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A taxonomic revision of *Proctoporus bolivianus* Werner (Squamata: Gymnophthalmidae) with the description of three new species and resurrection of *Proctoporus lacertus* Stejneger

NOEMÍ GOICOECHEA,¹ JOSÉ M. PADIAL,² JUAN CARLOS CHAPARRO,³
SANTIAGO CASTROVIEJO-FISHER,^{4,5} AND IGNACIO DE LA RIVA¹

ABSTRACT

The genus *Proctoporus* comprises seven montane species distributed across the Central Andes of Peru, Bolivia, and northern Argentina. Within this genus, the extensive morphological variation observed in populations traditionally assigned to *Proctoporus bolivianus* suggested the presence of additional species. Using a combination of morphological character differences and a phylogenetic hypothesis based on mitochondrial (12S, 16S, and ND4) and nuclear (c-mos) DNA sequences, we find *P. bolivianus* to be composed of six distinct lineages. Among these, we name and describe herein *Proctoporus carabaya*, *P. iridescens*, and *P. kiziriani* and we resurrect the name *Proctoporus lacertus*. The remaining two lineages are also considered unnamed species and are referred herein as confirmed candidate species (CCS), which we refrain from naming due to lack of appropriate material. The new species named

¹ Department of Biodiversity and Evolutionary Biology, Museo Nacional de Ciencias Naturales-CSIC, C/ José Gutiérrez Abascal 2, 28006 Madrid, Spain.

² Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, PA, 15213-4080.

³ Museo de Historia Natural, Universidad Nacional de San Antonio Abad del Cusco, Cusco, Peru.

⁴ Department of Herpetology, American Museum of Natural History, Central Park West at 79th Street, New York, NY, 10024-5192.

⁵ Laboratório de Sistemática de Vertebrados, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS, Brazil.

herein are found in the departments of Cusco and Puno, Peru, and are distinguishable from all other species of *Proctoporus* by unique combinations of morphometric, pholidosis, and color-pattern characteristics. A neotype of *P. bolivianus* is designated.

KEYWORDS: Andes; Bolivia; Gymnophthalmidae; new species; Peru; *Proctoporus bolivianus*; *Proctoporus lacertus*; Squamata; taxonomy.

INTRODUCTION

The gymnophthalmid lizards of the genus *Proctoporus* comprise seven montane nominal species that occur in central and southern Peru, Bolivia, and northern Argentina, with an additional unnamed species also known from Peru (Doan et al., 2005; Goicoechea et al., 2012). These small, partly fossorial, and secretive lizards represent a characteristic herpetofaunal component of cloud forest and wet puna habitats along the eastern slopes of the Central Andes (Doan and Castoe, 2005; Doan et al., 2005). The highest diversity of the genus *Proctoporus* occurs in Peru, with only three species, *P. guentheri*, *P. bolivianus*, and *P. xestus*, found in Bolivia, and only one, *P. xestus*, reaching northern Argentina.

Before 2005, the genus *Proctoporus* included 31 species distributed along the Andes from Venezuela to Bolivia, as well as Trinidad and Tobago (Duellman, 1979; Uzzell, 1958, 1970; Kizirian, 1996; Doan and Castoe, 2003; Doan and Schargel, 2003; Köhler and Lehr, 2004). Through molecular phylogenetic analyses including a broad array of gymnophthalmid genera, Castoe et al. (2004) found *Proctoporus* to be polyphyletic. Following Castoe et al. (2004), Doan and Castoe (2005) provided a monophyletic taxonomy by restricting *Proctoporus* to the *P. pachyurus* group (Uzzell, 1970), by placing species from Ecuador, Colombia, Venezuela, and Trinidad and Tobago into the resurrected genus *Riama* Gray, and by naming a new genus (*Petracola*) to include members of the *Proctoporus ventrimaculatus* group. They, however, never addressed the affinities and differences between these genera with *Opipeteur* or *Euspondylus*, thereby leaving the taxonomic status of these genera as uncertain. Recently, we presented a novel phylogenetic hypothesis for all members of *Proctoporus*, including topotypic specimens of *Proctoporus bolivianus* and samples of several additional populations, the highly similar monotypic genus *Opipeteur*, and two species of *Euspondylus*, *E. chasqui* and *Euspondylus* sp. (Goicoechea et al., 2012). We found *Proctoporus*, *Opipeteur*, and the two species of *Euspondylus* to form a monophyletic group, and inferred that seven additional distinct lineages exist within *P. bolivianus*. An updated taxonomy of *Proctoporus* as proposed by Goicoechea et al. (2012) is shown in figure 1.

Proctoporus bolivianus was described by Werner (1910) on the basis of a single female collected at Sorata, La Paz, Bolivia. This species has a purported broad distribution ranging from Departamento de Cusco in southern Peru to western Bolivia, at elevations from 2100 to 4000 m (Uzzell, 1970; Doan et al., 2005; Goicoechea et al., 2012). In a taxonomic revision of the *P. pachyurus* group, Uzzell (1970) pointed out the perplexing morphological variation among populations of *P. bolivianus* along its distributional range, and synonymized it with three species previously recognized as a synonym of *Proctoporus petersi* by Burt and Burt (1931) (*Oreosaurus lacertus* Stejneger, *Proctoporus longicaudatus* Andersson, and *Proctoporus obesus* Barbour

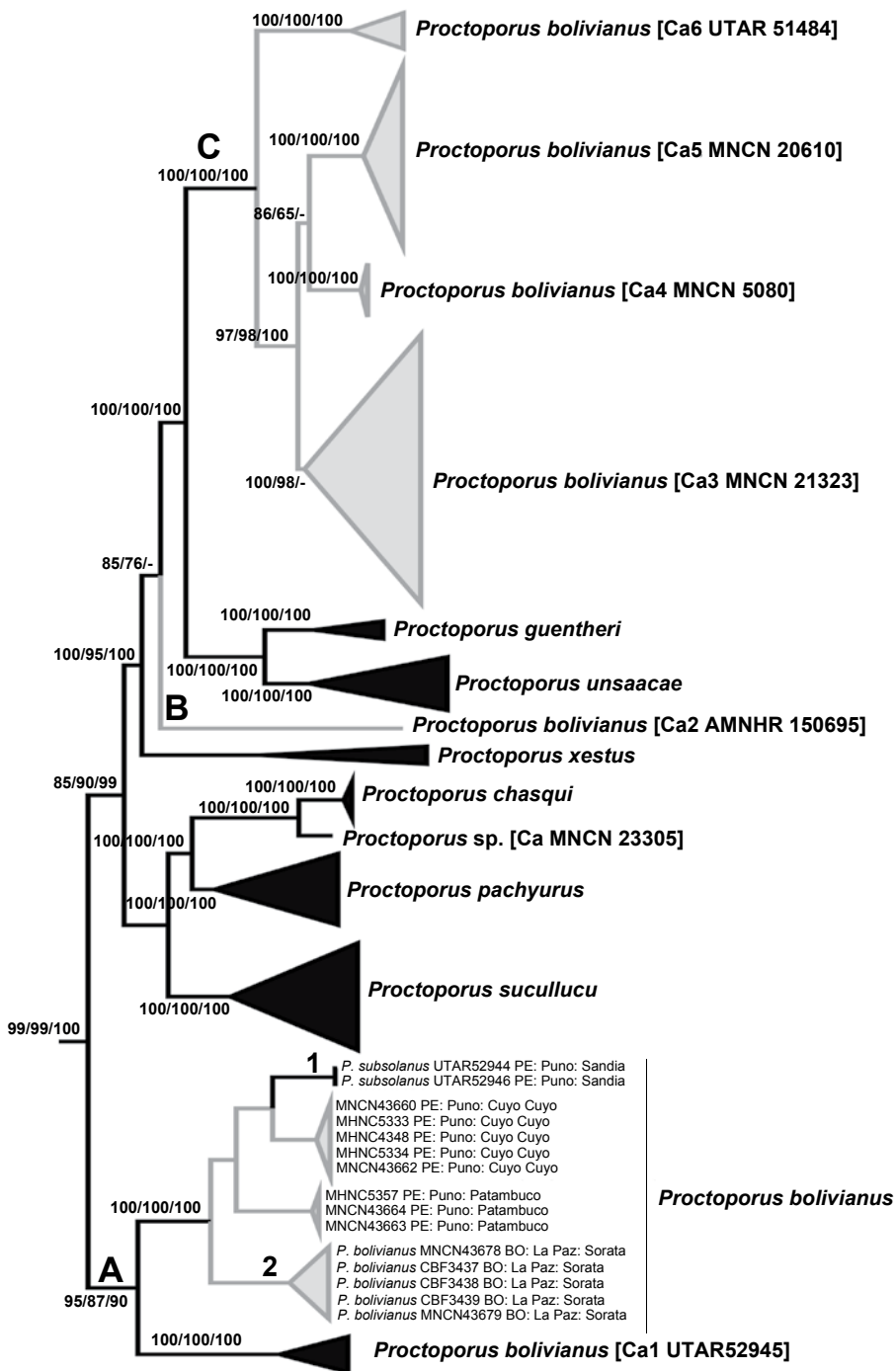


FIG. 1. Simplified maximum-likelihood topology with branch lengths modified and simplified from Goicoechea et al. (2012) to represent the updated taxonomy of the genus *Proctoporus* following results of this study. Values above nodes represent, in this order, maximum-likelihood and maximum-parsimony bootstrap values and Bayesian posterior clade probabilities. Gray branches correspond to populations assigned to *P. bolivianus* by Uzzell (1970), Doan and Castoe (2003), and Doan et al. (2005). Localities of *P. bolivianus* and *P. subsolanus* are showed in the tree. Numbers denotes clades containing topotypic samples of (1) *P. subsolanus* and (2) *P. bolivianus*.

and Noble). More recently, Doan and Castoe (2003) concluded that morphological and molecular evidence suggested the existence of three distinct species within nominal *P. bolivianus* from Cusco. Subsequently, Doan et al. (2005) reconstructed a more complete molecular phylogeny of the genus *Proctoporus* that included all nominal species considered valid at that time, including samples assigned to *P. bolivianus* from four localities of Cusco and one from Santa Cruz (central Bolivia), and several populations from Peru and La Paz (Bolivia) for morphological comparison. As a result they named a new species (*P. subsolanus*) and found an additional putative new species from Sandia (Puno, southern Peru) that remains to be named (see also Goicoechea et al., 2012; fig. 1). However, all the aforementioned studies lacked samples from the type locality of *P. bolivianus*, which hampered an adequate analysis of the taxonomic status of this variable nominal species. In fact, our inclusion (Goicoechea et al., 2012) of topotypic samples of *P. bolivianus* and a more complete sampling of populations from central and southern Peru in a molecular phylogeny revealed not only that *P. subsolanus* was a junior synonym of *P. bolivianus*, but also that the latter was paraphyletic, with allopatric populations showing high degrees of morphological and genetic diversity that suggested the presence of several unrecognized species.

The current study attempts to provide a new and updated taxonomy of the *Proctoporus bolivianus* complex that is congruent with the inferred phylogeny proposed by Goicoechea et al. (2012) and with the results of the study of morphological characters presented herein. As a result, we name and describe three new species and resurrect another one (*Proctoporus laceratus*) that were previously confounded under the name *P. bolivianus*.

