



A new elusive species of *Petracola* (Squamata: Gymnophthalmidae) from the Utcubamba basin in the Andes of northern Peru

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Abstract.—We described a new species of *Petracola* from the montane forests of the Utcubamba basin in Amazonas department, Andes of northern Peru (elevation 1,889 m). The new species is easily distinguishable from all other species of *Petracola* by having a gracile body, two supraoculars, one loreal scale, nine femoral pores per limb in males, and white venter with black semicircular marks on anterior margin of scales. An updated identification key for species of *Petracola* is provided.

Key words. Cordillera Central, Peruvian Yungas, *Petracola labioocularis*, precloacal pores, superciliaries, supraoculars

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Introduction

Modern molecular phylogenetic approaches sometimes combined with morphological data have revealed novel phylogenetic relationship for many groups of reptiles, viz.: South American pit viper genera *Bothrops*, *Bothriopsis*, and *Bothrocophias* by Fenwick et al. (2009); Teiidae lizards by Harvey et al. (2012); Jadin et al. (2013); and skinks by Hedges and Conn (2012). As in the aforementioned taxa, some important taxonomical changes were proposed for gymnophthalmid lizards by Doan and Castoe (2005), including the reallocation of *Proctoporus ventrimaculata* Boulenger 1900 in the genus *Petracola*.

The genus *Petracola* Doan and Castoe 2005 is a clade of small-sized Andean lizards with semifossorial habits occurring in cloud forest and puna habitats (Köhler and Lehr 2004; Kizirian et al. 2008). Three species endemic to Peru are currently recognized: *Petracola ventrimaculata* Boulenger 1900, known from multiple isolated localities between elevations of 3,050–3,600 m in the Andes of northern Peru, on both sides of the Marañón river (Kizirian et al. 2008); *P. labioocularis* Köhler and Lehr

2004, known only from the type locality at an elevation of 2,980 m in Central Peru; and *P. waka* Kizirian, Bayefsky-Anand, Eriksson, Le, and Donnelly 2008, known from four localities in Cajamarca department at elevations between 2,600 and 2,900 m.

In this paper, we describe a new species of *Petracola* based on morphological data from a single specimen, which was collected in 2007 in the Utcubamba basin of northeastern Peru. Subsequent visits by one of us (PJV) to the type locality of the taxon described herein, and other localities along the Utcubamba basin between 2012 and 2014, revealed no additional specimens of the new species. This discovery elevates the number of *Petracola* species to four species.

Materials and Methods

Museum abbreviations are Centro de Ornitología y Biodiversidad (CORBIDI) and Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos (MUSM), both collections from Lima, Peru. The following measurements were taken with a digital caliper and recorded

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to the nearest 0.1 mm, except for tail length, which was taken with a ruler and recorded within 1 mm: head length (HL), head width (HW), shank length (ShL), axilla-groin distance (AGD), and snout-vent length (SVL). For characters recorded on both sides, condition on the right side is presented first. Sex was determined by observation of hemipenes from X-ray photographs. Scale counts and color pattern data for *P. labioocularis* were taken from Köhler and Lehr (2004) and some high quality photographs of an adult male paratype (SMF 80113) provided by G. Köhler. Data for *P. ventrimaculata* and *P. waka* was taken from Kizirian et al. (2008) and from examination of specimens of *P. ventrimaculata* (see Appendix 1). For comparisons with species of *Euspondylus*, *Pholidobolus*, *Proctoporus*, and *Riama* data was taken from Montanucci (1973), Kizirian (1996), and Doan and Castoe (2005). We follow the terminology of Kizirian (1996) for scale counts and morphological characters.

Results

Generic assignment

The new species is assigned to the genus *Petracola* as defined by Doan and Castoe (2005) having, among other characters, smooth head scales; transparent lower eyelid; rectangular, smooth, and juxtaposed dorsal scales; and

by lacking prefrontals. The morphological characters defining *Petracola* are similar to those of the genera *Euspondylus*, *Pholidobolus*, *Proctoporus*, and *Riama*. Thus, placement of this new species in the genus *Petracola* is tentative, based only on morphology and partly on distribution (see discussion below).

