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## The rediscovery of *Oplurus bibronii* Guichenot, 1848 a valid species of the liolaemid genus *Phymaturus* (Iguania: Liolaemidae)

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### Abstract

*Oplurus bibronii* was a species described more than 160 years ago from the highlands of Ovalle, Chile. The species was earlier synonymized with *Phymaturus palluma* and since then its taxonomic status has not been re-examined. In February of 2011, we were successful in capturing specimens of *Phymaturus* in the highlands of Ovalle and additionally we examined high quality digital pictures of the type series of *O. bibronii*. Our analysis shows that the type series is composed of two different species, one of which overlaps their diagnostic characters with the characters of the specimens collected in the highlands of Ovalle, and therefore they correspond to *Phymaturus bibronii* (new combination). In addition, our review of the holotype, and some paratypes and topotypes of the recently described *P. paihuanense* shows that this is a junior synonym of *P. bibronii*.

**Key words:** *Phymaturus*, *Oplurus*, *bibronii*, *paihuanense*, Ovalle

### Resumen

*Oplurus bibronii* fue una especie descrita hace más de 160 años para las cordilleras de Ovalle, Chile. La especie fue tempranamente sinonimizada con *Phymaturus palluma* y desde entonces no se ha re-estudiado su situación taxonómica. En febrero del 2011, logramos capturar especímenes de *Phymaturus* en la cordillera de Ovalle y adicionalmente examinamos fotografías digitales de alta resolución de la serie tipo de *O. bibronii*. Nuestro análisis muestra que la serie tipo está compuesta por dos especies diferentes, una de las cuales sobrepone sus caracteres de diagnóstico con los especímenes capturados en la cordillera de Ovalle, y por lo tanto corresponde a *Phymaturus bibronii* (nueva combinación). Además, nuestro examen del holotipo, paratipos y topotipos de la especie recientemente descrita *P. paihuanense*, nos permite concluir que este es un sinónimo junior de *P. bibronii*.

### Introduction

*Phymaturus* is a genus of viviparous and herbivorous iguanian lizards that inhabit rocky outcrops in the highlands of Chile and Argentina and the Patagonian steppe in Argentina (Ceí 1986). It is characterized by a wide and

flattened head and body, tail with regular whorls of spinose scales and lateral nuchal skin folds obscured by fat-filled pouches (Etheridge 1995).

Currently, the genus is composed of thirty-eight species (Morando *et al.* 2013), divided into two groups: “*palluma*” and “*patagonicus*” (sensu Etheridge 1995). All Chilean species belong to the *palluma* group (Núñez *et al.* 2010), characterized by short superciliar scales, five or more suboculars, three or four rows of loreolabials; mental narrower than rostral, usually in contact with sublabial, sometimes fragmented, and highly developed caudal spines, with two rings per segment (Etheridge 1995; Lobo & Quinteros 2005a). Recently, in a molecular phylogenetic work, the *palluma* group has been divided into three groups: *mallimaccii*, *verdugo-roigorum* and *vociferator* (Morando *et al.* 2013). The *mallimaccii* group is also strongly supported by a morphological phylogeny, as the “*puna*” clade (Lobo *et al.* 2012a). This group is characterized by a dorsal pattern formed by a homogeneous fine spotting (“spray”) on males and currently is composed of nine species: *P. mallimaccii* (Cei 1980), *P. punae* (Cei *et al.* 1983), *P. antofagastensis* (Pereyra 1985), *P. laurenti* (Lobo *et al.* 2010), *P. paihuanense*, *P. alicahuense*, *P. darwini* (Núñez *et al.* 2010), *P. extrilidus* (Lobo *et al.* 2012b) and *P. denotatus* (Lobo *et al.* 2012c).

In the herpetology section of the “Historia Física y Política de Chile” of Claude Gay, Guichenot (1848, pages 53–55) described *Oplurus bibronii* from “...altas cordilleras de Ovalle, en la Provincia De Coquimbo (Chile)” based on specimens collected by C. Gay. He pointed out marked differences between the specimens of the type series, some yellowish olive green and others dark brown. Later, Duméril and Duméril (1851) provided a re-description of *Oplurus bibronii*, and also pointed out marked differences between the specimens of the type series: “brun-verdatre presque noir sur deux individus” (greenish-brown, almost black on two individuals; our translations). Later, Boulenger (1885) consider *O. bibronii* to be a synonym of *Phymaturus palluma* (Molina 1782), without comment or supporting data. Finally, Donoso-Barros (1966) in his work “Reptiles de Chile”, included the original illustration of *O. bibronii* under the original illustration of *Centrura flagellifer* (Bell 1843) (= *P. palluma*), although in the text, he accepts the synonymy proposed by Boulenger (1885).

According to Stuardo-Ortiz (1973), C. Gay explored the “cordilleras de Ovalle” between Ovalle and the pass of “Los Patos” (valley of the “Río Los Molles”), returning through the valley of the “Río Hurtado” during 1836 and 1837. Thus, the lizard species described later by Guichenot should be found in this area.

During a field trip in February of 2011, we collected five specimens of *Phymaturus* in the same area where C. Gay collected *Oplurus bibronii* (inside Ovalle, near Los Patos pass). Additionally, we examined high quality digital pictures of the type series of *O. bibronii* (detailed views of each specimen) deposited in the Muséum National d'Histoire Naturelle (Paris). After a careful analysis we are able to confirm that 1) the type series includes two different species, with two individuals of each, 2) one of these species corresponds to Guichenot’s *Oplurus bibronii* and the other must be designated as *Phymaturus sp.* and 3) *Phymaturus paihuanense*, recently described by Núñez *et al.* (2010), is a junior synonym of *P. bibronii*. In this contribution we are not able to provide a detailed re-description of *P. bibronii* because it requires a complete study of the type series under a stereomicroscope. Nevertheless, we provide information about several characters that can be used to diagnose it, taken from photographs of the two syntypes and from topotypes.