MATERIAL AND METHODS

PHYLOGENETIC FRAMEWORK

Phylogenetic hypotheses of relationships of *Proctoporus* were reconstructed by Goicoechea et al. (2012) using DNA sequences of three mitochondrial genes (12S rDNA, 16S rDNA, and ND4) and one nuclear encoding gene (*c-mos*). Here, we present a scheme of their maximum-likelihood phylogenetic reconstruction (fig. 1), as the basis of the new taxonomy. Candidate species are labeled according to the scheme proposed by Padial et al. (2010).

MORPHOLOGICAL DATA

Morphological data were obtained from preserved specimens of all known species of *Proctoporus*. Because we only had two specimens (one adult male and one juvenile) of the species previously referred to as *Euspondylus chasqui* Chávez, Siu-Ting, Durán, and Venegas (*Proctoporus chasqui*) we relied on the published account of Chávez et al. (2011). Seventeen qualitative and meristic morphological characters traditionally considered important in the classification of species within the family Gymnophthalmidae were examined for 131 specimens. Specimens examined and locality and museum data are listed in appendix 1. Characters and values are listed in tables 1, 2, and 3. Character definition and usage follow Uzzell (1970) and Doan and Castoe (2003). The senior author gathered all data to avoid interobserver variability.

TABLE 1. Comparison of morphometric and pholidosis characters from specimens of *Proctoporus subsolanus* and *Proctoporus bolivianus* from their type localities. Data of *Proctoporus subsolanus* have been taken from the original description by Doan et al., 2005 (column 1), and from topotypic samples (UTAR 52946 [paratype of *P. subsolanus*] and UTAR 52947) examined by us (column 2). Because we have not been able to examine females from these localities, only data for adult males are presented.

	<i>Proctoporus subsolanus</i> (holotype)	<i>Proctoporus subsolanus</i> (N=2)	<i>Proctoporus bolivianus</i> (N=2)
SVL (mm)	47.3–42.6	38.2–43.1 (40.6±12.0)	52.1–52.9 (52.5±0.3)
Tail length/SVL	-	1.4	1.4
Head length/Head width	-	1.4–1.6 (1.5±0.0)	1.5–1.6 (1.5±0.0)
Femoral pores	5–8	6–6	5–6
Supralabials	-	4–4	4–4
Presence of loreal scale	Partial nasal suture	1 Partial nasal suture /1 absent	Present
Supraoculars	3	3–3	3–3
Genials	4	4–4	4–4
Occipitals	2–3	3–4	3–4
Supratimpanic temporals	-	2–3	2–3
Scales around midbody	21–23	21–22	23–24
Transversal dorsal count	33–37	35–36	36–37
Transversal ventral scale rows	22–24	22–22	23–23
Number of transversal ventral scale rows	10–12	11–11	10–11
Lamellae under finger IV	10–14	11–11	10–11
Lamellae under toe IV	15–21	14–15	16–17
Proportion frontal/frontonasal		0.6–0.7 (0.6±0.0)	0.7–0.7 (0.7±0.0)

RESULTS

The phylogenetic reconstruction of Goicoechea et al. (2012) depicted in figure 1 shows that *Proctoporus bolivianus* is non-monophyletic. In order to provide a temporary solution to the non-monophyly of *P. bolivianus*, Goicoechea et al. (2012) recognized the existence of several unnamed species and synonymized another one. Below we provide a summary of these results and explain what taxonomic decisions we take herein and what remains to be addressed to improve the reconstruction of *Proctoporus* when more material becomes available. We furthermore designate a neotype for *P. bolivianus* since the holotype is lost (Uzzell, 1970).

Members of *P. bolivianus* are placed in three clades on the tree (fig. 1). In the clade labeled as A in figure 1, nominal *P. bolivianus* specimens from the type locality in western Bolivia are sister to populations from Puno identified as *P. subsolanus* by Doan et al. (2005). As a result, Goicoechea et al. (2012) synonymized *P. subsolanus* under *P. bolivianus*, a conclusion that is furthermore supported by morphological evidence (see comments under *P. bolivianus* below).

Proctoporus bolivianus sensu stricto is the sister group of an unnamed species from Puno, near Bolivia (*Proctoporus bolivianus* Ca1 in fig. 1) that was considered a confirmed candidate

TABLE 2. Comparison of morphometric and pholidosis characters from specimens from four populations assigned to *Proctoporus lacertus* by Stejneger (1913), Burt and Burt (1931) and Uzzell (1970). Because we have not been able to examine females from Torontoy, Ñusta Hispana, and Calca, only data for adult males are presented.

Locality	Tinccochaca (USNM 49551)	Torontoy (USNM 60726)	Ñusta Hispana (USNM 60699)	Calca (N=6) (see appendix 1))
Max SVL (mm)	48.8	54.5	56.0	54.8–61.6 (57.6±8.9)
Tail length/SVL	1.1	1.9	-	1.4–1.6 (1.5±0.1)
Head length/Head width	1.4	1.4	1.7	1.3–1.6 (1.4±0.0)
Femoral pores	6	6	6	6/0
Supralabials	4	4	4	4
Presence of loreal scale	Absent	Absent	Absent	Absent
Supraoculars	3	3	3	3
Genials in contact	4	4	4	4
Postparietals	3	3	3	3
Supratimpanic temporals	-	2	2	2–3
Scales around midbody	21	23	23	19–26
Longitudinal dorsal count	33	36	40	36–39
Longitudinal ventral scale rows	21	22	22	22–24
Transversal ventral scale rows	11	10	11	10–13
Lamellae under finger IV	13	10	10	8–10
Lamellae under toe IV	19	19	17	16–21
Proportion frontal/frontonasal	1.0	1.0	1.0	1.0–1.00 (1.0±0.0)
Dorsal coloration	Dark brown with one median dark colored stripe	Dark brown	Dark brown	Dark brown
Ventral coloration	Uniform dark brown, paler on throat and chin	Dark brown with some paler splitting	Dark brown with some paler splitting	Uniform dark plumbeous, paler on throat and chin

species (CCS) (*Proctoporus bolivianus* Ca1 UTAR52945 Doan et al., 2005) by Goicoechea et al. (2012). Despite being putatively sympatric, populations of *P. bolivianus* and the candidate species show large genetic divergences (p-distances = 9.9%–12.1%: Goicoechea et al., 2012). We nonetheless refrain from naming this species because we lack adequate material.

Another population contributing to the non-monophyly of *P. bolivianus* is represented by a specimen (labeled as B in fig. 1) from Central Bolivia (Amboró, Santa Cruz) assigned to *P. bolivianus* by Doan et al. (2005), and which is sister to the clade containing *P. unsaacaе*, *P. guentheri*, and clade C (see below). This population from Amboró was considered a CCS (*Proctoporus bolivianus* Ca2 AMNH150695 Doan et al., 2005) by Goicoechea et al. (2012). We nonetheless also refrain from naming this species because we lack adequate material.



FIG. 2. Holotype of *Proctoporus obesus* (USNM 60748). Photograph were taken by James Poindexter of the Smithsonian Institution, National Museum of Natural History.

The third clade (labeled as C in fig. 1) includes samples from southern Peru that group into three main well-supported clades, and another clade with samples from localities in central Cusco (Cochayoc, Canchayoc, and Carrizales). These four distinct lineages for which there are also distinctive diagnostic characters are herein recognized as nominal taxa (see Species Accounts below). Three of them are named as new (*Proctoporus iridescens*, *P. carabaya*, and *P. kiziriani*, corresponding, respectively, to *P. bolivianus* Ca3 MNCN21323, *P. bolivianus* Ca4 MNCN5580, and *P. bolivianus* Ca5 MNCN20610, sensu Goicoechea et al. 2012). For the clade containing specimens from Cochayoc, Canchayoc, and Carrizales (*Proctoporus bolivianus* Ca6 UTAR51484 Doan et al., 2005, according to Goicoechea et al., 2012), we apply the available name *P. lacertus* and discuss the status of this name and the other available names *P. longicaudatus* and *P. obesus* (see below).

SPECIES ACCOUNTS

Proctoporus bolivianus Werner, 1910

Figures 3A, 4

Proctoporus bolivianus Werner, 1910: 30.

Proctoporus longicaudatus Andersson, 1914: 6.

Proctoporus bolivianus: Dirksen and De la Riva, 1999: 203.

Proctoporus bolivianus: Doan and Schargel, 2003: 75.

Proctoporus subsolanus Doan et al., 2005: 330.

Proctoporus bolivianus: Goicoechea, et al., 2012: 953.

TABLE 3. Morphometric and pholidosis characters of *Proctoporus bolivianus*, *Proctoporus carabaya*, *Proctoporus iridescens*, *Proctoporus kiziriani*, and *Proctoporus lacertus*.

		<i>P. bolivianus</i> (N=14)	<i>Proctoporus carabaya</i> (n=2)	<i>Proctoporus iridescens</i> (n=14)	<i>Proctoporus kiziriani</i> (n=15)	<i>P. lacertus</i> (n=10)
Max SVL (mm)	MALE	38.2–56.5 (51.1±12.8)	58.1–66.5 (62.3±34.9)	53.6–58.9 (56.8±6.2)	43.3–59.3 (50.9±30.9)	49.9–61.6 (55.7±13.7)
	FEMALE	-	-	49.5–63.6 (55.7±26.6)	44.6–59.1 (52.1±37.9)	-
Tail length/ SVL	MALE	1.1–1.8 (1.5±0.1)	0.9–0.8 (0.8±0)	1.1–1.6 (1.3± 0.1)	1.4–1.6 (1.5±0.1)	1.4–1.9 (1.6±0.0)
	FEMALE	-	-	1.2–1.4 (1.3±0.1)	1.4–1.6 (1.5±0.0)	-
Head length/ Head width	MALE	1.4–1.8 (1.5±0.0)	1.4–1.5 (1.4±0.0)	1.4–1.5 (1.5±0.0)	1.1–11.5 (2.6±11.1)	1.3–1.7 (1.5±0.0)
	FEMALE	-	-	1.5–1.6 (1.5±0.0)	1.5–1.8 (1.6±0.0)	-
Femoral pores	MALE	5.0–7.0 (6.0±0.3)	5–6 (5.5±0.5)	5–6 (5.5±0.3)	5–7 (6.1±0.7)	6–6 (6.0±0.0)
	FEMALE	-	0	0	0	-
Supralabials	MALE	4.0–5.0 (4.0±0.1)	4–4 (4.0±0.0)	3–3 (3.0± 0.0)	4–4 (4±0.0)	3–4 (3.9±0.1)
	FEMALE	-	-	3–4 (3.3±0.2)	4–4 (4±0.0)	-
Presence of loreal scale	MALE	6 present/ 8 absent	YES	NO	YES	NO
	FEMALE	-	-	NO	YES	-
Supraocu- lars	MALE	3–3 (3±0)	3–3 (3.0±0.0)	3–3 (3.0±0.0)	3–3 (3.0±0.0)	3–3 (3.0±0.0)
	FEMALE	-	-	3–3 (3.0±0.0)	3–3 (3.0±0.0)	-
Genials	MALE	4–4 (4.0±0.0)	4–4 (4.0±0.0)	6–6 (6.0±0.0)	4–4 (4.0±0.0)	4–4 (4.0±0.0)
	FEMALE	-	-	4–4 (4.0±0.0)	4–4 (4.0±0.0)	-
Postpari- etals	MALE	2–4 (3.6±0.4)	3–3 (3.0±0.0)	3–3 (3.0±0.0)	3–4 (3.2±0.2)	3–4 (3.1±0.1)
	FEMALE	-	-	3–4 (3.1±0.1)	3–4 (3.2±0.2)	-
Supratym- panic tem- porals	MALE	2–3 (2.1±0.1)	2–2 (2.0±0.0)	2–2 (2.0±0.0)	2–3 (2.1±0.1)	2–3 (2.4±0.3)
	FEMALE	-	-	2–3 (2.4±0.3)	2–2 (2.0±0.0)	-
Scales around midbody	MALE	20–24 (21.7±1.6)	20–23 (21.5±4.5)	22–25 (23.2±1.6)	20–25 (22.5±1.8)	19–26 (22.5±4.7)
	FEMALE	-	-	21–25 (22.9±1.7)	22–24 (23.3±0.7)	-
Longitudi- nal dorsal count	MALE	33–37 (34.8±1.8)	34–35 (34.5±0.5)	34–37 (35.7±1.6)	35–39 (37.5±3.0)	36–40 (37.9±1.9)
	FEMALE	-	-	34–40 (37.3±3.5)	38–41 (39.5±1.7)	-