New species description

Petracola angustisoma sp. nov.

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Holotype: CORBIDI 00467 (Figs. 1–3A), adult male from vicinity of Cocachimba (06°02'37.2"S, 77°53'15.8"W; Datum WGS 84) at 1,889 m, Bongará province, Amazonas department, Peru, collected by P.J. Venegas on 24 June 2007.

Diagnosis: *Petracola angustisoma* differs from *P. labioocularis* (character states in parentheses) in having two supraoculars (three), 37 transverse dorsal scale rows (34–35), 22 transverse ventral scale rows (18–20), dorsum pale brown with seven discontinuous dark brown longitudinal stripes extending to the base of tail (brown or olive brown with a dorsolateral pale stripe on neck and body), and venter white with black semicircular marks on anterior margin of scales (grayish brown, with no pattern); precloacal pores absent (present); and by lacking supralabial-subocular fusion (present). The new species can be distinguished from *P. ventrimaculata* by having a gracile body (robust, Fig. 3B), three discontinuous superciliaries (two), loreal present (usually absent), nine femoral pores per hind limb in males (2–5), and venter white with black semicircular marks on anterior margin of scales (yellow with bold black bands); from *P. waka* it differs in having three discontinuous superciliaries (four, usually continuous), two genials (three), and nine femoral pores per hind limb in males (5–7; Table 1).

Petracola angustisoma differs from all known species of *Euspondylus*, except *E. spinalis*, by lacking prefrontal scales and from *E. spinalis* by having two supraoculars (three in *E. spinalis*); from *Pholidobolus* by having dorsals smooth and juxtaposed (imbricate, striate, or keeled in *Pholidobolus*); from *Proctoporus* by having smooth dorsal scales (keeled in *Proctoporus*); and from *Riama* by having smooth dorsals (smooth, striate, rugose, or keeled in *Riama*).

Description of holotype: Rostral scale wider than long, taller than adjacent supralabials, in contact with frontonasal, nasals, and anteriormost supralabials. Frontonasal longer than wide, widest at level of nares, distinctly larger than frontal. Frontal approximately as long as wide, widest at anterior suture of anteriormost supraocular, barely extending between frontoparietals. Frontoparietals hexagonal, in contact medially and with