## Material and methods

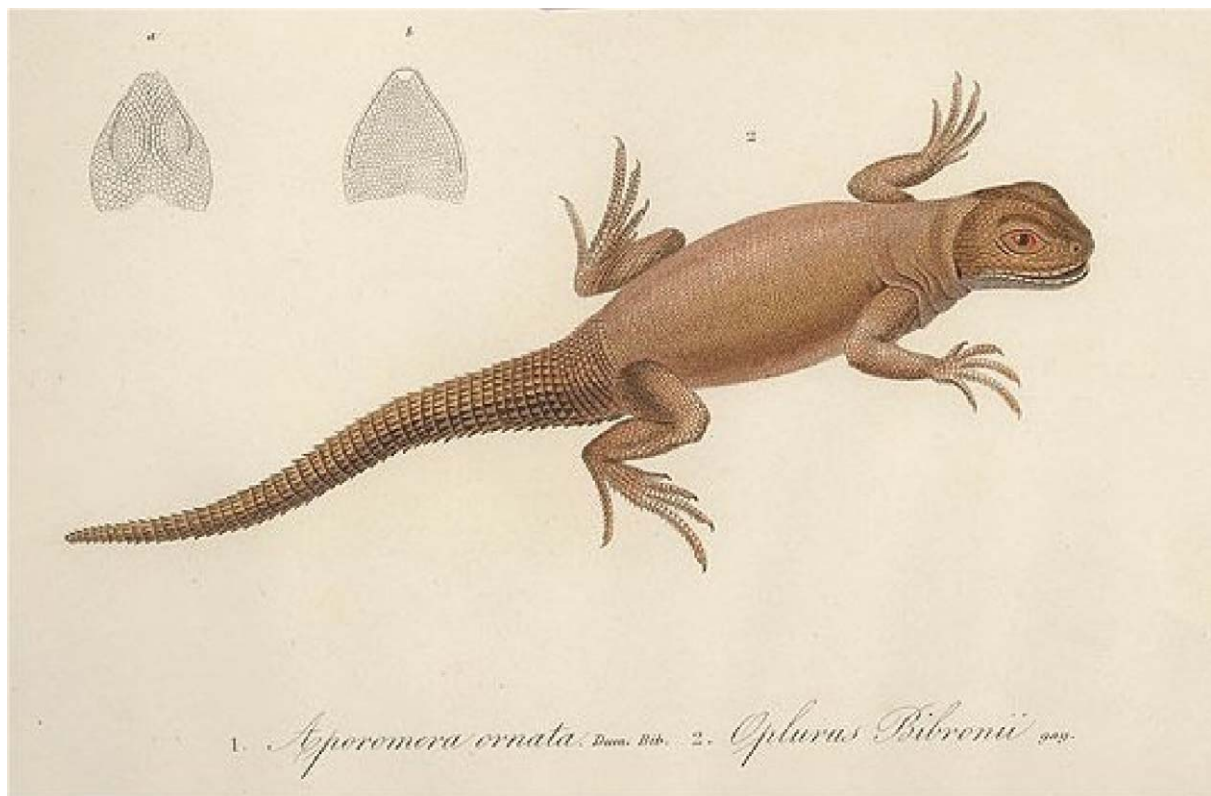
The characters for analysis and description were taken from Etheridge (1995), Lobo and Quinteros (2005a,b), and Lobo *et al.* (2010, 2012a). The description of colors in life was based upon photographs taken of recently collected specimens. We examined high quality digital pictures of several views of each specimen (dorsal, ventral and lateral views of head and neck, dorsal and ventral views of the entire specimens) of the type series of *Phymaturus bibronii* (MNHN 2395, 2395A, 1824 and 1824A provided by Dr. Ivan Ineich (curator of Reptiles at the Muséum National of Histoire Naturelle, Paris). Additionally, we examined topotypes of *Phymaturus bibronii* (SSUC Re 0428-32) from the Andean highlands of Ovalle, 33 km to E from Los Molles, near Los Patos pass (30°43′58″S – 70°19′56″W), 3176 m. J. Troncoso-Palacios, F. Lobo, J.C. Acosta and A. Laspiur cols. 12/02/2011. The topotypes were collected with a noose, sacrificed using sodic tiopenthal, fixed in 10% formaldehyde, preserved in 70% ethanol and deposited in Colección de Flora y Fauna, Profesor Patricio Sánchez Reyes de la Pontificia Universidad Católica de Chile (SSUC Re). Part of the liver of some specimens was extracted for future studies. Body measurements were taken with a digital calliper type Vernier ( $\pm 0.02$  mm precision). Scales observations were made under different

magnifying lenses. Additionally we examined twelve specimens of *Phymaturus paihuanense* (holotype and some paratypes and topotypes). These and others specimens examined are listed in Appendix I.

## Results

The four specimens collected by Gay belong to the genus *Phymaturus* (Gravenhorst 1837) that inhabits Chile and Argentina (Etheridge 1995), whereas the genus *Oplurus* (Cuvier 1829) is restricted to Madagascar and Comore archipelago in the western Indian Ocean (Münchenberg *et al.* 2008).

The four specimens collected by Gay belong to the *palluma* group, based on their short superciliar scales, 3–4 rows of loreolabials; mental narrower than rostral, in contact with sublabial, square-shaped non-imbricate superciliaries and strongly spiny tail scales (Etheridge 1995).



**FIGURE 1.** Illustration of *Oplurus bibronii* according to Gay (1854).

**Characters taken from the type series.** Two of the four specimens collected by Gay correspond to *Phymaturus bibronii* (new combination, Fig. 1) because their characteristics coincide with the characteristics of the topotypes that we collected near Los Patos pass. We here designate MNHN (Paris) 2395 as the lectotype of *Phymaturus bibronii* (Fig. 2). The other two must be designated as *Phymaturus sp.* (Fig. 3). Differences found between the two individuals of *P. bibronii* and the two of *Phymaturus sp.* are as follows: *Phymaturus bibronii* (MNHN (Paris) 2395-2395A, one male and one female): although the color of the dorsum is poorly preserved, it is possible to see that they have a brown background color with a thinly spotted dorsal pattern (“spray pattern”); 13–14 superciliaries, unfragmented subocular, posterior upper labials projecting (fang-like), preocular larger than canthal scale, 2 scales between nasal and rostral and the parietal eye has no white opaque color. The unfragmented subocular and the preocular larger than canthal scale are characters unique among *Phymaturus* chilean species. *Phymaturus sp.* (MNHN (Paris) 1824–1824A, two females): Dorsal pattern with thin reticulation in this specimen MNHN (Paris) 1824A and not discernible in specimen MNHN (Paris) 1824, 9–11 superciliaries, fragmented subocular scale (4–5), posterior upper labials not projecting, preocular scale smaller than canthal, 3 scales between nasal and rostral and parietal eye with white opaque color (Fig. 4). Additional characters for *P. bibronii* type series: 8 temporal scales, 15 scales between the parietal and rostral, 10 supralabials, 10–11 infralabials, 5–6 scales

between preocular and supralabials, the first rows of lorilabials not in contact with the subocular (separated by one row of lorilabials), 2 scales between nasal and canthal, and presence of 5 enlarged scales on the anterior border of auditory meatus.

**Diagnosis based on the type series and topotypes.** *Phymaturus bibronii* is a member of the *palluma* group, characterized by a light brown background color with spots of two different colors: dark brown and “color ferric oxide”. These spots are dispersed on the dorsum of the male and form bars on the sides of the females. Of the Chilean species, *P. bibronii* is the only one that always has a preocular larger than the canthal and is the species with the lowest number of suboculars (1–2) and is almost always unfragmented.