		<i>P. bolivianus</i> (N=14)	<i>Proctoporus</i> <i>carabaya</i> (n=2)	<i>Proctoporus</i> <i>iridescens</i> (n=14)	<i>Proctoporus</i> <i>kiziriani</i> (n=15)	<i>P. lacertus</i> (n=10)
Longitudinal ventral scale rows	MALE	22–24 (22.8±0.4)	23–23 (23.0±0.0)	22–24 (23.2±0.9)	22–23 (22.5±0.3)	22–27 (22.9±2.5)
	FEMALE	-	-	22–24 (22.8±0.4)	22–24 (23.3±0.7)	-
Transversal ventral scale rows	MALE	10–13 (11.4±0.6)	11–13 (12.0±2.0)	11–12 (11.7±0.2)	11–13 (12.2±0.4)	10–13 (10.9±0.9)
	FEMALE	-	-	10–13 (11.4±1.0)	12–12 (12.0±0.0)	-
Lamellae under 4th finger	MALE	7–11 (9.5±1.1)	8–9 (8.5±0.5)	9–10 (9.5±0.3)	7–12 (10.2±2.4)	8–10 (9±0.7)
	FEMALE	-	-	8–13 (10.4±3.5)	9–13 (11.2±2.2)	-
Lamellae under 4th toe	MALE	16–19 (17.5±0.9)	19–21 (20.0±2.0)	14–16 (15±0.8)	16–20 (18.4±1.3)	16–22 (18.5±3.8)
	FEMALE	-	-	14–20 (16.2±4.9)	17–20 (18.8±0.9)	-

NEOTYPE: CBF 3437 (field number MNCN 4729) (fig. 4) adult male, from Millipaya, 12 km S of Sorata (15°51'30.2"S/68°37'37.6"W), Province Larecaja, Department of La Paz, Bolivia, 3743 m, collected by Ignacio De la Riva, José Manuel Padial, Rodrigo Aguayo, and Nayarit Ayllón on 1 March 2006.

DIAGNOSIS: (1) Frontonasal length longer than frontal length; (2) nasoloreal suture present in some specimens; (3) supraoculars three; (4) superciliaries 3–4, first expanded onto dorsal surface of head; (5) postoculars 1–2; (6) palpebral disc made up of a single, undivided scale; (7) four supralabials anterior to the posteroventral angle of the subocular; (8) 2–3 pairs of genials in contact; (9) dorsal body scales quadrangular, slightly keeled; (10) transverse rows of dorsals 33–37; (11) transverse ventral rows 22–24; (12) a continuous series of small lateral scales separating dorsals from ventrals; (13) posterior cloacal plate made up of six scales in both sexes; (14) anterior preanal plate scales paired; (15) femoral pores per hind limb in males 5–7; (16) preanal pores absent; (17) subdigital lamellae on toe IV 16–19; subdigital lamellae on toe V 5–11; (18) limbs not overlapping when adpressed against body in adults; (19) pentadactyl; digits clawed; (20) dorsum and lateral surface of head dark brown, lip irregularly barred with cream coloring; ventral surface of head cream with clumps of black stippling on each scale; pregular region like head but with fainter stippling.

Specimens of *Proctoporus bolivianus* have an undivided palpebral disc, which identifies them as members of the genus *Proctoporus*, as opposed to *Riama* and *Petracola* (Uzzell, 1970; Doan and Castoe, 2005). *Proctoporus bolivianus* can be distinguished from its congeners by having the frontonasal longer than the frontal (subequal in all other members of the genera). It can also be distinguished from *P. pachyurus* by having three supraoculars (four in *P. pachyurus*) and fewer transverse dorsal scale rows (47–60 in *P. pachyurus*; 33–37 in *P. bolivianus*);



FIG. 3. Dorsal and ventral views of living specimens of **A**, *Proctoporus bolivianus* from Millipaya (La Paz, Bolivia); **B**, *Proctoporus iridescens* from the road between Huancasarani and Limbani (Puno, Peru); and **C**, *Proctoporus kiziriani* from road between Marcapata and Tambopampa (Cusco, Peru).



FIG. 4. Neotype of *Proctoporus bolivianus* (CBF 3437; snout-vent length, 52.1 mm).

from *P. succullucu* by having limbs not overlapping when adpressed; from *P. unsaaca*e and *P. guentheri* by the lack of a conspicuous series of lateral ocelli; from *Proctoporus carabaya* by having smaller size (SVL *P. carabaya* = 58.1–66.5; SVL *P. bolivianus* = 43.4–56.5); from *P. kiziriani* and *P. lacertus* by having first superciliary fused with first supraocular; from *P. iridescens* by having four supralabials anterior to the posteroventral angle of the subocular (three in *P. iridescens*); from *P. xestus* by the lack of prefrontal scales (present in *P. xestus*) and having keeled dorsal scales (smooth in *P. xestus*); and from *P. chasqui* by the lack of prefrontal scales.

DESCRIPTION OF THE NEOTYPE: Adult male, snout-vent length (SVL) 52.1 mm, regenerated tail length 88.0 mm; head scales smooth, without striations or rugosities; rostral scale wider (1.8 mm) than tall (1.0 mm), meeting supralabials on either side at above the height of supralabials, and becoming higher medially, in contact with frontonasal, nasals, and first supralabials; frontonasal longer than wide, longer in length than frontal, widest posteriorly, in contact with rostral, nasals, anteriormost supraocular, and frontal; prefrontals absent; frontal larger than wide, roughly pentagonal, not in contact with anteriormost superciliary, in contact with frontonasal, first two supraoculars, and frontoparietals; frontoparietals roughly hexagonal, in contact with frontal, second and third supraoculars, parietals, and interparietal; supraoculars three, all in contact with superciliaries, third in contact with frontoparietal, pari-

etal, and postocular; interparietal longer than wide, almost hexagonal, in contact with frontoparietals anteriorly, with parietals laterally, and occipitals posteriorly; parietals polygonal, with posterior sutures in contact with occipital, lateral sutures diagonally in contact with temporals, and medial sutures in contact with interparietal; occipitals three, smaller than parietals, medial pentagonal smaller than laterals. Nasal suture present, separating nasal from loreal scale; nasal in contact with rostral, first and second supralabials, frenocular, loreal, and frontonasal; nostril situated in anterior third of nasal scale; loreal scale not in contact with supralabials; three superciliaries, first fused with first supraocular; palpebral disc made up of a single transparent scale; suboculars two; postoculars two; temporals smooth, glossy, polygonal; supratympanic temporals two; four supralabials anterior to the posteroventral angle of the subocular. Mental wider (1.8 mm) than long (1.2 mm), in contact with first infralabial and postmental posteriorly; postmental single, pentagonal, in contact with mental, first infralabials and first pair of genials; two pairs of genials in contact, anterior pair in contact with second and third infralabials; second genials in contact with third and fourth supralabials; one pair of chin shields, separated by four smaller median pregulars; gular scale rows six; collar fold slightly distinct, concealing one row of small scales; lateral neck scales round, smooth. Dorsals rectangular, longer than wide, juxtaposed, slightly keeled, in 37 transverse rows; longitudinal dorsal scale rows 23 at midbody; continuous lateral scale series, smaller than dorsals; reduced scales at limb insertion regions present; transverse ventral scale rows 22; longitudinal ventral scale rows at midbody 10; anterior preanal plate scales paired; posterior preanal plate scales six, lateralmost scales small; scales on tail rectangular, juxtaposed, smooth. Limbs pentadactyl; digits clawed; dorsal brachial scales polygonal, subequal in size, subimbricate, smooth; ventral brachial scales roundish, subimbricate, smooth; antebrachial scales polygonal, subequal in size, smooth, ventral antebrachial scales smallest; dorsal manus scales polygonal, smooth, subimbricate; palmar scales small, rounded, subimbricate, domelike; dorsal scales on fingers smooth, quadrangular, covering dorsal half of digit, overhanging subdigital scales, three on finger I, six on II, nine on III, 11 on IV, seven on V; scales on anterodorsal surface of thigh large, polygonal, smooth, subimbricate; scales on posterior surface of thigh small, rounded, juxtaposed; scales on ventral surface of thigh large, rounded, flat, smooth; femoral pores five; preanal pores absent; scales on anterior surface of crus polygonal, smooth, juxtaposed, decreasing in size distally; scales on anterodorsal surface of crus rounded, juxtaposed; scales on ventral surface of crus large, smooth, flat, subimbricate; scales on dorsal surface of toes quadrangular, smooth, overhanging supradigital lamellae, three on toe I, seven on II, 12 on III, 17 on IV, nine on V; subdigital lamellae of toes single distally, double proximally, three on toe I, four on II, 11 on III, 14 on IV, nine on V; limbs not overlapping when adpressed against the body, separated by 8–9 dorsal scale lengths.

COLORATION IN PRESERVATIVE: Dorsal and lateral surfaces of head dark brown; lip irregularly barred with cream coloring; ventral surface of head yellowish cream with clumps of black stippling on each scale; pregular region like head but with fainter stippling, medial scales lacking stippling; gular region like head but with denser stippling per scale, forming longitudinal clumps. Dorsal surface of body nearly of the same color as head with two lighter dorsolateral

longitudinal stripes originating near occiput and extending to forelimb insertions; lateral surface of body of the same coloration as dorsum, fading lighter brown near venter; ventral surface of body with yellowish-cream ground color, scales with black stippling, medialmost scales lacking stippling. Color of limbs similar to body. Dorsal tail coloration like that of body, ventral surface of tail light brown with dark brown mottling anteriorly.

COLORATION IN LIFE: Similar to that in preservative but with orange coloration along flanks, forelimbs, tail, and ventral surface of the body (fig. 3A).

VARIATION: Coloration is similar among all specimens, with some of them having a lighter dorsum and more distinct longitudinal stripes. Stippling on the venter is more distinct or darker in some specimens and nearly absent in others, tending to form ventral lines (especially in younger specimens). The presence of ocelli is also variable. Variation of morphometric and meristic characters is shown in table 3.

