

Nomenclature and taxonomic status of the lizards listed by Philippi (1860) (Squamata: Liolaemidae, Teiidae and Tropicuridae)

Jaime Troncoso-Palacios¹, Yery Marambio-Alfaro^{2,3}

¹ Programa de Fisiología y Biofísica, Facultad de Medicina, Universidad de Chile, Independencia 1027, Santiago, Chile.

² Laboratorio de Sedimentología y Paleoambientes. Instituto de Ciencias Naturales Alexander von Humboldt, Facultad de Ciencias del Mar y Recursos Biológicos, Universidad de Antofagasta. Avda. Universidad de Antofagasta 02800, Chile.

³ Parménides Limitada, Avda. Batallones de Atacama 112, Caldera, Atacama, Chile.

Recibido: 29 Diciembre 2019

Revisado: 23 Marzo 2020

Aceptado: 05 Mayo 2020

Editor Asociado: A. S. Quinteros

doi: 10.31017/CdH.2020.(2020-060)

ABSTRACT

In 1860 Rudolph Amandus [Rodolfo Amando] Philippi published the book “Reise durch die Wueste Atacama auf Befehl der chilenischen Regierung im Sommer 1853–54”, a wonderful work of natural history, which was for a long time the most comprehensive source of geographic, cultural, botanic and zoological information on the Atacama Desert of Chile (currently Atacama and Antofagasta regions). In this book, Philippi listed several species of lizards, and described five new species. However, the taxonomic identities of several of these species still remain to be clarified. Here we provide comments on these species and show that not all of Philippi's (1860) type specimens were collected in Atacama Desert as has long been thought. We designate lectotypes for *Proctotretus pallidus* and *P. melanopleurus*; and confirm that *P. modestus* is a junior synonym of *L. bellii* and that *P. pallidus* is a junior synonym of *L. nigromaculatus*. In the case of *P. marmoratus*, since it is a secondary homonym of *L. marmoratus* Gravenhorst, 1838, we consider it an invalid name.

Key Words: *Aporomera*, Atacama, Desert, *Helocephalus*, *Liolaemus*, *Proctotretus*.

RESUMEN

En 1860 Rodolfo Amando [Rudolph Amandus] Philippi publicó el libro (*sic*) “Viage al Desierto de Atacama hecho de orden del Gobierno de Chile en el verano 1853-54”, un maravilloso trabajo de historia natural, el cual fue por mucho tiempo la fuente más completa de información geográfica, cultural, botánica y zoológica del desierto de Atacama de Chile (actualmente las regiones de Atacama y Antofagasta). En este libro, Philippi listó varias especies de lagartos, y describe cinco nuevas especies. Sin embargo, las identidades taxonómicas de varias de estas especies permanecen sin clarificar. Aquí nosotros proveemos comentarios sobre estas especies y demostramos que no todos los especímenes tipo de Philippi (1860) fueron colectados en el desierto de Atacama como se ha pensado por largo tiempo. Nosotros designamos lectotipos para *Proctotretus pallidus* y *P. melanopleurus*; y confirmamos que *P. modestus* es un sinónimo menor de *L. bellii* y que *P. pallidus* es un sinónimo menor de *L. nigromaculatus*. En el caso de *P. marmoratus*, dado que es un homónimo secundario de *L. marmoratus* Gravenhorst, 1838, lo consideramos un nombre inválido.

Palabras claves: *Aporomera*, Atacama, Desert, *Helocephalus*, *Liolaemus*, *Proctotretus*.

Introduction

The German naturalist and explorer Rudolph [Rodolfo] Amando Philippi (1808–1904), is well known for his major early contributions to the natural history of Chile. An overview of his life and work was summarized by Kabat and Coan (2017). In 1860 Philippi published the book “Reise durch die Wueste

Atacama auf Befehl der chilenischen Regierung im Sommer 1853–54”, describing his journey and field survey through the Atacama Desert carried out on behalf of the Chilean government between November 1853 and February 1855. The book provides data on various subjects as geography, culture, botany and

zoology with a detailed account of the trajectory. Philippi's journey in the Atacama Desert was wide-ranging and led from the coast to Andean highlands, covering the current Atacama and Antofagasta regions of northern Chile (Fig. 1). In the Zoology section of the book (Chapter 8, pp. 156–190), one amphibian and eight lizard species are discussed (pp. 165–169), including the description of a new genus and five new species providing a drawing of three of them (reproduced here in Fig. 2). Most of these liz-



Figure 1. Sketch of the route followed by Philippi during his travel through the Atacama Desert. He started in Coquimbo (1, in November 1853) and traveled by ship to Caldera (3, in May 1854), without visit Huasco (2), although some type specimens has been claim as collected in this last locality (see comments in regards to *Proctotretus pallidus*). Then, he went to Copiapó (4, in May), returned to Caldera (3, in May). Later he went to Chañaral (5, in December), Taltal (6, in December) and Paposo (7, in December), sailed up to Mejillones (8, in December), returned to Taltal (6, in January 1855) and traveled to Tilopozo (9, in January) and San Pedro (10, in January). He returned, passing again through Tilopozo (9, in February), Pajonal (11, in February), Finca de Chañaral (12, in February), and Puquios (13, in February) before finally reaching Copiapó (4, in February) at the end of his journey.

ards currently belong to the genus *Liolaemus*, which has been split into two subgenera, each split into several groups: *Liolaemus (sensu stricto* or “Chilean

group”), which include the *nigromaculatus*, *platei*, and other groups; and *Eulaemus* (or “Argentinean group”), which include the *darwinii*, *montanus*, and other groups (see Lobo *et al.*, 2010). Also, Philippi (1860) included species currently assigned to the genus *Callopiastes*, which includes only two species of larger teiid lizards (Harvey *et al.*, 2012), and from the to genus *Microlophus*, which includes approximately 20 species (Benavides *et al.*, 2007) with several taxonomic problems among the Chilean species (Troncoso-Palacios, 2018). Almost all species listed by Philippi (1860) are controversial in regard to their taxonomic status or their occurrence in the Atacama Desert (Ortiz and Núñez, 1986). Hereafter, we review the lizards listed by Philippi (1860) on the basis of extant type specimens and comparative material from several Chilean collections and provide comments on their nomenclatural and taxonomic status.

Materials and methods

We examined three type specimens collected by Philippi and an additional seven type specimens of his collection were examined through photographs: *Helocephalus nigriceps* ZSM 38/1930 lectotype, *Proctotretus modestus* ZMB 5350, 70546–47, *P. melanopleurus* FMNH 9969 syntype, and the specimens NMW 18914:1,2 considered by some authors as syntypes of *Proctotretus pallidus* (Tiedemann and Häupl, 1980; Gemel *et al.*, 2019). For the specimens NMW 18914:1,2 we estimated our measurements based on the rule included in each photograph (in millimeters). We also reviewed photographs of six non type specimens collected by Philippi. For comparisons, we examined 227 specimens not collected by Philippi but belonging to species that have been recorded in the area visited by him or in the surroundings (Appendix I). Scales were observed using binocular lenses 0.8–5x. The characters for scalation were taken according to Pincheira-Donoso and Núñez (2005) and Troncoso-Palacios *et al.* (2015).

Results and Conclusion

Proctotretus marmoratus (Philippi 1860, p. 165)

The genus *Proctotretus* is currently considered a junior synonym of *Stenocercus* (Frost, 1992), a genus that do not occur in Chile. However, currently all Chilean species formerly listed in the genus *Proctotretus* are placed in the genus *Liolaemus* (Etheridge, 1995; Abdala and Quinteros, 2014), among them,

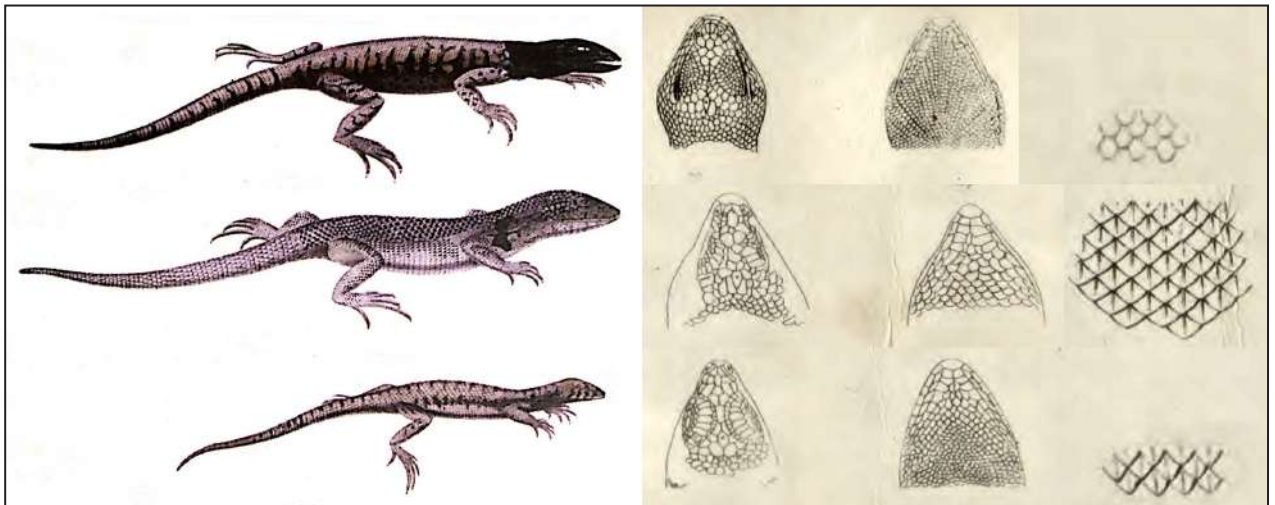


Figure 2. Lizards illustrated in Philippi (1860), here modified from two different copies of the book. Lateral aspect (right), cephalic scalation (center) and dorsal scalation (left). Above= *Helocephalus nigriceps*. Middle= *Proctotretus bisignatus*, listed as *P. nigromaculatus* in the zoological section of Philippi (1860). Below= *P. pallidus*.

