

The Type Locality of *Phymaturus palluma* (Molina, 1782) (Reptilia: Iguania: Liolaemidae) and the Status of *Phymaturus adrianae* Pereyra, 1992 and other Unnamed Populations

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Abstract. With the recent designation of the holotype of *Centrura flagellifer* Bell as the neotype of *Phymaturus palluma* Molina by the International Commission on Zoological Nomenclature, the type locality of *P. palluma* became problematic. It is likely that Charles Darwin collected the holotype of *C. flagellifer* during his round trip journey between Santiago, Chile and Mendoza, Argentina. A detailed account of his journey is presented, as well as the conclusion that the type locality is Cordón del Portillo, Mendoza province, Argentina, where Darwin collected and briefly characterized a viviparous lizard. Here we provide a re-description of Darwin's specimen and two morphological characters that distinguish it from other populations in Chile and Argentina previously assigned to this species. In November 2009, specimens from the locality where Darwin collected his "viviparous lizard" were collected, confirming the identity of the type. This study also reveals that *P. gynechomus* should be considered a junior synonym of *P. palluma*. Populations of *Phymaturus* of the *palluma* group farther to the north, from the Sierra de Uspallata and southern San Juan province, are determined to be different lineages and should be described formally. The name *P. adrianae* has been applied to the species that occurs in the Sierra de Uspallata, but we show here that it has not been formally named and is therefore a *nomen nudum*. Chilean populations previously considered to be *P. palluma* should be described formally.


Keywords. *Phymaturus*; Taxonomy; *palluma*; Type locality 

Resumen. Con la reciente designación del holotipo de *Centrura flagellifer* Bell como el neotipo de *Phymaturus palluma* Molina por la Comisión Internacional de Nomenclatura Zoológica, la localidad tipo de *Phymaturus palluma* se tornó problemática. Pareciera ser que Darwin colectó el holotipo de *Centrura flagellifer* durante su viaje de Santiago, Chile a Mendoza, Argentina y regreso. Aquí se presenta un detallado repaso de su viaje y la conclusión que se obtiene es que la localidad tipo es Cordón del Portillo, Mendoza, Argentina, donde Darwin colectó y brevemente caracterizó una lagartija vivípara. Aquí presentamos una re-descripción del espécimen de Darwin y proveemos de dos caracteres morfológicos que lo distinguen de otras poblaciones en Chile y Argentina previamente asignadas a esta especie. En noviembre de 2009 especímenes de la localidad donde Darwin colectó su lagartija vivípara fueron colectados confirmando la identidad del tipo. Este estudio también revela que *Phymaturus gynechomus* debería ser considerado sinónimo junior de *Phymaturus palluma*. Poblaciones de *Phymaturus* del grupo *palluma* de más al norte, Uspallata y sur de la provincia de San Juan son determinadas como un linaje independiente que debería describirse formalmente. El nombre de *Phymaturus adrianae* fue aplicado a la especie que se encuentra en Sierra de Uspallata, pero nosotros mostramos aquí que no fue formalmente nombrada, por ello es un *nomen nudum*. Las poblaciones chilenas previamente consideradas *P. palluma* deberían ser formalmente descripta.

INTRODUCTION

Phymaturus is a clade of iguanian lizards that occurs at moderate to high elevations in the cordilleras and pre-cordilleras of central Chile and adjacent western Argentina, as well as various volcanic tablelands of the Patagonian region of Argentina (Lobo and Quinteros, 2005a). They are viviparous, saxicolous herbivores and are nearly always found syntopically with one or more species of *Liolaemus*, which form their sister clade (Etheridge and Espinoza, 2000; Espinoza *et al.*, 2004). *Phymaturus* has the potential to serve as a model system for the exploration of questions in evolutionary biology and biogeography of viviparous, herbivorous lizards of high elevation (Habit and Ortiz, 1994;  1996; Chiszar *et al.*, 1999; Ibagüengoytia,

2005; Boretto *et al.*, 2007; Díaz Gómez, 2008; Cruz *et al.*, 2009). For this reason it is important that there be nomenclatural stability within the clade.

Phymaturus was divided into two groups by Etheridge (1995), with six species in the *patagonicus* group and four in the *palluma* group. Subsequently, the number of *Phymaturus* species has more than doubled: eleven more have been described or revalidated in the *patagonicus* group, and five more in the *palluma* group (Cei and Videla, 2003; Scolaro and Cei, 2003; Pincheira-Donoso, 2004; Lobo and Quinteros, 2005a, 2005b; Scolaro and Ibagüengoytia, 2007, 2008; Lobo and Abdala, 2007; Scolaro *et al.*, 2008; Corbalán *et al.*, 2009; Scolaro and Tappari, 2009; Scolaro and Pincheira-Donoso, 2010; Lobo *et al.*, 2011; ). These two groups have been supported by phylogenetic

analyses based on molecular and morphological evidence (Espinoza *et al.*, 2004; Lobo and Quinteros, 2005a).

With the rapid and continual increase in the number of species in the *Phymaturus palluma* group, it is important that the type locality of *P. palluma* be determined, because any one of these species might prove to be its synonym. With the designation of the holotype of *Centrura flagellifer* Bell, 1843 as the lectotype of *P. palluma* (Molina, 1782) by Etheridge and Savage (2003) and later validated by the International Commission on Zoological Nomenclature (2005), the type locality of *P. palluma* became problematic. A brief history of actions that lead to this decision may be found in Etheridge and Savage (2006) and references therein.

Recently Scolaro (2010) proposed the Sierra de Uspallata as the type locality for *P. palluma*. We have found that this proposal disregarded important and relevant information concerning the collection data provided by Charles Darwin in his field notes (Chancellor and Van Wyhe, 2009) and was based on a biased sample of specimens and localities. Consequently, here we present a more comprehensive analysis of this problem.

MATERIALS AND METHODS

Morphological observations were made using a stereoscopic microscope, and measurements were taken with a digital caliper. Specimens examined are listed in the appendix. Additionally, high resolution images (including a mm scale) of the neotype of *Phymaturus palluma* were provided by Dr. Colin McCarthy, and changing parameters of brightness and contrast, scaling, etc. allowed us to extract the maximum information possible (scale counts and measurements).

RESULTS

The type locality of *Centrura flagellifer*

It is uncertain why Bell (1843) failed to provide a locality in his description of *Centrura flagellifer*, although localities were provided for almost all other species described in that work. Additionally, the only lizards listed in a specimen list from the voyage of the Beagle provided by Keynes (2000:357–358) for the period of February through June 1835 were *Proctotretus* (= *Liolaemus*) and *Microlophus* species, all from near the coast of Chile. Gray (1845) listed two specimens in the British Museum under the name *Phymaturus* (sic) *palluma*, both of which were said to have come from “Chili.” One of them was from “Mr. Cuming’s collection,” the other was “Presented by C. Darwin Esq.” It is uncertain why Gray stated that both specimens came from Chile, but perhaps it was because

Mr. Cuming collected only in Chile, and Darwin’s collections from both Argentina and Chile were sent back to the museum from Chile. Gray (1845:226) noted the presence of pores: “vent with a series of pores in front” in Mr. Cuming’s specimens and their absence in Darwin’s specimen, and also that “The preanal pores were not mentioned either by Gravenhorst or Bell.” Boulenger (1885) also listed Chile as the locality from which Darwin’s specimen originated. We assume the type was collected during Darwin’s round-trip journey from Santiago, Chile, to Mendoza, Argentina, because he did not have the opportunity to collect in Maule and Talca provinces to the south, where other populations of the *palluma* group species occur. Cei and Videla (2002) considered the possibility that Darwin collected the type during his trip from Uspallata, on the eastern slopes of the Andes in Mendoza province, Argentina, or on the western slopes on his return to Santiago, Chile. Cei and Scolaro (2006) provided a figure indicating a possible route taken by Darwin between Santiago to Mendoza, along with shaded areas where *Phymaturus* is suggested to occur today, but without reference to the source of their information. On their map they indicated a locality west of Paso Las Cuevas, as the possible site of Darwin’s collection. Confusion about the supposed Chilean origin of the type was repeated by Duméril (1856:577), Cei and Lescure (1985:175), Cei (1986:177), and most recently by Pincheira Donoso *et al.* (2008), listing “*Centrura flagellifer* Bell 1843:25 (type locality: 119 “Chili”).”