DISTRIBUTION: This species is known from montane forests and humid puna grasslands in the eastern versant of the Andes in northern Bolivia and adjacent areas of Departamento de Puno in southern Peru (fig. 9) between 2100–3743 m, encompassing an approximate air distance of 200 km between the most distant localities, Sandia (Puno, Peru, 14°20'33.9"S/69°27'45.8"W) and Sorata (La Paz, Bolivia, 15°51'30.2"S/68°37'37.6"W).

HABITAT AND ECOLOGY: Individuals were found during the day under logs and stones, occupying disturbed areas and agricultural fields.

COMMENTS: *Proctoporus subsolanus* was described by Doan et al. (2005) from several specimens collected in Sandia (Puno, Peru; fig. 1). This species was distinguished from *P. bolivianus* by having frontonasal scales much longer than frontals (purportedly subequal in *P. bolivianus*). Nonetheless, frontonasals are subequal to frontals only in populations from central Cusco and Puno considered as *P. bolivianus* by Uzzell (1970), Doan and Castoe (2003) and Doan et al. (2005) and now corresponding to *Proctoporus carabaya*, *Proctoporus iridescens*, *Proctoporus kiziriani*, and *Proctoporus lacertus* (table 2). In fact, topotypic specimens of *P. bolivianus* have frontonasal scales much longer than frontals, just as in *P. subsolanus* (table 1). Furthermore, the presence of a frontonasal larger than the frontal was also noted in the original description of *P. longicaudatus*, a synonym of *P. bolivianus* collected near the type locality of this species in Sorata Valley (Bolivia) (Andersson, 1914). *Proctoporus subsolanus* has also been reported to have two supraoculars (three in our character analyses, but the first fused with the first superciliary), which would distinguish it from *P. guentheri* and *P. pachyurus* (Doan et al., 2005). This character state is nonetheless also observed in topotypic samples of *P. bolivianus*. In addition, our analysis of additional morphological characters did not reveal differences between *P. subsolanus* and *P. bolivianus* (table 1) and their color pattern is also similar. According to the original description, *P. subsolanus* has dorsal and lateral surfaces of the head and body dark brown, lips irregularly barred with cream, and two dorsolateral light brown longitudinal stripes originating near the occiput and extending to the forelimb insertions (Doan et al., 2005); the lateral and ventral surfaces of the body, the hind limbs and the tail were described as orange, with lateral scales having black stippling. As it is shown in figure 2A1 and 2A2, all these states are also present in topotypic specimens of *P. bolivianus*. Given the identical and/or broadly

overlapping ranges of character states between *Proctoporus subsolanus* and *P. bolivianus*, in addition to results from molecular phylogenetic analyses, we follow Goicoechea et al. (2012) and consider *P. subsolanus* as a junior synonym of *P. bolivianus*.

Three other synonyms of *P. bolivianus* are currently available: *Proctoporus lacertus* Stejneger, *Proctoporus obesus* Barbour and Noble, and *Proctoporus longicaudatus* Andersson. We consider *P. lacertus* a valid species and furthermore consider *P. obesus* a junior synonym of *P. lacertus*. A rationale for these decisions is provided under the account for *P. lacertus*. We nonetheless retain *P. longicaudatus* as a junior synonym of *P. bolivianus*. *Proctoporus longicaudatus* was described from a single specimen collected at Pelechuco (La Paz, Bolivia), approximately 115 km west of the type locality of *P. bolivianus* (Sorata; Andersson, 1914). We have not been able to examine the holotype of this species, but the original description is quite complete. All morphological characters mentioned in the description of *P. longicaudatus* (Andersson, 1914), and those observed in specimens from Pelechuco (MNCN 43655 and MNCN 43656) and topotypic specimens of *P. bolivianus* examined by us have overlapping ranges of morphological character states (see also Uzzell, 1970). Given the broadly overlapping ranges of character states between this species and *P. bolivianus*, and the geographic proximity of their type localities, we follow Uzzell (1970) and Doan and Castoe (2005) and consider *P. longicaudatus* as a junior synonym of *P. bolivianus*.

***Proctoporus carabaya*, new species**

Figure 5

Proctoporus bolivianus [Ca4 MNCN5580]: Goicoechea et al., 2012: 953.

HOLOTYPE: MHNC 5428 (field number MNCN 4709) (fig. 5), adult male, from Tambillo (13°52'40.9"S/70°12'57.2"W), Province Carabaya, Department of Puno, Peru 3818 m, collected by Ignacio De la Riva, José Manuel Padiá, Santiago Castroviejo-Fisher, and Juan Carlos Chaparro on 25 February 2006.

PARATYPES: MHNC 5429 (field number MNCN 4710), adult male, and MHNC 5430–31 (field numbers MNCN 4715, 4714), MNCN 43675–77 (field numbers MNCN 4710, 4711, 4713), juveniles, same data as holotype.

DIAGNOSIS: (1) Frontonasal length equal to frontal length; (2) nasoloreal suture present; (3) supraoculars three; (4) superciliaries 3–4, first expanded onto dorsal surface of head; (5) postoculars two; (6) palpebral disc made up of a single, undivided scale; (7) four supralabials anterior to the posteroventral angle of the subocular; (8) two pairs of genials in contact; (9) dorsal body scales quadrangular, slightly keeled; (10) transverse rows of dorsals 34–35; (11) transverse ventral rows 23; (12) a continuous series of small lateral scales separating dorsals from ventrals; (13) posterior cloacal plate made up of six scales in both sexes; (14) anterior preanal plate scales paired; (15) femoral pores per hind limb in males 5–6; (16) preanal pores absent; (17) subdigital lamellae on toe IV 19–21; subdigital lamellae on toe V 6–13; (18) limbs not overlapping when adpressed against body on adults; (19) pentadactyl; digits clawed; (20) dorsum dark brown without laterodorsal stripes; lateral ocelli absent; ventral surfaces dark with some light mottling on lateral side of scales; throat paler than rest of the body, with more evident cream splitting.



FIG. 5. Holotype of *Proctoporus carabaya* (MHNC 5428; snout-vent length, 66.5 mm).

Specimens of *Proctoporus carabaya* show the presence of an undivided palpebral disc, which identifies them as members of the genus *Proctoporus*, as opposed to *Riama* or *Petracola* (Doan and Castoe, 2005; Uzzell, 1970). *Proctoporus carabaya* can be distinguished from *P. pachyurus* by having three supraoculars (four in *P. pachyurus*) and fewer transverse dorsal scale rows (34–35 in *P. carabaya*, 47–60 in *P. pachyurus*); from *P. sucullucu*, by having limbs not overlapping when adpressed and loreal scale not in contact with supralabials (loreal in contact with second and third supralabials in *P. sucullucu*); from *P. bolivianus* by being larger and having the frontonasal subequal to frontal; from *P. unsaaca* and *P. guentheri* by having the loreal not in contact with supra-labials and by the absence of a series of ocelli (present in both *P. unsaaca* and *P. guentheri*); from *P. kiziriani* by having first supraocular fused with first superciliary and the lack of dorsolateral stripes; from *P. iridescens* by having four supralabials anterior to the posteroventral angle of the subocular (three in *P. iridescens*), presence of loreal scale (absent in *P. iridescens*), and two pairs of genials in contact (three pairs in *P. iridescens*); from *P. lacertus* by having first supraocular fused with first superciliary (not fused in *P. lacertus*) and a loreal scale (absent in *P. lacertus*); from *P. xestus* by the lack of prefrontal scales (present in *P. xestus*) and having keeled dorsal scales (smooth in *P. xestus*); and from *P. chasqui* by the lack of prefrontal scales.

DESCRIPTION OF HOLOTYPE: Adult male, snout-vent length (SVL) 66.5 mm, tail length 76.5 mm; head scales smooth, without striations or rugosities; rostral scale wider (2.0 mm) than tall (1.0 mm), meeting supralabials on either side at above the height of supralabials, and becoming higher medially, in contact with frontonasal, nasals, and first supralabials; frontonasal longer than wide, subequal in length with frontal, widest posteriorly, in contact with rostral, nasals, anteriormost supraocular, and frontal; prefrontals absent; frontal longer than wide, roughly polygonal, not in contact with anteriormost superciliary, in contact with frontonasal, first two supraoculars, and frontoparietals; frontoparietals polygonal, in contact with frontal, second and third supraoculars, parietals, and interparietal; supraoculars three, all in contact with superciliaries, third in contact with frontoparietal, parietal, and postocular; interparietal longer than wide, roughly rectangular, in contact with frontoparietals anteriorly, with parietals laterally, and with occipitals posteriorly; parietals polygonal, with anterior sutures in contact with frontoparietals and third supraoculars, posterior sutures in contact with occipital, lateral sutures diagonally in contact with temporal; occipitals three, smaller than parietals, subequal in size. Nasal divided, longer than high, in contact with first and second supralabials; loreal present, not in contact with supralabials, in contact with nasal, first superciliary, and frenocular; four superciliaries, first fused with first supraocular; two preoculars, first in contact with first superciliary and loreal scales, second in contact with frenocular, loreal, and first subocular; frenocular roughly triangular, in contact with second and third supralabials, second preoculars, first subocular, and loreal scales; palpebral disc made up of a single transparent scale; suboculars three; postoculars two; temporals smooth, glossy, polygonal; supralabials anterior to the posteroventral angle of the subocular four. Mental wider (2.0 mm) than long (1.1 mm), in contact with first infralabial and postmental posteriorly; postmental single, pentagonal, in contact with first infralabials and first pair of genials; two pairs of genials in contact, anterior pair in contact with first infralabials; second pair of genials in contact with second and third infralabials laterally; one pair of chin shields, separated by two smaller median pregulars; gular scale rows six; collar fold slightly distinct, concealing one row of small scales; lateral neck scales round, smooth. Dorsals rectangular, longer than wide, juxtaposed, with single high, rounded keel, in 35 transverse rows; longitudinal dorsal scale rows 23 at midbody; continuous lateral scale series, smaller than dorsals, partially hidden in lateral fold; reduced scales at limb-insertion regions present; transverse ventral scale rows 23; longitudinal ventral scale rows at midbody 11; anterior preanal plate scales paired; posterior preanal plate scales six, lateralmost scales small; scales on tail rectangular, juxtaposed; dorsal, dorsolateral, and ventrolateral caudal scales smooth; midventral subcaudal scales wider than adjacent scales, almost square, anteriormost midventral subcaudal scales subimbricate. Limbs pentadactyl; digits clawed; dorsal brachial scales polygonal, subequal in size, subimbricate, smooth; ventral brachial scales roundish, subimbricate, smooth; antebrachial scales polygonal, subequal in size, smooth, ventral antebrachial scales smallest; dorsal manus scales polygonal, smooth, subimbricate; palmar scales small, rounded, subimbricate, domelike; dorsal scales on fingers smooth, quadrangular, covering dorsal half of digit, overhanging subdigital scales, three on finger I, six on II, eight on III, 10 on IV, and four on V; scales on anterodorsal surface of thigh large, polygonal, smooth, subimbricate; scales on posterior surface of thigh small, rounded, juxtaposed; scales on ventral surface of thigh large, rounded, flat, smooth; femoral pores five; preanal pores absent; scales on anterior surface of crus

polygonal, smooth, juxtaposed, decreasing in size distally; scales on anterodorsal surface of crus rounded, juxtaposed; scales on ventral surface of crus large, smooth, flat, subimbricate; scales on dorsal surface of toes quadrangular, smooth, overhanging supradigital lamellae, three on toe I, six on II, 11 on III, 10 on IV, seven on V; subdigital lamellae single distally, double proximally, three on toe I, seven on II, 11 on III, 15 on IV, eight on V; limbs not overlapping when adpressed against the body, separated by eight to nine dorsal scale lengths.