P. marmoratus was considered as belonging to *Liolaemus* by Boulenger (1885, p. 140) who suggest that it is a questionable junior synonym of *L. nitidus* (Wiegmann, 1834), an opinion shared by Ortiz and Núñez (1986) and Pincheira-Donoso and Núñez (2005). Moreover, Philippi (1860) pointed out that in *P. marmoratus* “the ventral part from the chin to the anus has rounded and smooth scales”, the smooth scales on the throat being a diagnostic trait of *Liolaemus* (Etheridge, 1995). Thus, the correct name combination is *Liolaemus marmoratus* (Philippi, 1860), however, it is a secondary homonym with *L. marmoratus* Gravenhorst, 1838 (ICZN, 1999, Art. 53.3) and then Philippi’s *marmoratus* is an invalid (but available) name. We do not recommend the proposing of a replacement name because the species identity cannot be established. Philippi (1860) did not provide a type locality for “*P. marmoratus*”, type specimens are currently lost (Ortiz and Núñez, 1986) and description is brief and inaccurate, making it impossible to reach a clear conclusion on the species identity. Boulenger (1885) may have proposed the questionable synonymy of *P. marmoratus* and *L. nitidus* because of Philippi’s (1860) statement “(dorsal scales are) very pointed and strongly keeled” in *P. marmoratus*, as is found on *L. nitidus*, a diagnostic feature for this last species (Pincheira-Donoso and Núñez, 2005). Assuming that Philippi collected the specimens of “*P. marmoratus*” in his Atacama journey, we note that two species found in these localities have strongly keeled dorsal scales: *L. nitidus* and *L. zapallarensis* Müller and Hellmich, 1933. Since

Philippi (1860) did not provide additional features (e.g. color pattern or localities), no conclusion on the species identity can be reached.

Proctotretus nigromaculatus (Wiegmann, 1834) (Philippi 1860, p. 166, tab. VI, Fig. 2; reproduced here in Fig. 2)

Philippi (1860) starts his brief characterization of this species (currently *Liolaemus nigromaculatus*) attributing the species authority to Wiegmann, but then he added the following sentence in regards to the species illustration: “S(ection) Zool(ogy) tab(ularum) nomine *Proct(otretus). bisignatus*”, which introduced a new name (*P. bisignatus*) as junior synonym of *P. nigromaculatus*. The reasons why he introduced this new synonym are unknown. As a possible hypothesis to explain why Philippi listed this taxon as *P. nigromaculatus* but provided a drawing of it with the legend *P. bisignatus*, we propose that perhaps Philippi intended to describe this species as “*P. bisignatus*” and made a plate before he realized that it had already been described as *P. nigromaculatus* by Wiegmann. Later, Boulenger (1885, p. 147) synonymized *P. bisignatus* with *L. nigromaculatus*. Müller and Hellmich (1933a) restricted the type locality of *L. nigromaculatus* to Huasco (Atacama region, Chile) and Müller and Hellmich (1933b) resurrected *P. bisignatus* as a subspecies of *L. nigromaculatus*, restricting its type locality to Caldera (Atacama region, Chile). Afterwards, several authors considered both, *L. nigromaculatus* and *L. bisignatus* as full species (Ortiz, 1981; Pincheira-Donoso and Núñez, 2005),

but Troncoso-Palacios and Garín (2013) corrected the type locality of *L. nigromaculatus* to the transect between Puerto Viejo and Copiapó and determined that the population from Caldera (*L. bisignatus*) is conspecific with *L. nigromaculatus*. Despite the lack of a description and being introduced as junior synonym, *P. bisignatus* (= *L. bisignatus*) is an available name because a name associated with a drawing and published before 1931 is available (ICZN, 1999, Art. 12.2.7) and a name introduced as synonym but used as available name before 1961 is also available (ICZN, 1999, Art. 11.6.1). However, given that it is based in the same species that *L. nigromaculatus*, *L. bisignatus* (Fig. 3) is a junior synonym of *L. nigromaculatus*. A more detailed analysis can be read in Troncoso-Palacios and Garín (2013).

Proctotretus modestus (Philippi 1860, p. 166)

Philippi (1860) described it from both the Atacama desert and the mountains of the Santiago Province. The syntypes were assumed lost by Ortiz and Núñez (1986), but without making reference to the syntypes mentioned by Müller and Hellmich (1933a). In fact, Müller and Hellmich (1933a) and Hellmich (1934) listed three syntypes, two females and one juvenile male, placed in the Zoologisches Museum Berlin (currently Museum für Naturkunde Berlin) with the number ZMB 5350 (currently ZMB 5350, 70546–47) and they designated the current ZMB 5350 as “type” because it is the larger one. It is currently thought that *P. modestus* was collected by Philippi in his journey by the Atacama Desert (Ortiz and Núñez, 1986), however, the three type specimens were collected by Philippi in “Santiago de Chile”, a locality from central Chile, far to the

south of the Atacama Desert. Boulenger (1885, p. 141) included to *P. modestus* as a questionable junior synonym of *L. chiliensis*, whereas according to Müller and Hellmich (1933a) and Hellmich (1934), *P. modestus* is “identical” to *L. altissimus altissimus* Müller and Hellmich, 1932, this latter considered to be a junior synonym of *L. bellii* Gray, 1845, by Núñez (2004). The synonymies of Boulenger (1885), Müller and Hellmich (1933a), and Hellmich (1934) were rejected by Ortiz and Núñez (1986) because *L. chiliensis* and *L. altissimus altissimus* do not occur in the Atacama Desert. In fact, there are no *Liolaemus* species from the mountains of near Santiago that also occur in the localities visited by Philippi (Valladares-Faúndez, 2011; Troncoso-Palacios, 2014), but Ortiz and Núñez (1986) were unaware that the types of *P. modestus* were not collected in the Atacama Desert but rather near Santiago. Apparently, Philippi saw a *Liolaemus* species in the Atacama Desert that he erroneously confused with a *L. bellii* from the mountains near Santiago, then he collected the specimens in this last locality and provide the description in his Atacama book (Philippi, 1860), causing confusion and leading to Ortiz and Núñez (1986) to assume that *P. modestus* occurs in the Atacama Desert.

Since Müller and Hellmich (1933a) refer to ZMB 5350 as “type”, it should be considered as lectotype and ZMB 70546–47 as paralectotypes. Our examination of these specimens (Fig. 4) allow us to agree with Müller and Hellmich (1933a) and Hellmich (1934) in that it is conspecific with *L. bellii*, because *P. modestus* has lanceolate and subimbricate dorsal scales, dorsal pattern formed by “V” dark stripes bordered of whitish scales on the juvenile specimen, dorsal pattern formed by diffu-



Figure 3. Holotype of *P. bisignatus* (MNHNCL 1477) collected by Philippi and probably used to write the characterization of *P. nigromaculatus* and for drawing *P. bisignatus*.

se dark stripes bordered of whitish scales on adult specimens and ventral dark reticulation in both juvenile and adults, all diagnostic characters of *L. bellii* (Pincheira-Donoso and Núñez, 2005).

Finally, we remark that when Müller and Hellmich (1933a) and Hellmich (1934) addressed the status of *P. modestus*, they decided to keep *L. altissimus altissimus* as the valid name, because they erroneously thought that “*P. modestus* Philippi,

1860” was a secondary homonym (and then not a valid name) with *Liolaemus (Sauridis) modestus*, Tschudi, 1845. However, this last is a *Stenocercus* species (Laurent, 1984), then this claim is incorrect, but both *L. altissimus altissimus* and *P. modestus* are junior synonyms of *L. bellii*.

Proctotretus melanopleurus (Philippi 1860, p. 166)
Philippi (1860) provided neither type locality, nor

