenhorst (1838) stated that *L. unicolor* had relatively low head ("not higher than in *Sceloporus torquatus*" specimen which he illustrated). Morphology of the "mysterious specimen" is consistent with this remark but it is unclear how reliable it is, given its poor state of preservation. Thus, the true identity of this specimen remains unclear but most probably it represents *L. nitidus* or a very similar species.

Leiocephalus schreibersii

The iguanian lizard *Leiocephalus schreibersii* was originally described by Gravenhorst under the name *Pristinotus Schreibersii* on the basis of a single individual collected by Parreys in Santo Domingo, Dominican Republic (Gravenhorst, 1838). The holotype has long been thought to be

lost (e.g., Pregill, 1992) and we were also unable to locate it in the collection. Recently, a neotype (SMF 26228) has been designated for this species (Köhler, Rodríguez Bobadilla & Hedges, 2016).

Callopistes maculatus

Gravenhorst (1838) described the teiid *Callopistes maculatus* on the basis of two individuals which represent syntypes of this species. *Callopistes maculatus* is the type species of the genus *Callopistes* Gravenhorst, 1838, which itself is a type genus of the subfamily Callopistinae Harvey, Ugueto & Gutberlet Jr, 2012. However, phylogenetic position of *Callopistes* is not well understood; Tucker et al. (2016) place it within Tupinambinae (though as sister to all other tupinambines), thus not recognising Callopistinae, and so do Brizuela & Albino (2017), though some other authors retain that name (Goicoechea et al., 2016; Quadros, Chafrat & Zaher, 2018). One rediscovered teiid lizard specimen exactly matches the pattern of cephalic scales illustrated by Gravenhorst (1838), so we regard it as the rediscovered syntype. The second specimen from the type series was not illustrated and has not been found, so for the sake of stability we designate the surviving specimen as the lectotype.

Redescription of the lectotype. Dry specimen with broken tail, stored together (MNHUW 1320). Right forelimb is also broken but remains attached to the body (Figs. 12–13). Some aspects of the animal morphology are distorted because of soft tissue shrinkage. However, it seems that the postcloacal buttons are present, which indicates that the lectotype is a male. Dentition is heterodont, with anterior teeth monocuspid, conical or slightly recurved, and posterior teeth usually with two, sometimes three, cusps. At least two palatal teeth are present on the right pterygoid and at least one tooth present on the left one. Tongue deeply bifurcated. Interparietal scale is small, roughly hexagonal and surrounded by five scales, including only two parietals. Twelve scales separate interparietal from rostral and eight scales separate rostral from frontal (at the midline). Rostral scale separated from nasal by one scale and is twice wider than long. There are eight supralabials. Frontal scale is roughly pentagonal, with strongly asymmetrical posterior border – much more concave on its right side. Two rows of long, low lorilabials are present. Dorsally to them, there are three loreals. Upper temporal scales small and oval, while lower temporal scales are larger and some of them are hexagonal rather than oval. Nasal scale separated from canthal, in contact with seven scales. Eight enlarged supraoculars on the right side, also eight on the left side.

Mental scale is wider than long. There are 10 infralabials. Five scales contact the second infralabial (including two other infralabials). Posterior to mental scale, there are four pairs of large chinshields. They are separated from infralabials by one (anteriorly) or two (posteriorly) rows of sublabials. First pair of chinshields contact at the midline but second and farther pairs are separated by small, oval gular scales (it is impossible to tell exactly by how many). Whole throat is covered by such small, oval or roughly pentagonal, juxtaposed gulars, all about the same size. Interangular sulcus absent, intertympanic sulcus present. Between the throat and the posterior surface of the arms, scales are also juxtaposed but larger, some of them are oval, elongated, pentagonal or hexagonal. Whole venter (behind the posterior end of the arms) is covered by large, rectangular, juxtaposed scales. Similar, though slightly smaller and imbricate, scales cover

also the entire tail, forming numerous annuli. Dorsal surface of forelimbs is covered by roughly round, juxtaposed or slightly imbricate scales. Ventral forelimb scales much smaller, round, juxtaposed. Dorsal hindlimb scales are relatively large, quadrungular, juxtaposed or slightly imbricate. Posterior surface of thighs covered by much smaller, round or quadrungular, juxtaposed scales. Ventral thigh scales roughly rectangular, juxtaposed or minimally imbricate. Ventral shank scales much larger, rounded and juxtaposed (distally slightly imbricate). Infradigital lamellae on both fore- and hindlimbs are impossible to count precisely because of the distortion of the specimen.

Most of the original colour pattern is not preserved. Dorsum and flanks are dark brown-reddish and the ventral body part is almost uniformly yellowish, with many dark spots on the venter. Pileus is grayish with numerous large, irregular dark spots.

Chalcides viridanus

This species of scincine skink was described by Gravenhorst (1851) as *Gongylus viridanus* on the basis of three individuals collected on Tenerife by Pescke. It occurs also on islands of El Hierro and Gomera and a few smaller islets. Populations inhabiting these three large islands form three separate clades, with lizards from El Hierro and Gomera probably being sister groups (Brown & Pestano, 1998). Population from Tenerife is not homogenous and exhibits substantial divergence in mitochondrial DNA sequences, resulting in several geographical clusters (Brown, Campos-Delgado & Pestano, 2000; Brown, Woods & Thorpe, 2017). It also shows geographic variation in some morphological traits, such as scalation and some body dimensions, probably related to aridity of the habitats (Brown, Thorpe & Báez, 1993). However, nuclear DNA shows only shallow divergences and weak geographical pattern (Brown, Woods & Thorpe, 2017). Recently, J. Mateo (cited by Miras, Pérez-Mellado & Martínez-Solano, 2009) suggested that *C. viridanus* probably represents a species complex and possibly should be split. Moreover, it was sometimes regarded as synonymous with *C. simonyi*, a skink occurring on islands of Fuertaventura and Lanzarote (see review in Salvador, 2015). However, genetic studies suggest that *C. viridanus* is more closely related to *C. sexlineatus* and *C. coeruleopunctatus* than to *C. simonyi*, which belongs to a different clade (Brown & Pestano, 1998; Carranza et al., 2008; Suárez, Pestano & Brown, 2014). Nonetheless, detailed description of the syntypes of this species would be useful for potential future works on its taxonomy. Unfortunately, we were unable to locate these specimens in the collection. Two well preserved individuals collected on Tenerife by Zimmer in 1907 have been rediscovered (MNHUW uncatalogued; Fig. 14) and one of them could become the neotype. However, we refrain from making such designation, as no molecular data could be obtained from any of those specimens. We recommend that potential future neotype designation in *C. viridanus* should involve specimen from well defined area (more precise than just “Tenerife”), preferably also with molecular data, especially mitochondrial DNA, as there are several mitochondrial clades within this species.

General remarks

Natural history museums play crucial role in studying biodiversity. Redescriptions of historical specimens, especially name-bearing ones (onomatophores), housed in such places may have

important implications for taxonomy and nomenclature of many taxa (e.g., Ohler & Dubois, 2016), to some extent because many of the museum specimens are incorrectly identified and labelled (Goodwin et al., 2015). Such historical specimens served as the basis not only for recent redescriptions of important, name-bearing specimens (e.g., Bucklitsch et al., 2012; Borczyk, 2013; Mecke et al., 2016) but also descriptions of species new to science, hitherto unrecognised (e.g., Böhme et al., 2015), and revalidations of species from synonymy (e.g., Espinoza, Lobo & Etheridge, 2011). The latter point may be especially important for diverse, species-rich groups such as *Liolaemus*, with often controversial taxonomy (Lobo, Espinoza & Quinteros, 2010).

