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A new species of *Phymaturus* from rocky outcrops in the central steppe of Rio Negro province, Patagonia Argentina (Reptilia: Iguania: Liolaemidae)

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Abstract

A new *Phymaturus* species called *Phymaturus ceii*, in the honour of the late Professor José Miguel Cei, is described in the present study. The new species is a member of the "*Phymaturus patagonicus*" group from Patagonia. It lives at about 1200 m of altitude in a volcanic rocky habitat near to El Cuy plateau, in the central steppe of Rio Negro province, Argentina. The new species and the closely related *P. patagonicus* are morphologically compared, and its distribution and natural history are pointed out.

Key words: *Phymaturus ceii*, Liolaemidae, Patagonian Reptiles, Rocky Lizard, taxonomy

Resumen

Una nueva especie de *Phymaturus* denominada *Phymaturus ceii*, en honor al Profesor Dr. J.M. Cei se describe en este trabajo. La nueva especie pertenece al "grupo *Phymaturus patagonicus*" de Patagonia. *Phymaturus ceii* se encuentra a una altitud de aproximadamente 1200 m, en roquedales volcánicos vecinos a la Meseta de El Cuy, estepa central de la Provincia de Río Negro, Argentina. La nueva especie se compara morfológicamente con *P.patagonicus*, cercanamente relacionada, y se aportan datos de distribución e historia natural.

Palabras claves: *Phymaturus ceii*, Liolaemidae, Reptiles Patagónicos, Lagarto de Rocas, taxonomía

Introduction

Phymaturus comprises a group of iguanian lizards inhabiting rocky places of Patagonian plateaus and cordilleran slopes of the Andes, both eastern and western sides of Argentina and Chile. The genus has increased quickly in number of species since Donoso Barros (1966) and Peters and Donoso Barros (1970) up to these days, from only one species with two forms, to about 19 species at present. Of these, only two species are found in Chile and the rest of them in Argentina (Chebez *et al*. 2005; Scolaro 2005, 2006).

According to Etheridge (1995), the genus, now included in the Liolaemidae, recognizes two groups of species based on morphological characters. The *palluma* (= *flagellifer*, Cei & Scolaro 2006) group comprises actually a total of eight forms: *P.flagellifer* (*palluma*) (Molina 1782), *P.mallimacci* Cei 1980, *P.punae* Cei, Etheridge and Videla 1983, *P.antofagastensis* Pereyra 1985 and *P.adrianae* (Pereyra 1992, *sensu* Cei and

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Videla 2003). Recently, more species have been added to this group like *P.verdugo* Cei and Videla 2003, *P.vociferator* Pincheira-Donoso 2003 and *P.dorsimaculatus* Lobo and Quinteros 2005.

The other group named *patagonicus* comprises presently a total of eleven species. The former *P.patagonicus* Koslowsky 1898, and several species initially described as subspecies of that: the southernmost distributed form *P.indistinctus* Cei and Castro 1973, *P.nevadoi* Cei and Castro 1973, *P.somuncurensis* Cei and Castro 1973, *P.payuniae* Cei and Castro 1973 and *P.zapalensis* Cei and Castro 1973. Recently more species have been added like: *P.excelsus* Lobo and Quinteros 2005, *P.spectabilis* Lobo and Quinteros 2005 and *P.tenebrosus* Lobo and Quinteros 2005. Within this group other species have been revalidated such as *P.spurcus* Barbour 1921 (Lobo & Quinteros 2005b) and now *P.calcogaster* Scolaro and Cei 2003 is also included, formerly considered in intermediate status between the both groups.

As Etheridge (1995) has pointed out, *Phymaturus* is characterized by having wide and flattened head and body, tail with regular whorls of spinose scales, lateral nuchal skin folds with fat-filled pouches, among other exclusive characters. For the *patagonicus* group, characters defining the group are the presence of elongate superciliaries that are overlapping, a single elongate subocular usually not fragmented, caudal smooth scales rather than keeled and the Meckel's groove fused and closed. Characters defining the *flagellifer* (= *palluma*) group are the non-imbricate superciliaries scales, five or more suboculars, three to four rows of lorilabials, mental narrower than rostral and usually in contact with infralabials, well developed caudal spines, and two annuli per segment.