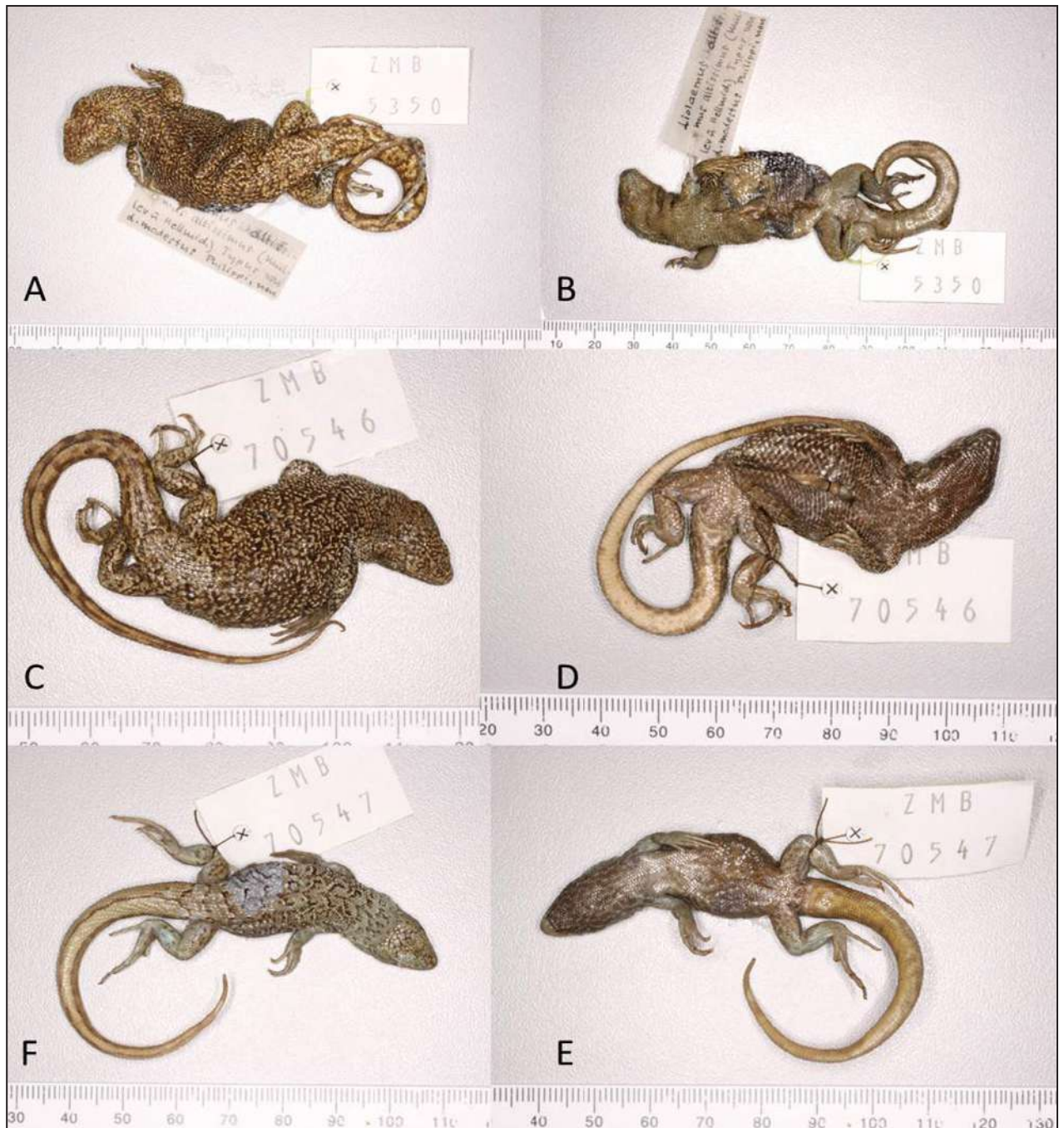


Figure 4. Specimens of *Proctotretus modestus*. A), B) Lectotype ZMB 5350, adult female. C), D) Paralectotype ZMB 70546, adult female. E), F) Paralectotype ZMB 70547, juvenile male. All photographs by Frank Tillack.

list of the type specimens nor an illustration of his *P. melanopleurus*. The description is brief (ten lines). Boulenger (1885, p. 155), included *P. melanopleurus* as questionable junior synonym of *L. darwinii* (Bell, 1843), a proposal followed by Quijada (1916), who listed three syntypes placed in the Museo de Historia Natural de Chile (MNHNCL) and he assumed the type locality as “Atacama”. Ortiz and Núñez (1986) pointed out that two syntypes of *P. melanopleurus* are placed in the Museo Nacional de Historia Natural de Chile (MNHNCL 1549 and 1550) and the third in the Field Museum of Chicago (FMNH 9969). They rejected Boulenger’s (1885) synonymy because *L. darwinii* occurs in southern South America in localities not visited by Philippi (1860) in his Atacama travels through northern Chile. Although Ortiz and Núñez (1986) pointed out a resemblance to *L. platei*, they stated that they “prefer to consider its status (*L. melanopleurus*) as doubtful because the specimens are poorly preserved, which do not allow the observation of other features (besides the black lateral stripe and midbody scale counts) and because no more specimens are known”. In regards to the third specimen placed in the Field Museum of Chicago, they pointed out that it is poorly preserved and discolored, questioning its assignment to *L. melanopleurus*. Later, Ortiz (1994) pointed out that *L. melanopleurus* is an “enigmatic Philippi’s species”. Etheridge (1995) included *L. melanopleurus* in the *L. montanus* group, however, this was rejected by Núñez *et al.* (2000) since tibia and supralabial scales do not match with the features found in the *L. montanus* group; they also stated that “this species (*L. melanopleurus*), if it exists, belongs to the *chiliensis* group” (probably in reference to subgenus *Liolaemus* also known as the Chilean group). Pincheira-Donoso and Núñez (2005, p. 333) stated that “the taxonomic position of *L. melanopleurus* is very confusing, especially due to age of the three known specimens..., and their natural deterioration”, but proposed the “resurrection” of *L. melanopleurus* (p. 8). However, doubts arise on the application of the term “species resurrection” by Pincheira-Donoso and Núñez (2005) because, in taxonomy, this term is applied when a taxon considered as junior synonym is revalidated (e.g. Szederjesi *et al.*, 2018), but *L. melanopleurus* was not a junior synonym at the time of Pincheira-Donoso and Núñez (2005). They also stated that *L. melanopleurus* is not a synonym of *L. platei* but that could be a senior synonym of *L. maldonadae* Núñez *et al.* 1991 (p. 443). Remarkably,

Pincheira-Donoso and Núñez (2005, p. 455) provide different voucher number for the syntypes of *L. melanopleurus* (MNHNCL 1646, two specimens), in regards to the numbers MNHNCL 1549–50 provided by Ortiz and Núñez (1986). Later, Pincheira-Donoso and Núñez (2007), remarked again on the doubtful status of this species: “is an enigmatic taxon. Indeed, it not only is known on the basis of two specimens, but the type locality also still remains a mystery”. Pincheira-Donoso and Núñez (2007) also pointed out that the relationships between *L. isabelae* Navarro and Núñez, 1993, and *L. melanopleurus* are a “matter for discussion”, suggesting the possible status of *L. isabelae* as junior synonym. Troncoso-Palacios (2014) provided a list of lizards of Atacama Region and stated that he reviewed one *Liolaemus* specimen (MZUC 11770, *L. juanortizi* Young-Downey and Moreno, 1992) from Puquios, Atacama, the last locality visited by Philippi before his return to Copiapó, and since *L. juanortizi* has a dark lateral stripe as is found on *L. melanopleurus*, Troncoso-Palacios (2014) suggested that MZUC 11770 may be conspecific with *L. melanopleurus*. However, Puquios, which ranges from 1400 to 2000 meters above sea level (masl), is out of the distributional and elevation ranges of *L. juanortizi*, which has its closest record in Quebrada Patón, approximately 50 km S from Puquios (Troncoso-Palacios, 2013) and it is only known from 3800 masl (Pincheira-Donoso *et al.*, 2008). We conclude that the information on the MZUC 11770 label is inaccurate and this specimen of *L. juanortizi* was probably collected along a road that goes through Puquios to reach 3800 masl in some locality off the path followed by Philippi. Moreover, we did not find *L. juanortizi* in two field campaigns to Puquios (March 2016 and January 2019), where we found only *L. velosoi* Ortiz, 1987. Troncoso-Palacios *et al.* (2016) pointed out that “*L. melanopleurus* remains a problematic species in terms of identification as the type locality is imprecise and no additional specimens have been found in more than 100 years”. Finally, Núñez and Gálvez (2015) listed MNHNCL 1646, which include two specimens, as the “holotype”, but without an indication of which one of these two specimens they refer. We also remark that it is not possible to designate a holotype for *L. melanopleurus*, instead a lectotype should be designed.

Philippi (1860) stated that *P. melanopleurus* has the following measures (in inches and lines converted here to cm): total length= 11.4 cm, head

length= 1.2 cm length, foreleg length= 1.7 cm, hind leg length= 2.3 cm, tail length= 6.8 cm, snout-foreleg distance= 1.7 cm, foreleg-hind leg distance= 2.1 cm. When we reviewed the syntypes placed in the MNHNCL (May 2011 and November 2016), these shared the number MNHNCL 1646, without distinction between specimens, however, both are easily distinguishable because one is much larger (snout vent length= 70.6 mm) than other (SVL= 46.7 mm). Two different voucher codes should be provide for the two specimens that currently shared the MNHNCL 1646 voucher code, however, such action is under the sole authority of the MNHNCL collection manager and beyond the scope of our study. The tail is currently lacking in both specimens; thus, total length and tail length cannot be compared with the data provided by Philippi (1860). Other measures are (MNHNCL 1646, larger and smaller specimen respectively): head length= 1.6 and 1.2 cm, foreleg length= 2.2 and 1.6 cm, hind leg length= 3.3 and 2.4 cm, axilla-angle distance (foreleg-hind leg distance?)= 2.6 and 1.9 cm. We have no data for FMNH 9969. This strongly suggests that Philippi (1860) took the measures from the smaller MNHNCL 1646 specimen. The squamation described by Philippi (1860) is useless to differentiate between the type specimens placed in the MNHNCL because both shared the features provided in the description (keeled and ovate shaped dorsal scales). However, only the larger specimen MNHNCL 1646 (Fig. 5) displays the deep black lateral stripes described by Philippi (1860), a character that was used by him to name the species (*melanopleurus* means black side in Greek). All this evidence suggests that Philippi based his description of *P. melanopleurus* on data from at least two specimens. Since the larger MNHNCL 1646 specimen features the black lateral stripe running from the shoulder to the middle of the trunk, we designate it as the lectotype. MNHNCL 1646 specimens have the following features (lectotype and paralectotype, respectively): midbody scales 56, 42; 7, 6 supralabial scales with the fourth turned upward; nasal and rostral scales not in contact in the lectotype and in contact in the paralectotype. The lectotype has four scales on the frontal area, 2 anterior and 2 posterior, whereas it is a single scale in the paralectotype (MNHNCL 1646) and we have no data for the FMNH 9969 specimen. The MNHNCL 1646 paralectotype has a short dark brown spot over the shoulder until the axilla. Whitish belly in both specimens, without additional discernible color features. Both specimens

lack almost all the tail, the head of the lectotype is slightly crushed (but cephalic scalation is discernible). In regards to the FMNH 9969 specimen: SVL= 44.8 mm (Ortiz and Núñez, 1986); tail is complete; no lateral dark stripe is discernible, and color pattern is severely deteriorated.