Implications for *Liolaemus* taxonomy

We decided not to evert hemipenes in the rediscovered *Liolaemus* specimens because of their fragility which might lead to damaging them. The fact that in none of them any femoral or preanal pores can be observed, suggests that all of these individuals are females. However, members of the subgenus *Liolaemus* (also called the *chiliensis* section – a group to which all rediscovered lizards belong) tend to have significantly fewer preanal pores than do members of *Eulaemus* (Laurent, 1992) and there are several *Liolaemus* species in which both females and males completely lack these pores (Lobo, 2001; Pincheira-Donoso & Scolaro, 2007). Also, the 'taphonomical' factor must be taken into consideration.

It seems unlikely that species described by Gravenhorst (1838) represent valid species, given the fact that they are known from single (*L. conspersus*, *L. hieroglyphicus*) or a few (*L. lineatus*) specimens and no new individuals have been reported for 180 years. However, there are several *Liolaemus* species currently considered valid that are known only from the type locality or only from the type specimen (Meiri et al., 2018), so this fact alone does not argue against their validity. All rediscovered specimens are significantly asymmetric. Asymmetry is often (although not always) found in hybrids (Graham et al., 2010). This and the often mosaic character distribution might suggest that at least some of the rediscovered lizards are hybrids (it is also worth noting that interspecific hybridisation occurs commonly in *Liolaemus* lizards; Olave et al., 2018). However, this can only be tested by possible future molecular analyses and more thorough field studies. Unfortunately, type localities stated for Gravenhorst's taxa are usually very vague; Cauquenes Province for *L. conspersus* and *L. hieroglyphicus*, only the type locality given for *L. lineatus* is more precise – Valparaíso (Gravenhorst, 1838).

None (except *L. lemniscatus*) of the *Liolaemus* nomina coined by Gravenhorst (1838) were, to our best knowledge, used as valid names after 1899. This, however, does not make them "forgotten names", because only senior synonyms can be *nomina oblita*, not the junior ones (Ohler & Dubois, 2018).

Conclusions

We rediscovered several important specimens from the long thought to be lost Gravenhorst's herpetological collection at the University of Wrocław: type specimens of teiid lizard *Callopistes maculatus* and liolaemids *Liolaemus conspersus*, *L. hieroglyphicus* and *L. lineatus*.

Reexamination of morphology of liolaemids reveals several taxonomically informative differences between these specimens and their presumed senior synonyms, respectively, *L. nigromaculatus*, *L. lemniscatus* and *L. nitidus*. Unfortunately, our attempts of molecular analyses were unsuccessful, so resolving status of these taxa needs further, more complex studies. Nonetheless, rediscovery of these important specimens underscores the importance of natural history collections, their proper management and protection, a point recently further strengthened by the tragic fire in the National Museum of Brazil in Rio de Janeiro in September 2018.

Acknowledgements

We thank Jan Kotusz and Tadeusz Stawarczyk (MNHUW) for access to specimens in their care and Agnieszka Pietras-Lebioda for help with molecular analyses.

References

Abdala CS, Quinteros AS. 2014. Los últimos 30 años de estudios de la familia de lagartijas más diversa de Argentina. Actualización taxonómica y sistemática de Liolaemidae. *Cuadernos de herpetología* 28:55–82.

Böhme W, Ehrlich K, Milto K, Orlov N, Scholz S. 2015. A new species of desert monitor lizard (Varanidae: *Varanus*: *Psammosaurus*) from the Western Zagros region (Iraq, Iran). *Russian Journal of Herpetology* 22:41–52.

Borczyk B. 2013. Rediscovery and redescription of the holotype of *Liolaemus lemniscatus* Gravenhorst, 1838 (Reptilia, Squamata, Liolaemidae). *ZooKeys* 320:97–101 DOI: 10.3897/zookeys.320.5372.

Boulenger GA. 1885. *Catalogue of the lizards in the British Museum (Natural History). Volume II. Iguanidae, Xenosauridae, Zonuridae, Anguidae, Anniellidae, Helodermatidae, Varanidae, Xantusiidae, Teiidae, Amphisbaenidae*. London: Order of the Trustees, Taylor and Francis DOI: 10.5962/bhl.title.21097.

Brizuela S, Albino AM. 2017. Redescription of the extinct species *Callopistes bicuspidatus* Chani, 1976 (Squamata, Teiidae). *Journal of Herpetology* 51:343–354 DOI: 10.1670/16-121.

Brown RP, Campos-Delgado R, Pestano J. 2000. Mitochondrial DNA evolution and population history of the Tenerife skink *Chalcides viridanus*. *Molecular Ecology* 9:1061–1067 DOI: 10.1046/j.1365-294x.2000.00962.x.

Brown RP, Pestano J. 1998. Phylogeography of skinks (*Chalcides*) in the Canary Islands inferred from mitochondrial DNA sequences. *Molecular Ecology* 7:1183–1191 DOI: 10.1046/j.1365-294x.1998.00442.x.

Brown RP, Thorpe RS, Báez AM. 1993. Patterns and causes of morphological population differentiation in the Tenerife skink, *Chalcides viridanus*. *Biological Journal of the Linnean Society* 50:313–328 DOI: 10.1111/j.1095-8312.1993.tb00934.x.

Brown RP, Woods M, Thorpe RS. 2017. Historical volcanism and within-island genetic divergence in the Tenerife skink (*Chalcides viridanus*). *Biological Journal of the Linnean Society* 122:166–175 DOI: 10.1093/biolinnean/blx044.

Bucklitsch Y, Geissler P, Hartmann T, Doria G, Koch A. 2012. Rediscovery and re-description of the holotype of *Lygosoma vittigerum* (= *Lipinia vittigera*) Boulenger, 1894. *Acta Herpetologica* 7:325–329 DOI: 10.13128/Acta_Herpetol-11037.

Burmeister H. 1861. *Reise durch die La Plata Staaten mit besonderer Rücksicht auf die physische Beschaffenheit und den Culturzustand der Argentinischen Republik. Ausgeführt in den Jahren 1857, 1858, 1859 und 1860*. Halle: H.W. Schmidt.

Carranza S, Arnold EN, Geniez P, Roca J, Mateo JA. 2008. Radiation, multiple dispersal and parallelism in the skinks, *Chalcides* and *Sphenops* (Squamata: Scincidae), with comments on *Scincus* and *Scincopus* and the age of the Sahara Desert. *Molecular Phylogenetics and Evolution* 46:1071–1094 DOI: 10.1016/j.ympev.2007.11.018.

Cei JM. 1981. *Liolaemus pseudoanomalus*, a substitute name for *Liolaemus marmoratus* (Burmeister 1861). *Journal of Herpetology* 15:253–254 DOI: 10.2307/1563394.

Dubois A, Ohler A. 2000. Systematics of *Fejervarya limnocharis* (Gravenhorst, 1829) (Amphibia, Anura, Ranidae) and related species. 1. Nomenclatural status and type-specimens of the nominal species *Rana limnocharis* Gravenhorst, 1829. *Alytes* 18:15–50.

Espinoza RE, Lobo F, Etheridge R. 2011. Taxonomic history of the iguanian lizard *Liolaemus pictus major* Boulenger, with a revalidation of *Liolaemus capillitas* Hulse. *Journal of Herpetology* 45:129–133 DOI: 10.1670/10-028.1.

Etheridge R. 2000. A review of lizards of the *Liolaemus wiegmannii* group (Squamata, Iguania, Tropiduridae), and a history of morphological change in the sand-dwelling species. *Herpetological Monographs* 14:293–352 DOI: 10.2307/1467049.

Etheridge R, Espinoza RE. 2000. Taxonomy of the Liolaeminae (Squamata: Iguania: Tropiduridae) and a semi-annotated bibliograpy [bibliography]. *Smithsonian Herpetological Information Service* 126:1–64 DOI: 10.5479/si.23317515.126.1.