*Phymaturus bibronii* differs from *P. palluma* (Molina 1782), *P. verdugo* (Cei & Videla 2003), *P. vociferator* (Pincheira-Donoso 2004), *P. dorsimaculatus* (Lobo & Quinteros 2005a), *P. roigorum* (Lobo & Abdala 2007), *P. gynechlonus* (Corbalán *et al.* 2009), *P. querque* (Lobo *et al.* 2010), *P. maulense* (Núñez *et al.* 2010) and *P. damasense* (Troncoso-Palacios & Lobo 2012) in that the males of these species have a dorsal pattern formed by a widespread black or dark brown reticulation and temporal scales of the “seed” type with rugosities, whereas the male of *P. bibronii* has a dorsal pattern formed by a homogeneous fine spotting (“spray”) and smooth temporal scales.



**FIGURE 2.** Dorsal view of *Phymaturus bibronii*. Top: Lectotype MNHN (Paris) 2395. Bottom: MNHN (Paris) 2395A. Photograph by I. Ineich.

*Phymaturus bibronii* differs from the argentine species of the *mallimaccii* group (*puna* clade) as follows: it differs from *P. mallimacci* (Cei 1980) because the male of the latter has a yellow background color with small dark spots dispersed within this color and the female has a reddish background color with dispersed dark spots, whereas the male of *P. bibronii* has a light brown background color with spots of two colors (dark and “color ferric oxide”) dispersed, and the female has a light brown background with spots forming bars on the flanks. *P. bibronii* differs from *P. punae* (Cei *et al.* 1983), because the male of the latter has a yellow background color with small dark spots dispersed and melanism in the head and neck folds, whereas the male of *P. bibronii* has a different dorsal pattern without melanism on the head and neck folds. Also, *P. punae* has the rostral scale divided, but is undivided in *P. bibronii*. *P. bibronii* differs from *P. antofagastensis* (Pereyra 1985), because the male of the latter has four-five brown markings over the head (“dice pattern”) and a “spray” dorsal spotting pattern partially aggregated (but without reticulation), and the females have transvers lighter stripes over the back; however the male of *P. bibronii* lacks the “dice pattern” on the head and the spots are not aggregated. Moreover, the females of *P. bibronii* never have lighter stripes over their backs. *P. bibronii* differs from *P. laurenti* (Lobo *et al.* 2010), in that the male of the latter lacks a vertebral line and has enlarged postcloacal scales; but the male of *P. bibronii* almost always has a vertebral line and never has enlarged postcloacal scales. Moreover, the background color in the male of *P. laurenti* is yellow (light brown in *P. bibronii*) and *P. laurenti* has enlarged scales on the center of the chest, but this character is lacking in *P. bibronii*. *P. bibronii* differs from *P. extridilus* (Lobo *et al.* 2012b), because it has a yellow scapular spot, gular melanism in both sexes and lacks posterior supralabials projected downward. *P. bibronii* never has gular melanism and has no yellow scapular spot and has posterior supralabials projecting downward. Also, the preocular scale is similar in size to the canthal scale in *P. extridilus* (larger than canthal in *P. bibronii*). *P. bibronii* differs from *P. denotatus* (Lobo *et al.* 2012c), because females of the latter have small white spots dispersed over the dorsum and sides of their necks, a condition unknown in all other species of *Phymaturus* and the male has a yellow background color. Moreover, the preocular scale is similar in size to the canthal scale (larger than canthal in *P. bibronii*).

The differences between *Phymaturus bibronii* and other chilean species of the *mallimaccii* group (*puna* clade) are as follows. *P. bibronii* differs from *P. alicahuense* (Núñez *et al.* 2010) because the background color in males of *P. alicahuense* is greenish yellow, while the male of *P. bibronii* has a light brown background color. Moreover, this species has 1–3 suboculars (2–5 on the right side according to Núñez *et al.* (2010) and 1–2 in *P. bibronii*); subocular unfragmented in 28.6% of specimens (80.0% in *P. bibronii*) and 190–240 midbody scales (196–218 in *P. bibronii*). Also, the preocular scale is similar in size to the canthal scale in 85.7% of specimens of *P. alicahuense* (always larger than the canthal in *P. bibronii*).

*Phymaturus bibronii* differs from *P. darwini* (Núñez *et al.* 2010) because the latter has a conspicuous pattern of large, lighter bars on the back, with the shape of a triangle at the level of the shoulders in both sexes. Also, *P. darwini* has 3–4 subocular scales and the preocular is smaller or similar in size than the canthal.