The taxonomic status of the species, as well as other populations of *Phymaturus* are largely unresolved and remain still under study (Lobo & Abdala 2006). On the basis of the significant differences observed in a just discovered form from Río Negro central steppe, we now present it as a new species described and discussed below.

Material and methods

The new specimens (N = 25) were carefully examined, accurately measured, and compared with phenotypically close species of the genus. Measurements of standardized morphological characters, used in taxonomic studies, were performed using a precision calliper (0.1 mm) and a dissection stereomicroscope for other observations and scale counts. Data were obtained on adult individuals, recognized by the presence of mature gonads and the functional development of secondary sex characters. Data were analysed using *t*-test. Assumptions of normality were tested with the Snedecor F test. When normality or variance-homogeneity assumptions were broken, the non-parametric Mann-Whitney rank sum test was used (Sokal & Rohlf, 1969). For comparative purposes, arithmetic mean, standard deviation (SD), and range were given.

The unique combination of metric and meristic characters of a discovered population justifies its recognition and identification as a new species. The acronym for the mentioned herpetological collection where the holotype and paratypes are deposited is MLP-R, which stands for Museum of La Plata (Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, provincia de Buenos Aires).

Results

***Phymaturus ceii* n. sp.**
(Figures 1 and 2)

Type Material.Holotype: MLP-R 5289, adult male, collected in open rocky outcrops near Chasicó (40º 23' 02" S; 69º 00' 33" W; 1150 m asl), south of El Cuy Plateau, Rio Negro Province, Argentina. Collected by J.A. Scolaro and O.F. Tappari, 24 March 2006.