COLORATION IN PRESERVATIVE: Dorsal and lateral surfaces of head dark brown (fig. 5); lip irregularly barred with cream coloring; ventral surface of head cream with clumps of black stippling on each scale; pregular region like head but with fainter stippling. Dorsal and lateral surface of body nearly the same color as head; ventral surface of body dark brown ground color, with cream spots on posterior margin of some scales. Limbs similar to body, dorsal surface of arms with dark coloration decreasing toward ventral surface, ventral surface of arms gray without black stippling, dorsal surface of legs similar to body, ventral surface of legs with cream ground color and scattered gray stippling. Dorsal tail coloration like that of body, ventral surface of tail like ventral surface of the body but without mottling.

COLORATION IN LIFE: Likely similar to that in preservative, but no field notes or color photos of living specimens are available.

VARIATION: Scalation of the paratypes are similar to the holotype. Coloration among the specimens examined is also very similar, with adults darker than juveniles. Two juvenile specimens (MHCN 5430–31) have two light brown dorsolateral longitudinal stripes that originate near the occiput and extend to forelimb insertions. Variation of morphometric and meristic characters is shown in table 3. The small sample size (only two adult males and five juveniles) did not allow us to study variation due to sexual dimorphism.

DISTRIBUTION: *Proctoporus carabaya* is known only from type locality (fig. 9).

HABITAT AND ECOLOGY: Individuals were found during the day under logs and stones around the small village of Tambillo, occupying disturbed areas and agricultural fields.

ETYMOLOGY: The specific terms refers both to the province and the mountain range where the species occurs, the Cordillera de Carabaya, one of the most spectacular formations in the Andes of southern Peru.

Proctoporus iridescens, new species

Figures 3B, 6

Proctoporus bolivianus [Ca3 MNCN21323]: Goicoechea et al., 2012: 953.

HOLOTYPE: MHNC 5359 (field number MNCN 4590) (fig. 6), adult male, from the road between Huancasarani and Limbani (14°10'29.4"S/69°41'36.1"W), Province Sandia, Department of Puno, Peru, 3643 m, collected by Ignacio De la Riva, José Manuel Padial, Jaime Bosch, Santiago Castroviejo-Fisher, and Juan Carlos Chaparro on 16 February 2006.

PARATYPES: MNCN 43666 (field number MNCN 4589), adult male, and MNCN 43667 (field number MNCN 4593), MHNC 5361 (field number MNCN 4592), adult females, same data as holotype; MNCN 43668–69 (field numbers MNCN 4607, 4699), MHNC 5421 (field number MNCN 4698), adult females, from road between Ollachea and Corani (13°50'31.2"S/70°29'51.7"W), Province Carabaya, Department of Puno, Peru, 3213 m, collected

by Ignacio De la Riva, José Manuel Padial, Jaime Bosch, Santiago Castroviejo-Fisher, and Juan Carlos Chaparro on 24 February 2006; MHNC 5699 (field number MNCN 4793), MHNC 5701 (field number MNCN 4795), MNCN 44222 (field number MNCN 4798), MNCN 44224 (field number MNCN 4790), adult females, and MNCN 44223 (field number MNCN 4789), MNCN 44225 (field number MNCN 4791), juveniles, from road between Usicayos and Quetapalo (14°07'21.1"S/70°57'06.7"W), Province Carabaya, Department of Puno, Peru, 3773 m, collected by Ignacio De la Riva, José Manuel Padial, Santiago Castroviejo-Fisher, and Juan Carlos Chaparro on 5 February 2007.

DIAGNOSIS: (1) Frontonasal length equal to frontal length; (2) nasoloreal suture absent; (3) three supraoculars; (4) 3–4 superciliaries, first not expanded onto dorsal surface of head; (5) postoculars two; (6) palpebral disc made up of a single, undivided scale; (7) three supralabials anterior to the posteroventral angle of the subocular; (8) three pairs of genials in contact; (9) dorsal body scales quadrangular, slightly keeled; (10) transverse rows of dorsals 34–37 in males and 34–40 in females; (11) transverse ventral rows 22–24 in both sexes; (12) a continuous series of small lateral scales separating dorsals from ventrals; (13) posterior cloacal plate made up of six scales in both sexes; (14) anterior preanal plate scales paired; (15) femoral pores per hind limb in males 5–6 in males, absent in females; (16) preanal pores absent; (17) subdigital lamellae on toe IV 14–20; subdigital lamellae on toe V 6–13; (18) limbs not overlapping when adpressed against body in adults; (19) pentadactyl; digits clawed; (20) dorsum dark gray; lateral surface of head like dorsal surface, lip irregularly barred with cream coloring; ventral surface of head cream with clumps of black stippling on each scale; pregular region like head but with fainter stippling.

Specimens of *Proctoporus iridescens* show the presence of an undivided palpebral disc, which identifies them as members of the genus *Proctoporus*, as opposed to *Riama* and *Petracola* (Doan and Castoe, 2005; Uzzell, 1970). *Proctoporus iridescens* can be distinguished from its congeners by having three supralabials anterior to the posteroventral angle of the subocular (four in all other species of *Proctoporus*) and three pairs of genials in contact (two in all other species of *Proctoporus*). It can also be distinguished from *P. pachyurus* by having three supraoculars not fused with superciliaries (four supraoculars in *P. pachyurus*, first fused with first superciliary), and 34–40 transverse dorsal scale rows (47–60 in *P. pachyurus*); from *P. succullucu* by having limbs not overlapping when adpressed against body, first supraocular not fused with first superciliary (fused in *P. succullucu*), and by the lack of loreal scale (present in *P. succullucu*); from *P. bolivianus* by having frontonasal subequal to frontals and first supraocular not fused with first superciliary; from *P. unsaaca* and *P. guentheri* by the absence of a series of lateral ocelli; from *P. carabaya* by having first supraocular not fused with first superciliary and the lack of loreal scale; from *P. kiziriani* by the lack of loreal scale (present in *P. kiziriani*) and by the absence of dorsal stripes; from *P. lacertus* by having three supralabials anterior to the posteroventral angle of the subocular (four in *P. lacertus*); from *P. xestus* by the lack of prefrontal scales (present in *P. xestus*) and having keeled dorsal scales (smooth in *P. xestus*); and from *P. chasqui* by the lack of prefrontal scales.

DESCRIPTION OF HOLOTYPE: Adult male, snout-vent length (SVL) 56.0 mm, regenerated tail length 62.8 mm; head scales smooth, without striations or rugosities; rostral scale wider (1.9 mm) than tall (0.9 mm), meeting supralabials on either side at above the height of supralabials, and becoming higher medially, in contact with frontonasal, nasals, and first supralabi-



FIG. 6. Holotype of *Proctoporus iridescens* (MHNC 5359; snout-vent length, 56.0 mm).

als; frontonasal longer than wide, widest posteriorly, in contact with rostral, nasals, anteriormost supraocular, and frontal; prefrontals absent; frontal longer than wide, pentagonal, not in contact with anteriormost superciliary, in contact with frontonasal, first two supraoculars and with frontoparietals; frontoparietals pentagonal, in contact with frontal, second and third supraoculars, parietals, and interparietal; supraoculars three, all in contact with superciliaries, third in contact with frontoparietal, parietal, and postocular; interparietal longer than wide, roughly heptagonal, in contact with frontoparietals anteriorly, parietals laterally, and occipitals posteriorly; parietals polygonal, with posterior sutures in contact with occipital, lateral sutures diagonally in contact with temporal; occipitals three, smaller than parietals, medial pentagonal smaller than laterals. Nasal entire with no separate loreal scale, longer than high, in contact with first supralabials, first superciliary, and frenocular; nostril situated in anterior third of nasal scale; three superciliaries, first not fused with first supraocular; palpebral disc made up of a single transparent scale; suboculars two; postoculars two; temporals smooth, glossy, polygonal; supratympanic temporals two; supralabials anterior to the posteroventral angle of the subocular three. Mental wider (2.2 mm) than long (1.8 mm), in contact with first infralabial and postmental posteriorly; postmental single, pentagonal, in contact with mental, first infralabials, and first pair of genials; three pairs of genials in contact, anterior pair in contact with first and second infralabials; second pair of genials in contact with second and third infralabi-

als; third pair of genials in contact with third and fourth infralabials laterally; one pair of chin shields, separated by two smaller median preulars; gular scale rows eight; lateral neck scales round, smooth. Dorsals rectangular, longer than wide, juxtaposed, slightly keeled, in 33 transverse rows; longitudinal dorsal scale rows 23 at midbody; continuous lateral scale series, smaller than dorsals, partially hidden in lateral fold, reduced scales at limb-insertion regions present; transverse ventral scale rows 22; longitudinal ventral scale rows at midbody 12; anterior preanal plate scales paired; posterior preanal plate scales six, lateralmost scales small; scales on tail rectangular, juxtaposed; all caudal scales smooth. Limbs pentadactyl; digits clawed; dorsal brachial scales polygonal, subequal in size, subimbricate, smooth; ventral brachial scales roundish, subimbricate, smooth; antebrachial scales polygonal, subequal in size, smooth, ventral antebrachial scales smallest; dorsal manus scales polygonal, smooth, subimbricate; palmar scales small, rounded, subimbricate, domelike; dorsal scales on fingers smooth, quadrangular, covering dorsal half of digit, overhanging subdigital scales, three on finger I, five on II, eight on III, 10 on IV, five on V; scales on anterodorsal surface of thigh large, polygonal, smooth, subimbricate; scales on posterior surface of thigh small, rounded, juxtaposed; scales on ventral surface of thigh large, rounded, flat, smooth; femoral pores five; preanal pores absent; scales on anterior surface of crus polygonal, smooth, juxtaposed, decreasing in size distally; scales on anterodorsal surface of crus rounded, juxtaposed; scales on ventral surface of crus large, smooth, flat, subimbricate; scales on dorsal surface of toes quadrangular, smooth, overhanging supradigital lamellae, three on toe I, six on II, seven on III, seven on IV, five on V; subdigital lamellae single distally, double proximally, three on toe I, four on II, 11 on III, 14 on IV, nine on V; limbs not overlapping when adpressed against the body, separated by eight to nine dorsal scale lengths.

COLORATION IN PRESERVATIVE: Dorsal and lateral surfaces of head dark gray (fig. 6); lip irregularly barred with cream color; ventral surface of head creamy gray with clumps of black stippling on each scale; preular region like head but with fainter stippling; gular region like head. Dorsal and lateral surface of body nearly same color as head; ventral surface of body with dark gray ground color, with cream spots on posterior margin of some scales. Limbs similar to body. Dorsal tail coloration like that of body, ventral surface of tail like ventral surface of the body but without mottling.

COLORATION IN LIFE: Dorsal, lateral, and ventral surfaces are similar to coloration in preservative but with bluish-green iridescences (fig. 3).