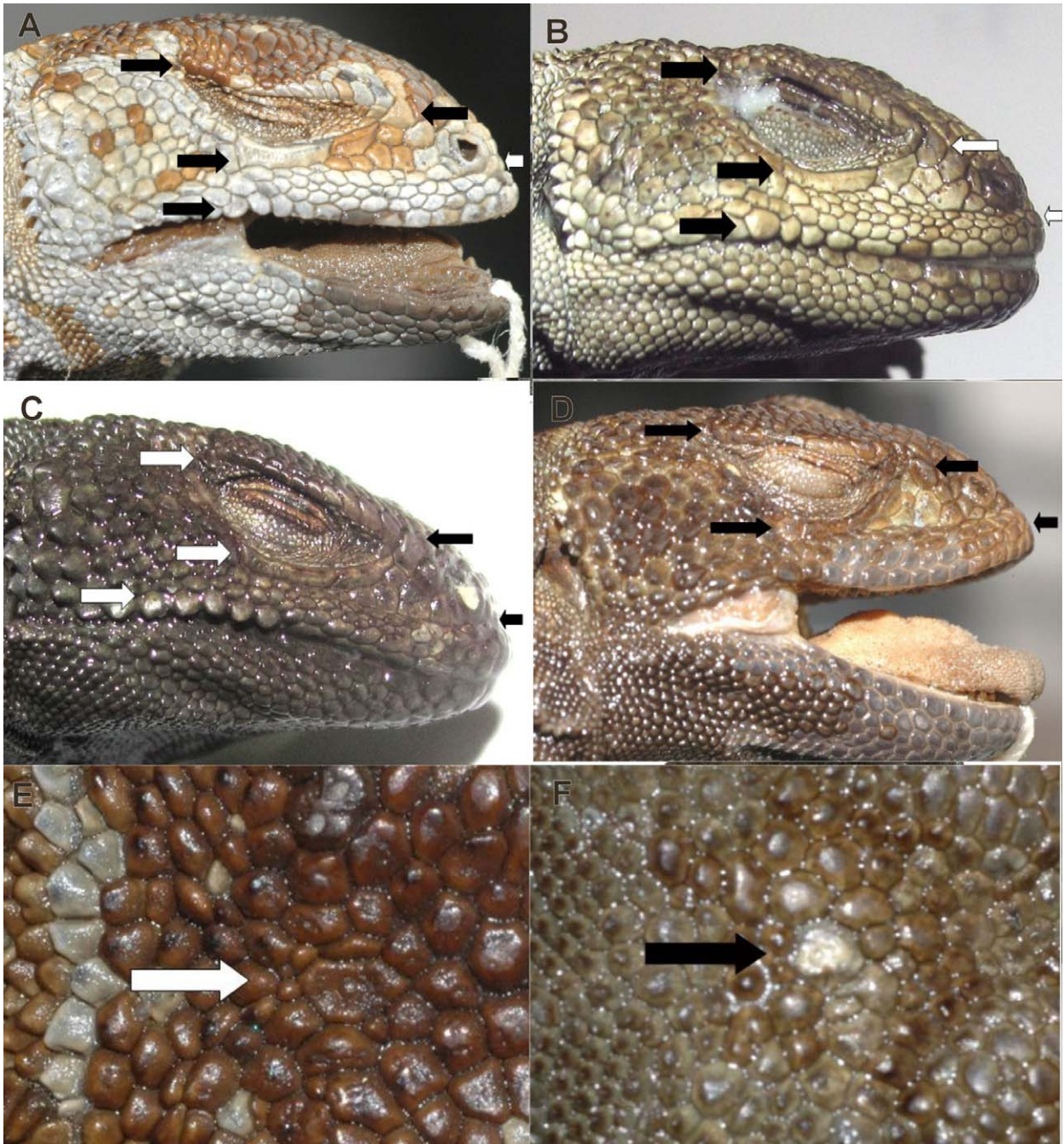
## Redescription of topotypes

Based on one adult male (SSUC Re 0432, Fig. 5) and four adult females (SSUC Re 0428-31, Figs. 6–7). Adult male SVL: 103.1 mm. Adult females SVL: 99.4 ( $\pm 1.4$ ) mm. Male head length: 2.3 mm. Females head length: 19.2 ( $\pm 1.3$ ) mm. Male head width: 20.6 mm. Females head width: 18.2 ( $\pm 0.9$ ) mm. Male head height: 12.6 mm. Females head height: 10.8 ( $\pm 0.8$ ) mm. Male interorbital distance: 7.6 mm. Females interorbital distance: 7.3 ( $\pm 0.5$ ) mm. Male Internasal distance: 3.3 mm. Females Internasal distance: 3.1 ( $\pm 0.3$ ) mm. Length of the humerus in male: 19.6 mm. Length of the humerus in females: 16.4 ( $\pm 1.9$ ) mm. Length of the tibia in male: 16.3 mm. Length of the tibia in females: 14.5 ( $\pm 2.0$ ) mm. Length of the right foot in the male: 24.4 mm. Length of the right foot in the females: 23.0 ( $\pm 1.3$ ) mm. Male tail length (not regenerated) 109.8 mm. Females tail length (regenerated only in SSUC Re 0428): 82.3 ( $\pm 13.4$ ) mm. Scales in contact with the interparietal: 7–9. Fifteen to nineteen scales between interparietal and rostral. Interparietal length: 1.3 ( $\pm 0.3$ ) mm. The parietal eye has no white opaque color. Supraorbital semicircles formed by 16–17 scales, inconspicuous in SSUC Re 0432. Thirteen–fourteen juxtaposed and flat superciliaries scales. Subocular scale unfragmented on the right side and left side (only fragmented in two on the left side of SSUC Re 0432). The subocular not in contact with the first row of lorilabials (separated by one row of scales). Subocular length: 4.3 ( $\pm 0.4$ ) mm. Eye length: 4.3 ( $\pm 0.2$ ) mm. Preocular scale larger than canthal and in contact with it. Four to six scales between preocular and supralabials. Canthal separated from nasal by two

scales. Seven to ten scales in contact with the nasal. Nasal separated from rostral by two scales. Canthal separated from nasal by two scales. Rostral scale undivided (only divided into two in SSUC Re 0429). Seven to nine temporal scales, rhomboidal and slightly keeled. Three to seven scales on the anterior border of auditory meatus projected to the meatus. Nine to ten supralabial scales, the posterior ones are projected down, like “fangs”. Six to seven scales in contact with pentagonal mental. Fifty-two to sixty-four gulars (between commissures). Well developed antehumeral pocket. Gular fold well developed and posterior gular folds present. No enlarged scales in the posterior margin of the gular fold. Round, smooth, juxtaposed dorsal scales. Scales on the middle of the back are slightly smaller than those of the flanks. Ventral scales larger than dorsals. Ventral scales: 160.2 ( $\pm 8.0$ ). Midbody scales: 207.6 ( $\pm 8.3$ ). Male with precloacal pores in one row. Eight precloacal pores (plus three supernumerary). No enlarged postcloacal scales. Females without precloacal pores (with the exception of SSUC Re 0428, which has four). Supra-femorals slightly keeled, the scales are pentagonal or hexagonal and arranged juxtaposed or sub-imbricated. Infra-femorals smooth, pentagonal or hexagonal and arranged juxtaposed. Supra-tibials with keel more pronounced than in the supra-femorals; the scales are pentagonal and arranged sub-imbricated. Infra-tibials smooth, rhomboidal and juxtaposed. Nineteen to twenty-five subdigital lamellae on the fourth finger of the right hand. Twenty-four to twenty-five subdigital lamellae on the fourth finger of the right foot. Scales of the tail arranged in spinose annuli, slightly keeled, imbricated, projected outward.



**FIGURE 3.** Dorsal view of *Phymaturus* sp. Top: MNHN (Paris) 1824A. Bottom: MNHN (Paris) 1824. Photograph by I. Ineich.



**FIGURE 4.** Main diagnostic characters of the specimens studied. A) Lateral view of the head of *Phymaturus bibronii* (syntype MNHN (Paris) 2395A). B) Lateral view of the head of *P. bibronii* (topotype SSUC Re 0432). C) Lateral view of the head of *P. paihuanense* (= *P. bibronii*) (holotype MNHN-CL 4053). D) Lateral view of the head of *Phymaturus* sp. (MNHN (Paris) 1824A). E) Parietal scale of *P. bibronii* (syntype MNHN (Paris) 2395A). F) Parietal scale of *Phymaturus* sp. (MNHN (Paris) 1824). The arrows indicate the superciliaries scales, canthal scale, subocular scale, scales between nasal and rostral, supralabials and interparietal scale.