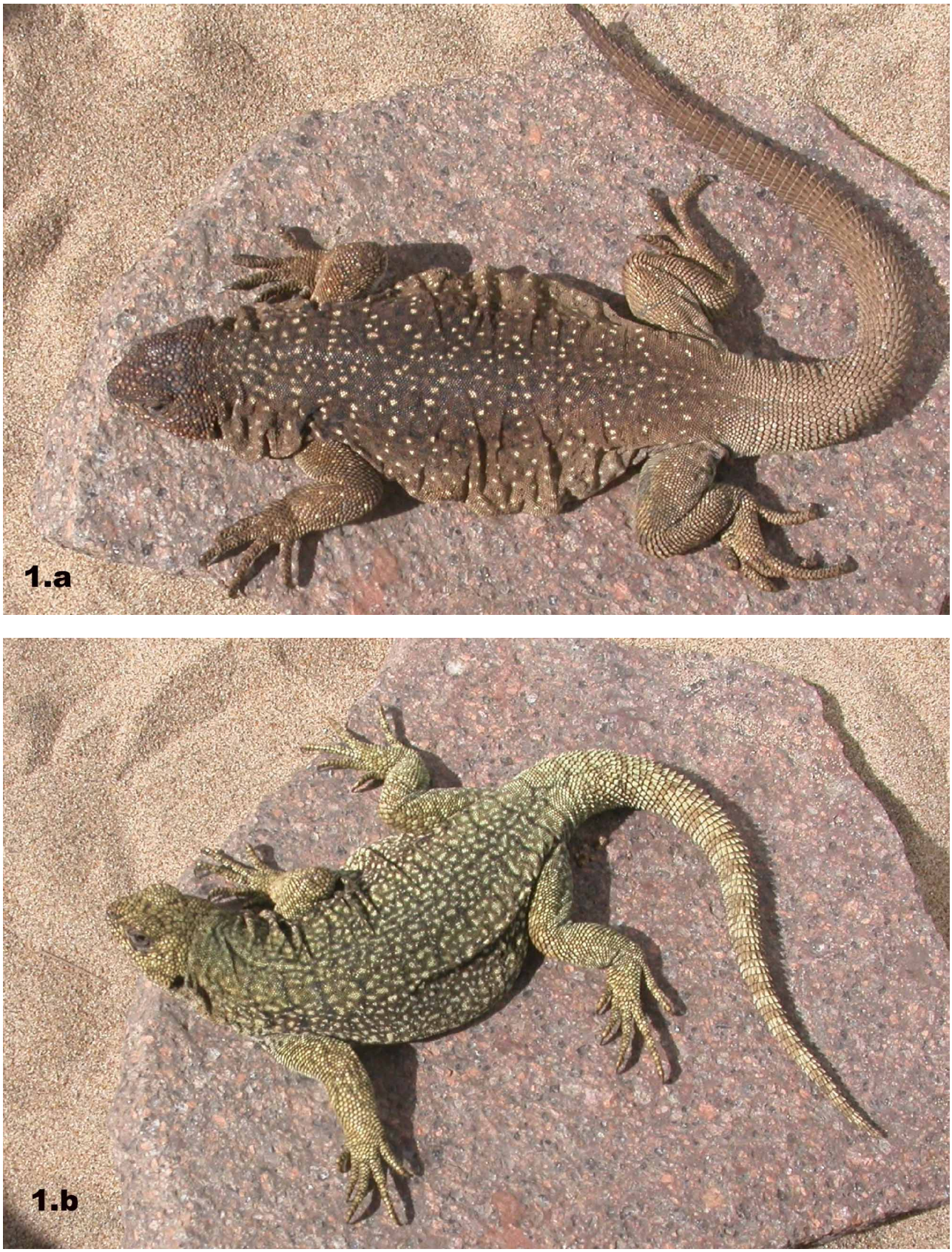

FIGURE 1. a. Adult male holotype of *Phymaturus ceii* in life from Chasicó, Río Negro, dorsal view. Photo: J.A. Scolaro, 24-03-2006. **b.** Adult male paratype of *Phymaturus ceii* in life from Chasicó, Río Negro, dorsal view, light greenish phase. Photo: J.A. Scolaro, 24-03-2006.

FIGURE 2. a. Adult female paratype of *Phymaturus ceii* in life from Chasicó, Río Negro, dorsal view. Photo: J.A. Scolaro, 24-03-2006. **b.** Adults male and female: ventral view. Photo: J.A. Scolaro, 24-03-2006.

Paratypes: MLP-R 5290, adult male; MLP-R 5291, adult female; MLP-R 5292, adult female; MLP-R 5293, adult male. All specimens have the same data of collection as the holotype.

Etymology. The species is dedicated to honour José Miguel Cei who reviewed this manuscript but died before its publication. He was internationally recognized and his work will remain indelible for future generations of herpetologists, because of his profuse and invaluable scientific contribution and proposal of new ideas for the biological sciences and evolution.

Diagnosis. *Phymaturus ceii* shows a noticeable sexual dichromatism. Males show a dorsal pattern of dark brown brick-like background, sometimes with light green shades intensely mottled with little white-grey spots. Females show a dorsal pattern of light brown background mottled with little grey spots and three strips, one vertebral and one on each side. These strips are conformed by dark brown scales of an intense variegated with numerous light brown spots separated by two strips of light brown scales. The coloration is dark brown, flecked with ocellus of irregular spots of a creamy colour, in different proportions on the limbs and an attenuated prominence of spiny scales on its caudal verticilles. It presents the Meckel's groove fused, undivided subocular scale, thin and imbricate superciliaries scales and smooth dorsal scales on the tail. It shows two rows of lorilabials scales between the subocular and the supralabials.