Here we provide a day-by-day account of Darwin’s journey from the day he left Santiago on 18 March 1835 to his return on 10 April 1835 and note the species of the *Phymaturus palluma* group whose ranges he likely passed through, as well as the species whose ranges he did not pass through. We then provide what we believe to be strong evidence that the viviparous lizard Darwin collected on 24 March at Cordón del Portillo in north-western Mendoza province, Argentina, is the neotype of *P. palluma*. We then describe this specimen—the holotype of *Centrura flagellifer*—in some detail, and compare it to Darwin’s description of the lizard he collected at Cordón del Portillo, and to a female *Phymaturus* collected at Cordón del Portillo in November 2009. We conclude that the holotype of *C. flagellifer* is the specimen that Darwin collected and described from Cordón del Portillo, and is the species now known as *P. gynechlonus*.

Darwin’s journey

The following account of Darwin’s journey is based on Keynes (1988:304–323; 2003:276–288). On 18 March 1835, Charles Darwin left Santiago, Chile and proceeded up the valley of the Río Maipo and passed the mines of San Pedro Nolasco to the Río Yeso near its confluence with the Río El Volcán, a tributary of the Río Maipo. On

20 March, he continued up the Río Yeso Valley. He mentions crossing two Andean ridges, the western one he called the Piuquenes ridge (Fig. 1), and stated that its western slope drains into the Pacific Ocean and the eastern slope into the Atlantic. The eastern one he called the Portillo ridge (Cordón del Portillo). On 21 March, he crossed over this ridge via the Portillo Argentino (not mentioned by Darwin) at 4358 m, and was then in Argentina. After crossing into Argentina, Darwin mentions the view of the snowfields of Cerro Tupungato and the slopes of Cordón del Portillo. The next day he camped at Los Arenales (2500 m). On 24 March, Darwin passed over the Cordón del Portillo (ca. 2000 m) and through La Guardia (del Portillo, ca. 2000 m; Fig. 1, locality 2), and thence through Estancia de Chaquiao to the eastern base of the Cordón del Portillo, where he camped for the night. On 25 March, he continued his journey toward Mendoza, staying at Estacado (now Baños de Alto Verde; 875 m), thence to Luxan (now Luján de Cuyo, ca 937 m; Fig. 1, locality 3), arriving in Mendoza (964 m) on 28 March. Darwin departed Mendoza on 29 March, ascended the eastern slopes of the northern part of the Sierra de Los Paramillos (or Sierra de Uspallata), staying that night at Villavicencio on the eastern slope of the Sierra de Los Paramillos (Sierra de Uspallata). The following day he traveled to Los Hornillos (now Termas de Villavicencio; 760 m; Fig. 1, locality 4). On 31 March he ascended the slopes of the Sierra de Uspallata, and at 2768 m he saw snow-white projecting columns of silicified trees, from which he collected samples that were later identified as the fossilized remains of *Araucaria* trees. On 1 April Darwin crossed the Sierra de Uspallata (Fig. 1, locality 5) by what he called the Uspallata Pass to Estancia Uspallata. He then went to Polvadera, through the Paso de Las Animas, and reached the Río de las Vacas (Punta de Vacas; 2385 m) on 3 April. The following day he passed through the region of Las Cuevas (3150 m).

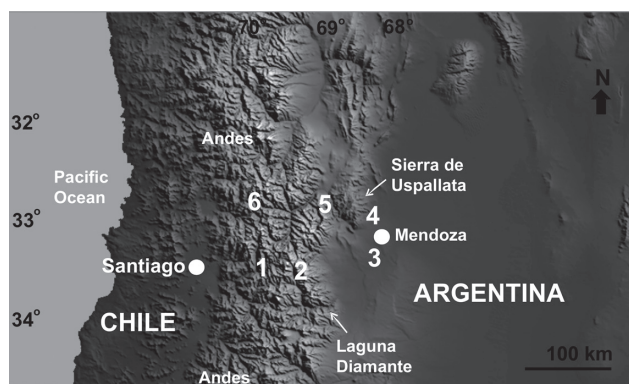


Figure 1. Map of western Mendoza province (Argentina) showing different sites visited by Charles Darwin in March 1835. **(1)** Paso de los Piuquenes (border between Chile and Argentina). **(2)** Cordón del Portillo (Darwin captured a “viviparous lizard” at this pass). **(3)** Luján de Cuyo. **(4)** Villavicencio. **(5)** Uspallata. **(6)** Las Cuevas, Puente del Inca (border between Argentina and Chile). Laguna Diamante is the type locality of *Phymaturus gynechloinus*.

On 5 April he crossed the Andes and entered Chile at the “Paso de la Cumbre” (now the Paso de Bermejo; 3150 m; Fig. 1, locality 6) and stayed the night at Los Ojos del Agua near Juncal, about 16 km from the border in the upper Río Aconcagua Valley. On 6 April, Darwin continued his descent into the valley of the Río Aconcagua, staying the night and all of the next day at the “Guard House.” On 8 April he left the Aconcagua Valley, staying the night at Villa de Santa Rosa (816 m). The following day he crossed the Cuesta de Chacabuco and stayed that night at Colina (500 m), arriving in Santiago on 10 April.

No specimens of the *Phymaturus palluma* group are known from the region through which Darwin passed on his journey from Santiago to the border with Argentina (Fig. 1, locality 1). His entire journey in Argentina was within northwestern Mendoza province where two *palluma* group species occur: *P. gynechloinus* in the southern leg of his journey from the Chilean border to the city of Mendoza, and the Uspallata species (see discussion of the status of *P. adrianae* below) in the northern leg from Mendoza to the Chilean border. Although Darwin passed through the region where the Uspallata species occurs, it is likely that he did not collect that species there because the only specimen of *Phymaturus* that he gave to the British Museum is the type of *Centrura flagellifer*, which, as we show below, belongs to a different species that does not occur there. Lobo and Abdala (2007) cite numerous records of *Phymaturus* from Mendoza province and it is almost certain that Darwin had the opportunity to collect *Phymaturus* on that leg of his journey. Recently, we were able to study a sample of specimens of *Phymaturus* collected at Cordón del Portillo, where Darwin is known to have collected a “viviparous lizard.” Today this locality is quite accessible, and tourist agencies of Mendoza province offer visits to this entire area. There is also a Gendarmería station (border military force of Argentina) in approximately the same location as the earlier XIX century Guardia Nacional station, where Darwin himself reported to have stayed. Additionally, one of the authors (RE) collected the Uspallata species of *Phymaturus* in the western foothills of the Sierra de Uspallata, 27 km NE Uspallata, Las Heras department, Mendoza province (32°28'52.2"S; 69°09'59.2"W; 2768 m). It was collected only a few meters from a large, marble slab with the following inscription: “Carlos R. Darwin – Homenaje en el Centenario del Origen de las Especies 1859 November 1959,” below which is the inscription “En estos cerros el ilustre naturalista descubrió ejemplares de *Araucarias* fósiles el 30 de Marzo de 1835.”