**Color in life:** Male: Dorsum of the head brown, darker than the body. Scales with dark spots more abundant toward the occipital. Lateral area of the head brown, with whitish scales between the anterior border of auditory meatus and supralabials, which disappear before reaching the snout. Dorsum with background color light brown, with lighter vertebral line extending from the occiput to the base of the tail. Spots of two different colors (dark brown and color ferric oxide) dispersed on the back, not forming discernible figures. Pale green flanks, without spots. Dorsal limbs brown, without spots. Dorsal tail greenish brown without design. Yellow belly from gular fold to the base of the tail, without spots. Brown color from the gular fold to the snout. Orange precloacal pores. The ventral side of the limbs is yellow and the ventral side of the tail is brown.



**FIGURE 5.** Dorsal view in life of *Phymaturus bibronii* male (SSUC Re 0432).



**FIGURE 6.** Dorsal view in life of *Phymaturus bibronii* female with common dorsal pattern (SSUC Re 0430).





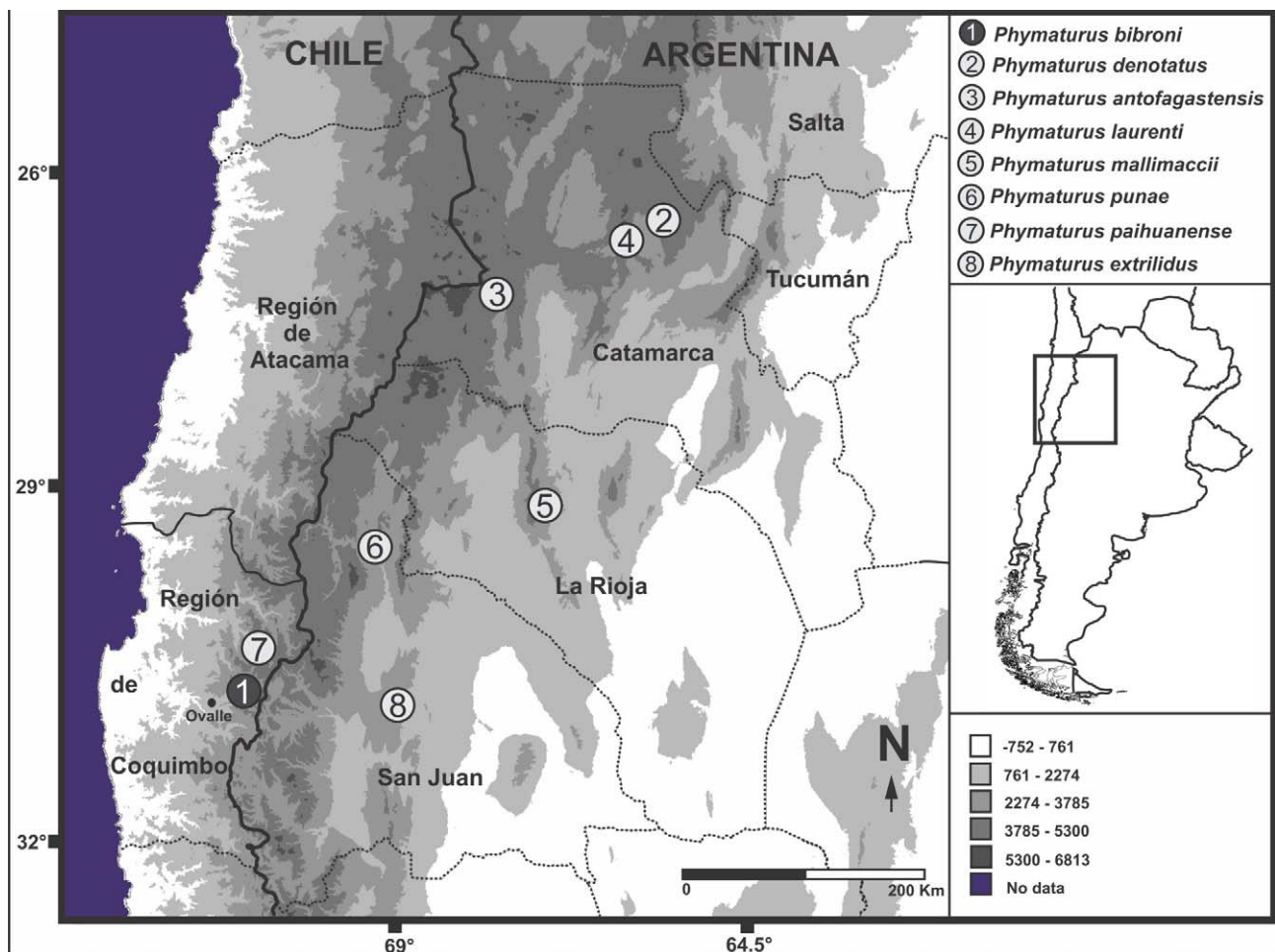
**FIGURE 7.** Dorsal view in life of *Phymaturus bibronii* female with ocellated dorsal design (SSUC Re 0431).



**FIGURE 8.** Dorsal view in life of *Phymaturus paihuanense* (junior synonym of *P. bibronii*) male (SSUC Re 0427).

Female: Dorsum of the head brown, darker than the body. Scales with dark spots more abundant toward the occiput. Sides of the head similar to the head of male. Dorsum with background color light brown, with lighter vertebral line extending from the occiput to the base of the tail, inconspicuous or marked. Seven to eight series of dark bars extending from the flanks to the paravertebral fields, without merging in the vertebral area. These bars are ocelli shaped in one specimen. Ferric oxide color spots are dispersed on the back. Dorsal limbs brown, with or without dark spots. Dorsal area of the tail brown, with dark rings. Light brown flanks. Belly white with gray throat. Some specimens have yellowish cloacal area. Ventral side of the limbs whitish. Ventral tail whitish on the first third and then brown.

**Distribution and habitat:** *Phymaturus bibronii* inhabits rocky slopes in Andean highlands in eastern Coquimbo near the international border with Argentina. This locality belongs to the Altoandina phytogeographic province (Cabrera & Willink 1973) above 3000 masl at the 30° parallel. Access to these locations is only possible in the spring to summer due to snow accumulation during fall and winter months in the austral hemisphere. Floristic elements such as xerophilous grasses, annual and cushion plants are dominants, being the most abundant species *Calceolaria* sp.



**FIGURE 9.** Distributio map of *P. bibronii* and some species of the *mallimaccii* group. It shows the administrative boundaries of Chile and Argentina.

*Phymaturus bibronii* was found 33 km to E from Los Molles, to 85 km to E from Ovalle, in the Andes mountains (30°43'58''S–70°19'56''W), near the “Los Patos” pass, in the basin of the river “Los Molles”, at 3176 m, according to the trajectory made by C. Gay. This is in Limarí province, Coquimbo region, where it was found on large rocks, near streams, in bush environments.