Description of the holotype. A medium-sized lizard; snout-vent length SVL 85.8 mm; tail length 104.6 mm (complete, not regenerated, 1.2 times of SVL); head length 17.7 mm; head width 15.8 mm; eye-nose distance 6.3 mm; forelimb length 26.8 mm; hind limb length 48.7 mm; axilla-groin distance 43.2 mm (50.3% of SVL); fourth finger length 11.6 mm; fourth toe length 14.4; scales in dorsal head 22; scales around midbody 234; ventral scales between mental and precloacal pores 178; supralabial scales 8-8; infralabial scales 7-8 decreasing posteriorly; subdigital lamellae on fourth finger 22; subdigital lamellae on fourth toe 28; precloacal pores 10; cephalic scales granular, almost smooth; supraorbital semicircles with large bulky scales, rounded, with an small azygous anteriorly, incomplete posteriorly on both sides; no distinct enlarged supraoculars; nine upper ciliaries; subocular elongate, slightly shorter than eye diameter, separated from supralabials by two rows of lorilabials; preocular separated from lorilabial row by two scales; temporals smooth irregularly quadrangular, in 7–8 rows from auditive opening to the subocular; external auditory meatus enlarged, transversal, with few enlarged (5–6) scales on its anterior border and diminute granular scales on posterior border; rostral more wide than high, separated by two small scales from nasals; nasal moderate, lateral, surrounded by 8 small scales; parietals irregular and rough with evident interparietal, surrounded by 8 scales; nuchals granular in few irregular rows; post–auricular folds evident with interposed transversal folds with round, almost granular, scales; undivided concave subocular; two lorilabial rows between subocular and supralabials; mental pentagonal smaller than rostral, surrounded by five irregular rectangular scales; two rows of 4–5 bilateral postmentals decreasing behind; dorsal scales small, round and juxtaposed; middorsal scales slightly enlarged decreasing smaller and granular toward ventro-laterals; ventrals slightly larger than dorsals, almost squared and smooth; gulars rounded and smaller; 75 gulars between auditory meatus; caudal scales quadrangular regularly imbricate in verticiles, proximally larger and smooth on dorsum, or softly keeled, distally more rectangular and keeled; scales in limbs round and slightly keeled in the upper side, granular and rounded in the lateral region, larger and flat in the lower side, infracarpals and infratarsals with round margins, becoming trifid to the base of fingers and toes. Subdigital lamellae of fingers keeled; claws moderately long.

Coloration. In life, the new species shows a notable sexual dichromatism. Males show a dorsal pattern of dark brown brick-like background, sometimes with light greenish tones intensely speckled with little white-grey spots; its head is uniform in colour and its tail can present soft light brown and dark brown alternate rings (Figure 1 a, b). Females show a dorsal pattern of light brown background speckled with little grey spots and three strips, one vertebral and one on each side, consisting of dark brown scales spattered with numerous variously light-brown spots. The dark strips are separated by two strips of light brown scales, which are sometimes irregularly broken. Its head is uniformly brown and its tail always presents rings forming two rows of scales, alternated with a soft light and dark brown colour (Figure 2 a). Ventrally, males show a pale reticulated

dark grey on the throat over a light grey background; the neck upper part of the abdomen and front legs show a light grey colour; while the lower part of the abdomen and thighs vary in colour, from a pale yellow to a pale brick-like red. Females show a similar variegated coloration on throat and neck and a homogeneous pale grey on the ventral surface and legs (Figure 2 b).

Morphological variation. The sample comprised 11 adult males and 14 adult females. Preliminary analyses allow us to establish sex differences being the females significantly larger in size than the males (SVL, $P < 0.01$; axilla-groin distance, $P < 0.01$). SVL 79.5–95.0 mm. Head length 15.0–20.9 mm representing 0.18–0.22% of SVL. Tail length 69.7–104.6 mm, 0.90–1.31 times SVL. Scales around midbody 232–245 (mean = 241.4; SD = 6.9). Dorsal head scales 19–23. Ventrals 175–190 (mean = 184.7; SD = 6.6). Precloacal pores only in males 6–15 (mean = 9; SD = 2.3). Scales surrounding interparietal 6–8 (mean = 7; SD = 0.8). Scales contacting mental 4–6 (mean = 5.1; SD = 0.8). Dorsal colour pattern is more variable between males than in females, from dark brown brick-like to light greenish tones background. Not all specimens shows strong ventral coloration (brick-like red), suggesting that this coloration may be related to season or physiological conditions. Other morphological measurements, means and ranges are shown in Table 1.

TABLE 1. *Phymaturus ceii*: means, standard deviations (SD) and ranges of the main morphometric characters. Measures in mm and scale numbers; ratios as proportions.