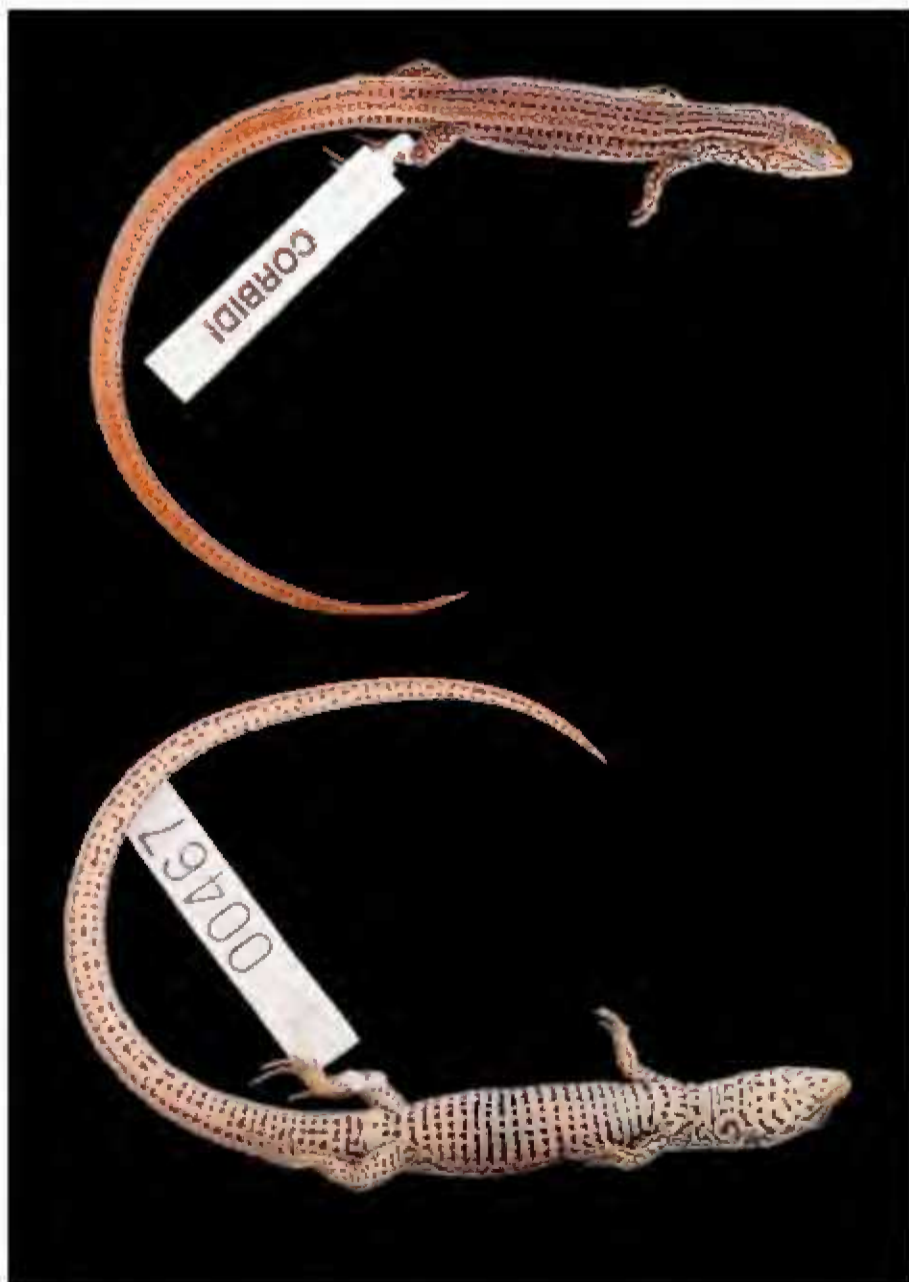


Fig. 1. *Petracola angustisoma* sp. nov., holotype CORBIDI 00467, male, 43.6 mm SVL. Dorsal (upper) and ventral (bottom) views. Photographs by D. Quirola.