**Natural history:** At the time of the capture in February, the females were gravid showing embryos in different stages of development. One female near parturition with three advanced-development offspring at the same time exhibiting several small immature follicles. The other two pregnant females each retain between three and four small embryos with abundant yolk. At the same time the females showing small follicles at different stages

distinguishable by coloration varying between yellowish and opaque whitish. Similar reproductive characteristics in females with embryos in different developmental stages for this period was observed for the related species *P. antifagastensis* in Catamarca, Argentina. (Boretto & Ibarguengoyía 2006).

*Phymaturus bibronii* is an herbivorous lizard. Likewise various types of seeds of undetermined plant species were found in feces. This suggests that *P. bibronii*, as other *Phymaturus* species, are highly generalist (Castro *et al. in preparation*).

Finally, lizards of genus *Liolaemus* were observed in sympatry occupying similar habitat characteristics (probably juveniles of *L. maldonadae*).

### The identity of *Phymaturus paihuanense* (Núñez *et al.* 2010)

Núñez *et al.* (2010) described *Phymaturus paihuanense* (Fig. 8) from the mountains inside Paihuano (near Alcohuaz), at the locality of “Los Piuquenes”. This is approximately 38 km (straight line) north of the zone in which *P. bibronii* was found (near the pass of “Los Patos”, Fig. 9). In the description, Núñez *et al.* (2010) do not mention *Oplurus bibronii*, a species mentioned and illustrated in two classic works of the Chilean fauna and herpetology: “Historia Física y Política de Chile” (Gay 1854; Guichenot 1848) and “Reptiles de Chile” (Donoso-Barros 1966). Although, Donoso-Barros (1966, page xxxviii) included *P. bibronii* as a synonym of *P. palluma* (“dibujo original de Guichenot representando el tipo de *Oplurus bibronii* = *Phymaturus palluma palluma*”), the inclusion and discussion of relations between *P. bibronii* and *P. paihuanense* was needed in the diagnosis of the last.

**TABLE 1.** Scalation and morphological characters of geographically nearby species to *Phymaturus bibronii* (examined juveniles are excluded) and *Phymaturus* sp. Average and standard deviation are presented.

	<i>P. bibronii</i> (type series) M=1, F=1	<i>P. bibronii</i> (Los Patos pass) M=1, F=4	<i>P. paihuanense</i> (= <i>P. bibronii</i> , Piuquenes) M=7, F=5	<i>Phymaturus</i> sp. (unknown location) F=2	<i>P. punae</i> M=3, F=5	<i>P. extrilidus</i> M=5, F= 15
Midbody scales	?	207.6 (±8.3)	199.8 (±7.9)	?	179.2 (±10.9)	216.8 (±10.8)
Ventrals	?	160.0 (±8.0)	157.1 (±6.8)	?	185.3 (±8.2)	192.9 (±11.7)
Size of preocular in respect of size canthal	Larger	Larger	Larger	Smaller	Similar / Smaller	Similar
Subocular fragmentation	1	1 – 2	1–2	4–5	3–5	1–3
Yellow scapular spot	Absent	Absent	Absent	Absent	Absent	Present
Vertebral line in males	?	Present	Present	?	Absent	Absent
Scales between rostral and nasal	2	2	2	3	2	2
Superciliaries	13–14	13–14	13–14	9–11	9–12	9–14
Posterior Supralabials projected down	Yes	Yes	Yes	No	No	No

Our examination of twelve specimens of *Phymaturus paihuanense* (including the holotype) allowed us to establish that overlapping diagnostic characters with the two specimens of the *P. bibronii* type series, that is: dorsal pattern thinly spotted (“spray pattern”), 13–14 superciliaries, subocular almost always unfragmented (84.6% of specimens), posterior upper labials projected (fang-like), preocular larger than canthal scale and 2 scales between nasal and rostral. Additionally, specimens of *P. paihuanense* are indistinguishable from topotypes of *P. bibronii*.

There were no differences in the number of Midbody scales, ventrals (Table 1); or in the rest of the characters examined. The color pattern of the males of *P. paihuanense* is equal to *P. bibronii*, characterized by a background color "light brown" which varies in different shades. Only the male SSUC Re 0421 have a striking whitish coloration on the flanks, absent in other specimens. In the same way, the females of *P. paihuanense* have the same color pattern as *P. bibronii* females, though the female SSUC Re 0422 has a striking dark coloration on the shoulders and neck.

## Discussion

According to Stuardo-Ortiz (1973), in his journey from Ovalle to Los Patos (1837), C. Gay started from Ovalle and then he went to Sotaquí, Monte Patria, La Junta and Los Patos pass (valley or the river "Los Molles"). He then returned through the valley of the river "Hurtado," passing through the towns of Hurtado and Tambo to finally arrive at La Serena. In our reconstruction of Gay's survey, we followed the course of the river "Los Molles," from Ovalle to Los Patos pass and *Phymaturus* specimens were found only near Los Patos pass at 3176 m. Given the limited knowledge of Chilean herpetofauna by 1848, is understandable that Guichenot (1848) included *P. bibronii* within the African genus *Oplurus*, since some species of *Oplurus* have highly developed caudal spines (Glaw & Vences 2007), similar to *Phymaturus*.

*Phymaturus bibronii* shows some characteristics that are unique among Chilean species of the genus. No other Chilean species always have the preocular scale larger than the canthal (only 14.3% of *P. alicahuense* exhibit this condition); although the preocular scale larger than the canthal is a common characteristic in several Argentinean species (e.g. *P. palluma*). Moreover, *P. bibronii* is the Chilean species with less subocular fragmentation; it is fragmented into two only in the 20.0% of the specimens from the type locality and in 15.4% of specimen from Los Piuquenes, always on only one side. On the other hand, even more unusual are the morphological characteristics of the specimens collected by C. Gay, initially considered syntypes of *P. bibronii* but now considered as *Phymaturus sp.* Indeed, of the Chilean species, only some specimens of *P. maulense* and *P. vociferator* have three scales between the nasal and rostral. Of these, only *P. vociferator* has similar subocular fragmentation (2–4 in *P. vociferator* and 4–5 in *Phymaturus sp.*) and may have a dorsal pattern almost completely melanic. Although Gay visited the Laguna del Laja (type locality of *P. vociferator*) it is hard to believe that he had mixed samples from southern Chile with samples from northern Chile. The differences in the color pattern of *Phymaturus sp.* with respect to *P. bibronii* were early noted by Guichenot (1848) and Duméril and Duméril (1851). Both specimens of *Phymaturus sp.* exhibit different degrees of preservation (lesser deterioration in their superficial scalation compared with the two *P. bibronii* syntypes) and received two consecutive numbers separated from those assigned to the two *P. bibronii*. This last fact adds a degree of uncertainty about the origin of both samples. Perhaps they received non correlative numeration because they were collected at different times and places?