Variable	Males (N = 11)		Females (N = 14)		Comparison		
	Mean	Range	Mean	Range	Mean	SD	*P*
Snout-vent length (SVL)	84.1	79.5– 89.9	88.0	82.2 – 95.0	86.3	3.76	<0.01
Tail length (TL)	92.2	69.7 – 104.6	93.7	86.5 – 99.9	94.6	5.23	
Axilla-groin distance (AGD)	44.1	41.3 – 51.3	47.8	42.9 – 53.8	46.2	3.56	<0.01
Head length (HL)	17.3	15.0 – 20.9	17.4	16.5 – 18.6	17.4	1.08	
Head width (HW)	15.9	15.5 – 16.7	15.6	14.8 – 16.4	15.8	0.49	
Eye-nose distance (ED)	6.5	5.9 – 7.5	7.0	5.8 – 7.9	6.8	0.66	
Forelimb length (FLL)	30.3	26.8 – 32.4	30.9	28.5 – 34.9	30.6	1.84	
Hindlimb length (HLL)	47.5	41.8 – 50.6	46.6	43.1 – 50.8	46.9	2.34	
Fourth finger length (FFL)	10.7	9.1 – 11.6	10.7	9.2 – 13.3	10.7	1.05	
Fourth toe length (FTL)	14.2	13.4 – 15.5	14.1	11.3 – 18.8	14.1	1.36	
Head dorsal scales (HDS)	20.6	19 – 22	20.9	19 – 23	20.8	1.13	
Scales surrounding interparietal	7	6 – 8	7	6 – 8	7	0.8	
Fourth toe subdigital lamellae	27.3	25 – 29	27.6	25 – 31	27.5	1.36	
Fourth finger subdigital lamellae	22.9	22 – 24	22.2	21 – 24	22.5	1.08	
Supralabial scale number	8.3	8 – 9	8.3	7 – 9	8.3	0.76	
Infralabial scale number	8.2	7 – 9	7.7	7 – 9	7.9	0.76	
Scales contacting mental	5.4	4 – 6	4.9	4 – 6	5.1	0.78	
Precloacal pore number	9.2	6 – 15	–	–	9	2.31	
AGD/SVL ratio	1.11	1.04 – 1.22	1.09	1.00 – 1.16	1.10	0.05	
TL/SVL ratio	1.12	1.04 – 1.22	1.09	1.01 – 1.16	1.10	0.05	
HLL/AGD ratio	1.01	1.08 – 1.16	0.98	0.85 – 1.09	1.02	0.09	
HLL/SVL ratio	0.56	0.52 – 0.62	0.53	0.48 – 0.59	0.54	0.03	

Geographic distribution. *Phymaturus ceii* was found on isolated volcanic outcrops of the type locality. More explorations in neighbouring areas are necessary in order to determine the whole species range.

Natural history. The Chasicó locality in Río Negro is a landscape formation of mountains, basaltic plateau and slope erosions. It shows altitudes around 1000–1200 m above sea level. Volcanic effusions and strong wind erosion have sculptured the present relief of this extended plateau. The region's climate is characterized by prevalent cold aridity, 150–300 mm of annual rain, 8–10°C of mean temperature, with a strongly marked seasonal lack of humidity (in spring and summer), and intense winds from the west.

Phymaturus ceii's biotope is found inside the arid district of the Monte Austral, a steppe showing open ground, with gravel and effusive rocks. The dominant landscape is the barren steppe, with shrubby, low herbaceous coverage, with bare soil percentages above 50%. The dominant vegetation is composed by cushion bushes and sparse large clumps, the Floristic Physiognomy Dominion are low shrubby steppes (with *Nassauvia glomerulosa* "colapiche", *N. axillaris* "uña de gato", *Chuquiraga avellanedae* "quilimbay", *Mulinum spinosum* "neneo", *Senecio spp.* "charcaos", *Stillingia patagonica, Acantholipia seriphioides* "tomillo" and *Grindelia chiloensis* "melosa"), and mean shrubby-grass steppes (with *Prosopis denudans* "algarrobillo patagónico", *Prosopidastrum globosum* "manca caballo" and *Lycium spp.* "yaoyín", and bund grasses (*Stipa speciosa* "coirón amargo", *Festuca pallescens* "coirón dulce"and *Stipa humilis* "coirón llama"). On the basins, appears the halophilous shrubby steppe of *Atriplex lampa* "zampa" (Cabrera 1971).