Etheridge R, Frost DR. 2012. Catalogue of the Iguania Pleurodonta. *Available at http://research.amnh.org/vz/herpetology/catalogue-iguania-pleurodonta* (accessed 9 October 2018).

Fitzinger L. 1843. *Systema reptilium. Fasciculus primus. Amblyglossae*. Vienna: Braumüller et Seidel Bibliopolas.

Goicoechea N, Frost DR, De la Riva I, Pellegrino KCM, Sites Jr J, Rodrigues MT, Padial JM. 2016. Molecular systematics of teioid lizards (Teioidea/Gymnophthalmoidea: Squamata) based on the analysis of 48 loci under tree-alignment and similarity-alignment. *Cladistics* 32:624–671 DOI: 10.1111/cla.12150.

Goodwin ZA, Harris DJ, Filer D, Wood JRI, Scotland RW. 2015. Widespread mistaken identity in tropical plant collections. *Current Biology* 25:R1066–R1067 DOI: 10.1016/j.cub.2015.10.002.

585 Graham JH, Raz S, Hel-Or H, Nevo E. 2010. Fluctuating asymmetry: methods, theory, and
586 applications. *Symmetry* 2:466–540 DOI: 10.3390/sym2020466.

587 Gravenhorst JLC. 1838. Beiträge zur genauern Kenntniss einiger Eidechsengattungen. *Nova Acta*
588 *Physico-Medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum* 18(2):712–
589 784.

590 Gravenhorst JLC. 1851. Über die im Zoologischen Museum der Universität Breslau befindlichen
591 Wirtelschleichen *(Pseudosaura)*, Krüppelfüssler *(Brachypoda)*, und einige andere, denselben
592 verwandte Reptilien aus den Zünften der Schleichen und Dickzüngler. *Nova Acta Physico-*
593 *Medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum* 23(1):291–394.

594 Harvey MB, Ugueto GN, Gutberlet Jr RL. 2012. Review of teiid morphology with a revised
595 taxonomy and phylogeny of the Teiidae (Lepidosauria: Squamata). *Zootaxa* 3459:1–156.

596 Hellmich W. 1934. Die Eidechsen Chiles, insbesondere die Gattung *Liolaemus*, nach den
597 Sammlungen Goetsch-Hellmich. *Abhandlungen der Bayerischen Akademie der Wissenschaften,*
598 *Mathematisch-naturwissenschaftliche Abteilung, Neue Folge* 24:1–143.

599 Jałoszyński P, Wanat M. 2014. Johann Ludwig Christian Gravenhorst, the first director of the
600 Museum of Natural History, University of Wrocław, and his collection of Ichneumonidae. *Genus*
601 25:583–599.

602 Köhler G, Rodríguez Bobadilla MJ, Hedges SB. 2016. A new dune-dwelling lizard of the genus
603 *Leiocephalus* (Iguania, Leiocephalidae) from the Dominican Republic. *Zootaxa* 4121(5):517–
604 532 DOI: 10.11646/zootaxa.4121.5.2.

605 Laurent RF. 1992. On some overlooked species of the genus *Liolaemus* Wiegmann (Reptilia
606 Tropiduridae) from Peru. *Breviora* 494:1–33.

607 Lobo F. 2001. A phylogenetic analysis of lizards of the *Liolaemus chiliensis* group (Iguania:
608 Tropiduridae). *Herpetological Journal* 11:137–150.

609 Lobo F. 2005. Las relaciones filogéneticas dentro del grupo *chiliensis* (Iguania: Liolaemidae:
610 *Liolaemus*): sumando nuevos caracteres y taxones. *Acta zoológica lilloana* 49:65–87.

611 Lobo F, Espinoza RE. 1999. Two new cryptic species of *Liolaemus* (Iguania: Tropiduridae) from
612 northwestern Argentina: resolution of the purported reproductive bimodality of *Liolaemus*
613 *alticolor*. *Copeia* 1999:122–140 DOI: 10.2307/1447393.

614 Lobo F, Espinoza RE, Quinteros S. 2010. A critical review and systematic discussion of recent
615 classification proposals for liolaemid lizards. *Zootaxa* 2549:1–30.

616 Martinez LE, Avila LJ, Perez CHF, Perez DR, Sites Jr JW, Morando M. 2011. A new species of
617 *Liolaemus* (Squamata, Iguania, Liolaemini) endemic to the Auca Mahuida volcano, northwestern
618 Patagonia, Argentina. *Zootaxa* 3010:31–46.

619 Mecke S, Mader F, Kieckbusch M, Kaiser H, Böhme W, Ernst R. 2016. Tracking a syntype of
620 the Australian skink *Anomalopus leuckartii* (Weinland, 1862): 'lost' treasures in the

Senckenberg Natural History Collections Dresden highlight the importance of reassessing and safe-guarding natural history collections. *Vertebrate Zoology* 66:169–177.

Meiri AS, Bauer AM, Allison A, Castro-Herrera F, Chirio L, Colli G, Das I, Doan TM, Glaw F, Grismer LL, Hoogmoed M, Kraus F, LeBreton M, Meirte D, Nagy ZT, Nogueira CdC, Oliver P, Pauwels OSG, Pincheira-Donoso D, Shea G, Sindaco R, Tallowin OJS, Torres-Carvajal O, Trape J-F, Uetz P, Wagner P, Wang Y, Ziegler T, Roll U. 2018. Extinct, obscure or imaginary: the lizard species with the smallest range. *Diversity and Distributions* 24:262–273 DOI: 10.1111/ddi.12678.

Miras JAM, Pérez-Mellado V, Martínez-Solano I. 2009. *Chalcides viridanus*. *The IUCN Red List of Threatened Species* 2009:e.T61490A12480456 DOI: 10.2305/IUCN.UK.2009.RLTS.T61490A12480456.en.

Ohler A, Dubois A. 2016. The identity of the South African toad *Sclerophrys capensis* Tschudi, 1838 (Amphibia, Anura). *PeerJ* 4:e1553 DOI: 10.7717/peerj.1553.

Ohler A, Dubois A. 2018. Article 23.9 of the *Code* cannot be used to reject the nomen *Hyla quoyi* Bory de Saint-Vincent, 1828 as a *nomen oblitum*. *Zoosystema* 40:109–121 DOI: 10.5252/zoosystema2018v40a6.

Olave M, Avila JA, Sites Jr JW, Morando M. 2018. Hybridization could be a common phenomenon within the highly diverse lizard genus *Liolaemus*. *Journal of Evolutionary Biology* 31:893–903 DOI: 10.1111/jeb.13273.

Ortiz JC. 1981. Estudio multivariado de las especies de *Liolaemus* del grupo *nigromaculatus* (Squamata – Iguanidae). *Anales Museo de Historia Natural de Valparaíso* 14:247–265.

Panzera A, Leaché AD, D'Elía G, Victoriano PF. 2017. Phylogenomic analysis of the Chilean clade of *Liolaemus* lizards (Squamata: Liolaemidae) based on sequence capture data. *PeerJ* 5:e3941 DOI: 10.7717/peerj.3941.

Pincheira-Donoso D, Núñez H. 2005. Las especies chilenas del género *Liolaemus* Wiegmann, 1834 (Iguania: Tropiduridae: Liolaeminae). Taxonomía, sistemática y evolución. *Publicación Ocasional del Museo Nacional de Historia Natural, Chile* 59:7–486.

Pincheira-Donoso D, Scolaro JA. 2007. Iguanian species-richness in the Andes of boreal Patagonia: evidence for an additional new *Liolaemus* lizard from Argentina lacking precloacal glands (Iguania, Liolaeminae). *Zootaxa* 1452:55–68 DOI: 10.11646/zootaxa.1452.1.4.