We reviewed specimens of almost all *Liolaemus* (*sensu stricto*) that occur in the Atacama Desert (except *L. puna*) and agree with Pincheira-Donoso and Núñez (2005) in that it is unlikely that *L. melanopleurus* could be assignable to *L. platei* or any of the species of the *L. platei* group, because in our review of 71 specimens of this group —*L. nigrocoeruleus* Marambio-Alfaro and Troncoso-Palacios, 2014, *L. platei*, *L. velosoi* and *L. hellmichi* Donoso-Barros, 1975— we found a maximum SVL of 61.2 mm; whereas the lectotype of *L. melanopleurus* has SVL= 70.6 mm. Moreover, we did not found a specimens of the *L. platei* group with four scales on the frontal area (2 anterior and 2 posterior) as occurs in the lectotype of *L. melanopleurus*. On the other hand, *L. paulinae* Donoso-Barros, 1961, and *L. puna* Lobo and Espinoza, 2004, appear to be unlikely candidates because *L. paulinae* has maximum SVL= 54.6 mm (Pincheira-Donoso and Núñez, 2005) and *L. puna* has maximum SVL= 55.6 mm (Lobo and Espinoza, 2004). Furthermore, *L. nitidus* can be discarded as conspecific with *L. melanopleurus* because it has 28–38 midbody scales, whereas *L. melanopleurus* has 42–56.

If Philippi collected *L. melanopleurus* in the Atacama Desert as was assumed by Quijada (1916), then the most probably candidates to be conspecific with it due to its size and midbody scale counts are *L. atacamensis* Müller and Hellmich, 1933 (max. SVL= 67.2 mm, midbody scales= 47–54), *L. constanzae* Donoso-Barros, 1961, (max. SVL= 75.3 mm, midbody scales= 54–64), *L. isabelae* (max. SVL= 82.8 mm, midbody scales= 54–60), *L. nigromaculatus* (max. SVL= 83.0 mm, midbody scales= 49–62) and *L. zapallarensis* (max. SVL= 85.3 mm, midbody scales= 48–54); all of which have a dark lateral stripe on males with additional color features that could be assumed to be absent in *L. melanopleurus* type specimens due the deteriorated conservation status of these, but *L. zapallarensis* can be discarded because the dorsal scales of it have keels and mucrons markedly more developed than the dorsal scales of *L. melanopleurus*.

While it has been long assumed that *L. melanopleurus* and all of Philippi's other species were



Figure 5. Type specimens of *Liolaemus melanopleurus*. A), B), C) and D) MNHNCL 1646 lectotype. E) MNHNCL 1646 paralectotype. F) FMNH 9969 paralectotype (Photograph by Kathleen Kelly).

collected during his Atacama journey, here we clarify that at least some of his specimens were collected in Central Chile (see *P. modestus* section). Therefore, it cannot be discarded that his *L. melanopleurus* specimens may have been collected outside of the Atacama Desert in one of the various localities that Philippi visited in the Valparaíso, Santiago, Los Ríos, and Los Lagos regions of Chile (Barros-Arana, 1904). If this is the case, it would be almost impossible to determine the taxonomic identity of *L. melanopleurus*, due to the precarious state of conservation of the type specimens, which can explain why more than 100 years later, no author has been able to

identify “*P. melanopleurus*” despite one synonymy proposed as questionable (Boulenger, 1885) and several insinuated synonymies (Ortiz and Núñez, 1986; Ortiz, 1994; Núñez *et al.*, 2000; Pincheira-Donoso and Núñez, 2005, 2007; Troncoso-Palacios, 2014). Even more problematic, the lectotype of *L. melanopleurus* has four scales on the frontal area, 2 anterior and 2 posterior, which is a very uncommon feature in *Liolaemus* (see Pincheira-Donoso and Núñez, 2005), not found in any of the specimens that we reviewed (see Appendix I) except the *L. melanopleurus* lectotype itself. This suggests that the lectotype could be an aberrant specimen, as has been

pointed out for other type specimens of currently unidentified *Liolaemus* (Borczyk and Skawinski, 2019). We conclude that it is not currently possible to determine to which population of *Liolaemus* lizards the specimens described as *L. melanopleurus* belong.

In regards to the nomenclature, without doubt *L. melanopleurus* is an available name because it has a description and the types stand. Besides, a *nomen dubium* is an available name whose application is unknown or doubtful, because the type is not identified (ICZN, 1999, Art. 8) or because taxonomic identity of a species name cannot be determined from its existing name-bearing type (ICZN, 1999, Art. 75.5). In the case of *L. melanopleurus*, although type specimens do not allow the taxonomic identification of it as junior or senior synonym of one of the currently known Chilean *Liolaemus* species and no new specimens have been found, the possibility of *L. melanopleurus* as extinct species or aberrant specimens cannot be discarded.

Proctotretus pallidus (Philippi 1860, p. 166, tab. VI, Fig. 3; reproduced here in Fig. 2)

Philippi (1860) described and illustrated *P. pallidus*, with the stated type locality of "... bei Paposo", Antofagasta region, Chile, stating that this species is abundant but without listed type specimens. It is described as a lizard with a lateral neck fold covered by granular scales, with ovate and slightly keeled dorsal scales; color whitish with mottling of small black spots. Measures are provided in inches (zoll) and lines (linien), which converted to centimeters are: total length= 13.4 cm, head length= 1.5 cm, foreleg length= 2.5 cm, hind leg length= 3.2 cm, tail length= 7.6 cm.

Boulenger (1885, p. 147) considered *Proctotretus pallidus* a junior synonym of *L. nigromaculatus*. The status of the *P. pallidus* syntypes has been disputed. Tiedemann and Häupl (1980) listed two syntypes of *P. pallidus* (NMW 18914:1,2) with the locality of Huasco, Chile, and which were donated by Franz Steindachner in 1874. We remark that this date is congruent with the 1916 catalogue of the lizards placed in the Chilean National Museum of Natural History (Quijada, 1916) in which *P. pallidus* is not mentioned. Tiedemann and Häupl (1980) cite Peters and Donoso-Barros (1970) as reference for the current status of *P. pallidus*, viz., as synonym of *L. nigromaculatus*. Ortiz and Núñez (1986) rejected the type status of NMW 18914: 1,2 because the given locality for these specimens (Huasco) does not

match Philippi's (1860) locality information (Paposo). Ortiz and Núñez (1986) further pointed out that NMW 18914: 1,2 are juveniles of *L. nigromaculatus*. They also proposed that the drawing of *P. pallidus* in Philippi (1860) resembles *Liolaemus platei* Werner, 1898, but stated that more evidence is needed. However, Ortiz and Núñez (1986) finally considered *P. pallidus* a junior synonym of another Philippi species, *L. melanopleurus*. Recently, Marambio-Alfaro and Troncoso-Palacios (2014) agreed with Ortiz and Núñez (l.c.) that *P. pallidus* could be related to *L. platei*, because as of 2014, the only *Liolaemus* species recorded in Paposo was *L. platei* (Ortiz, 1973); however, given that several species related to *L. platei* have been described with type localities geographically closer to Paposo than the type locality of *L. platei* (Donoso-Barros, 1974; Ortiz, 1987; Núñez *et al.*, 2001; Marambio-Alfaro and Troncoso-Palacios, 2014), it seems to be unlikely that the Ortiz's (1973) *Liolaemus* from Paposo actually belongs to *L. platei*, being more likely that it belongs to another species of the *L. platei* group. Moreover, Ruiz de Gamboa and Ferrú (2015) subsequently recorded *L. nigromaculatus* from Paposo, so at present two *Liolaemus* are known from this locality: *L. nigromaculatus* and one *Liolaemus* sp. of the *L. platei* group.

Photographs of the NMW specimens allow us to conclude that the NMW 18914 series consists of two species: NMW 18914:1 is a member of the *L. platei* group, whereas NMW 18914:2 is assignable to *L. nigromaculatus*, which matches with both species currently known from Paposo. In fact, NMW 18914:2 has slightly keeled dorsal scales without mucron, and the nasal scale is separated from the rostral scale as in *L. nigromaculatus* (Troncoso-Palacios and Garín, 2013). In contrast, NMW 18914:1 shows strongly keeled dorsal scales with mucron and, although scales of the snout are a bit damaged, the rostral and the nasal scales appear to be in contact as occurs in the species of the *L. platei* group (Marambio-Alfaro and Troncoso-Palacios, 2014).

In regards to the qualitative characters mentioned by Philippi (1860:166), NMW 18914:1 does not match those provided for *P. pallidus* because it has black dorsal patches (versus mottling of black spots in *P. pallidus*) and features a black lateral stripe not mentioned by Philippi. Moreover, it has strongly keeled dorsal scales (slightly keeled in *P. pallidus*) and an inconspicuous lateral neck fold. However, this specimen clearly resembles the drawing of *P. pallidus* provided by Philippi (1860), since both

shared a dark lateral stripe, antehumeral spot and very similar dark head transversal stripes (Fig. 6).

However, specimen NMW 18914:2 matches the qualitative description of *P. pallidus* in that it also has small black spots on dorsum, ovate and slightly keeled dorsal scales, and a lateral neck fold covered by granular scales. Nevertheless, it does not resemble the drawing of *P. pallidus* provided by Philippi (1860).

In regards to the measurements, NMW 18914:1 is very close to the data provided by Philippi (1860) for *P. pallidus*: total length= 12.9 cm, head length= 1.4 cm and tail length= 7.8 cm. However, NMW 18914:2 has very different total length (8.5 cm), head length (0.9 cm) and tail length (3.5 cm).

We conclude that *P. pallidus* is based on both NMW 18914 specimens and that the locality information was altered in the NMW collections at some time following Boulenger's (1885) synonymy with *L. nigromaculatus* and following the restriction of the type locality of *L. nigromaculatus* to Huasco by Müller and Hellmich (1933a). However, given that Philippi never went to Huasco (Ortiz and Núñez 1986), we propose to correct the collection locality of the NMW 18914 specimens to "Paposo, Antofagasta Region, Chile", following Philippi's (1860:167) statement that this species was "common at Paposo". Such alterations of collection data are not unusual, given the old dates involved, and we note that the

collection data of *Helocephalus nigriceps*, another Philippi's species were similarly confused following its publication date (see below).