A number of *palluma* group species occur north of this region: *Phymaturus punae* (Cei *et al.*, 1983) from the Sierra de San Guillermo, San Juan province; *P. antofagastensis* (Pereyra, 1985) from Catamarca province; and *P. mallimacii* (Cei, 1980) from La Rioja province. Still others in the same clade are known from the south:

P. roigorum (Lobo and Abdala, 2007) on the Payún plateau; *P. verdugo* (Cei and Videla, 2003) in southwestern Mendoza province; *P. vociferator* (Pincheira-Donoso, 2004) from south-central Chile; *P. dorsimaculatus* (Lobo and Quinteros, 2005a) in western Neuquén province; and *P. querque* (Lobo and Quinteros, 2005a, Lobo *et al.*, 2010) from Laguna Blanca, Neuquén province. All of these species can be distinguished from *P. gynechlonus* and the Uspallata species (See Diagnosis below). Specimens of *Phymaturus* have been reported from the region of Chile just west of the Argentine border through which Darwin passed on his return. According to Pereyra (1991), there is population of *Phymaturus* 30 km south of Laguna del Inca, at Mina La Disputada (33°10'S; 70°19'W), which is the same species found in Maule province far to the south, and therefore not the same species that occurs in the Sierra de Uspallata. Laguna del Inca and Portillo are just west of the Paso de Bermejo, and not far from Darwin's route. On their map, Cei and Sclaro (2006) indicated the existence of specimens from the area of Portillo and Laguna del Inca, but provided no descriptions or information concerning their whereabouts. However, it is unlikely that Darwin was able to collect anything on this, the last leg of his journey. He became quite ill on the return trip, and on 9 April he wrote in his journal that he "saw nothing enjoyed nothing."

Identity of the neotype of *Phymaturus palluma*

On 24 March 1835, Darwin (*in* Chancellor and Van Whye, 2009; available also online at <http://darwin-online.org.uk/>) described a viviparous lizard he collected at Cordón del Portillo as "Viviparous (Autumn) Lizard: centre of back. scales. black edged narrowly with dirty yellow this band broadest in centre: on each side of this ash-colored space: — sides scales blackish brown: rather more broadly edged with yellow — Belly pale ash color; legs and head do [furnished] with few black spots: killed by blow of hammer: young are protruded: soon died: high barren mountain first limit of bushes." This is the only mention of a viviparous lizard in Darwin's notebooks from the time he left Santiago, Chile and returned. The pattern he described is characteristic of the dorsal, lateral and ventral pattern described for members of the *Phymaturus palluma* group by Lobo and Quinteros (2005a) and Lobo and Abdala (2007). Also, there is a deep cut that is clearly visible on the neck of the type specimen of *P. palluma* (Fig. 1). At our request, Dr. Patrick Campbell, Curator of Reptiles at the British Museum of Natural History, examined the specimen and reported, "I can confirm that there is indeed a definite break in the skin which may well have been caused by the strike of a hammer. There is quite a large hole in this position. I also can confirm that by feel, the skull is quite cleanly broken here." Furthermore, the skin

along the sides of the abdomen is flaccid, characteristic of females that have recently undergone parturition. Species of *Phymaturus* in the *palluma* group for which their reproductive biology has been studied indicate that *Phymaturus* females are gravid and experience parturition in late summer or early autumn, late February or in March (Habit and Ortiz, 1996, Boretto and Ibarguengoytia, 2006; Boretto *et al.*, 2007; Boretto, 2008). Two females of the Uspallata species (Vallecitos) that we examined are gravid with embryos fully developed on 30 March (MCN 3128 and 3129). Thus, the known dates for parturition of *Phymaturus* in this region are consistent with Darwin's report of his viviparous lizard. Samples of *Phymaturus* collected during the last two years at Cordon del Portillo were available for our examination, and these samples exhibit the color pattern consistent with Darwin's description. The scalation is consistent with that of the neotype of *P. palluma* (see description of the neotype below). No other lizard species exhibiting "dirty yellow" (Darwin's description) occurs in this area.

The only members of the *palluma* group that occur within the region through which Darwin traveled in Argentina are the Uspallata species and recently described (Corbalán *et al.*, 2009) *Phymaturus gynechlonus*. The latter is the only known species that is likely to occur at the Cordon del Portillo. The color pattern of the female is consistent with Darwin's description and the scalation is consistent with that of the neotype of *P. palluma*. No other lizard species exhibiting "dirty yellow" (Darwin's description) is found in this area. It therefore seems likely that *P. gynechlonus* is a synonym of *P. palluma*.

Description of the neotype of *Phymaturus palluma*

BMNH 1946.8.29.84. Cordón del Portillo, Mendoza province, Argentina. 24 March 1835. Charles Darwin col. Female (Fig. 2). SVL 88.0 mm. Head width 18.5 mm. Axilla-groin distance 44.0 mm (50% of Snout-vent length). Humerus length: 10.5 mm. Tibia length: 16.0 mm. Foot length: 19.5 mm. Tail length (complete, not regenerated) 85.0 mm (0.96 times SVL). Body moderately wide, trunk width: 32.0 mm (36.3% of SVL). Twenty smooth dorsal head scales. Nasal bordered by eight scales, not in contact with rostral. Canthal separated from nasal by two scales. Loreal region flat. Twelve enlarged supralabial scales with the tenth upturned posteriorly but not contacting subocular. Eight convex, juxtaposed temporals. Distance between eye and auditory meatus: 6 mm. Mental subpentagonal, in contact with six scales. Interparietal larger than parietals and bordered by eight scales. Frontal region without an azygous scale. Eight scales between frontal region and rostral. Supraorbital semicircles inconspicuous. Six scales between superciliaries and frontal region. Seven slightly enlarged supraoculars. Ten to eleven juxtaposed short

superciliaries. Fourteen upper ciliary scales. Twelve lower ciliary scales. Subocular unfragmented, separated from supralabials by one row of lorilabials. Fifteen lorilabials, the fourteenth contacting subocular. Preocular separated from lorilabial row by three scales. Scales of throat round, flat, and juxtaposed. At least eighty gular scales between auditory meata. Lateral nuchal folds well developed, with granular scales all over their surfaces. Antehumeral pocket well developed. In ventral view, gular fold not well developed and posterior gular folds present with their anterior margins without enlarged scales on their borders. Thirty-four scales on chest between humeri. Belly with hypertrophied lateral folds of skin. Dorsal scales round, smooth, juxtaposed. Dorsal scales along mid trunk between the level of shoulders and thighs. Thirty-two dorsal scales along midline of the trunk in a distance equivalent to head length. Thirty-eight scales across trunk (at mid-body) in a distance equivalent to head length. Mid-dorsal scales not larger than those on flanks. Ventral scales larger than dorsals. Ventral scales between antehumeral fold and cloaca 108. No precloacal pores. Width of proximal end of tail 13.8 mm. Number of tibial scales (ventral view along midline) between knee and heel 23. Number of thigh scales (ventral view along midline) between knee and the level of groin 28. Number of supradigital lamellae