Pincheira-Donoso D, Scolaro JA, Sura P. 2008. A monographic catalogue on the systematics and phylogeny of the South American iguanian lizard family Liolaemidae (Squamata, Iguania). *Zootaxa* 1800:1–85.

Portelli SN, Quinteros AS. 2018. Phylogeny, time divergence, and historical biogeography of the South American *Liolaemus alticolor-bibronii* group (Iguania: Liolaemidae). *PeerJ* 6:e4404 DOI: 10.7717/peerj.4404.

Pregill GK. 1992. Systematics of the West Indian lizard genus *Leiocephalus* (Squamata: Iguania: Tropiduridae). *The University of Kansas Museum of Natural History Miscellaneous Publication* 84:1–69.

Quadros AB, Chafrat B, Zaher H. 2018. A new teiid lizard of the genus *Callopistes* Gravenhorst, 1838 (Squamata, Teiidae) from the Lower Miocene of Argentina. *Journal of Vertebrate Paleontology* DOI: 10.1080/02724634.2018.1484754.

Quinteros AS. 2013. A morphology-based phylogeny of the *Liolaemus alticolor–bibronii* group (Iguania: Liolaemidae). *Zootaxa* 3670(1):1–32 DOI: 10.11646/zootaxa.3670.1.1.

Salvador A. 2015. Lisneja – *Chalcides simonyi* Steindachner, 1891. In: Salvador A, Marco E, eds. *Enciclopedia virtual de los vertebrados españoles*. Madrid: Museo Nacional de Ciencias Naturales, 1–6.

Suárez NM, Pestano J, Brown RP. 2014. Ecological divergence combined with ancient allopatry in lizard populations from a small volcanic island. *Molecular Ecology* 23:4799–4812 DOI: 10.1111/mec.12897.

Torres-Pérez F, Boric-Bargetto D, Rodríguez-Valenzuela E, Escobar C, Palma RE. 2017. Molecular phylogenetic analyses reveal the importance of taxon sampling in cryptic diversity: *Liolaemus nigroviridis* and *L. monticola* (Liolaeminae) as focal species. *Revista Chilena de Historia Natural* 90:5 DOI: 10.1186/s40693-017-0068-z.

Troncoso-Palacios J. 2011. *Liolaemus pseudolemniscatus* Lamborot and Ortiz, 1990 (Squamata: Liolaemidae): distribution extension in Central Chile. *Check List* 7:849–851 DOI: 10.15560/7.6.849.

Troncoso-Palacios J, Garin CF. 2013. On the identity of *Liolaemus nigromaculatus* Wiegmann, 1834 (Iguania, Liolaemidae) and correction of its type locality. *ZooKeys* 294:37–56 DOI: 10.3897/zookeys.294.4399.

Troncoso-Palacios J, Schulte JA, Marambio-Alfaro Y, Hiriart D. 2015. Phenotypic variation, phylogenetic position and new distributional records for the poorly known *Liolaemus silvai* Ortiz, 1989 (Iguania: Iguanidae: Liolaemini). *South American Journal of Herpetology* 10:71–81 DOI: 10.2994/SAJH-D-14-00007.1.

Tschudi JJ. 1845. Reptilium conspectum quae in republica Peruana reperiuntur et pleraque observata vel collecta sunt in itinere. *Archiv für Naturgeschichte* 11:150–170.

Tucker DB, Colli GR, Giugliano LG, Hedges SB, Hendry CR, Moriarty Lemmon E, Lemmon AR, Sites Jr JW, Pyron RA. 2016. Methodological congruence in phylogenomic analyses with morphological support for teiid lizards (Sauria: Teiidae). *Molecular Phylogenetics and Evolution* 103:75–84 DOI: 10.1016/j.ympev.2016.07.002.

Vervust B, Van Dongen S, Van Damme R. 2009. The effect of preservation on lizard morphometrics – an experimental study. *Amphibia-Reptilia* 30:321–329 DOI: 10.1163/156853809788795209.

694 Wanat M, Pokryszko BM. 2014. Museum of Natural History, University of Wrocław – 200 years
695 of history in two countries. *Genus* 25:567–582.

696 Wiktor J. 1997. Muzeum Przyrodnicze Uniwersytetu Wrocławskiego. Historia i ludzie, 1814–
697 1994. *Acta Universitatis Wratislaviensis* 1920:1–130.

Figure 1

Holotype of *Liolaemus conspersus* Gravenhorst, 1838 (MNHUW 1321).

(A) Dorsal view. (B) Ventral view. Scale bar equals 1 cm.


A
B

Figure 2

Head of the holotype of *Liolaemus conspersus* Gravenhorst, 1838 (MNHUW 1321).

(A) Left lateral view. (B) Right lateral view. (C) Dorsal view. (D) Dorsal view as illustrated by Gravenhorst (1838). Scale bar equals 1 cm.

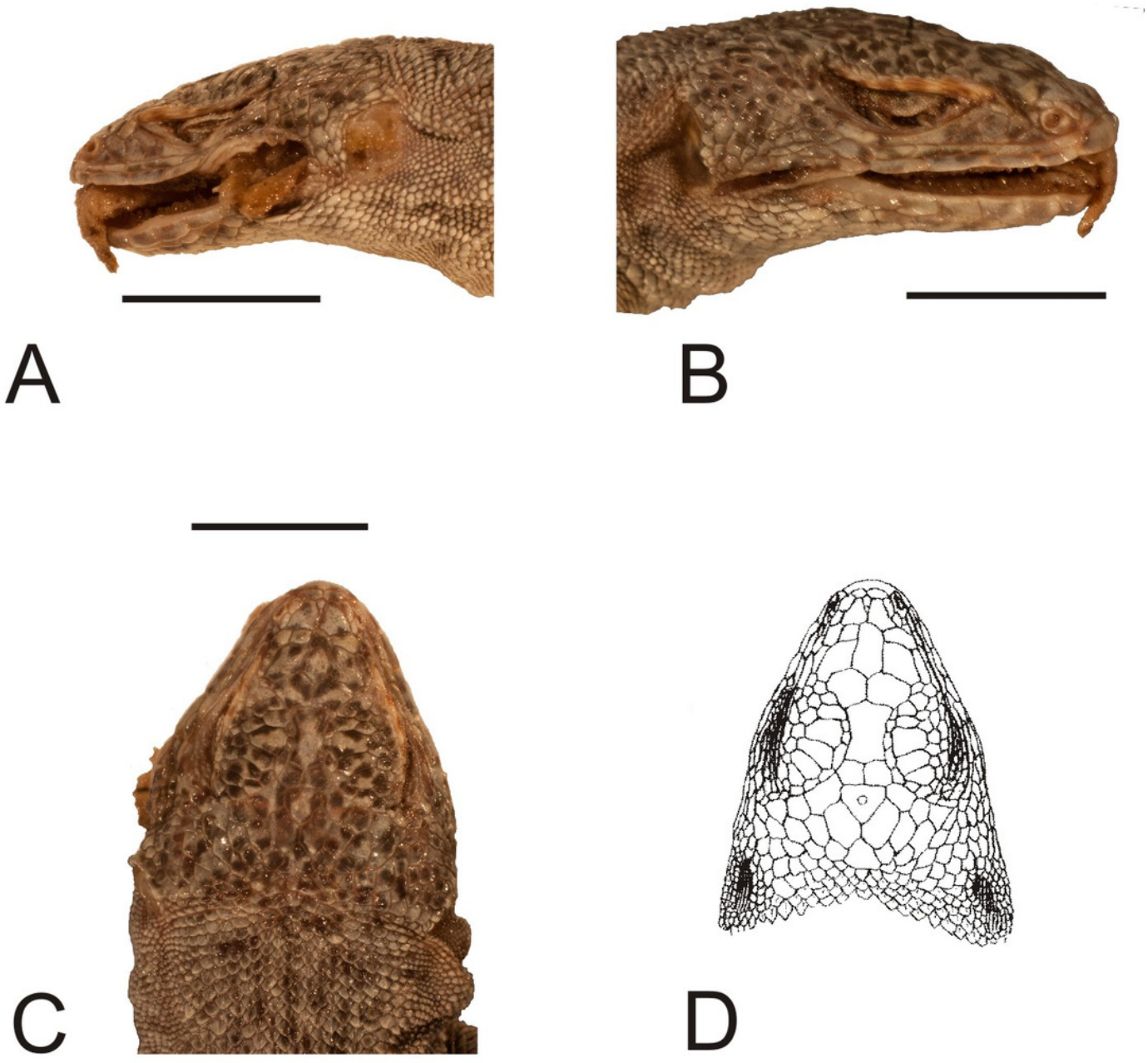


Figure 3

Morphological details of *Liolaemus conspersus* holotype (MNHUW 1321).