As occurs with *P. melanopleurus*, Philippi (1860) based his description of *P. pallidus* on more than one specimen, but in this case, each specimen is of a different species. The evidence suggests that he based the drawing and measurements on specimen NMW 18914:1, but the qualitative characters of dorsal scales, dorsal color, and lateral neck folds are based on NMW 18914:2. We designate the NMW 18914:2 as lectotype of *Procotretus pallidus*, because this specimen matches the qualitative characters of the original description and it also the only specimen to present the pale dorsal color used by Philippi to name the species (*pallidus* means pale). Thus, specimen NMW 18914:1, while recognized here as a paralectotype, cannot be a name-bearing type of *L. pallidus* because it belongs to unidentified species of the *L. platei* group. Accordingly, *P. pallidus* becomes a subjective junior synonym of *L. nigromaculatus*, leaving the current taxonomy of this species and all valid names for the species of the *L. platei* group unaffected.

Microlophus lessoni Duméril and Bibron, 1837 (Philippi 1860, p. 167)

Philippi's account includes lizards that he assigned to *M. lessoni* and notes them as being "common on

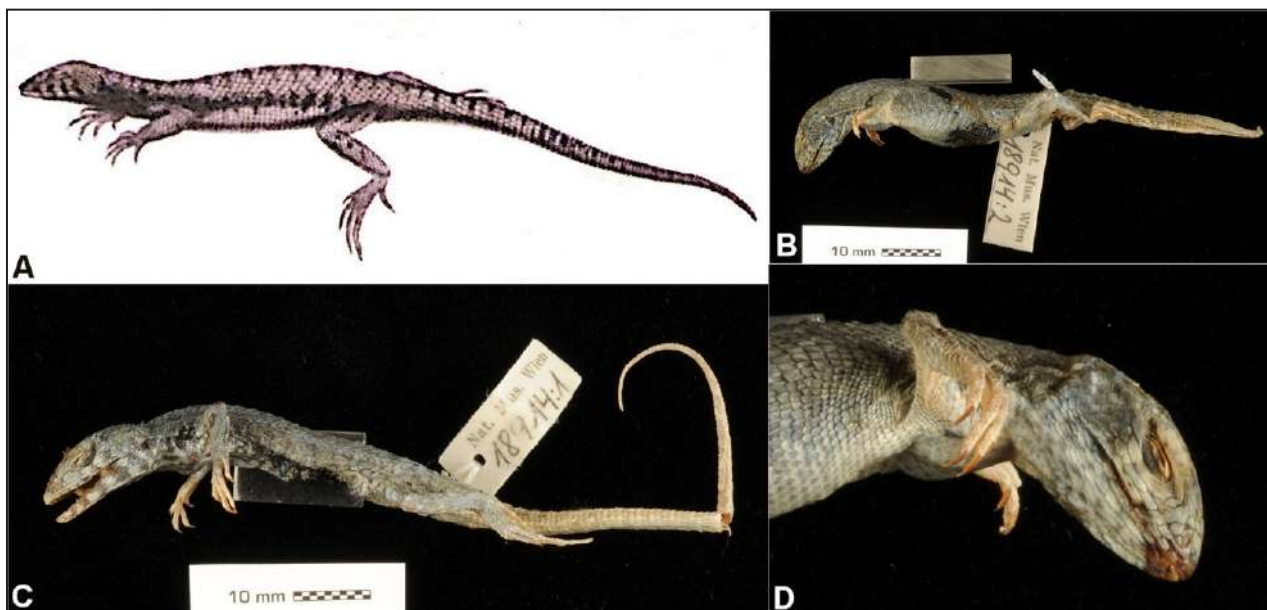


Figure 6. Drawing of *P. pallidus* by Philippi (1860) and photographs of the type specimens. A) Drawing of *P. pallidus*. B) Specimen NMW 18914:2, here designated as lectotype of *P. pallidus* and probably used by Philippi (1860) for character description. It is assignable to *L. nigromaculatus*. C) Specimen NMW 18914:1 of *Liolaemus* sp. of the *L. platei* group, probably used by Philippi (1860) for the drawing of *P. pallidus*. D) Head of NMW 18914:2. All photographs by Alice Schumacher and Georg Gassner.

cliffs along the whole coast of the desert”, without further details or specific localities. According to Mertens (1956), *M. lessoni* is a junior synonym of *M. peruvianus* (Lesson, 1830), but the latter species does not occur in Chile (Ortiz, 1980; Ruiz de Gamboa, 2016; Núñez *et al.*, 2018). However, two other *Microlophus* species occur in the localities visited by Philippi, viz *M. maminensis* (Donoso-Barros, 1966) and *M. marianus* (Donoso-Barros, 1966) (Núñez and Jaksic, 1992; Troncoso-Palacios, 2018). Using the key to the Chilean species of the genus *Microlophus* provided by Ortiz (1980), we determined three specimens of *Microlophus* collected by Philippi and sent to the Zoologisches Museum Berlin to best fit *M. marianus*. The specimens were collected in the Atacama Desert but the exact locality is unknown. All specimens have dark throats. While ZMB 5353 A and C are darkened and the dorsal color pattern is not discernible, ZMB 5353 B (Fig. 7) has dark paravertebral coloration. These features match *M. marianus* according to Ortiz (1980). Moreover, *M. marianus* inhabits in the coast of the Atacama desert, whereas *M. maminensis* occurs in the inner Desert (Ortiz, 1980). Thus, we conclude that Philippi (1860:167) refers to *M. marianus*.

Helocephalus nigriceps (Philippi 1860, p. 167, tab. VI, Fig. 1; reproduced here in Fig. 2)
Philippi (1860:167) described this lizard from Pajonal, Atacama Desert, Chile. Koslowksy (1898) assigned this taxon to *Liolaemus signifer* var. *nigriceps* and Donoso-Barros (1966: 335) considered it member of *Ctenoblepharis*. Laurent (1984) definitively returned it to *Liolaemus*; Lobo *et al.* (2010) placed it in *L. montanus* group of the subgenus *Eulaemus*. According to Ortiz and Núñez (1986), one of the syntypes is lost and the other remains in the Zoologische Staatssammlung München, which they designated as the lectotype (ZSM 38/1930). The lectotype (Fig. 8) and the illustration provided by Philippi (1860) (Fig. 2) have allowed the unquestionable identification of this species as the *Liolaemus* lizard that occurs in the high Andean areas of the southeastern portion of the Antofagasta Region of Chile and adjacent areas of the Jujuy and Salta Provinces of Argentina (Donoso-Barros, 1966; Avila *et al.*, 2013) with a black head, gray dorsal ground color, and transverse orange dorsal bars bordered by dark scales (Donoso-Barros, 1966; Pincheira-Donoso and Núñez, 2005). Franzen and Glaw (2007, p. 224) stated 1860 as date of collection of the lectotype, but Philippi went to Pajonal in

February 1855, then the lectotype was collected this year and most likely, the year was confused with the year of publication of Philippi's (1860) book.

Aporomera ornata Duméril and Bibron, 1839 (Philippi 1860, p. 168)

Philippi (1860) attributed species authority to Duméril and Bibron and listed as junior synonyms *Ameiva oculata* D'Orbigny and Bibron, 1847, and *Aporomera ocellata* Guichenot, 1848 (in Gay, 1848). We note that all these names are currently considered junior synonyms of *Callopiastes maculatus* Gravenhorst, 1838. The characterization provided by Philippi (1860) is not detailed, lacking for example a description of the color pattern. However, he provided a total length of 15 inches (38.1 cm), a comparatively large size for a Chilean lizard. He stated that the specimens that he found showed some differences in regards to the Gay (1854) plate, but he thinks that these differences are due to the fact that the painter did not notice certain details. Indeed, Gay's (1854) plate of *A. ocellata* clearly corresponds to the lizard currently known as *C. maculatus*, characterized by Donoso-Barros (1966: 378) as a large lizard with rounded dorsal black spots bordered by white and brown dorsal color. Moreover, we reviewed three specimens labeled as *Aporomera ornata* and collected by Philippi in “Santiago de Chile” (ZMB 5354 [two specimens] and 5355) which can be unambiguously assigned to *C. maculatus* (Fig. 9), confirming the species identification.

Final remarks

Correct taxonomy is a key aspect of biodiversity and conservation studies (Mora *et al.*, 2011; Thomson *et al.*, 2018). However, sometimes taxonomists have to deal with names whose application is uncertain due to the lack of or the deterioration of type specimens, the lack of or imprecision of type localities, and/or ambiguous or inaccurate descriptions (e.g. Borczyk and Skawinski, 2019). The status of several species described by Philippi (1860) has been controversial (Ortiz and Núñez, 1986; Pincheira-Donoso and Núñez, 2005), but based on the findings of our research we provide updates on their nomenclatural and taxonomic status (Table 1). We point out that while Philippi's (1860) lizard descriptions contain several omissions and mistakes, these kinds of issues were common in the early taxonomy of the Chilean lizards (see Langstroth, 2011; Troncoso-Palacios,



Figure 7. Specimen ZMB 5353B listed as *Microlophus lessoni* by Philippi (1860) but here designated as *M. marianus*. All photographs by Frank Tillack.



Figure 8. Lectotype ZSM 38/1930 of *Helocephalus nigriceps* (currently *Liolaemus nigriceps*). Photograph by Michael Franzen.



Figure 9. Specimen ZMB 5355 of *Apromera ornata* (currently *Callopistes maculatus*) collected by Philippi. Photograph by Frank Tillack.

Table 1. Nomenclatural status and taxonomic status of the lizards described by Philippi in the Zoology Section of his book. * There are two specimens with the voucher code MNHNCL 1646.