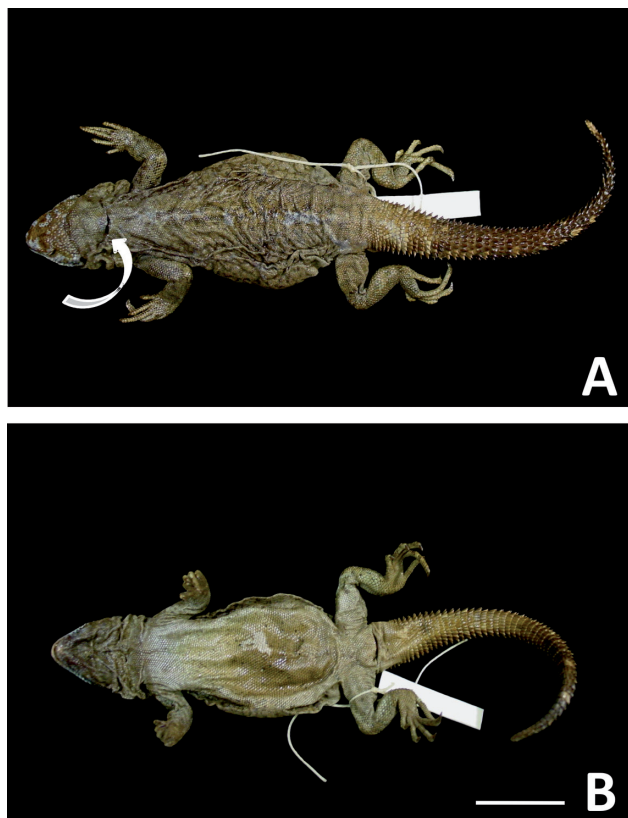


Figure 2. (A) Dorsal and (B) ventral views of the neotype of *Phymaturus palluma* (BMNH 1946.8.29.84) respectively. See the conspicuous evidence over the dorsum of neck (arrow) of how the individual was sacrificed by Charles Darwin. Scale = 20 mm.

Table 1. Measurements (mm) of two scales of the loreal region of *Phymaturus palluma* (including the type specimen from Cordón del Portillo and those previously identified as *P. gynochlorus*), the Uspallata species, and two Chilean samples. X = mean, SD = standard deviation, MIN = minimum, MAX = maximum.

	X	SD	MIN	MAX
<i>P. palluma</i> (N = 10)				
Canthal length	1.35	0.21	1.00	1.6
Preocular length	1.79	0.23	1.50	2.2
Canthal/preocular	0.76	0.12	0.54	1
Uspallata/Southern San Juan Province populations (N = 18)				
Canthal length	1.26	0.14	0.90	1.50
Preocular length	1.92	0.16	1.60	2.20
Canthal/preocular	0.65	0.08	0.50	0.88
El Planchón/San Clemente, Chile populations (N = 16)				
Canthal length	1.61	0.30	0.90	2.10
Preocular length	1.14	0.42	0.50	2.20
Canthal/preocular	1.53	0.49	0.88	3.33

of finger III 14. Length of finger III 8.5 mm. Number of subdigital lamellae of toes I 11; II 18. Claws moderately long (fourth toe claw: 2.0 mm).

Color of neotype in alcohol. Dorsal background brown with a diffuse reticulated pattern of fine irregularly distributed dark lines formed by one to two scales in width. This pattern is more conspicuous on flanks. Also this pattern is projected over fore- and hindlimbs. Dorsal side of tail dark brown but not forming any evident pattern. Throat dark brown, chest and most part of abdominal region immaculate with the exception of very few and widely scattered small spots. Ventral surface of tail light brown.

Diagnosis of *Phymaturus palluma*. *Phymaturus palluma* is a member of the *palluma* group (Etheridge, 1995), distinguished from members of the *patagonicus* group by having rectangular and non-overlapping superciliary scales, a fragmented subocular, lorilabials in two or more rows, dorsal caudal scales rugose, and an open Meckel's groove (Lobo and Quinteros, 2005a). Within the *palluma* group, *P. palluma* differs from Chilean specimens (which up-to-now have been considered as *P. palluma*) in having less fragmented head scales, conspicuous in the loreal and preocular regions where the preocular scale is larger than the canthal (Table 1). Smaller scales in the loreal and preocular region are unique in Chilean populations (Fig. 3). In female *P. palluma* the sides of the head are white, unlike Chilean specimens. Transverse light stripes on the trunk are more often present in Chilean specimens, rarely in *P. palluma* females (Fig. 4). The throats of Chilean females are immaculate or with very few spots, whereas in *P. palluma* females they are often melanistic as in males. The dorsal surface of the