VARIATION: Coloration is similar among all the specimens with some of them having a lighter dorsum. Stippling on the venter is more distinct in some specimens and nearly absent in others; throat coloration is also variable, with some specimens having lighter coloration in this region. Sexual dimorphism includes males having wider heads (relative to head length; see table 3); femoral pores number is also sexually dimorphic, with males possessing 5–6 femoral pores per leg and females lacking them. Variation of morphometric and meristic characters is shown in table 3.

DISTRIBUTION: This Peruvian species has a relatively broad distribution, from the Limbani valley and Corani in northern department of Puno to the Kosñipata Valley, in the department of Cusco, covering an air distance of 160 km approximately, with an altitudinal range of 2700–3850 m (fig. 9).

HABITAT AND ECOLOGY: Individuals were found during day time under rocks and logs in cloud forests and humid cleared areas.

ETYMOLOGY: The specific epithet comes from Greek *iris* (“rainbow”), in allusion to the pretty iridescent reflections of the scales of this species.

***Proctoporus kiziriani*, new species**

Figures 3C, 7

Proctoporus bolivianus [Ca5 MNCN20610]: Goicoechea et al., 2012: 953.

HOLOTYPE: MHNC 5366 (field number MNCN 4602) (fig. 7), adult male, from road between Marcapata and Tambopampa, (13°35'00.4"S/71°02'05.1"W), Province Quispicanchi, Department of Cusco, Peru, 3500 m, collected by Ignacio De la Riva, José Manuel Padial, Santiago Castroviejo-Fisher, and Juan Carlos Chaparro on 20 February 2006.

PARATYPES: MNCN 43670–72 (field numbers MNCN 4603, 4605, 4606) adult males, and MNCN 43673 (field number MNCN 4608) adult female, same data as holotype; MHNC 5680 (field number MNCN 4750), MNCN 44216 (field number MNCN 4744), MNCN 44218–19 (field numbers MNCN 4746, 4747) adult males, and MHNC 5682–83 (field numbers MNCN 4751, 4752), MHNC 5685 (field number MNCN 4754), MNCN 44217 (field number MNCN 4745), MNCN 44220–21 (field numbers MNCN 4748, 4749), adult females, from Huancarayo, Marcapata Valley, Province Quispicanchis, Department of Cusco, Peru, 3368 m, collected by Ignacio De la Riva, José Manuel Padial, Santiago Castroviejo-Fisher, and Juan Carlos Chaparro on 31 January 2007.

DIAGNOSIS: (1) Frontonasal length usually equal to frontal length; (2) nasoloreal suture present; (3) three supraoculars; (4) 3–4 superciliaries, first not expanded onto dorsal surface of head; (5) postoculars two; (6) palpebral disc made up of a single, undivided scale; (7) supralabials anterior to the posteroventral angle of the subocular four; (8) two pairs of genials in contact (9) dorsal body scales quadrangular, slightly keeled; (10) transverse rows of dorsals 35–39 in males and 38–41 in females; (11) transverse ventral rows 22–23 in males and 22–24 in females; (12) a continuous series of small lateral scales separating dorsals from ventrals; (13) posterior cloacal plate made up of six scales in both sexes; (14) anterior preanal plate scales paired; (15) femoral pores per hind limb in males 5–7, absent in females; (16) preanal pores absent; (17) subdigital lamellae on toe IV 16–20; subdigital lamellae on toe V 7–13; (18) limbs not overlapping when adpressed against body in adults; (19) pentadactyl; digits clawed; (20) dorsum brown or pale brown with dorsolateral pale stripes bordered by a discontinuous dark line on neck and body; lateral ocelli usually present in both sexes; ventral surfaces black, with pale stippling.

Specimens of *Proctoporus kiziriani* show the presence of an undivided palpebral disc, which identifies them as members of the genus *Proctoporus*, as opposed to *Riama* and *Petracola* (Doan and Castoe, 2005; Uzzell, 1970). *Proctoporus kiziriani* can be distinguished from *P. pachyurus* by having three supraoculars not fused with superciliaries (four supraoculars in *P. pachyurus*, first fused with first superciliary) and by having 35–41 transverse dorsal scale rows (47–60 in *P. pachyurus*); from *P. sucullucu* by having limbs not overlapping when adpressed, first supraocular not fused with first superciliary (fused in *P. sucullucu*), and loreal scale not in contact with supralabials (loreal in contact with second and third supralabials in *P. sucullucu*); from *P. bolivianus* by having frontonasal length equal to frontal and first supraocular not fused



FIG. 7. Holotype of *Proctoporus kiziriani* (MHNC 5366 snout-vent length, 59.1 mm).

with first superciliary; from *P. unsaaca* and *P. guentheri* by not having the first superciliary expanded onto dorsal surface of the head; from *Proctoporus carabaya* by having first supraocular not fused with first superciliary and by the presence of dorsolateral stripes; from *P. iridescens* by having four supralabials anterior to the posteroventral angle of the subocular (three in *P. iridescens*) and two pairs of genials in contact (three pairs in *P. iridescens*); from *P. lacertus* by the presence of loreal scales (absent in *P. lacertus*) and dorsolateral stripes; from *P. xestus* by the lack of prefrontal scales and having keeled dorsal scales (smooth in *P. xestus*); and from *P. chasqui* by the lack of prefrontal scales.

DESCRIPTION OF HOLOTYPE: Adult male, snout-vent length (SVL) 59.1 mm, regenerated tail 52.6 mm; head scales smooth, without striations or rugosities; rostral scale wider (1.7 mm) than tall (0.9 mm), meeting supralabials on either side at a point above the height of supralabials and becoming higher medially, in contact with frontonasal, nasals, and first supralabials; frontonasal longer than wide, widest posteriorly, in contact with rostral, nasals, anteriormost superciliary, and frontal; prefrontals absent; frontal longer than wide, pentagonal, not in contact with anteriormost superciliary, in contact with frontonasal, first two supraoculars, and frontoparietals; frontoparietals pentagonal, in contact with frontal, second and third supraoculars, parietals, and interparietal; supraoculars three, all in contact with superciliaries, third in contact with frontoparietals, parietal, and postocular; interparietal longer than wide, pentagonal, in contact with frontoparietals anteriorly, parietals laterally, and occipitals posteriorly; parietals polygonal, with posterior

sutures in contact with occipital, lateral sutures diagonally in contact with temporal, third supra-ocular, and frontoparietal; occipitals five, smaller than parietals, three median smaller than laterals. Nasal entire with no separate loreal scale, longer than high, in contact with rostral, frontonasal, first and second supralabials, first superciliary, and frenocular; nostril situated in anterior third of nasal scale; four superciliaries, first not expanded onto dorsal surface of head; two preoculars, first in contact with first superciliary, frenocular, and nasoloreal scales, second in contact with frenocular and first subocular; frenocular in contact with third supralabial, second preoculars, first subocular, and nasoloreal scales; palpebral disc made up of a single transparent scale; suboculars three; postoculars two; temporals smooth, glossy, polygonal; supratympanic temporals two; supralabials anterior to the posteroventral angle of the subocular four. Mental wider (1.9 mm) than long (1.3 mm), in contact with first infralabial and postmental posteriorly; postmental single, pentagonal, in contact with mental, first and second infralabials, and first pair of genials; two pairs of genials in contact, anterior pair in contact with second and third infralabials; second genials in contact with third and fourth infralabials laterally; one pair of chin shields, separated by irregular pregulars; gular scale rows five; collar fold slightly distinct, concealing two rows of small scales; lateral neck scales round, smooth. Dorsals rectangular, longer than wide, juxtaposed, with single keel, in 35 transverse rows; longitudinal dorsal scale rows 23 at midbody; continuous lateral scale series, two to three scales wide, smaller than dorsals; reduced scales at limb-insertion regions present; transverse ventral scale rows 22; longitudinal ventral scale rows at midbody 20; anterior preanal plate scales paired; posterior preanal plate scales six, lateralmost scales small; scales on tail rectangular, juxtaposed; dorsal and dorsolateral caudal scales not keeled, ventral and ventrolateral caudal scales smooth; midventral subcaudal scales wider than adjacent scales, almost square. Limbs pentadactyl; digits clawed; dorsal brachial scales polygonal, subequal in size, subimbricate, smooth; ventral brachial scales roundish, subimbricate, smooth; antebrachial scales polygonal, subequal in size, smooth, ventral antebrachial scales smallest; dorsal manus scales polygonal, smooth, subimbricate; palmar scales small, rounded, subimbricate, domelike; dorsal scales on fingers smooth, quadrangular, covering dorsal half of digit, overhanging subdigital scales, three on finger I, five on II, seven on III, 10 on IV, seven on V; scales on anterodorsal surface of thigh large, polygonal, smooth, subimbricate; scales on posterior surface of thigh small, rounded, juxtaposed; scales on ventral surface of thigh large, rounded, flat, smooth; femoral pores seven; preanal pores absent; scales on anterior surface of crus polygonal, smooth, juxtaposed, decreasing in size distally; scales on anterodorsal surface of crus rounded, juxtaposed; scales on ventral surface of crus large, smooth, flat, subimbricate; scales on dorsal surface of toes quadrangular, smooth, overhanging supradigital lamellae, two on toe I, three on II, eight on III, 10 on IV, seven on V; subdigital lamellae single distally, double proximally, three on toe I, seven on II, nine on III, 19 on IV, 11 on V; limbs not overlapping when adpressed against the body, separated by eight to nine dorsal scale lengths.

COLORATION IN PRESERVATIVE: Dorsal surface of head dark brown (fig. 7); lateral surface of head like dorsal surface, with light mottling; ventral surface of head cream with black spots stippling on each scale. Gular region like head but with denser stippling per scale, forming longitudinal clumps. Dorsal surface of body same color as head, with dark brown spots that form four stripes extending from occiput to just posterior to forelimb insertions, with cream

color between stripes; flanks with same coloration as dorsum, fading to lighter brown near venter and with a series of ocelli with dark borders and cream centers. This series of ocelli begins anterior to forelimb insertion, near tympanum, and ends near hind-limb insertion. Ventral surface of body with black ground color, scales with black stippling. Forearms and hind limbs with same background color as dorsum. Dorsal and ventral tail coloration like that of body and gray on the regenerated portion.

COLORATION IN LIFE: Dorsal, lateral, and ventral surfaces are similar to coloration in preservative, but with orange coloration along flanks, forelimbs and tail, not expanding into ventral region of the body (fig. 3C).

VARIATION: Coloration is similar among all the specimens, with some having a lighter dorsum and more distinct longitudinal stripes. Stippling on the venter is more distinct or grayer in some specimens and nearly absent in others. The presence of ocelli is also variable. Little sexual dimorphism is observed; the primary difference is that males have wider heads (relative to head length; see table 3). The number of femoral pores is also a sexually dimorphic character, with males possessing 5–7 femoral pores per leg and females lacking them. Variation of morphometric and meristic characters is shown in table 3.

DISTRIBUTION: This species is known from montane forests of Marcapata Valley, in the department of Cusco, southeastern Peru (fig. 9).

HABITAT AND ECOLOGY: Individuals were found during the day under logs and stones.

ETYMOLOGY: We dedicate this species to our colleague and friend David A. Kizirian (American Museum of Natural History), as a tribute for his outstanding contribution to the knowledge of gymnophthalmid lizard systematics.

Proctoporus lacertus, Stejneger, 1913

Figure 8

Oreosaurus lacertus Stejneger, 1913: 546.