	Nomenclatural status	Taxonomic status according to this and previous research (see text)	Type specimens
<i>Helocephalus nigriceps</i>	Available name	<i>Liolaemus nigriceps</i>	Lectotype ZSM 38/1930 (extant) and paralectotype lost (unknown voucher code)
<i>Proctotretus marmoratus</i>	Available name but secondary homonym	Invalid	Lost (unknown voucher code)
<i>P. modestus</i>	Available name	Invalid, junior synonym of <i>Liolaemus bellii</i>	Lectotype ZMB 5350 and paralectotypes ZMB 70546–47 (all extant)
<i>P. melanopleurus</i>	Available name	Taxonomic application is unknown	Lectotype MNHNCL 1646* (larger specimen), paralectotype MNHNCL 1646 (smaller specimen) and paralectotype FMNH 9969 (all extant)
<i>P. pallidus</i>	Available name	Invalid, junior synonym of <i>Liolaemus nigromaculatus</i>	Lectotype NMW 18914:2 (extant). NMW 18914:1 (extant) cannot be considered a name-bearing type because it belongs to <i>Liolaemus</i> sp. of the <i>L. platei</i> group.

2018; Troncoso-Palacios *et al.*, 2019). Finally, we remark that Philippi (1860) did not provide additional taxonomic information, such as family, for any of the lizards listed, but the current families are: Family Teiidae, genus *Callopietes* (listed as *Aporomera*); Family Tropicuridae, genus *Microlophus*; and Family Liolaemidae, genus *Liolaemus* (listed as *Helocephalus* and *Proctotretus*).

Acknowledgments

To Mario Penna (Universidad de Chile) for his support. We are grateful to Frank Tillack (Museum für Naturkunde, Berlin, Germany) for sharing data, photographs of several specimens collected by Philippi, literature and for his very appreciate corrections and comments to the early version of this manuscript. Herman Núñez (Museo Nacional de Historia Natural de Chile, Santiago), Jorge Artigas (Museo de Zoología de la Universidad de Concepción, Chile), Patricio Zavala (Colección Patricio Sánchez de la Pontificia Universidad Católica de Chile, Santiago) and Franklin Troncoso (Museo de Historia Natural de Concepción) for access to specimens under their care. Kathleen Kelly (Field Museum of Natural History, Chicago, USA), Michael Franzen (Zoologische Staatssammlung München, Germany), Alice Schumacher and Georg Gassner (Naturhistorisches Museum Wien, Austria) kindly send us photographs of type specimens collected by R.A. Philippi. One anonymous reviewer, Roberto Langstroth and the editor Sebastian Quinteros for all their corrections and comments.

Literature cited

- Abdala, C.S. & Quinteros, A.S. 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.
- Avila, L.J.; Martínez, L.E. & Morando, M. 2013. Checklist of lizards and amphisbaenians of Argentina: an update. *Zootaxa* 3616: 201–238.
- Barros-Arana, D. 1904. Don Rodolfo Amando Philippi su vida i sus obras. Imprenta Cervantes, Santiago.
- Benavides, E., Baum, R., McClellan, D. & Jack, W. 2007. Molecular phylogenetics of the lizard genus *Microlophus* (Squamata: Tropicuridae): aligning and retrieving indel signal from nuclear introns. *Systematic Biology* 56: 776–797.
- Bell, T. 1843. Reptiles. In: Darwin, C. (Ed.). *The Zoology of the Voyage of the H.M.S. Beagle, Under the Command of Captain Fitzroy, R.N., During the Years 1832 to 1836. Volume 5: 1–51.* London: Smith, Elder and Co.
- Borczyk, B. & Skawinski, T. 2019. Tracking down the lizards from Gravenhorst's collection at the University of Wrocław: type specimens of *Callopietes maculatus* Gravenhorst, 1838 and three *Liolaemus* species rediscovered. *PeerJ* 7:e6525.
- Boulenger, G.A. 1885. Catalogue of the lizards in the British Museum (Natural History). Volume 2. Iguanidae, Xenosauridae, Zonuridae, Anguidae, Anellidae, Helodermatidae, Varanidae, Xantusiidae, Teiidae. Printed by Order of the Trustees, London.
- Donoso-Barros, R. 1961. The reptiles of the Lund University Chile Expedition. *Copeia* 1961: 486–487.
- Donoso-Barros, R. 1966. Reptiles de Chile. Ediciones de la Universidad de Chile, Santiago.
- Donoso-Barros, R. 1974. Nuevos reptiles y anfibios de Chile. *Boletín de la Sociedad de Biología de Concepción* 48: 217–229.
- Etheridge, R.E. 1995. Redescription of *Ctenoblepharys adspersa* Tschudi, 1845, and the taxonomy of Liolaeminae (Reptilia: Squamata: Tropicuridae). *American Museum Novitates* 3142: 1–34.
- Franzen, M. & Glaw, F. 2007. Type catalogue of reptiles in the Zoologische Staatssammlung München. *Spixiana* 30: 201–274.

- Frost, D.R. 1992. Phylogenetic analysis and taxonomy of the *Tropidurus* group of lizards (Iguanidae: Tropiduridae). *American Museum Novitates* 3033: 1–68.
- Gay, C. 1854. Atlas de la historia física y política de Chile. Tomo II. En la Imprenta de E. Thunot, Paris.
- Gemel, R.; Gassner, G. & Schweiger, S. 2019. Katalog der Typen der Herpetologischen Sammlung des Naturhistorischen Museums Wien –2018. *Annalen des Naturhistorischen Museums in Wien*, B, 121: 33–248.
- Gravenhorst, J.L.C. 1838. Beiträge zur genauern Kenntniss einiger Eidechsen Gattungen. *Nova Acta Physico-medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum, Halle* 18: 712–784.
- Gray, J.E. 1845. Catalogue of the Specimens of lizards in the Collection of the British Museum. London: Trustees of the British Museum.
- Guichenot, A. 1848. Reptilianos. In: Gay C. (Ed.). Historia Física y Política de Chile. Volume 2 (Zoología): 1–136. Paris: Maulde and Renou.
- Harvey, M.B., Ugueto, G.N. & Gutberlet, R.L. 2012. Review of Teiid morphology with a revised taxonomy and phylogeny of the Teiidae (Lepidosauria: Squamata). *Zootaxa* 3459: 1–156.
- Hellmich, W. 1934. Die Eidechsen Chiles insbesondere die Gattung *Liolaemus*. Nach den sammlungen Goetsch-Hellmich. Abhandlungen. Bayerischen Akademie der Wissenschaften. *Mathematisch-Naturwissenschaftliche Klasse* 24: 1–140.
- ICZN, 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London. Available in: <http://www.nhm.ac.uk/hosted-sites/iczn/code>.
- Kabat, A.R. & Coan, E.V. 2017. The life and work of Rudolph Amandus Philippi (1808–1904). *Malacologia* 60: 1–30.
- Koslowsky, J. 1898. Enumeración sistemática y distribución de los reptiles argentinos. *Revista del Museo de La Plata* 8: 161–200.
- Langstroth, R.P. 2011. On the species identities of a complex *Liolaemus* fauna from the Altiplano and Atacama Desert: insights on *Liolaemus stolzmanni*, *L. reichei*, *L. jamesi pachecoi*, and *L. poconchilensis* (Squamata: Liolaemidae). *Zootaxa* 2809: 20–32.
- Laurent, R.F. 1984. On some iguanid genera related to or previously confused with *Liolaemus* Wiegmann. *Journal of Herpetology* 18: 357–373.
- Lesson, R.P. 1830. Observations générales sur les reptiles recueillis dan la voyage de la corvette La Coquille. In Duperrey, L.I. (Ed.). Voyage autour du Monde, execute par Ordre du Roi, sur la Corvette de sa Majesté, La Coquille, pendant les années 1822, 1823, 1824, 1825. Volume 2 (Zoologie) and Atlas. Tome 2, Partie 1, Chapt. 9, Livraison 17: 1–66. Paris: Arthur Bertrand.
- Lobo, F. & Espinosa, R.E. 2004. Two new *Liolaemus* from the Puna region of Argentina and Chile: Further resolution of purported reproductive bimodality in *Liolaemus alticolor* (Iguania: Liolaemidae). *Copeia* 2004: 850–867.
- Lobo, F., Espinoza, R.E. & Quinteros, A.S. 2010. A critical review and systematic discussion of recent classification proposals for liolaemid lizards. *Zootaxa* 2549: 1–30.
- Marambio-Alfaro, Y. & Troncoso-Palacios, J. 2014. Una nueva especie de *Liolaemus* del grupo de *L. nigromaculatus* (Iguania: Liolaemidae) para la Región de Atacama, Chile. *Basic and Applied Herpetology* 28: 65–77.
- Mertens, R. 1956. Zur Kenntnis der Iguaniden-Gattung *Tropidurus* in Peru. *Senckenbergiana Biologica* 37: 101–136.
- Mora, C.; Tittensor, D.P.; Adl, S.; Simpson, A.G.B. & Worm, B. 2011. How many species are there on Earth and in the ocean? *PLoS Biology* 9: e1001127.
- Müller, L. & Hellmich, W. 1932. Beiträge zur Kenntnis der Herpetofauna Chiles. III. *Liolaemus altissimus altissimus*, *Liolaemus altissimus araucaniensis*. *Zoologischer Anzeiger* 98: 197–208.
- Müller, L. & Hellmich, W. 1933a. Beiträge zur Kenntnis der Herpetofauna Chiles. VI. Ueber einige *Liolaemus* Arten des Berliner Naturkundlichen Museums. *Zoologischer Anzeiger*. *Zoologischer Anzeiger* 101: 121–134.
- Müller, L. & Hellmich, W. 1933b. Beiträge zur Kenntnis der Herpetofauna Chiles. VII. Der Rassenkreis des *Liolaemus nigromaculatus*. *Zoologischer Anzeiger* 103: 128–142.
- Navarro, J. & Nuñez, H. 1993. *Liolaemus patriciaturrae* y *Liolaemus isabelae*, dos nuevas especies de lagartijas para el norte de Chile. Aspectos biogeográficos y citotaxonómicos (Squamata, Tropiduridae). *Boletín del Museo Nacional de Historia Natural de Chile* 44: 99–113.
- Núñez, H. 2004. Cambios taxonómicos para la herpetofauna de Argentina, Bolivia y Chile. *Noticiario Mensual del Museo Nacional de Historia Natural de Chile* 353: 28–34.
- Núñez, H. & Gálvez, O. 2015. Catálogo de la Colección Herpetológica del Museo Nacional de Historia Natural y nomenclátor basado en la colección. *Publicación Ocasional del Museo Nacional de Historia Natural de Chile* 64: 1–203.
- Núñez, H. & Jaksic, F. 1992. Lista comentada de los reptiles terrestres de Chile continental. *Boletín del Museo Nacional de Historia Natural de Chile* 43: 63–91.
- Núñez, H.; Esquerré, D.; Garín, C. & Pincheira-Donoso, D. 2018. Diversidad de especies. Reptiles. In: Biodiversidad de Chile, Patrimonios y Desafíos. Tomo I. 3th Edition. Figueroa, A.; Rovira, J.; Flores, S.; Tala, C.; Avilés, R.; Orellana, J.L.; Ferreyra, J.; Díaz, P. & Armendaris, A. (Eds.). Ministerio del Medio Ambiente, Santiago, Chile 430 p.
- Nuñez, H.; Navarro, J. & Loyola, J. 1991. *Liolaemus maldonadae* y *Liolaemus cristiani*, dos especies nuevas de lagartijas para Chile (Reptilia, Squamata). *Boletín del Museo Nacional de Historia Natural de Chile* 42: 79–88.
- Núñez, H.; Navarro, J. & Veloso, A. 2000. *Liolaemus foxi*, una nueva especie de lagarto para el Norte de Chile (Squamata: Reptilia: Sauria). *Boletín del Museo Nacional de Historia Natural de Chile* 49: 117–130.
- Núñez, H.; Schulte, J.A. & Garín, C. 2001. *Liolaemus josephorum*, nueva especie de lagartija para el Norte de Chile. *Boletín del Museo Nacional de Historia Natural de Chile* 50: 91–107.
- Ortiz, J. C. 1973. Nota distribucional sobre *Liolaemus platei* (Squamata: Iguanidae). *Anales del Museo de Historia Natural de Valparaíso* 6: 75–80.
- Ortiz, J.C. 1980. Revisión taxonómica del género *Tropidurus* en Chile. *Reunión Iberoamericana de Zoología de Vertebrados* 1: 355–377.
- Ortiz, J.C. 1981. Estudios multivariado de las especies de *Liolaemus* del grupo *nigromaculatus* (Squamata-Iguanidae). *Anales del Museo de Historia Natural de Valparaíso* 14: 247–265.
- Ortiz, J.C. 1987. Une nouvelle espece de *Liolaemus* (Sauria, Iguanidae) du Chili. Bulletin du Muséum d'histoire Naturelle. *Section A Zoologie Biologie et Ecologie Animales* 9: 265–270.
- Ortiz, J.C. 1994. Una nueva especie de lagarto altoandino del