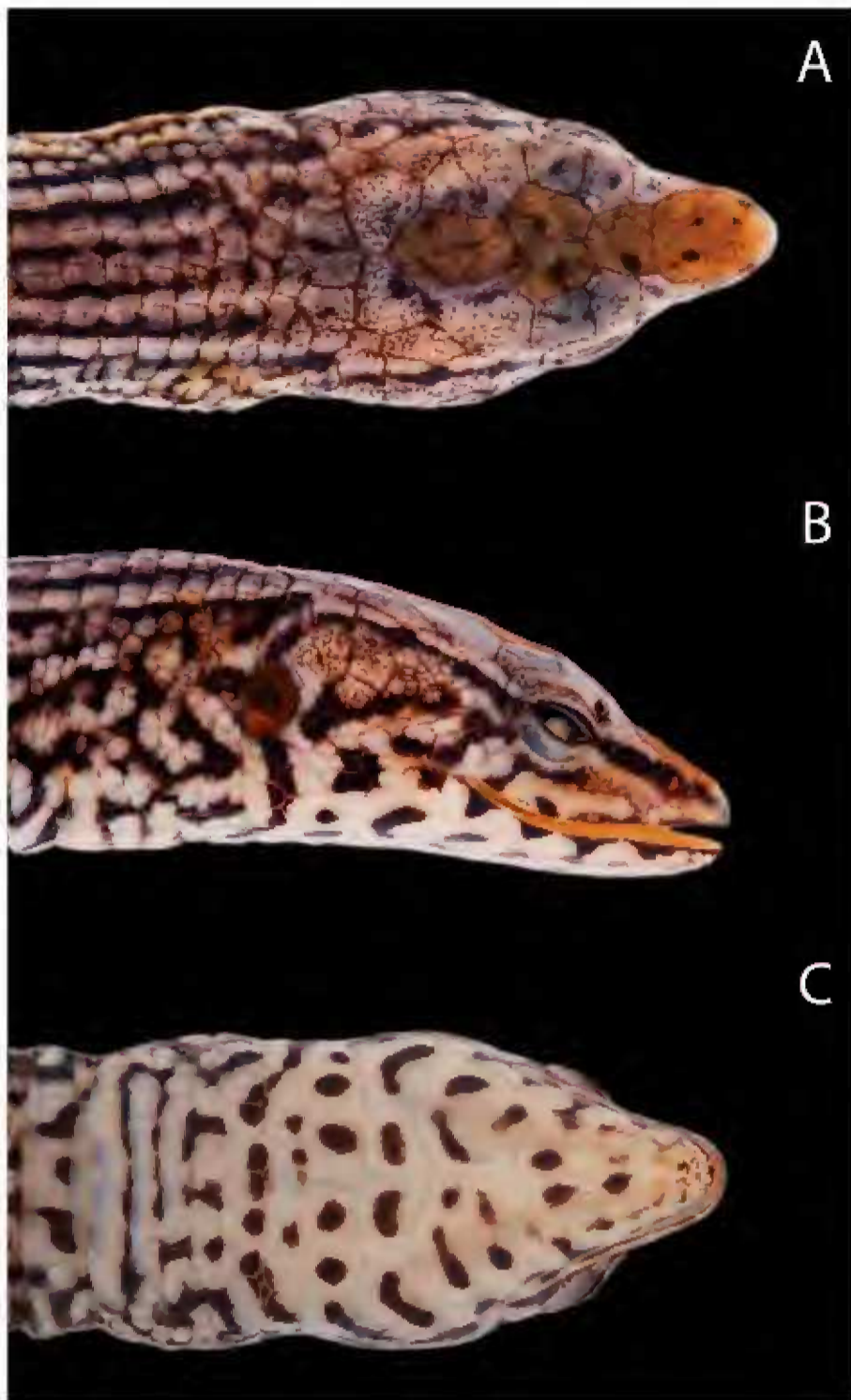


Fig. 2. Dorsal (A), lateral (B), and ventral (C) views of the head of *Petracola angustisoma* sp. nov. Holotype, CORBIDI 00467, male. Photographs by D. Quirola.

supraoculars. Interparietal hexagonal. Parietals polygonal, longer than wide. Postparietals two, with posterior sutures forming a nearly straight line. Supraoculars two. Anterior supraocular larger than posterior supraocular. Superciliary series discontinuous, 2-1/2-1, the anteriormost extending onto dorsal surface of head. Nape scales immediately posterior to head scales larger than adjacent dorsals. Nasal subtriangular, pierced in center by nostril, with shallow groove extending dorsally to loreal. One loreal on each side, not in contact with supralabials. Palpebral disc transparent with minute brown flecks. Supralabials eight. Suboculars three. Postoculars two. Supratympanic temporals 3/3. Tympanum recessed, transparent. Infralabials six. Genials two, meeting at broad midventral sutures. Pregulars in somewhat regular transverse rows, anteriormost two rows larger than posterior rows. Gulars in eight rows. Gular fold distinct, concealing three rows of small scales.

Dorsals smooth, juxtaposed, rectangular, in 37 transverse rows and 19 longitudinal rows (at tenth transverse ventral scale row). Ventrals smooth, in 22 transverse and 10 longitudinal rows. Dorsals and ventrals separated by



Fig. 3. Two species of *Petracola* in life. Holotype of *P. angustisoma* sp. nov. (A), and adult male of *P. ventrimaculata* (CORBIDI 03630) from Laguna Norte, Cajamarca (B). Photographs by P.J. Venegas.

approximately three longitudinal rows of small to granular scales, which are continuous with small to granular scales at insertion of limbs. Cloacal plate with two large anterior and four large posterior scales. Tail complete. Caudal scales rectangular, smooth, glossy, in 98 transverse rows.