Proctoporus obesus Barbour and Noble, 1920: 616.

Proctoporus bolivianus: Uzzell, 1970: 1.

Proctoporus bolivianus: Doan and Castoe, 2003:433.

Proctoporus bolivianus: Doan et al. (2005): 325.

Proctoporus bolivianus [Ca6 UTAR51484 Doan et al., 2005]: Goicoechea et al., 2012: 953.

HOLOTYPE: USNM 49551 (fig. 8), adult male, from Tincochaca, Province La Convención, Department of Cusco, Peru, 2800 m.

PARATYPES: USNM 49551, same data as holotype; USNM 49549 from Ollantaytambo, Province Urubamba, Department of Cusco, Peru, 2792 m; MCZ 12085 and MCZ 12087 from Tincochaca, Province La Convención, Department of Cusco, Peru, 2800 m.

DIAGNOSIS: (1) Frontonasal length usually equal to frontal length; (2) nasoloreal suture absent; (3) three supraoculars; (4) 3–4 superciliaries, first expanded onto dorsal surface of head; (5) postoculars two; (6) palpebral disc made up of a single, undivided scale; (7) four supralabials anterior to the posteroventral angle of the subocular; (8) two pair of genials in contact; (9)

dorsal body scales quadrangular, slightly keeled; (10) transverse rows of dorsals 36–40; (11) transverse ventral rows 22–24; (12) a continuous series of small lateral scales separating dorsals from ventrals; (13) posterior cloacal plate made up of six scales in both sexes; (14) anterior preanal plate scales paired; (15) femoral pores per hind limb in males six; (16) preanal pores absent; (17) subdigital lamellae on toe IV 16–22; subdigital lamellae on toe V 5–13; (18) limbs not overlapping when adpressed against body in adults; (19) pentadactyl; digits clawed; (20) dorsum dark gray; lateral surface of head like dorsal surface, lip irregularly barred with cream coloring; ventral surface of head cream with clumps of black stippling on each scale; preular region like head but with fainter stippling.

Specimens of *Proctoporus lacertus* show the presence of an undivided palpebral disc, which identifies them as members of the genus *Proctoporus*, as opposed to *Riama* and *Petracola* (Doan and Castoe, 2005; Uzzell, 1970). *Proctoporus lacertus* can be distinguished from *P. pachyurus* by having three supraoculars (four in *P. pachyurus*) and 36–40 transverse dorsal scale rows (47–60 in *P. pachyurus*); from *P. succullucu* by having limbs not overlapping when adpressed against body and the lack of loreal scale (present in *P. succullucu*); from *P. bolivianus* by having frontonasal length subequal to frontal length (*P. bolivianus* has frontonasal longer than frontal); from *P. unsaacae* and *P. guentheri* by the lack of both loreal scale and a continuous series of lateral ocelli; from *P. kiziriani* by the lack of loreal scale (present in *P. kiziriani*) and by having darker dorsal background color; from *P. carabaya* by the lack of loreal scale and first supraocular not fused with first superciliary; from *P. iridescens* by having three supralabials anterior to the posteroventral angle of the subocular and two pairs of genials in contact (three supralabials and three pairs of genials in *P. iridescens*); from *P. xestus* by the lack of prefrontal scales (present in *P. xestus*) and by having keeled dorsal scales (smooth in *P. xestus*); and from *P. chasqui* by the lack of prefrontal scales.

REDESCRIPTION OF HOLOTYPE: Adult male, snout-vent length (SVL) 48.78 mm, tail length 54.66 mm; head scales smooth, without striations or rugosities; rostral scale wider (1.44 mm) than tall (0.91 mm), meeting supralabials on either side above the height of supralabials and becoming higher medially, in contact with frontonasal, nasals, and first supralabials; frontonasal longer than wide, subequal in length to frontal, in contact with rostral, nasals, anteriormost supraocular, and frontal; prefrontals absent; frontal longer than wide, roughly polygonal, not in contact with anteriormost superciliary, in contact with frontonasal, first two supraoculars, and frontoparietals; frontoparietals polygonal, in contact with frontal, second and third supraoculars, parietals, and interparietal; supraoculars three, all in contact with superciliaries, third in contact with frontoparietal, parietal, and postocular; interparietal longer than wide, heptagonal, in contact with frontoparietals anteriorly, parietals laterally, and occipitals posteriorly; parietals polygonal, with anterior sutures in contact with frontoparietals and third supraoculars, posterior sutures in contact with occipital, lateral sutures diagonally in contact with temporal; occipitals three, smaller than parietals, medial pentagonal smaller than laterals. Nasal entire with no separate loreal scale, longer than high; four superciliaries, first fused with first supraocular; palpebral disc made up of a single transparent scale; suboculars two; postoculars two; temporals smooth, glossy, polygonal; supratympanic temporals two; supralabials toward the posteroventral angle of the subocular four.

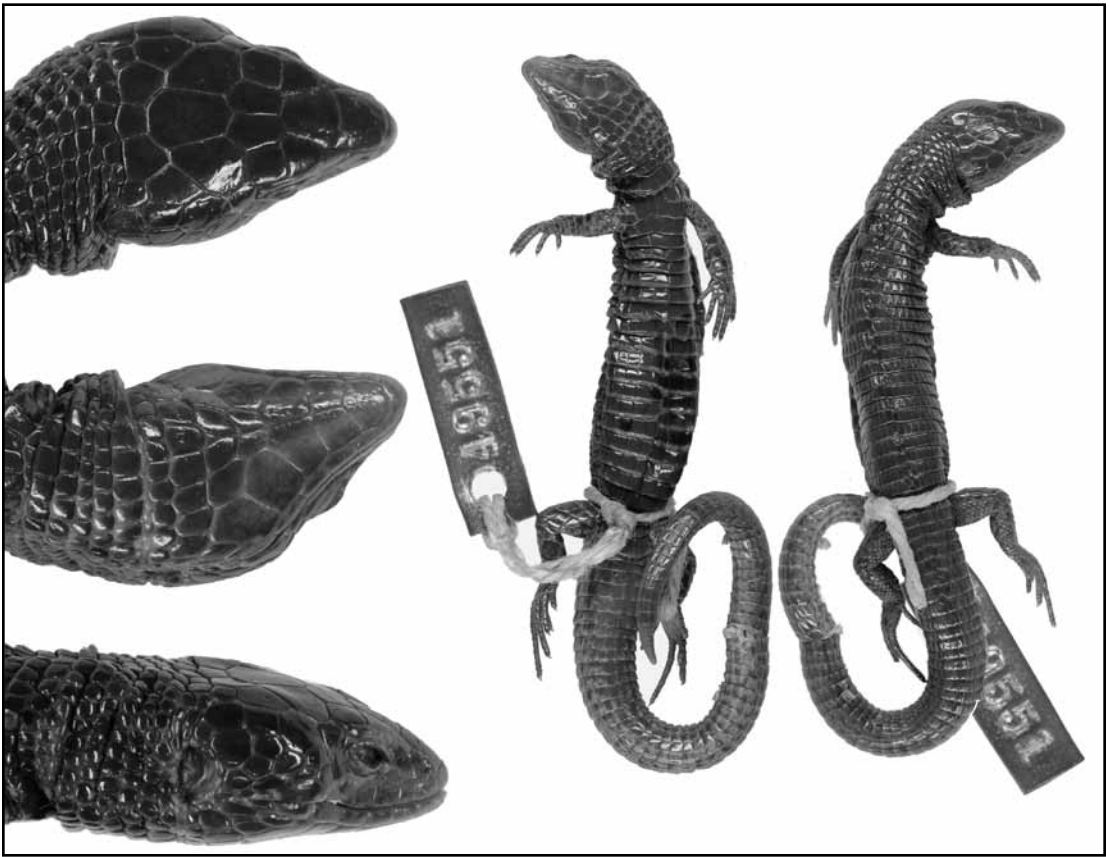


FIG. 8. Holotype of *Proctoporus lacertus* (USNM 495551 snout-vent length, 48.78 mm).

Mental wider (1.55 mm) than long (0.95 mm), in contact with first infralabial and postmental posteriorly; postmental single, pentagonal, in contact with first and second infralabials and first pair of genials; two pairs of genials in contact, anterior pair in contact with second and third infralabials; second pair of genials in contact with third and fourth infralabials laterally; one pair of chin shields, separated by two smaller median pregenials; gular scale rows four; collar fold slightly distinct, concealing one row of small scales; lateral neck scales round, smooth. Dorsals rectangular, longer than wide, juxtaposed, with single high, rounded keel, in 33 transverse rows; longitudinal dorsal scale rows 21 at midbody; continuous lateral scale series, smaller than dorsals, partially hidden in lateral fold; reduced scales at limb-insertion regions present; transverse ventral scale rows 21; longitudinal ventral scale rows at midbody 11; anterior preanal plate scales paired; posterior preanal plate scales six, lateralmost scales small; scales on tail rectangular, juxtaposed; dorsal, dorsolateral, and ventrolateral caudal scales smooth; midventral subcaudal scales wider than adjacent scales, almost square, anteriormost midventral subcaudal scales subimbricate. Limbs pentadactyl; digits clawed; dorsal brachial scales polygonal, subequal in size, subimbricate, smooth; ventral brachial scales roundish, subimbricate, smooth; antebrachial scales polygonal, subequal in size, smooth, ventral antebrachial scales smallest; dorsal manus scales polygonal, smooth, subimbricate; palmar scales

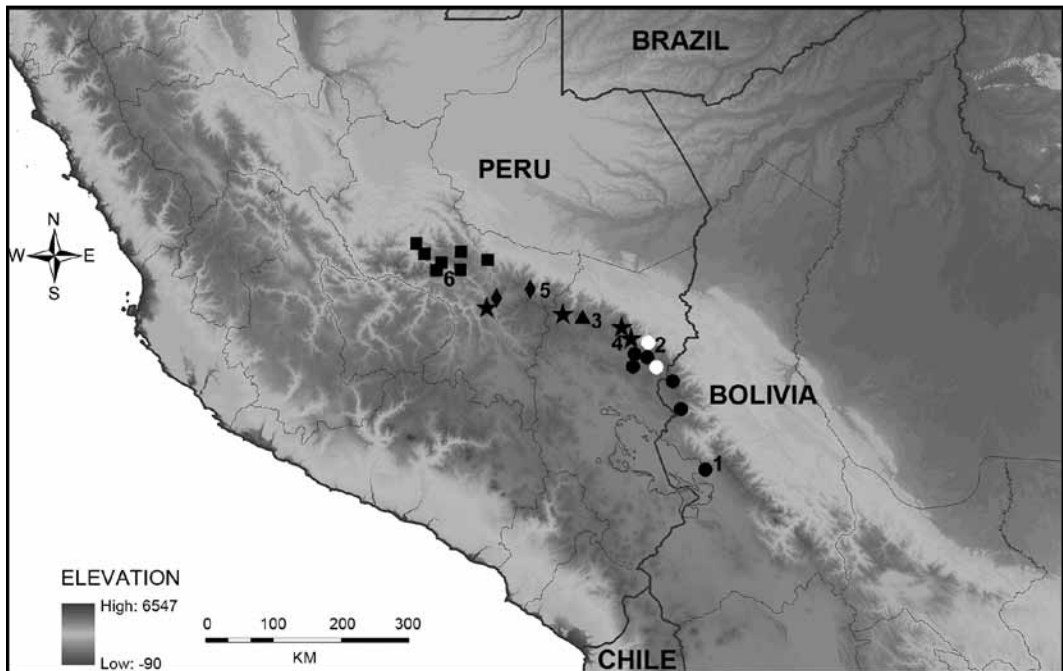


FIG 9. Map showing the geographic distributions of *Proctoporus lacertus*, *Proctoporus bolivianus*, and the new species of *Proctoporus* described herein based on specimens listed in appendix 1 and in Uzzell (1970), Doan and Castoe (2003), and Doan et al. (2005). Circles represent populations of *P. bolivianus* (white circles correspond to populations previously assigned to *P. subsolanus*). Squares represent populations of *P. lacertus*, triangles represent populations of *Proctoporus carabaya*, stars represent populations of *Proctoporus iridescens*, and diamonds represent populations of *Proctoporus kiziriani*. Numbers indicate the type localities of: 1, *P. bolivianus*; 2, *P. subsolanus*; 3, *P. carabaya*; 4, *P. iridescens*; 5, *P. kiziriani*; and 6, *P. lacertus*.