The species inhabits a limited microhabitat and shares a general steppe habitat with other Iguanids *Liolaemus* (*L. elongatus, L. bibronii, L. boulengeri, L. rothi*), *Diplolaemus sexcinctus* and the gekkonid *Homonota darwinii*. However, because the new species tends to occupy only the rocky outcrops patches, few individuals of these other species share its microhabitat. The colubrid snakes *Philodryas patagoniensis* and *Philodryas trilineata* and the viperid *Bothrops ammodytoides* are common at the same locality, and may be its predators.

Discussion and conclusions

The new species *Phymaturus ceii* is a member of the *patagonicus* group of *Phymaturus.* It presents characteristics defined for the group by Etheridge (1995) and Lobo and Quinteros (2005b) for the "*patagonicus"* group like the Meckel's groove fused, undivided subocular scale, thin and imbricate superciliaries scales and smooth dorsal scales on the tail. Nevertheless, it distinguishes itself from the rest of *Phymaturus* species by its coloration, size, and lepidosis.

Ventral pigmentation and the dorsal colouring pattern are unique in *P.ceii* (Fig. 1 a), showing dark brown coloration flecked with ocellus of irregular spots of a creamy colour. This species also shows two rows of lorilabial scales between the subocular and the supralabial scales, an attenuated prominence of spiny scales on its caudal verticilles, and limbs of different proportions. Sexual dimorphism is more accentuated in *P. ceii* than in the rest of the species of the "*patagonicus* group" of the genus, except for *P. payuniae,* and the species of the "*flagellifer* (= palluma) group".

As regards *P. spectabilis, P. tenebrosus,* and *P. zapalensis*, *P. ceii* is distinguished from the rest of the "patagonicus group" by a smaller size (SVL, $P < 0.01$). It is distinguished from *P. somuncurensis* and *P. calcogaster* by having larger its hind limbs length and axilla-groin distance.

The increased scale number around midbody ($P < 0.01$) is one of the distinctive characters of *P.ceii*, together with the high number of ventral scales ($P < 0.01$), separating it from *P. patagonicus, P. spurcus, P. excelsus, P. spectabilis,* and *P. tenebrosus*. It also differentiates from these species and from *P. zapalensis*, with the exception of *P. calcogaster,* by showing two rows of lorilabials scales between subocular and supralabial scales.

In addition, to the variables listed above, *P. ceii* differentiates from *P. patagonicus* in having a larger number of the fourth finger lamellae and of the fourth toe lamellae ($P < 0.01$), and in the colour pattern (Table 2).

TABLE 2. Variation of some morphometric selected variables of *Phymaturus ceii* and *P. patagonicus* from Terra Typica (means, Standard deviations and *P* of Student's *t*-test).

	Phymaturus ceii			*P. patagonicus*			
Variables	N	Mean	SD	N	Mean	SD	*P*
Snout-vent length	25	86.3	3.8	18	84.1	6.2 #	
Scales around midbody	11	241.4	6.9	18	174.4	11.7 #	<0.01
Dorsals in head-length	25	20.8	1.1	18	20.9	2.1 #	
Ventral scales	11	184.7	6.6	18	156.5	9.1 #	<0.01
Subocular fragmentation	25	1.0	0	18	1.2	0.4 #	
Lorilabial rows	25	2.0	0	10	1.5	0.5	
Scales contacting mental	25	5.1	0.8	10	4.6	0.8	
Scales contacting interparietal	25	7.0	0.8	10	7.1	0.7	
Precloacal pores in males	11	9.2	2.3	11	10.6	1.6	
Fourth finger lamellae	25	22.5	1.1	18	16.7	1.8 #	<0.01
Fourth toe lamellae	25	27.5	1.4	18	22.5	0.7 #	<0.01

data from Lobo & Quinteros (2005a)

Phymaturus ceii differentiates from *P. spurcus, P. calcogaster, P. spectabilis,* and *P. zapalensis* for not having the subocular fragmented scale as these species have. Specifically, *P. ceii* also differentiates from *P. zapalensis* in the head shape showing a similar head width, but a longer head length and eye-nose distance. *Phymaturus ceii* has a higher number of scales contacting mental (5.4 *vs* 4), and a higher number of precloacal pores (9.2 *vs* 7.6).