Troncoso-Palacios & Marambio-Alfaro — Lizards listed by Philippi (1860)

- género *Liolaemus* (Sauria, Tropicuridae). *Boletín de la Sociedad de Biología de Concepción* 65: 191–195.
- Ortiz, J.C. & Núñez, H. 1986. Catálogo crítico de los tipos de reptiles conservados en el museo Nacional de Historia Natural Santiago, Chile. *Publicación Ocasional del Museo Nacional de Historia Natural de Chile* 43: 1–23.
- Peters, J.A. & Donoso-Barros, R. 1970. Catalogue of the Neotropical Squamata: Part II. Lizards and amphisbaenians. *Bulletin of the United States National Museum* 297: 1–293.
- Philippi, R.A. 1860. Reise durch die Wueste Atacama auf Befehl der chilenischen Regierung im Sommer 1853–54. Unternommen und beschrieben von Rudolph Amandus Philippi. Eduard Anton, Halle.
- Pincheira-Donoso, D. & Núñez, H. 2005. Las especies chilenas del género *Liolaemus* (Iguanidae Tropicuridae, Liolaeminae). Taxonomía, sistemática y evolución. *Publicación Ocasional del Museo Nacional de Historia Natural de Chile* 59: 7–486.
- Pincheira-Donoso, D. & Núñez, H. 2007. Conspecificity of *Liolaemus isabellae* Navarro and Núñez, 1993 and *Liolaemus nigroventrolateralis* Ortiz 1994 (Iguania: Tropicuridae: Liolaeminae) from northern Chile. *Herpetological Journal* 17: 65–67.
- Pincheira-Donoso, D.; Scolaro, J.A. & Lura, P. 2008. A monographic catalogue on the systematics and phylogeny of the South American iguanian lizard family Liolaemidae (Squamata, Iguania). *Zootaxa* 1800: 1–85.
- Quijada, B. 1916. Catálogo sistemático de los reptiles chilenos i extranjeros conservados en el Museo Nacional de Historia Natural. *Boletín del Museo Nacional de Historia Natural de Chile* 9: 22–47.
- Ruiz de Gamboa, M. 2016. Lista actualizada de los reptiles de Chile. *Boletín Chileno de Herpetología* 3: 7–12.
- Ruiz de Gamboa, M. & Ferrú, M. 2015. *Liolaemus nigromaculatus* (Many-spotted Tree Iguana). *Herpetological Review* 46: 217.
- Szederjesi, T.; Latif, R.; Márton, O. & Csuzdi, C. 2018. Resurrection of the earthworm species *Dendrobaena fedtschenkoi* (Michaelsen, 1900), a former synonym of *Dendrobaena byblica* (Rosa, 1893) (Clitellata: Megadrili). *Zootaxa* 4496: 190–196. doi: 10.11646/zootaxa.4496.1.14.
- Thomson, S.A.; Pyle, R.L.; Ahyong, S.T.; Alonso-Zarazaga, M.; Ammirati, J.; et al. 2018. Taxonomy based on science is necessary for global conservation. *PLoS Biology* 16: e2005075.
- Tiedemann, F. & Häupl, M. 1980. Typenkatalog der herpetologischen Sammlung Teil II: Reptilia. *Kataloge der wissenschaftlichen Sammlung des Naturhistorischen Museums in Wien*. 4 (Vertebrata 2): 5–70.
- Tschudi, J.J. 1845. Reptilium conspectus quae in Republica Peruana reperiuntur et pleraquae observata vel collecta sunt in itinere a Dr. J. J. de Tschudi. *Archiv für Naturgeschichte* 11: 150–170.
- Troncoso-Palacios, J. 2013. Revisión del estatus taxonómico de *Liolaemus donoso* Ortiz, 1975 (Iguania: Liolaemidae). *Boletín del Museo Nacional de Historia Natural de Chile* 62: 119–127.
- Troncoso-Palacios, J. 2014. Nueva lista actualizada de los reptiles terrestres de la Región de Atacama, Chile. *Boletín Chileno de Herpetología* 1: 1–4
- Troncoso-Palacios, J. 2018. Propuesta de restricción de la localidad tipo de *Microlophus tarapacensis* (Donoso-Barros, 1966) (Squamata: Tropicuridae) en base a evidencias históricas. *Cuadernos de Herpetología* 32: 123–127.
- Troncoso-Palacios, J. & Garín, C.F. 2013. On the identity of *Liolaemus nigromaculatus* Wiegmann, 1834 (Iguania, Liolaemidae) and correction of its type locality. *ZooKeys* 294: 37–56.
- Troncoso-Palacios, J.; Elorza, A.A.; Púas, G.I. & Alfaro-Pardo, E. 2016. A new species of *Liolaemus* related to *L. nigroviridis* from the Andean highlands of Central Chile (Iguania, Liolaemidae). *ZooKeys* 555: 91–114.
- Troncoso-Palacios, J.; Schulte II, J.A.; 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.
- Troncoso-Palacios, J.; Ruiz de Gamboa, M. & Campbell, P.D. 2019. *Liolaemus jamesi* (Boulenger, 1891): restriction of the type locality and holotype characterization (Squamata: Liolaemidae). *Zootaxa* 4612: 442–446.
- Valladares-Faúndez, P. 2011. Análisis, síntesis y evaluación de la literatura de lagartos de la Región de Atacama, Chile. *Gayana* 75: 81–98.
- Wiegmann, A.F.A. 1834. In: Meyen, F.J.F. (Ed.). Beiträge zur Zoologie gesammelt auf einer Reise um die Erde. Siebente Abhandlung. Amphibien. *Nova Acta Physico-Medica Academia Caesarea Leopoldino-Carolina, Halle* 17: 185–268.
- Young-Downey, A. & Moreno, J. 1992. A new species of tropidurine lizard (Squamata: Tropicuridae) from Los Andes of northern Chile. *Gayana (Zoología)* 55: 391–396.

Appendix I.

Specimens examined. Abbreviation used: FMNH (Field Museum of Natural History, Chicago, USA), MNHNCL (Museo Nacional de Historia Natural de Chile, Santiago), MRC (Museo Regional de Historia Natural de Concepción, Concepción), MZUC (Museo de Zoología de la Universidad de Concepción, Concepción), NMW (Naturhistorisches Museum Wien, Austria), SSUC (Colección de la Pontificia Universidad Católica de Chile, Santiago), ZMB (Museum für Naturkunde, Berlin, Germany; formerly Zoologisches Museum Berlin), ZSM (Zoologische Staatssammlung München, Germany)

Type specimens collected by Philippi: *Liolaemus melanopleurus*. MNHNCL 1646 (2 specimens). Chile. FMNH 9969. Chile. *Liolaemus modestus*. ZMB 5350, 70546–47. Santiago de Chile (highlands), Metropolitan Region, Chile. *Liolaemus nigromaculatus* (*L. bisignatus* holotype). MNHN-CL 1477. Atacama (restricted to Caldera, Atacama Region), Chile. *Liolaemus pallidus*. NMW 18914:1,2. Paposo (previously listed from Huasco in error), Antofagasta Region, Chile. *L. nigriceps*. ZSM 38/1930. Pajonal, Antofagasta Region, Chile.

Additional material (no types) collected by Philippi: *Callopiastes maculatus*. ZMB 5354 (two specimens), 5355. Santiago de Chile, Metropolitan Region, Chile. *Microlophus marianus*. ZMB 5353 (A, B and C). Atacama Desert, Chile.