Forelimbs pentadactyl, with claws. Anterodorsal scales smooth, glossy, polygonal, and larger than those on posterior side. Dorsal scales on brachium much larger than ventrals. Ventral scales on brachium subgranular. Anterior scales on antebrachium polygonal, smooth, and glossy. Posteroventral scales on antebrachium roundish, smooth, and glossy. Palmar scales domed, some with central pits. Dorsal scales on finger I 2/3, II 5/5, III 8/8, IV 10/9, and V 6/6. Subdigital lamellae undivided; on finger I 5/5, II 10/9, III 13/12, IV 13/13, and V 7/8.

Scales on anterior surface of thigh polygonal, smooth, glossy, and distinctly larger than adjacent scales. Scales on anteroventral surface of thigh polygonal smooth and glossy. Femoral pores 9/9. Scales on posterior surface of thigh small, round, smooth, and glossy. Scales on dorsal surface of crus polygonal to round, subimbricate, smooth, and glossy. Scales on ventral surface of crus significantly larger than adjacent scales. Scales on dorsal surface of foot polygonal, irregularly arranged, subimbricate, and of varying sizes. Dorsal scales on toe I 3/3, II 6/6, III 9/9, IV 12/12, V 7/7, and single. Plantar scales ovoid and domed. Subdigital lamellae divided from a point halfway

Table 1. Scutellational characters in species of *Petracola*. Range followed by mean \pm standard deviation is given for quantitative characters if applicable.

Characters	<i>Petracola angustisoma</i> (n = 1)	<i>Petracola labioocularis</i>	<i>Petracola ventrimaculata</i> (n = 107)	<i>Petracola waka</i>
Supraoculars	2	3	2/2 (n = 106) 3/3 (n = 1)	2/2 (n = 35) 3/2 (n = 2) Other (n = 2)
Superciliaries	2-1/2-1	1-2/1-2	1-1/1-1 (n = 77) 2-1/2-1 (n = 8) 4/4 (n = 3) Other (n = 19)	4/4 (n = 32) 4/3 (n = 2) 5/4 (n = 1) 3/3 (n = 1) 2-1/2-1 (n = 1) 1-1/1-1 (n = 1) Other (n = 1)
Postoculars	2	2-3	2/2 (n = 103) Other (n = 4)	2/2 (n = 17) 3/3 (n = 14) 2/3 (n = 3) 3/2 (n = 4) Other (n = 1)
Loreals	1/1	0	0/0 (n = 97) 1/1 (n = 6) Other (n = 16)	2/2 (n = 5) 1/1 (n = 7) 2/1 (n = 1) 1/2 (n = 3) 0/0 (n = 1)
Supralabials	8	—	6/6 (n = 39) 7/7 (n = 34) 6/7 (n = 10) Other (n = 23)	8/8 (n = 14) 7/7 (n = 13) 8/7 (n = 6) 7/8 (n = 2) 7/6 (n = 2)
Infralabials	6	—	6/6 (n = 60) 7/6 (n = 11) 6/5 (n = 11) Other (n = 24)	7/7 (n = 14) 6/6 (n = 15) 5/6 (n = 2) 6/5 (n = 1) 8/7 (n = 1) 6/7 (n = 1) 5/5 (n = 1)
Genials	2/2	2-3 (2.7 \pm 0.45)	2/2 (n = 103) 3/3 (n = 3) 3/2 (n = 1)	3/3 (n = 35)
Transverse dorsal scale rows	37	34-35 34.7 \pm 0.45	30-41 34.24 \pm 2.25 (n = 107)	36-49 (n = 39; 42.2 \pm 4.16)
Longitudinal dorsal scale rows	19	—	15-23 18.71 \pm 1.52 (n = 107)	—
Transverse ventral scale rows	22	18-20 19.2 \pm 0.72	21.88 \pm 1.43 (n = 106)	23-28 (n = 37; 25.0 \pm 1.23)
Longitudinal ventral scale rows	10	10	8-13 10.82 \pm 1.02 (n = 106)	—
Femoral pores per hind limb in males	9	10-11	2-5	5-7
Femoral pores per hind limb in females	—	0-3	0-6	0-4