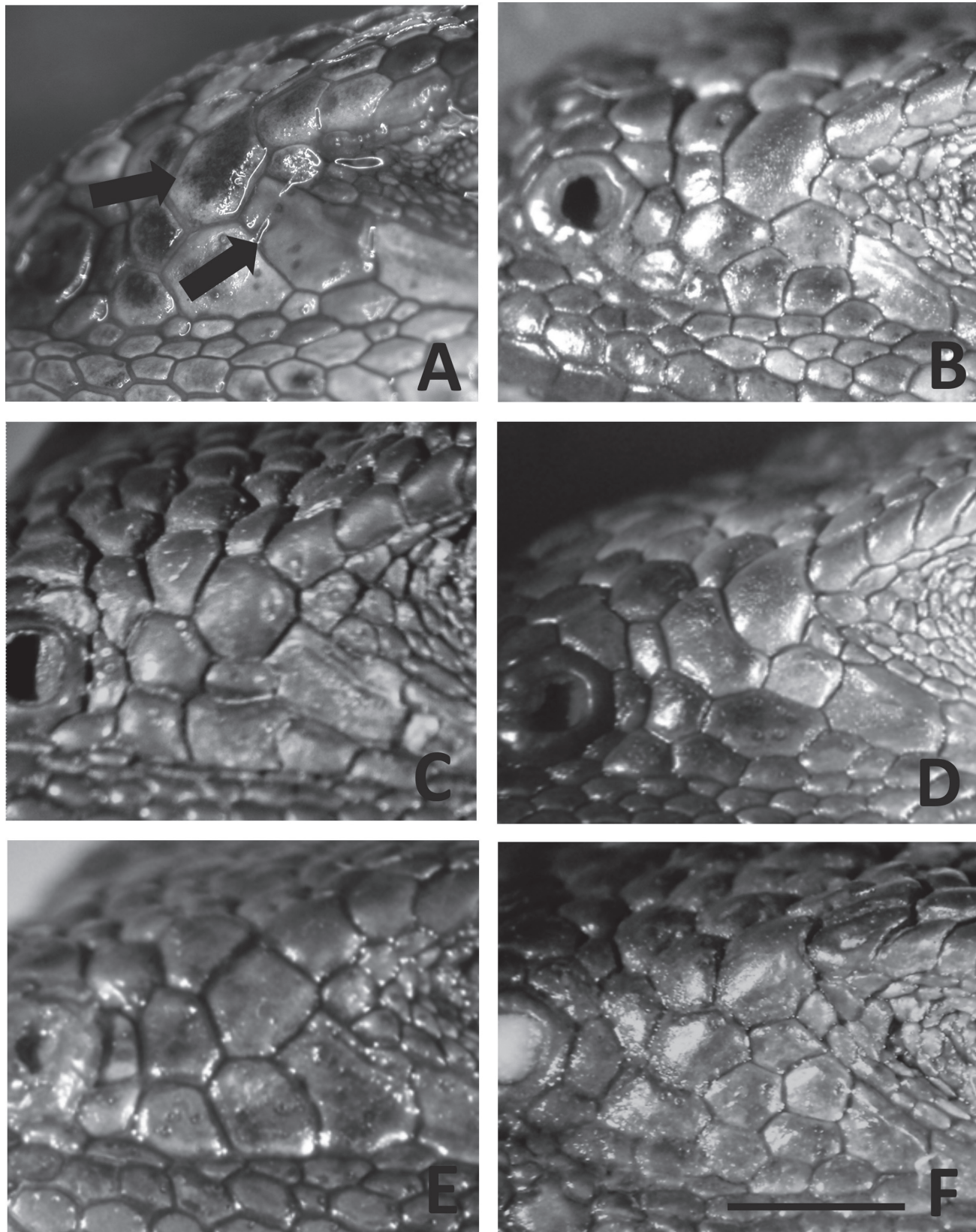


Figure 3. (A) Left side of head of *Phymaturus palluma* BMNH 1946.8.29.84 (neotype). Arrows indicate canthal and first preocular scales. Notice that in the type and all Argentine specimens, the preocular scale is larger than the canthal. (B) *Phymaturus* sp. El Planchón, Chile (MNHN 1632). (C) *Phymaturus* sp. from Uspallata, Mendoza province, Argentina (MCN 2107). (D) *Phymaturus* sp. El Planchón, Chile (MNHN 1638). (E) *Phymaturus* sp. from Uspallata, Mendoza province, Argentina (MCN 2110). (F) *Phymaturus* sp. El Planchón, Chile (MNHN 1643). Scale = 4 mm.

head is melanistic in adult males of *P. palluma* but in adult male of the Chilean species melanism is restricted to the sides of the head. Additionally, Pereyra (1991) found that specimens from Curicó, Talca, and the Metropolitan region of Chile are karyotypically different from those from San Juan and Mendoza provinces in Argentina. Chilean specimens have $2n = 35(M)/36(F)$, those from Argentina $2n = 29(M)/30(F)$. *P. palluma* differs from those members of the *palluma* group included in the *puna* clade (Lobo and Quinteros, 2005a)—i.e., *P. punae*, *P. mallimaccii*, *P. laurenti*, and *P. antofagastensis*—in having a reticulate dorsal pattern rather than a pattern of fine and regular spotting “spray pattern” (of Lobo and Quinteros, 2005a). Males of *P. verdugo* have a completely black head, the black pigment extending back onto the dorsum of the shoulders; females exhibit almost no pattern, and commonly are light brown. In adult *P. roigorum* there is no dorsal melanism, and their dorsal reticulation extends over the head. In adult males of this species the yellow color is restricted to the tail, whereas in male

P. palluma their entire dorsal surface is yellow. Females of *P. dorsimaculatus* and *P. vociferator* have lateral transverse black bars on the shoulders and sides of the head, whereas black bars are absent in females *P. palluma*. In *P. vociferator* males these bars become fused on the anterior flanks to form a continuous black area. In *P. dorsimaculatus* the second chinshields are in contact midline but are separate in *P. palluma*. Comparison with the population of the Uspallata species and *P. gynechlomus* becomes problematic because they are morphologically quite similar. All three forms, *P. palluma*, *P. gynechlomus*, and the Uspallata species (including specimens from southern San Juan province) have white-faced females, and the reticulate dorsal body pattern (which can be inconspicuous in some individuals). However, the Uspallata species exhibits a bolder dorsal reticulate pattern than *P. palluma* and *P. gynechlomus* (Figs. 5 and 6). According to Corbalán *et al.*, (2009) females of *P. gynechlomus* do not exhibit any pattern at all, but in specimens examined by the authors from the type locality (Fig. 6) and from Valle Hermoso (south of Laguna

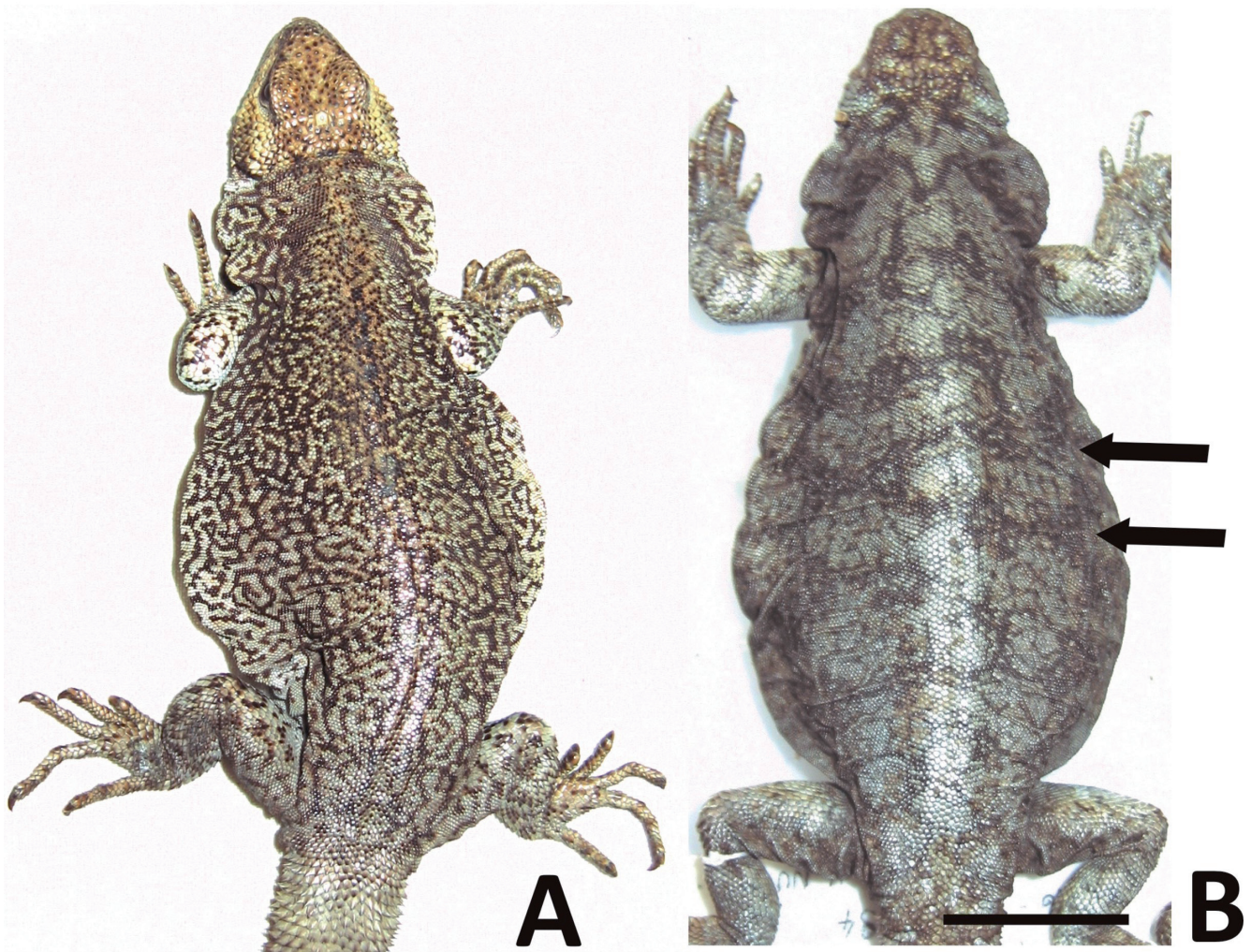


Figure 4. Dorsal view of females of *Phymaturus palluma*. **(A)** MCN 3130. Female from Cordón del Portillo. **(B)** MNHN 1631. Female from El Planchón, Chile. Arrows indicates transversal dark stripes present in females of Chilean populations. Scale = 20 mm.