We conclude that *Phymaturus paihuanense* (Núñez *et al.* 2010), is a junior synonym of *P. bibronii* (Guichenot 1848). This conclusion is based on the fact that *P. paihuanense* coincides with the characteristics that diagnose the syntypes and topotypes of *P. bibronii*. Moreover, Núñez *et al.* (2010) commit some mistakes in the diagnosis. They postulate that the species is distinguished from *P. mallimaccii* due to: "*Phymaturus mallimaccii*, tiene las extremidades posteriores lo que no se verifica en *P. paihuanense*" Núñez *et al.* (2010, p 58) ("*Phymaturus mallimaccii* has hindlimbs which is not verified in *P. paihuanense*", our translations). This was probably a mistake in the drafting, but Núñez *et al.* (2010) did not include other diagnostic character between *P. paihuanense* and *P. mallimaccii*. Núñez *et al.* (2010) indicate that *P. paihuanense* does not have a dorsal pattern and that the cephalic region has the same color of the body. However, our review of eight topotypes in life, shows that both female and male have a dorsal pattern and that the head region is darker than the body. Núñez *et al.* (2010) indicate that subocular fragmentation varies between 2–5 (n = 9). We believe that this is highly unlikely, since in our sample (which includes the holotype and three paratypes) it is mostly unfragmented (only fragmented into two in two specimens, n = 12).

In this work we have included *Phymaturus gynechlomus* as a valid species, although its status is currently being studied by Lobo & Etheridge (*in review*).

The diversity of the *Phymaturus* genus in Chile is underestimated (Núñez *et al.* 2010). For a long time, all Chilean populations of *Phymaturus* were assigned to *P. palluma* (Donoso-Barros 1966; Núñez 1992). However,

new studies have placed the type locality of this species in Mendoza, Argentina (Scolaro 2010; Lobo & Etheridge *in review*) and have increased the number of Chilean species of *Phymaturus*: *P. vociferator*, *P. alicahuense*, *P. darwini*, *P. maulense*, *P. damasense* and *P. bibronii* (this study, by revalidation). We hope that in the future new research will improve our knowledge of Chilean *Phymaturus* populations.

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## APPENDIX I. Specimens examined.

- Phymaturus antofagastensis*: SDSU 1991. Argentina, Prov. Catamarca, Dpto Antofagasta, Agua de los Pocitos. E. Teran & O. Pagaburo cols. 28/11/81. MCN 309-310. Camino a Paso San Francisco, Abdala, C.; R. Espinoza, F. Lobo & M.I. Martínez Oliver. MCN 1429–1436. A 130 km de Fiambalá sobre ruta a Paso San Francisco. Dpto. Antofagasta, Prov. de Catamarca, Argentina. J.C. Acosta col.
- Phymaturus alicahuense*: MNHN-CL 3820-22, 3827-28, 4101, 4104. Quebrada de los Piuquenes, Región de Valparaíso (32°16'07"S; 70°28'19"W; 2948 m). A. Veloso, C. Veloso, P. Espejo and E. Soto cols. 18-19/03/2005.
- Phymaturus bibronii*: SSUC Re 0428-32. Cerca del Paso Los Patos, interior de Los Molles, al interior de Ovalle. Región de Coquimbo. J. Troncoso-Palacios, F. Lobo, J.C. Acosta & A. Laspiur cols. 12/02/2011. *Phymaturus paihuanense* (= *P. bibronii*): MNHN-CL 4051-54. Valle Los Piuquenes, Paihuano, río Claro, (30°23'S; 70°23'W; 3194 m). H. Núñez, A. Veloso, C. Veloso, P. Espejo and A. Cortés cols. 20/01/2006. SSUC Re 0412, 0421-27. Quebrada Los Piuquenes, Interior de Alcohuaiz, Paihuano, río Claro, Región de Coquimbo. Troncoso-Palacios, J., F. Lobo, A. Laspiur & J.C. Acosta Cols. 10/02/2011.
- Phymaturus damasense*: MNHN-CL 4782. Las Damas river, approximately 1.5 Km to east from Termas del Flaco (34°57'56"S –70°24'45"W), 66 km SE from San Fernando, Región del Libertador Bernardo O'Higgins, Chile. J. Troncoso-Palacios & F. Ferri cols. 14/01/2011. MNHN-CL 4745-48. Termas del Flaco (Río Las Damas Región del). H. Núñez & D. Esquerré cols. 01/02/ 2011. SSUC Re 0413-17. Las Damas river, approximately 1.5 km to east from Termas del Flaco (34°57'56"S –70°24'45"W), 66 km SE from San Fernando, Región del Libertador Bernardo O'Higgins, Chile. J. Troncoso-Palacios & F. Ferri cols. 14/01/2011.