between base and tip to the base of toes in 7/6 rows on toe I, 12/12 on II, 17/16 on III, 20/19 on IV, 11/13 on V. Measurements (mm) and proportions of the holotype: SVL 43.6 mm; TL 100 mm; HL 9.6; HW 6.7; ShL 5; AGD 23.4; TL/SVL 2.3; HL/SVL 0.2; HW/SVL 0.2; ShL/SVL 0.1; and AGD/SVL 0.5.

Holotype color in life: Dorsal background pale brown with seven discontinuous black longitudinal stripes on dorsum and two on flanks (continuous on neck) extending onto base of tail; dorsal and dorsolateral aspects with six longitudinal rows of dark yellow flecks extending onto tail; limbs covered by dark brown reticulations;

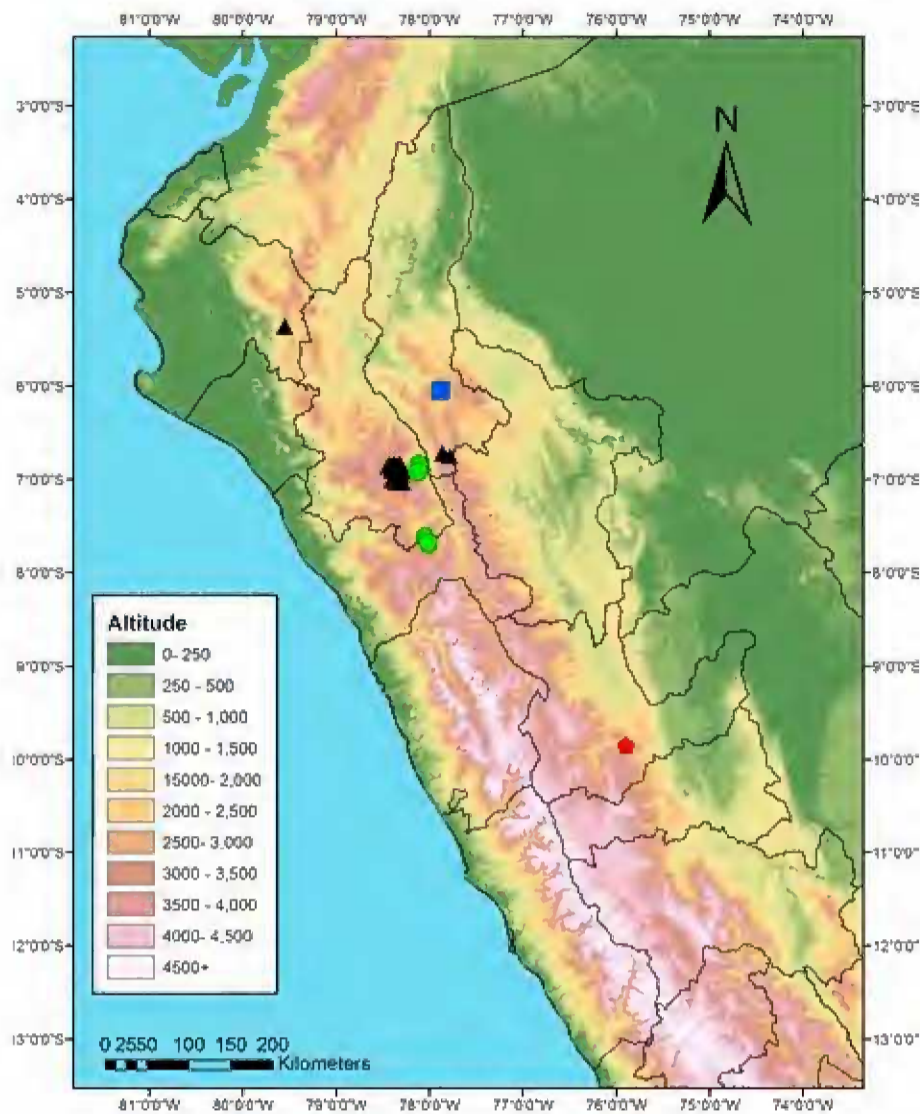


Fig. 4. Distribution map of species of *Petracola*. *Petracola angustisoma* sp. nov. (blue square), *P. ventrimaculata* (black triangles), *P. labioocularis* (red pentagon), *P. waka* (green circles).

tail with scattered dark brown marks; sides of head with longitudinal black stripes; labials and ventrolateral region of head white with black marks; sides of neck covered with black reticulations; and four faint ocelli with creamy brown center above the forelimb insertion (Fig. 3A). Ventral surface of body including limbs and tail white; ventral surface of head with irregular black marks on the center of each scale; ventral surface of neck with two transverse black stripes; ventral surface of trunk and tail with black semicircular marks on anterior margin of scales, arranged in transverse rows; ventral surface of forelimbs with black reticulations; ventral surface of hind limbs with roundish black marks.

Color in preservative: Similar to color in life but the dark yellow flecks on dorsum, dorsolateral region and tail are cream instead of dark yellow, and the center of the four ocelli above forelimb are cream instead of creamy brown (Fig. 1).

Distribution and natural history: The new species is known only from its type locality in a montane forest of the Utcubamba basin, northern portion of Cordillera Central, Peru, at 1,889 m (Fig. 4). Following the terrestrial ecoregions of the world by Olson et al. (2001), this locality lies in the Peruvian Yungas ecoregion. The holotype of *P. angustisoma* was found under a pile of decaying vegetation inside an abandoned house, along with a juvenile specimen of *Mastigodryas boddaerti*. The