Diamante) females may or may not exhibit the fine reticulate pattern. Females collected in Cordón del Portillo (Fig. 4) exhibit the same thin reticulated pattern of the neotype. Females of the Uspallata species lack flank color that it is present in *P. palluma* and *P. gynechlomus* (Fig. 6). Males of the three populations (*P. palluma*, *P. gynechlomus*, and Uspallata species) exhibit a “dirty” melanic dorsum of head, in contrast to *P. verdugo*, in which the black is intense and complete.

We re-examined specimens from the Sierra de Uspallata (around 32°28'S; 69°09'W) but also from the western slopes of the Andean mountains (between 33°21'S; 69°51'W and 35°62'S; 69°95'W), north and south of the type locality of *Phymaturus gynechlomus* and from the type locality of *P. gynechlomus* (see Appendix) and specimens collected at Cordón del Portillo. Corbalán *et al.* (2009) did not list coordinates but the *P. gynechlomus* type locality is not hard to locate: “...collected in rocky slopes near Cruz

de Piedra River, 2 km W of Alvarado Refuge of Laguna del Diamante Reserve, (2433 m of elevation), San Carlos Department, Mendoza province, Argentina”. This site is situated very close to the entrance to the Reserva Laguna Diamante; other material corresponds to a location near the type locality of *P. gynechlomus*: from Quebrada Cruz de Piedra, Departamento San Carlos, collected by R. Sage (MVZ 180771–74). We were unable to find any characteristics to distinguish *P. palluma* from *P. gynechlomus* (Fig. 6).

Scolaro (2010) stated that the Sierra de Uspallata should be considered the type locality of *Phymaturus palluma* and that Darwin probably collected a specimen (now the neotype of that species) in this region. However, Darwin was very precise in relation to the locality where he captured a “viviparous lizard” (Cordon del Portillo, 24 March 1835), and we see no reason to consider his notes mistaken. Darwin never mentioned collecting any lizards in the Sierra de Uspallata, and *Phymaturus palluma* is the

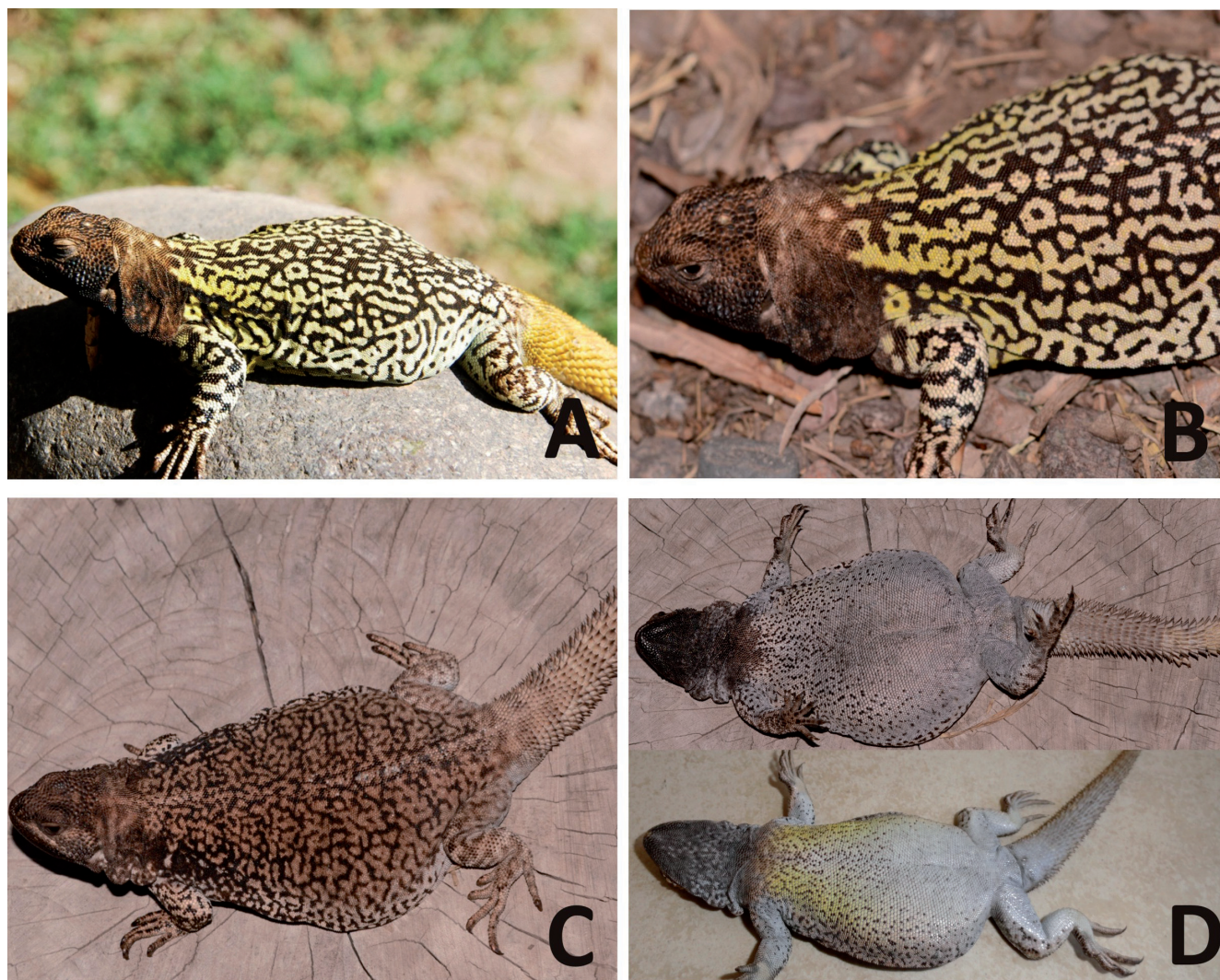


Figure 5. (A, B) Male of the Uspallata *Phymaturus* species. (C) Female of the same species. (D) Ventral views of females of the Uspallata species (upper) and *P. palluma* (exhibiting flank color).

species of *Phymaturus* collected by Darwin housed in the British Museum. Thus there is no evidence that Darwin collected the type of *P. palluma* in the Sierra de Uspallata.

Scolaro's (2010) statistical support for his conclusions is based on a very small sample of *Phymaturus gynechlomis* from Laguna Diamante (7) and individuals from Uspallata (8). The sample lacks representatives from Cordón del Portillo and includes a third species, *P. vociferator* (5). It failed to include *P. verdugo* and/or *P. roigorum*, which also are closely related species (see Lobo and Quinteros, 2005a; Lobo *et al.*, 2012). Scolaro (2010) made his analysis without taking into consideration the extended range of populations and distribution from southern Mendoza to the latitude of Uspallata (see maps in Lobo and Abdala, 2007; Corbalán *et al.*, 2009), which should be surveyed (including Cordón del Portillo that is included between both extremes). While Scolaro (2010) obtained measurements of the neotype he did not notice the cut over the neck

made by a hammer, as Darwin himself recorded as the method in which the animal was sacrificed on the same page where he stated that he collected a "dirty yellow," "viviparous" lizard on the same day he was at "Cordón del Portillo" (Darwin in Chancellor and Van Whye, 2009).