- Phymaturus darwini*: MNHN-CL 4040, 4042-43, 4045. Valle Rieccillo, Minera Los Bronces, Región de Valparaíso, (33°03'S; 70°22'W; 3053 m). H. Núñez, A. Veloso, C. Veloso and P. Espejo cols. 26/01/2006. SSUC Re 125-27. Cerro Carpa, Provincia de Santiago, Región Metropolitana de Santiago. J. Troncoso-Palacios & F. Meza cols. 15/11/2011.
- Phymaturus denotatus*: MACN 4012 (ex-MCN 3184). Laguna Blanca, 3440 m elevation, Belén, Catamarca Province, Argentina. L. Fernández, F. Lobo, S. Nenda, and D. Slodki cols. 13/03/2010. MACN 40513 (ex-MCN 3175), MACN 40514 (ex-MCN 3185), MACN 40515 (ex-MCN 3182), MACN 40516 (ex-MCN 3180), MACN 40517 (ex-MCN 3160), MCN 3159, 3176; MCN 3161, 3170, 3181, 3183, 3186; MCN 3177–79, 3187–89, MACN 40373–40374. Laguna Blanca, 3800 m, Belén, Catamarca Province, Argentina. S. Barrionuevo, B. Blotto, and S. Nenda cols. 12/12/2009.
- Phymaturus dorsimaculatus*: MCN 1573 (holotype). Copahue, Dpto. Ñorquin. Neuquén, Argentina. Abdala, C.; Avila, L.; F. Lobo; M. Morando, col. MCN 1571-72, 1574-75 (paratypes). Same data as holotype. MCN 1568-69. Termas de Copahue, Dpto. Ñorquin, Neuquén, Argentina. MCN 1566-67. Copahue, Dpto. Ñorquin, Neuquén. MVZ 232503. Depto. Ñorquin, Termas de Copahue; elevation 2050 m. Prov. Neuquén, Argentina, M. I. Christie col. MCN 1566-67 Copahue, Dpto. Ñorquin, Neuquén, Argentina. D. Pérez col.
- Phymaturus extrilidus*: MCN-UNSA 2655, 2657, 2669–71, 2673, 2721–35, 2737. Argentina, Provincia de San Juan, Departamento Ullum, Reserva Natural de Uso Múltiple Don Carmelo, hillside (Sierra La Invernada) behind the field station, 3133 m. R. E. Espinoza, F. Lobo, L. Quiroga, and E. Sanabria, 12 December 2007. MCN-UNSA 2712, 2714–20. Argentina, Provincia de San Juan, Departamento Ullum, Reserva Natural de Uso Múltiple Don Carmelo, Aguada de Pinchagua, 3122 m, R. E. Espinoza, F. Lobo, L. Quiroga, and E. Sanabria cols. 13/12/2007.
- Phymaturus laurentii*: MCN 313-317, 320, 322. Cuesta de Randolpho. Catamarca. Abdala, C.; R. Espinoza, F. Lobo, I Martínez Oliver cols. 18/01/2001. MCN 306-307, 323-327. Cuesta de Calalaste. Catamarca. Abdala, C.; R. Espinoza, F. Lobo, I Martínez Oliver cols.. MCN 1919-21. Norte de Antofagasta de la Sierra, Catamarca. Casimiro, B., Espinoza, R., Lobo, F., S. Quinteros col. MCN 3133 al este de El Peñón, camino al cerro Galán. Antofagasta de la Sierra, Catamarca. Chocobar, Raúl Col.
- Phymaturus mallimaccii*: REE-CSUN 183, 489-491. Cueva de Pérez, Sierra de Famatina, Prov. de La Rioja. Argentina. R. Espinoza & F. Cruz cols. MCN 920. Camino a la Mejicana, 3430 m. Dpto. Famatina. Prov. de La Rioja. Morando, M.; L. Avila y L. Belver cols.
- Phymaturus maulense*: MNHN-CL 3938-42, 3945, 4038-39. Vilches Alto, El Enladrillado, Reserva Nacional Altos de Lircay, (35°35'S; 70°58'W, 2189 m). A. Veloso, P. Espejo and S. Araya cols. 16-17/04/2005. MZUC 35959-60. Enladrillado, Lircay, Provincia de Talca, Región del Maule. J. Troncoso-Palacios col. 28/11/2011. MVZ 232506-07. On the road to Laguna del Maule (Los Cóndores Pass), Talca Prov.; elevation 1800 m. Región VII (= Región del Maule), Chile. R. Sage col. SSUC Re 0410-11. Laguna del Maule, Talca Prov. Región VII; F. Ferri-Yáñez col. MNHN-CL 2353, 2460-61. Baños del Campanario (1500 m), Talca, San Clemente. J.C. Torres-Mura col.
- Phymaturus palluma* (= *Phymaturus gynechomus*): MCN 3130-31. Camino al Portillo Argentino (Cordón del Portillo), Mendoza, Argentina. C. Abdala, V. Juárez col. MVZ 126991. Dpto Malargüe, Valle Hermoso, Prov. De Mendoza, Argentina. R. Sage col. MVZ 126992-94. Lago de la Niña Encantada. 6 km E de los Molles, elevation 2000 m. Prov. De Mendoza, Argentina. R. Sage. MVZ 126995. Dpto Malargüe, en el extremo norte del Valle Hermoso. Prov. De Mendoza, Argentina. R. Sage. MVZ 126996-126999. Depto. Tupungato, Quebrada de Chupasangral, 4 km NW Cerro Chupasangral; elevation 2800 m. Prov. Mendoza, Argentina. R. Sage. MVZ 127023. Depto. Las Heras, 2 km E Los Hornillos, Prov. Mendoza, Argentina. R. Sage col. MVZ 127025-27. Depto. Malargüe, 2 km E Agua Botada Prov. Mendoza, Argentina. R. Sage col.
- Phymaturus punae*: MCZ 19217 (holotype). 7 km SE refuge de la Reserva Provincial, cerca del Rio San Guillermo, 3500 m. Prov. de San Juan, Argentina, R. Etheridge, J.M. Cei & F. Videla cols. MCZ 163982, 84, 86-88. (paratypes). Same data of holotype. SDSU 1978-79. Argentina: Prov. San Juan: Dpto. Iglesia: Llano de los Hoyos, Reserva Prov. San Guillermo. R. E. Etheridge col.
- Phymaturus querque*: FML 21556 (holotype) Laguna Blanca, Laguna Blanca National Park, Zapala department, Neuquén province, Argentina. C. Abdala, S. Quinteros, G. Scrocchi, J. C. Stazonelli col. 11/18/2007. FM L 21211 (paratype). One female. Same data as holotype. IBA 793 (paratype). Two males and two females. Laguna Blanca. Neuquén province, Argentina. J. M. Cei, L. Cei and R. Ferreira col. 01/06/1972. MACN 34514 (2 males, one female, two juveniles). Laguna Blanca. Neuquén. G. Gnida col. 1988. MVZ 232504-05. Puesto Control, 3.5 km N Laguna Blanca. Dpto. Zapala, prov. de Neuquén, Argentina. 1800 m. M. I. Christie col. SDSU 1971. Argentina: Prov. Neuquén: Dpto Zapala: south shore of Laguna Blanca. R. E. Etheridge col.
- Phymaturus roigorum*: MCN 1963 (holotipo) Puesto Rojas, 16 km. de Ruta Provincial 180. El Nevado. Departamento de San Rafael, Mendoza Province, C. Abdala; R. Juarez; C. Robles col. MCN 1962, same data holotype. SDSU 1948-51, 56, 62 64-65. Argentina: Prov. Mendoza: Dpto Malargüe: 3 km NW of base of Volcán Payún. R. Etheridge. SDSU 1972, 1974-75. Argentina: Prov. Mendoza: Dpto Malargüe: 10 km S of base of Volcán Payún. R. Etheridge. 04/02/1983. IBA 733 (5 specimens). Base Campamento. Lado SW del Payún. Mendoza. Argentina. L. P. Castro col.
- Phymaturus verdugo*: MCN 1958, 1960–61. Río El Gancho 4 km. from Las Loicas. Mendoza Province, Argentina. Abdala, C.; R. Juárez; C. Robles col. MCN 1973–77. 12.5 km from Las Loicas to Bardas Blancas, road to El Pehuenche. Abdala, C.; R. Juárez; C. Robles col.
- Phymaturus vociferator*: MNHN-CL 3852. El Refugio (37° 20' S; 71° 18'W), Laguna del Laja, 1700 m, Antuco, Octava Región Administrativa de Chile). S. Martín col. 01/12/2000. MNHN-CL 3853 – 55. El Refugio (37° 20' S; 71° 18'W), Laguna del Laja, 1700 m, Antuco, Octava Región Administrativa de Chile). D. Pincheira-Donoso col. 18/11/2001. MRC 0020-23. Antuco, Chile. C. Valdovinos-Zarges col (undated).