(A) Close-up of the cloacal region. No femoral or preanal pores can be observed. (B) Dorsal scales. Some of them are rounded, some lanceolate but all with strong keel. Scale bar equals 1 cm in (A) and 2 mm in (B).

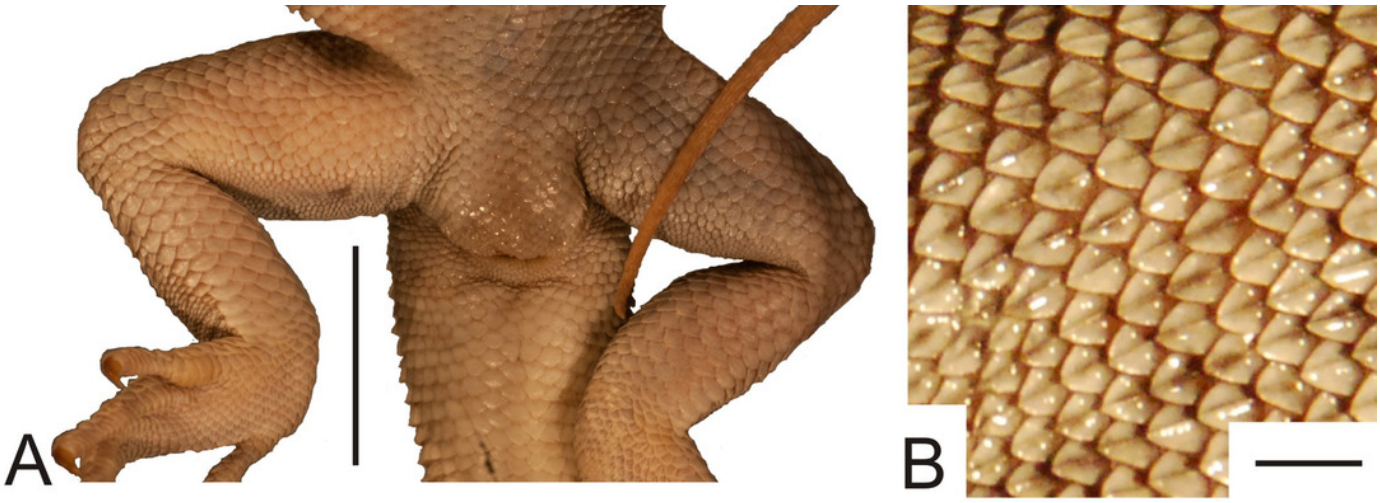


Figure 4

Holotype of *Liolaemus hieroglyphicus* Gravenhorst, 1838 (MNHUW 1322).

(A) Dorsal view. (B) Ventral view. Scale bar equals 1 cm.

Figure 5

Head of the holotype of *Liolaemus hieroglyphicus* Gravenhorst, 1838 (MNHUW 1322).

(A) Left lateral view. (B) Right lateral view. (C) Dorsal view. Scale bar equals 1 cm.

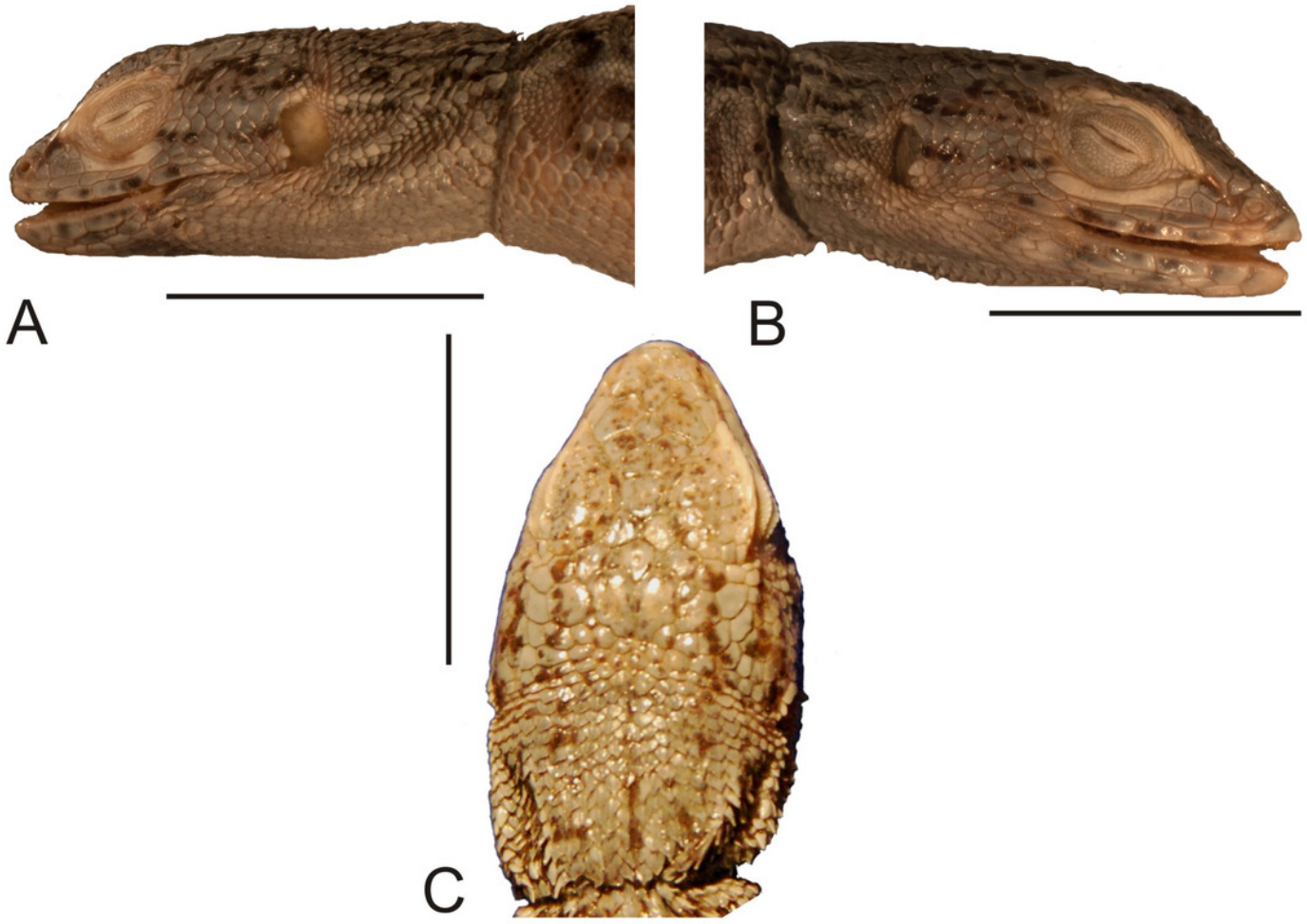
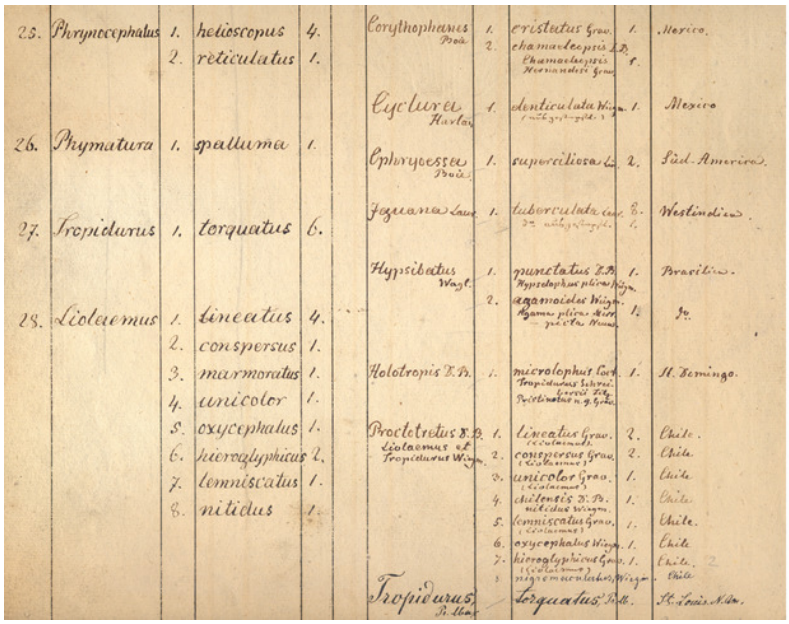