Furthermore, *P. ceii* is distinguished from *P. indistinctus,* by having a smaller body size, sexual dimorphism and dichromatism, and by having less-developed lateral neck folding. *P. ceii* also is distinct from *P. nevadoi* and *P. payuniae* by its smaller body size, a more conspicuous sexual dimorphism and dichromatism, longer hindlimbs, and more-conspicuous spines in the caudal scales.

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Specimens examined and localities

Specimen numbers preceded by the acronym are in collections as follows: IADIZA-CH, Colección Herpetológica del Instituto Argentino de Investigaciones de Zonas Áridas, CONICET, Mendoza; IBA, Instituto de Biología Animal, Mendoza, Argentina; MACN, Museo Argentino de Ciencias Naturales "B. Rivadavia", Buenos Aires, Argentina; MLP-R, Colección Herpetológica del Museo de La Plata, Buenos Aires, Argentina; MCN-UNS, Museo de Ciencias Naturales, Universidad Nacional de Salta; JAS-DC, J.A. Scolaro-Diagnostic Collection; JMC-DC, J. M. Cei-Diagnostic Collection; UNCo-PH, Universidad Nacional del Comahue, Colección Herpetológica, Bariloche, Río Negro.

Phymaturus ceii. Rio Negro, Chasicó, 1150 m asl, south of El Cuy Plateau: MLP-R 5289 (Holotype), MLP-R 5290-93 (Paratypes); JAS-DC 1000, 1002-09, 1018-24, 1026-29, 1031.

Phymaturus calcogaster. Laguna de las Vacas, Telsen, Chubut: MACN 38109 (Holotype), MLP-R 5130-5135 (Paratypes); JAS-DC 797-800; JAS-DC 801-804.

Phymaturus indistinctus. Puerta del Diablo, Sarmiento, Chubut: JAS-DC 55, 399; Sierra de San Bernardo, Sarmiento, Chubut: JAS-DC 838, 839; Las Pulgas, Sarmiento, Chubut: IBA 666-1, IBA-2, 3.

Phymaturus nevadoi. Agua de la India Muerta, Nevado, Mendoza: IBA R-0999 (1-3).

Phymaturus patagonicus. 40 km west Dolavon, Chubut: IADIZA-CH 00080; JAS-DC 813-820; IBA-R 0789; JMC-DC 335-336, 760, 842-845, 1300; MCN-UNS 1284-87.

Phymaturus payuniae. Base del Volcán Payún, Mendoza: IBA 769-2(4-8); Meseta del Payún, Volcán Payún, Mendoza: IADIZA-CH 00087-8, 00087-9; JMC-DC 99, 807, 808.

Phymaturus somuncurensis. Meseta de Somuncurá, Río Negro: MLP-S 908-909, 1645-1651; MACN 37431-37440, 36147-48; Laguna Raimundo, Meseta Somuncurá, Río Negro: JMC-DC 337-338, 832-833; Cerro Corona, Meseta de Somuncurá, Río Negro: IADIZA-CH 00212 y 00254; JAS-DC 154, 211, 217-220, Laguna Blanca, Meseta de Somuncurá, R.Negro: JAS-DC 60, 609-614.

Phymaturus spurcus. Estancia Huanuluán, Río Negro: MCN-UNS 1237-49, 1262; JAS-DC 821-823, 825-831.

Phymaturus tenebrosus. Cerro Alto, Ruta 40, Río Negro: MACN 1271; MCN-UNS 1263-73; JAS-DC 811, 824, 832-837.

Phymaturus zapalensis. Laguna Teru, Zapala, Neuquén: IBA-R 0590, 0861, 0792; JMC-DC 007, 008; Laguna Blanca, Zapala, Neuquén: MLP-S 1942; sur de Piedra del Águila, Neuquén: IBA-R 0866; laguna del Burro: MLP-S 2273; Laguna Blanca: UNCo-PH 38,104, 109-113.