small, rounded, subimbricate, domelike; dorsal scales on fingers smooth, quadrangular, covering dorsal half of digit, overhanging subdigital scales, five on finger I, eight on II, 11 on III, 11 on IV, seven on V; scales on anterodorsal surface of thigh large, polygonal, smooth, subimbricate; scales on posterior surface of thigh small, rounded, juxtaposed; scales on ventral surface of thigh large, rounded, flat, smooth; femoral pores six; preanal pores absent; scales on anterior surface of crus polygonal, smooth, juxtaposed, decreasing in size distally; scales on anterodorsal surface of crus rounded, juxtaposed; scales on ventral surface of crus large, smooth, flat, subimbricate; scales on dorsal surface of digits quadrangular, smooth, overhanging supradigital lamellae, two on toe I, five on II, eight on III, 12 on IV, six on V; subdigital lamellae single distally, double proximally, five on toe I, eight on II, 14 on III, 16 on IV, 11 on V; limbs not overlapping when adpressed against the body, separated by eight to nine dorsal scale lengths.

COLORATION IN PRESERVATIVE: Dorsal and lateral surface of head dark brown; ventral surface of head cream with dark brown splitting on preangular and gular region. Dorsal surface of body same color as head, but with dark brown spots that form one median stripe. Lateral surface of body same color as head. Ventral surface of body darker than dorsal coloration. Limbs with similar coloration as body. Coloration of dorsal and ventral surfaces of tail paler than body coloration (fig. 8).

COLORATION IN LIFE: Data of coloration of living specimens is not available, as none of the specimens examined in this study had been collected by us.

VARIATION: Only two specimens examined (USNM 49551 [fig. 8] and MCZ 12085) have the first superciliary expanded onto the dorsal surface of the head. The coloration is similar among all the specimens, but some have a darker ground color and can show a dorsal dark stripe on middorsum. Stippling on the venter is more distinct or grayer in some specimens and nearly absent in others. The coloration of some of the specimens is pale, as opposed to the dark brown and black of several others.

DISTRIBUTION: This species is known from several localities in central department of Cusco, all of them at an elevation above 2800 m, reaching an altitude of 4019 m (T.M. Doan, personal commun.) (fig. 9).

HABITAT AND ECOLOGY: This species is rarely found exposed on the ground surface and is nearly exclusively observed under rocks (Doan, 2008).

COMMENTS: *Proctoporus lacertus* was described by Stejneger (1913) as *Oreosaurus lacertus* from a specimen collected at Tincochaca, Cusco, Peru. Subsequently, according to morphological comparisons, Uzzell (1970) synonymized *P. lacertus* Stejneger, along with *Proctoporus obesus* Barbour and Noble and *Proctoporus longicaudatus* Andersson, with *P. bolivianus*. However, he did state that the names of the junior synonyms remained available should further data support the distinctiveness of these forms (Uzzell, 1970).

All morphological characters mentioned in the description of *P. lacertus* (Stejneger, 1913), and those observed in specimens from Torontoy, Ñusta Hispana (previously assigned to *P. lacertus*; Stejneger, 1913; Barbour and Noble, 1920; Burt and Burt, 1931), and from Calca examined by us, have morphological character states that overlap with those of *P. lacertus* (table 2). Given the paraphyletic position of populations from central Cusco (Cochayoc, Canchayoc, and Carrizales) with respect to *Proctoporus bolivianus*, the identical or broadly overlapping ranges of character states between Calca populations and those previously assigned to *P. lacertus*, as well as the geographic proximity of all these populations and the type locality of *P. lacertus*, we consider it appropriate to resurrect the name *P. lacertus* for populations from the central region of the Departamento de Cusco. We have provided a redescription of this species above on the basis of an extended set of specimens, thus improving the original, but incomplete description by Stejneger (1913).

Proctoporus obesus was described from a single specimen from Ñusta Hispana, Cusco, Peru (Barbour and Noble, 1920). The holotype of this species is damaged, and many of the characters presented in the original description as well as in subsequent revisions (Uzzell, 1970; Doan and Castoe, 2003) had to be guessed. We were not able to examine the holotype of this species, but the USMN collection kindly provided us photographs of this specimen (fig. 2). It seems to differ greatly from specimens of *P. bolivianus*. The frontonasal length is subequal to the frontal length in the holotype of *P. obesus* (frontonasal is longer than frontal in *P. bolivianus*) and the dorsal body scales are quite smooth (slightly keeled in *P. bolivianus*). Also, data from the original description along with additional data provided by Uzzell (1970) and Doan and Castoe (2003) indicate that *P. obesus* greatly differs from *P. bolivianus*. Furthermore, the type locality of *P. obesus* is far from the distribu-

tional range of *P. bolivianus*. *Proctoporus obesus* nonetheless overlaps in range with *P. lacertus*. Uzzell (1970) and Doan and Castoe (2005) already noticed its large head and large size and robustness; thus, *P. obesus* could indeed represent a distinct species. However, until specimens from the type locality are obtained and compared to all other currently accepted species we prefer to consider it as a junior synonym of *P. lacertus* rather than a synonym of *P. bolivianus*.

KEY TO THE SPECIES OF *PROCTOPORUS*

- 1a. Presence of prefrontals. 2
- 1b. Absence of prefrontal scales 3
- 2a. Smooth dorsal scales, single large elongate subocular, presence of large spines at the base of the sulcus spermaticus *P. xestus*
- 2b. Keeled dorsal scales, several small subocular scales *P. chasqui*
- 3a. Four supralabials anterior to the posteroventral angle of the subocular and two pair of genials in contact 4
- 3b. Three supralabials anterior to the posteroventral angle of the subocular and three pairs of genials in contact *P. iridescens*
- 4a. Two to three supraoculars 5
- 4b. Four supraoculars *P. pachyurus*
- 5a. Venter uniformly dark or with dark stippling or mottling near lateral scale rows 6
- 5b. Venter clear yellow or orange without dark mottling *P. guentheri*
- 6a. No continuous series of lateral ocelli 7
- 6b. Continuous series of lateral ocelli *P. unsaaca*
- 7a. Frontonasal scale longer than frontal scale 8
- 7b. Frontonasal scale equal in length to frontal scale 9
- 8a. Limbs overlapping when adpressed *P. sucullucu*
- 8b. Limbs not overlapping when adpressed *P. bolivianus*
- 9a. First supraocular not fused with first superciliary 10
- 9b. First supraocular fused with first superciliary *P. carabaya*
- 10a. Absence of loreal scale *P. lacertus*
- 10b. Presence of loreal scale *P. kiziriani*

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APPENDIX 1

SPECIMENS EXAMINED

Museum acronyms refer to: **AMNH**, American Museum of Natural History; **CBF**, Colección Boliviana de Fauna; **MHNC**, Museo de Historia Natural, Cusco, Peru; **MNCN**, Museo Nacional de Ciencias Naturales, Madrid, Spain; **USNM**, Smithsonian Institution, National Museum of Natural History, Washington; **UTA**, University of Texas, Arlington (UTA). Numbers in brackets represents the original field numbers.

Proctoporus bolivianus

PERU: Puno: Sandia (UTA 52946–47 [TMD01267, TMD01271]); Cuyo-Cuyo (MHNC 5333 [MNCN4532], MHNC 5348–49 [MNCN4566, MNCN4568], MNCN 43660–62 [MNCN4531, MNCN4534, MNCN4567]); Patambuco (MHNC 5357 [MNCN5357], MNCN 43663–64 [MNCN4583, MNCN4584]); BOLIVIA: La Paz: Pelechuco (MNCN 43655–56 [MNCN4143, MNCN4142]); Millipalla, 12 km S of Sorata (CBF 3437–39 [MNCN4729, MNCN4731, MNCN4733], MNCN 43678–79 [MNCN4730, MNCN4732]); Charazani (CBF 2329 [MNCN4159]); Caalaya (CBF 2330 [MNCN4162]).

Proctoporus chasqui

PERU: Ayacucho: Road between Abra Tapuna and San Francisco (MNCN 44407–08 [MNCN4830, MNCN4831]).

Proctoporus guentheri

PERU: Cusco: Urubamba (UTA 55366–67 [TMD01322, TMD01324]); Paucartambo (USNM 346179 [USNM206266]); BOLIVIA: La Paz: Apolo (USNM 336148 [USNM107286]).

Proctoporus lacertus

PERU: La Convención: Tincochaca (USNM 49551, 49552); Calca (UTA 55315–23 [TMD01301, TMD01307, TMD01309, TMD01310, TMD01311, TMD01312, TMD01313, TMD01316, TMD01317], USNM 298685–90 [JEC6264, JEC6265, JEC6266, JEC6267, JEC6268, JEC6269]); Ollantaytambo (USNM 49549, USNM 107649); Ñusta Hispana (USNM 60699); Torontoy (USNM 60726); Paucartambo (AMNH 142921 [AMNH11568]).

Proctoporus pachyurus

PERU: Junín: Cerro San Cristóbal (MHNC 4693–94 [TA504, TA505], MHNC 4696 [TA507]); Tarma (UTA 55267–72 [TMD01211, 01213, TMD01214, TMD01215, TMD01216, TMD01220], UTA 55314 [TMD01195]); Palca (USNM 299581–82 [JEC7092, JEC7093]).

Proctoporus sucullucu

PERU: Apurímac: Abancay (UTA 52950 [TMD01146], UTA 55273–78 [TMD01140, TMD01141, TMD01143, TMD01144, TMD01157, TMD01159]); Cusco: Quillabamba (USNM 298632–33 [JEC6093, JEC6094]); Puno: Ollachea (USNM 299125–27 [JEC6591, JEC6592, JEC6593]); Ayacucho, Anco (MNCN 44474–82 [MNCN5012, MNCN5013, MNCN5014, MNCN5015, MNCN5016, MNCN5017, MNCN5018, MNCN5019, MNCN5020]).

Proctoporus unsaacae

PERU: Urubamba (UTA 55289–90 [TMD01031, TMD01032], UTA 55291–92 [TMD01033, TMD01035], UTA 55294–95 [TMD01094, TMD1037, TMD01094]).

Proctoporus xestus

BOLIVIA: (AMNH 22740–41); Cochabamba (AMNH 38957–62).

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