Figure 6

Excerpts from two surviving pre-World War II catalogues of herpetological specimens in the Museum of Natural History in Wrocław.



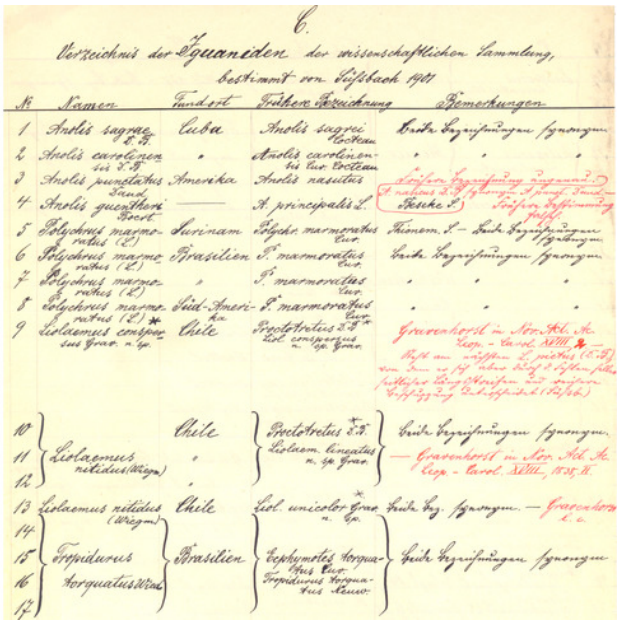


Figure 7

Lectotype of *Liolaemus lineatus* Gravenhorst, 1838 (MNHUW 1323).

(A) Dorsal view. (B) Ventral view. Scale bar equals 1 cm.


A
B

Figure 8

Head of the lectotype of *Liolaemus lineatus* Gravenhorst, 1838 (MNHUW 1323).

(A) Left lateral view. (B) Right lateral view. (C) Dorsal view. (D) Dorsal view as illustrated by Gravenhorst (1838). Scale bar equals 1 cm.

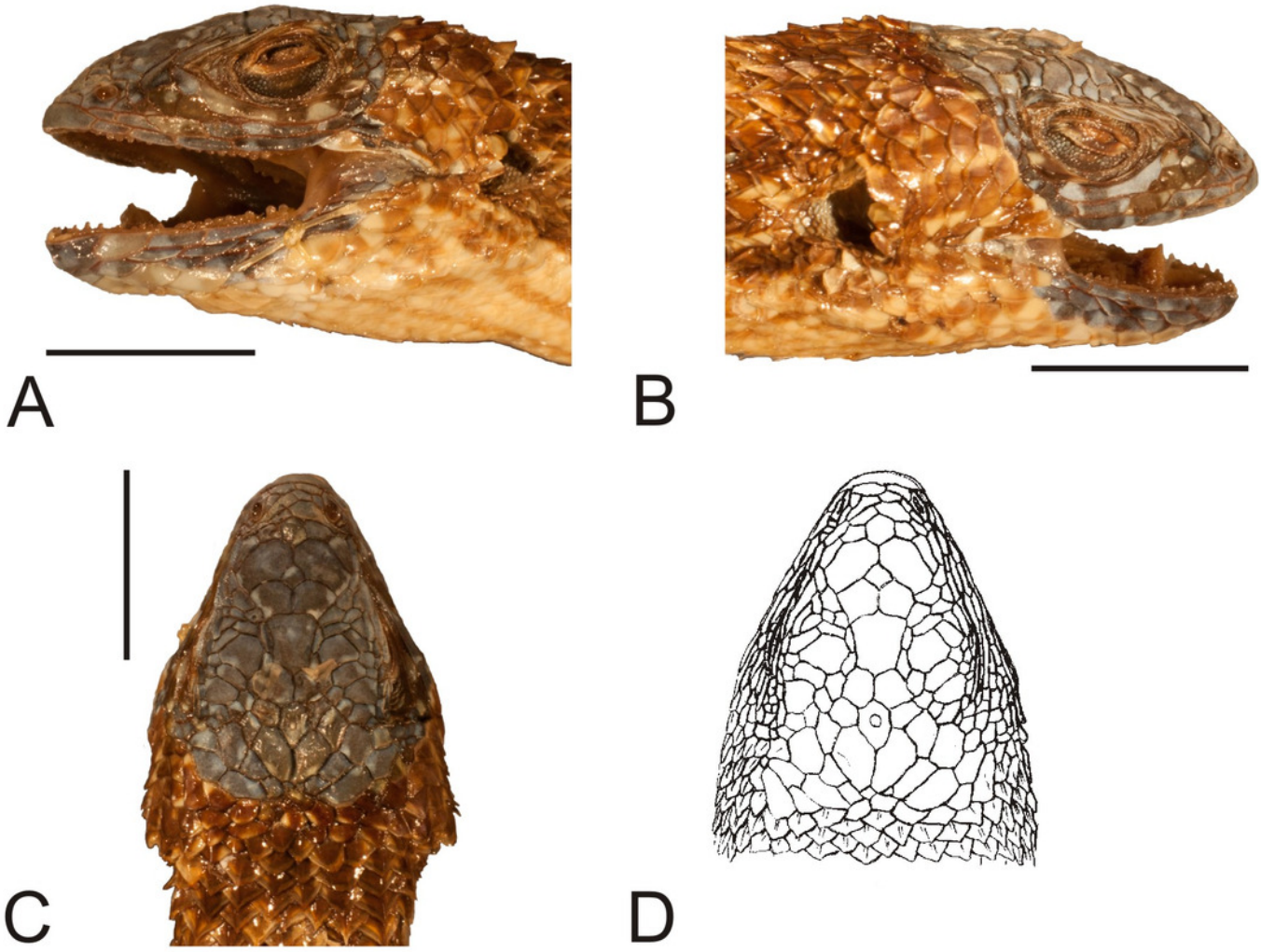


Figure 9

Paralectotype of *Liolaemus lineatus* Gravenhorst, 1838 (MNHUW 1323).