Specimens not collected by Philippi but from localities visited by Philippi or from the surroundings: *Liolaemus atacamensis*. MZUC 30193, 30196. Punta Teatinos, Coquimbo Region, Chile. J.C. Ortiz coll. September 14, 1982. SSUC Re 454, 464–68. Lomas de Buitre, Freirina, Atacama Region, Chile. J. Troncoso-Palacios, Y. Marambio and D. Hiriart colls. May, 2012. SSUC Re 455–61. Playa Humedal Pachingo, Coquimbo Region, Chile. C. Garín coll. December 10, 2009. SSUC Re 469. 20 km N from Vallenar, Atacama Region, Chile. F. Ferri coll. 2010. SSUC Re 470–71. El Trapiche, Coquimbo Region, Chile. J. Troncoso-Palacios, Y. Marambio and D. Hiriart colls.

May, 2012. *Liolaemus bellii*. MNHNCL 1599. Sewell, O' Higgins Region, Chile. M. Elgueta coll. December 1982. SSUC 201-05. Casa de Piedra, Farellones, Metropolitan Region, Chile. F. Ferri coll. October 12, 2010. SSUC Re 206-09. El Colorado, Farellones, Metropolitan Region, Chile. F. Ferri coll. November 13, 2011. SSUC Re 398-404, 543. El Olivares, Metropolitan Region, Chile. C. Garín coll. Undated. SSUC Re 562-66. La Parva, Metropolitan Region, Chile. J. Opazo coll. December, 2003. SSUC Re 654, 656. Lagunillas, Metropolitan Region, Chile. D. Esquerré coll. February 15, 2015. *Liolaemus constanzae*. MNHNCL 1499-1500. Quebrada de Taltal, Agua Verde, Antofagasta Region, Chile. S. Zunino and M. Riveros colls. February 10, 1975. MNHNCL 1516-1520. Quebrada de Taltal, Agua Verde, Antofagasta Region, Chile. H. Núñez, J. Yáñez and Contreras colls. September 27, 1982. MZUC 29247, 29250-51. Toconao, Antofagasta Region, Chile. Unknown collector and date. MZUC 28763-65, 28767-69. Agua Verde (Quebrada de Taltal), Antofagasta Region, Chile. J.C. Ortiz, S. Zunino and M. Riveros colls. February 10, 1975. SSUC Re 338-39, 341-42, 346. Cuesta Barros Arana, Antofagasta Region, Chile. F. Ferri coll. October 22, 2011. SSUC Re 340, 343-45, 347. Cuesta Barros Arana, Antofagasta Region, Chile. F. Ferri coll. October 25, 2011. SSUC Re 348. Southern Salar de Atacama, Antofagasta Region, Chile. F. Ferri coll. October 24, 2011. SSUC RE 482. El Abra, Antofagasta Region, Chile. G. Lobos and F. Torres colls. November 23, 2003. SSUC RE 483, 485, 488. El Abra, Antofagasta Region, Chile. G. Lobos and F. Torres colls. November 21, 2003. *Liolaemus hellmichi*. MNHNCL 4126-37. Cerro Moreno, Antofagasta Region, Chile. P. Espejo coll. December 31, 2000. MZUC 25942-52. Cerro Moreno, Antofagasta Region, Chile. J.C. Ortiz coll. April 2, 2001. *Liolaemus isabellae*. SSUC Re 157, 159, 160. El Cerrito, Salar de Pedernales, Atacama Region, Chile. F. Ferri and J. Troncoso-Palacios colls. February 22, 2012. SSUC Re 158. Montandón, Salar de Pedernales, Atacama Region, Chile. F. Ferri and J. Troncoso-Palacios colls. February 22, 2012. *Liolaemus juanortizi*. MZUC 11782. Río Patón, Atacama Region, Chile. T. Cekalovic coll. December 20, 1963. MZUC 11770. Puquios, Atacama (road through Puquios?), Chile. R. Buzeta coll. December 19, 1963. SSUC Re 755-56. Paso pircas coloradas, Copiapó, Atacama Region, Chile. Unknown collector and date. *Liolaemus nigrocoeruleus*. SSUC Re 527-32, 552-54. Seven km NE from Barranquilla, unnamed hill, Atacama Region, Chile. J. Troncoso-Palacios and Y. Marambio-Alfaro colls. May, 2012. SSUC Re 533-34. Nine km NE from Barranquilla, unnamed hill, Atacama Region, Chile. J. Troncoso-Palacios and Y. Marambio-Alfaro colls. May, 2012. *Liolaemus nigromaculatus*. MNHNCL 2237-38. 20 km of Caldera, between Copiapó and Caldera, Atacama Region, Chile. H. Núñez coll. September 30, 1991. MNHNCL 2249-55. Travesía, Copiapó, Atacama Region, Chile. H. Núñez coll. September 28, 1999. MRC 051, 053. Caldera, Atacama Region, Chile. J. Moreno coll. May, 1982. MRC 162, 273, 276, 282-83. Caldera, Atacama Region, Chile. J. Moreno coll. 1983. MRC 087-94. Copiapó, Atacama Region, Chile. C. Valdovinos coll. September 15, 1984. MRC 514. Copiapó, Atacama Region, Chile. Unknown collector. November, 1996. MZUC 14820. Sector algarrobal (between Vallenar and Copiapó), Atacama Region, Chile. J. Moreno coll. August 21, 1984. SSUC Re 306-15, 474-75. Caldera, Atacama Region, Chile. F. Ferri coll. November, 2011. SSUC Re 453,

462-63. 50 km N from Vallenar, Atacama Region, Chile. J. Troncoso-Palacios coll. June 5, 2011. SSUC Re 476-77. Caldera, Atacama Region, Chile. Y. Marambio coll. May, 2012. SSUC Re 478 20 Km SE from Puerto Viejo, Atacama Region, Chile. J. Troncoso-Palacios and Y. Marambio colls. May, 2012. SSUC Re 642-43. Paposo, Antofagasta Region, Chile. M. Ferru and M. Ruiz de Gamboa colls. June, 2014. ZMB 613. Transect between Puerto Viejo and Copiapó, Atacama Region, Chile. F.J.F. Meyen coll. March, 1831. *Liolaemus nitidus*. SSUC Re 59, 69, 72-74, 78-79, 82. Altos de Cantillana, Metropolitan Region, Chile. Unknown collector and date. SSUC Re 298. Dunas de Ritoqui, Valparaíso Region, Chile. Ferri F. coll. November 13, 2010. SSUC Re 299, 300. Road to Farellones, curve 20, Metropolitan Region, Chile. Ferri F. coll. December 8, 2010. SSUC Re 301. Lo Valdés, Región Metropolitana, Chile. Ferri F. coll. January 9, 2011. SSUC Re 302-03. Road to Farellones, curve 20, Metropolitan Region, Chile. Ferri F. coll. March 15, 2012. SSUC Re 418. Altos de Cantillana, Metropolitan Region, Chile. C. Correa coll. December 14, 2011. SSUC Re 548. Parque Nacional Llanos de Challe, Atacama Region, Chile. G. Lobos. June, 2002. SSUC Re 705-06. Quebrada de la Plata, Maipú, Metropolitan Region, Chile. C. Garín coll. December 17, 2015. SSUC Re 725, 727-28. Cerro Provincia, Metropolitan Region, Chile. C. Garín coll. *Liolaemus paulinae*. SSUC Re 361. Calama, Antofagasta Region, Chile. C. Garín coll. October 27, 2010. SSUC Re 486. Mina El Abra, Antofagasta Region, Chile. G. Lobos and F. Torres colls. November 22, 2003. SSUC Re 487. Mina El Abra, Antofagasta Region, Chile. G. Lobos and F. Torres colls. November 21, 2003. SSUC Re 561. Embalse río Loa, Antofagasta Region, Chile. G. Lobos and F. Torres colls. November 22, 2003. *Liolaemus platei*. MZUC 2152-53. Combarbalá, Coquimbo Region, Chile. I. Peña coll. November, 1961. SSUC Re 321. Illapel, near Reserva Nacional Las Chinchillas, Coquimbo Region, Chile. F. Ferri coll. Undated. SSUC Re 420. Coquimbo, Coquimbo Region, Chile. J. Troncoso-Palacios and Y. Marambio colls. December 12, 2011. SSUC Re 526, 555. Coquimbo, Coquimbo Region, Chile. J. Troncoso-Palacios and Y. Marambio colls. May, 2012. *Liolaemus velosoi*. MZUC 36612-14, 36618-20, 36624. Estación Paipote, Atacama Region, Chile. J.C. Ortiz coll. February 16, 1978. MZUC 32695, 32699, 32702, 32704, 32706. Copiapó, Atacama Region, Chile. R. Moreno coll. February, 2000. MRC 054. Copiapó, Atacama Region, Chile. Unknown collector. June 16, 1982. MRC 055. Copiapó, Atacama Region, Chile. Unknown collector. April 20, 1982. MRC 061, 062, 066. Copiapó. Unknown collector. July 19, 1982. SSUC Re 322-26. Tierra Amarilla. J. Troncoso-Palacios and F. Ferri. colls. November 23, 2011. SSUC Re 330. Diego de Almagro. F. Ferri, J. Troncoso-Palacios colls. December 9, 2011. SSUC Re 327-29, 331-34, 419. Diego de Almagro. F. Ferri and J. Troncoso-Palacios colls. December 12, 2011. *Liolaemus zapallarensis*. MZUC 29118, 29122-23. Las Tacas, Coquimbo Region, Chile. J.C. Ortiz coll. October 15, 1976. MZUC 29127. Las Tacas, Lagunillas, Coquimbo Region, Chile. J.C. Ortiz and J. Simonetti colls. September 10, 1977. SSUC Re 472. Totoralillo, Coquimbo Region, Chile. J. Troncoso-Palacios and Y. Marambio colls. December 12, 2011.