The status of *Phymaturus adrianae*

In 1992 Pereyra gave a presentation at the Congress of the Argentine Herpetological Society in La Plata, Argentina, during which he proposed the recognition of the Uspallata species as a new species. In the published abstracts of that meeting (Pereyra, 1992), the name appears in the title and in the text as "*Phymaturus adrianae* n. sp." His specimens of this species were said to have come from "San Juan y Mendoza de Argentina." Subsequently Cei and Videla (2003) used *P. adrianae* for the

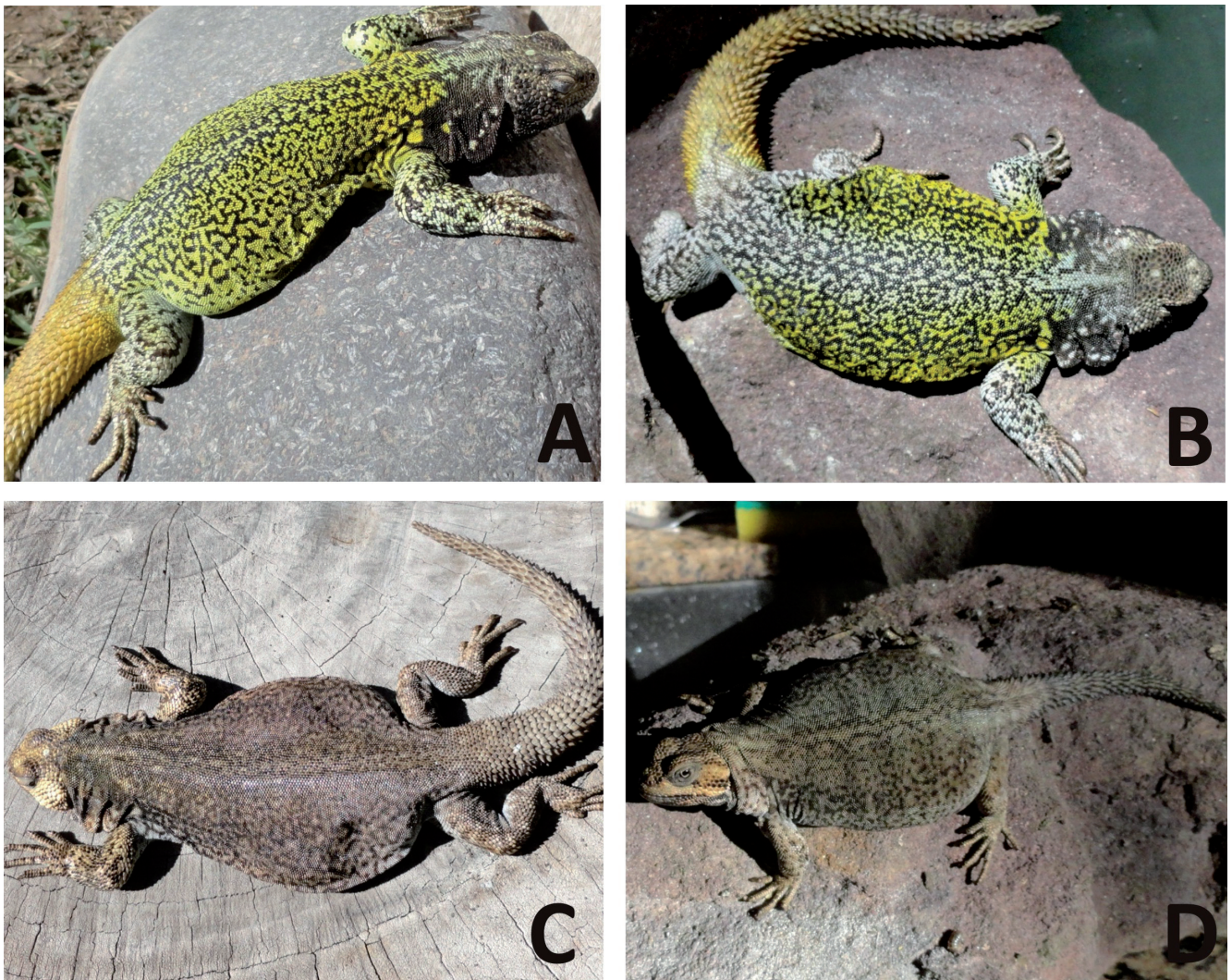


Figure 6. (A, C) Male and female of *Phymaturus palluma* from Cordón del Portillo (Arroyo Guardia Vieja). (B, D) Male and female of *Phymaturus gynechlomis* (= *P. palluma*) from its type locality. Both females exhibit a fine reticulated pattern.

same population, attributing the name to Pereyra, citing his unpublished master's thesis (Pereyra, 1991) and the published abstract of the congress (Pereyra, 1992). They employed this name for Argentine specimens from Paramillo de Uspallata, Las Heras department, Mendoza province (at about 3000 m) studied by Videla (1982), and for specimens from the "Uspallata highlands." Additionally, Cei and Videla (2003) provided several diagnostic characteristics and a color photograph (plate 4.1) of the species. The name was also used by Pincheira-Donoso (2004) in his description and diagnosis of *P. vociferator*. Because the abstracts of the congress (Pereyra, 1992) were primarily for use of participants, the name *P. adrianae* is not available (ICZN Code Art. 9.9). Although the publication of Cei and Videla (2003) contains information sufficient to diagnose the species, it does not qualify as a valid description because there is no explicit designation of a holotype or syntype, required for all species descriptions after 1999 (ICZN Code Art. 16.4). Thus the name *P. adrianae* must be considered a *nomen nudum*.

DISCUSSION

Based on the day-by-day account of Darwin's round-trip journey from Santiago, Chile, to Mendoza, Argentina, as well as on Darwin's field notes taken during that time, we conclude that the holotype of *Centrura flagellifer*, now the neotype of *Phymaturus palluma*, was collected by Darwin at Cordón del Portillo in northwestern Mendoza province, Argentina, on 24 March 1835. Critical evidence includes Darwin's brief description of the specimen, his statement that it gave birth to its young, and that it was killed by the blow of a hammer, the last point confirmed by the Curator of Reptiles at the Natural History Museum, London. Additionally, specimens recently collected at the type locality conform to the characteristics of scalation and color pattern of the neotype. We also conclude that *P. gynechlomis* is a junior synonym of *P. palluma*. As a separate issue, we find that the name *P. adrianae*, proposed for a species that occurs in the Sierra de Uspallata, northern Mendoza province and southern San Juan province, is a *nomen nudum*.

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APPENDIX

Material examined

***Phymaturus dorsimaculatus*.** MCN 1573 (Holotype): Copahue, Dpto. Ñorquin, 37°49'S; 71°06'W, Neuquén, Argentina, Abdala, C.; Avila, L.; F. Lobo; M. Morando, col. 13/01/1999. MCN 1571–1572, 1574–1575 (Paratypes): Same data as holotype. MCN 1568–1569: Termas de Copahue, Dpto. Ñorquin, Neuquén, Argentina, 37°49'14"S, 71°05'12"W, 2050 m, 13/01/1999. MCN 1566–1567: Copahue, Dpto. Ñorquin, Neuquén. MVZ 232503: Depto. Ñorquin, Barda W Termas de Copahue. 2050 m, Neuquén, Argentina, M. I. Christie, 29/12/94. MCN 1566–1567, MCN 1484–1488 (CS): Copahue, Dpto. Ñorquin, Neuquén, Argentina, D. Pérez, 01/99.