(A) Dorsal view. (B) Ventral view. Scale bar equals 1 cm.


A


B

Figure 10

Head of the paralectotype of *Liolaemus lineatus* Gravenhorst, 1838 (MNHUW 1323).

(A) Left lateral view. (B) Right lateral view. (C) Dorsal view. (D) Dorsal view as illustrated by Gravenhorst (1838). Scale bar equals 1 cm.

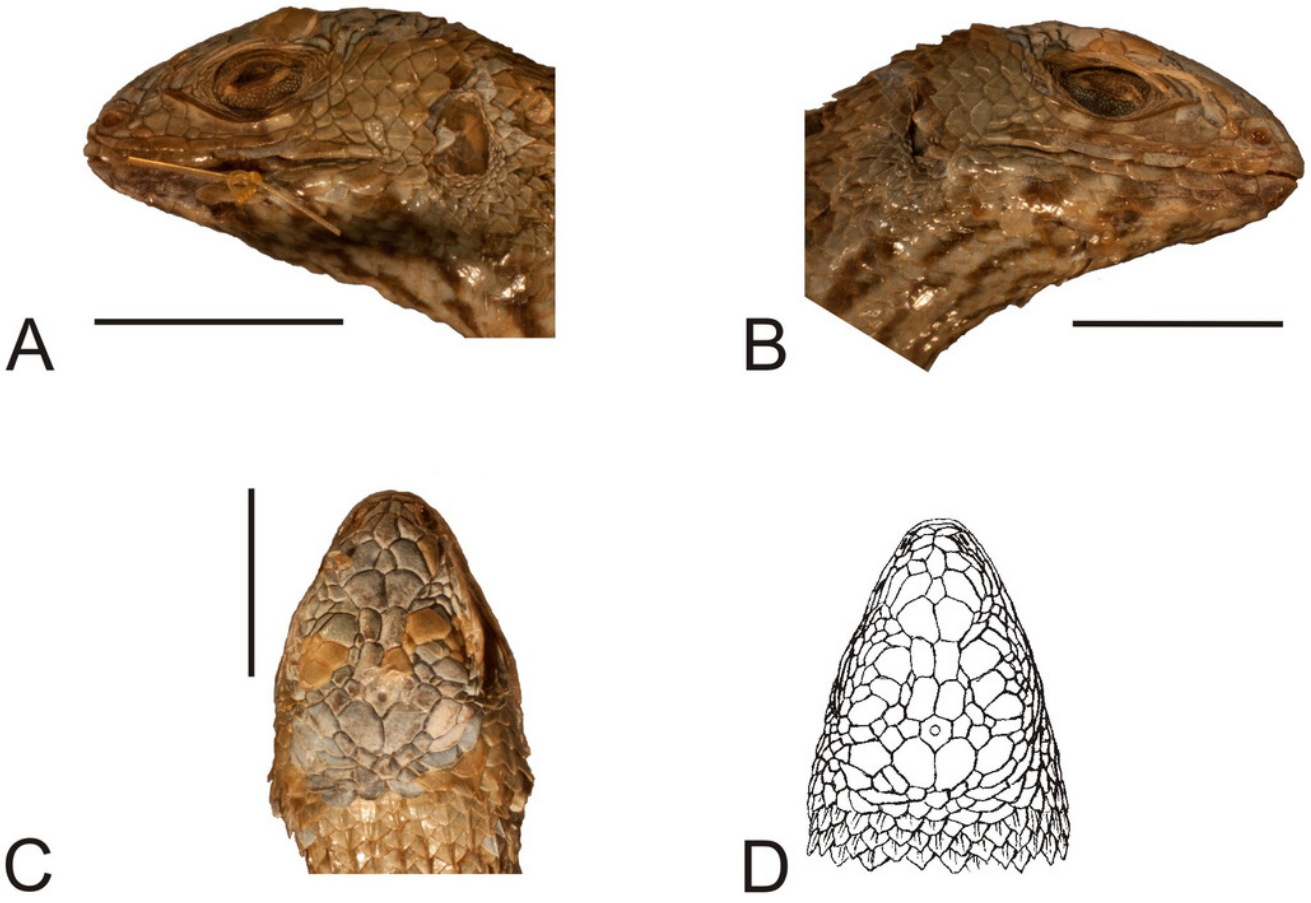


Figure 11

Indeterminate *Liolaemus* lizard ("mysterious specimen"; MNHUW uncatalogued).

(A) Whole specimen in dorsal view. (B) Dorsal view of the head. (C) Whole specimen in lateral view. Scale bar equals 1 cm.

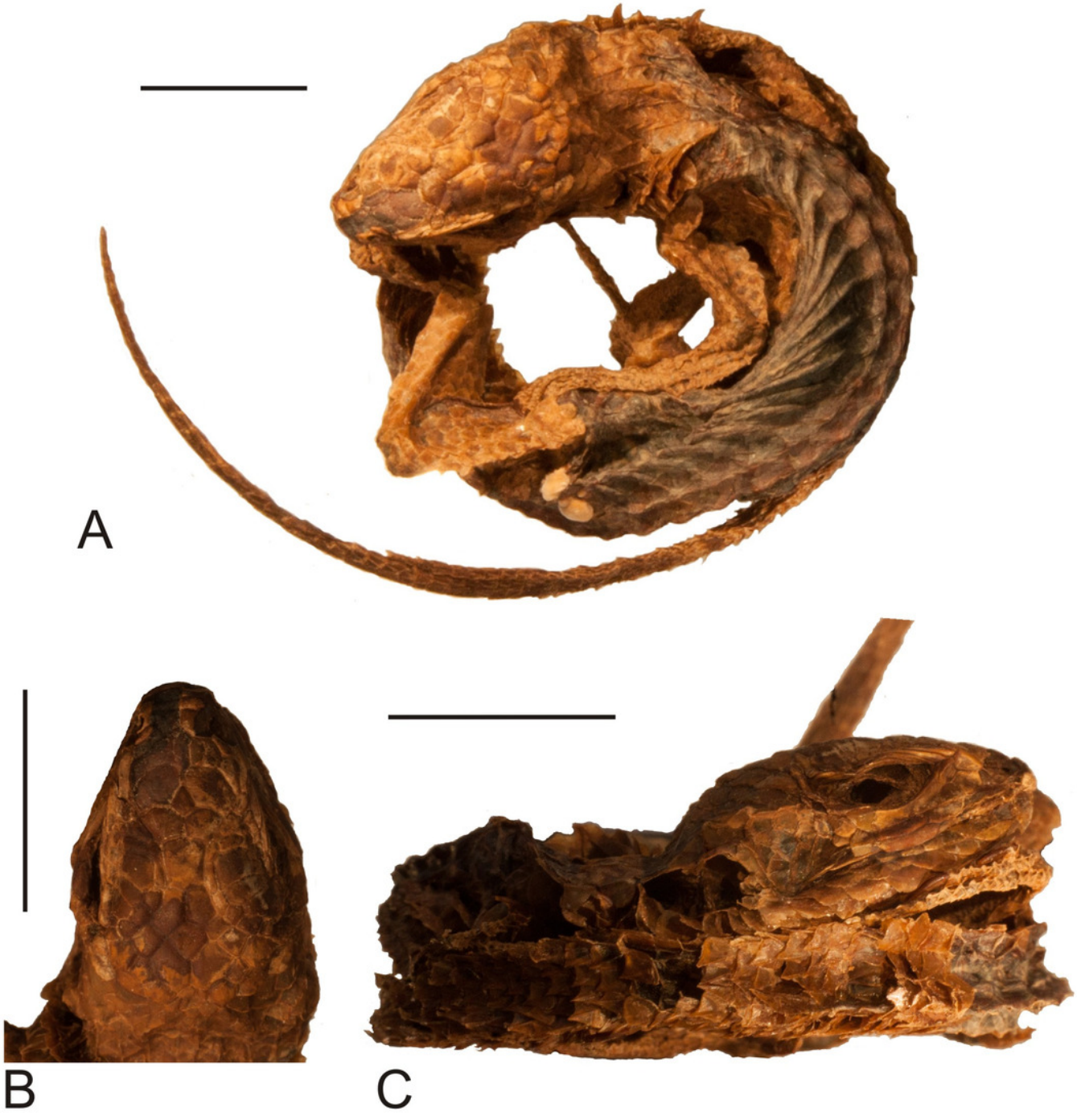


Figure 12

Lectotype of *Callopistes maculatus* Gravenhorst, 1838 (MNHUW 1320).