***Phymaturus palluma* (= *Phymaturus gynechlomus*).** MCN 3130–3131: Camino al Portillo Argentino (Cordón del Portillo), 33°36'53.8"S 69°29'16.7"W, Mendoza, Argentina. MCN 3612–13, 3619–22: Camino al Portillo Argentino, Arroyo Guardia Vieja, 33°36'53.8"S, 69°29'16.7"W, Prov. Mendoza, Argentina. MVZ 126991: Dpto Malargüe, Valle Hermoso, Prov. De Mendoza, Argentina, R. Sage, 5/1/69. 35°20'S; 70°15'W. MVZ 126992–126894: Lago de la Niña Encantada, 6 km E de los Molles, 2000 m, Prov. De Mendoza, Argentina, R. Sage, 9/1/69. 33°18'S; 69°83'W. MVZ 126995. Dpto Malargüe, en el extremo norte del Valle Hermoso, Prov. Mendoza, Argentina, R. Sage, 12/1/69, 35°11'S, 70°10'W. MVZ 126996–126999: Depto. Tupungato, Quebrada de Chupasangral, 4 km NW Cerro Chupasangral, 2800 m, Prov. Mendoza, Argentina, R. Sage, 28/1/69, 33°21'S; 69°51'W. MVZ 127025–127027: Depto. Malargüe, 2 km E Agua Botada Prov. Mendoza, Argentina, R. Sage, 24/3/70. 35°62'S, 69°95'W. MVZ 180771–180774. Depto. San Carlos, Quebrada Cruz de Piedra. Prov. Mendoza, Argentina, R. Sage, 28/12/75, 34°26'S, 68°90'W. MCN 3627–30, 3635–43, 3645: Camino a Laguna Diamante, 34°14'33.6"S, 69°24'00.0"W, Depto. San Carlos, Prov Mendoza, Argentina.

***Phymaturus Uspallata species*.** SDSU 1969–1970: Argentina: Prov. Mendoza, Dpto. Las Heras, 20 km NE Uspallata, 2500 m, R. Etheridge, 26.I.83. SDSU 3387: Argentina, Prov. Mendoza, Dpto La Heras, 27 km NE Uspallata, 32°28'52.2"S, 69°09'59.2"W, 2768 m, R. Etheridge, R. Espinoza, S. Torres, E. Pereyra, 10.II.95. SDSU 3388: Argentina, Prov. Mendoza, Dpto La Heras, 27 km NE Uspallata, 32°28'52.2"S, 69°09'59.2"W, 2768 m, R. Etheridge, R. Espinoza, S. Torres. MVZ 145146: Depto. Las Heras, Pampa de Canota, 20 km E, 8 km S Estancia Uspallata, 3000 m, Prov. Mendoza, Argentina, R. Sage, 12/11/68, 32°65'S, 69°27'W. MVZ 92902, 92904, 92908 (DS): Dpto. Las Heras, Mendoza, Argentina, 16/12/67, R. Sage. REE-SDSU 2306–2307, 2312–2313, 2315 (DS): 20 km NE Uspallata, 2500 m, R. Etheridge, 26/1/83. IADIZA-CH. S/N (2 specimens): Paramillos, Prov. de Mendoza, Argentina. IBA 760 (4 specimens): Paramillos, Mendoza, 2000 m, Argentina, 1/71, L. G. Castro. MCN 2650–2653, 2659–2662, 2696–2708: El Portezuelo, San Juan province, Argentina, Espinoza, R. E., F. Lobo, E. Sanabria, L. Quiroga. MCN 3614–17, 3624–26: Paramillos, prov de Mendoza, Argentina, 32°28'59.3"S, 69°07'36.5"W. MVZ 127023: Depto. Las Heras, 2 km E Los Hornillos, Prov. Mendoza, Argentina, R. Sage, 13/2/70. 32°51'S, 68°99'W.

***Phymaturus cf. palluma* (Maule, Chile).** MVZ 232506–232507: On the road to Laguna del Maule (Los Condores Pass), Talca Prov., elevation 1800 m. Region VII (= Region del Maule), Chile, R. Sage, 18/4/87.

***Phymaturus roigorum*.** MCN 1963 (Holotype): Puesto Rojas, 16 km de Ruta Provincial 180, El Nevado, Departamento de San Rafael, Mendoza province, C. Abdala, R. Juarez, C. Robles. MCN 1962: same data holotype. FML 17705–17708 (Paratypes): same data holotype. MCN 2096–2103 (Paratypes): 6 km al Sur de Real del Molle, sobre la base del volcán Payún Liso, 2128 m, 36°28'51.1"S, 69°22'27.9"W, Departamento de Malargüe, Provincia de Mendoza, Argentina, C. S. Abdala, R.

Juárez, J. P. Juliá, A. Brunetti, 05/03/2006. SDSU 1948–1951, 1956, 1962 1964–1965: Argentina, Prov. Mendoza, Dpto Malargüe, 3 km NW of base of Volcán Payún, R. Etheridge, 4/02/1983. SDSU 1972, 1974–1975: Argentina, Prov. Mendoza, Dpto Malargüe, 10 km south of base of Volcán Payún, R. Etheridge, 4.II.83. REE-SDSU 2323–2327 (DS): 4 km W Base Volcán Payún, 200 m, Dpto. Malargüe, Prov. de Mendoza, Argentina, R. Etheridge, 4/02/1983. IADIZA-CH 00091: Base del Volcán Payún, 1800–2000 m, Prov. de Mendoza, Argentina, J. M. Cej, F. Videla, 31/01/1982. IBA 733 (5 specimens): Base Campamento, Lado SW del Payún, Mendoza, Argentina, 06/01/1971, L. P. Castro.

Phymaturus cf. palluma (CH). MVZ 199435–199438, 230992. Hotel Termas de Chillán. Region VIII (= Region del Bío Bío), Chile. J. H. Carothers col. 1/12/1985. MCZ 165456. Cordillera de Chillán. Chile. G. Moreno col. 25/02/1978. MCZ 169935. Chile. Philippi col.

Phymaturus querque. IBA 793 (4 specimens). Laguna Blanca. Neuquén, Argentina. J. M. Cej, L. Cej and R. Ferreira cols. 6/01/1972. MVZ 232504–232505. Puesto Control, 3.5 km N Co. de 1 Laguna PN Laguna Blanca. 23°80'S; 56°83'W. Dpto. Zapala, prov. de Neuquén, Argentina. 1800 m. 18/03/1994. M. I. Christie col. SDSU 1971. Argentina: Prov. Neuquén: Dpto Zapala: south shore of Laguna Blanca. R. E. Etheridge col. FML 34514, 17712–17713. Laguna Blanca, Laguna Blanca National Park, Neuquén province, Argentina. C. Abdala, S. Quinteros, G. Scrocchi, J. C. Stazzonelli col. 11/18/2007.

Phymaturus cf. palluma (EP). MNHN 2352, 2460–2461. Baños del Campanario (1500 m), Talca, San Clemente. 2-3/2/1992. J. C. Torres-Mura. MNHN 3505-3509. Curicó Puesto Militar San Pedro, Pichuante, Cuesta Vergara. Chile. 35°10'S; 70°36'W. H. Núñez and A. Labra cols. 27/02/84. MNHN 1632–1633, 1638, 1643. El Planchón (Int. Curicó). 26/II/1984. M. A. Labra and H. Núñez cols.

Phymaturus verdugo. MCN 1958, 1960–1961. Río El Gancho 4 km from Las Loicas. 01/02/2006. Abdala, C.; R. Juárez; C. Robles col. Mendoza province, Argentina. MCN 1973–1977. 12.5 km from Las Loicas to Bardas Blancas, road to El Pehuénche. 01/02/2006. Abdala, C.; R. Juárez; C. Robles col. Mendoza province, Argentina.