(A) Dorsal view. (B) Ventral view. Scale bar equals 1 cm.


A
B

Figure 13

Head of the lectotype of *Callopistes maculatus* Gravenhorst, 1838 (MNHUW 1320).

(A) Left lateral view. (B) Right lateral view. (C) Dorsal view. (D) Dorsal view as illustrated by Gravenhorst (1838). Scale bar equals 1 cm.

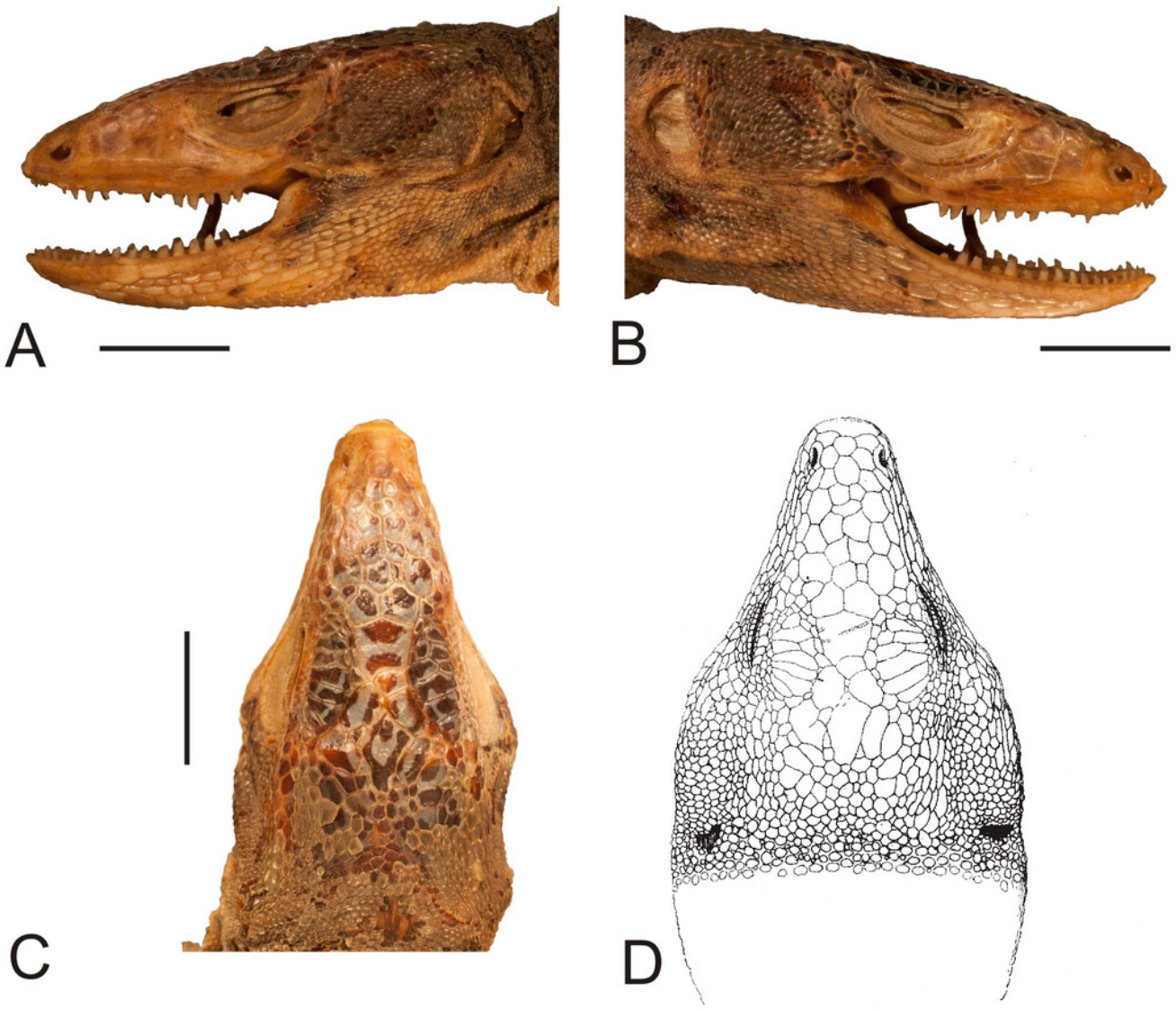


Figure 14

Two specimens of *Chalcides viridanus* (Gravenhorst, 1851) (MNHUW uncatalogued) collected by Zimmer on Tenerife.

Scale bar equals 1 cm.

Table 1(on next page)

Morphometric measurements of the rediscovered lizards.

"R" indicates measurement taken from the right side of the specimen and "L" – from the left side. Note that not all measurements could be taken.

	Liolaemus conspersus	*Liolaemus hieroglyphicus*	*Liolaemus lineatus* second variety	*Liolaemus lineatus* third variety	"Mysterious specimen"	*Callopistes maculatus*
SVL	83.9	54.0	89.4	54.3	-	141
Tail length	137.7	11.7	123.4	76.0	-	292 (the last 203 mm are broken)
Head length	21.0	13.2	22.8	18.6	17.9	38.2
Head width	16.9	9.5	16.1	13.2	11.7	20.9
Head height	9.0	6.8	12.9	11.0	-	19.3
Axilla-groin distance	40.5	22.6	-	-	-	67.0
Tail base width	11.8	7.0	11.6	9.0		14.8
Interorbital distance (between postorbital semicircles)	1.4	1.5	3.0	2.6	1.6	4.9
Eye-auditory meatus distance	7.2	4.1	9.1	6.8	5.3	12.6
Internarial distance	3.9	2.7	3.6	3.1	3.3	4.7
Arm length	11.2 R/11.8 L	7.4 R/6.2 L	12.4 R/13.1 L	11.1 R/10.9 L	-	19.1 L
Thigh length	14.2 R/16.0 L	10.2 R/10.1 L	15.6 R/16.4 L	14.7 R/14.1 L	-	33.0 R/26.6 L
Shank length	17.9 R/17.7 L	10.2 R/10.1 L	16.8 R/17.6 L	14.4 R/14.7 L	15.4 R	31.1 R/28.2 L
Foot length	26.2 R/25.4 L	16.1 R/14.6 L	26.1 R/24.8 L	19.9 R/19.0 L	-	-
Subocular length	5.5 R	4.2 R	6.1 R	5.7 R	-	-
Preocular length	1.6 R	0.9 R	1.4 R	1.3 R	-	-
Rostral length/width	1.6/3.9	0.8/2.6	1.4/3.8	0.9/3.7	-	2.3/4.7

Mental length/width	2.3/4.7	1.5/2.7	1.9/3.9	1.7/3.3	-	2.6/4.1
Auditory meatus height/width	4.1/2.5 R	2.0/1.5 R	3.5/2.8 R	-	-	6.0/3.5 R

1