type locality lies in the vicinity of Cocachimba and is composed of croplands with scattered large boulders and bushes, embedded in a matrix of humid montane forest. However, the forest has been almost completely removed and only some small patches of secondary forest remain close to ravines. Sympatric species of squamate reptiles are *Atractus* sp., *Chironius exoletus*, *M. boddaerti*, and *Stenocercus huancabambae*.

Etymology: The specific epithet *angustisoma* is a noun (in apposition) in the nominative singular and derives from the Latin words *angusti* (= narrow) and *soma* (= body). It refers to the slender body of this species.

Discussion

Although the practice of describing species with a single specimen is not recommended, we feel confident about the identity of *Petracola angustisoma* as a different taxon, due to its strikingly distinctive diagnostic characters. Unfortunately we were not able to collect additional specimens, despite repeated surveys to the type locality and other adjacent localities along the Utcubamba basin. The genus *Petracola* was erected by Doan and Castoe (2005) based on the results of a phylogenetic study of gymnophthalmid lizards using molecular evidence (Castoe et al. 2004), where samples of *Proctoporus ventrimaculata* (KU 219838) and *Proctoporus* cf. *ventrimaculata* (KU 212687) resulted paraphyletic to *Proctoporus* (see Fig. 6 in Castoe et al. 2004). Based on morphological evidence, the authors assigned *Proctoporus labioocularis* (Köhler and Lehr 2004), a species from central Peru (Fig. 4), to the genus *Petracola*. Three years later Kizirian et al. (2008) described *Petracola waka*, remarking that the new species allocation to the genera was based on convenience rather than confidence regarding phylogenetic relationships; however, they overlooked the fact that one of the paratypes of *P. waka* (KU 212687) was included in Castoe et al. (2004) phylogeny. Therefore, the assignment of this species to the genus *Petracola* is supported by molecular evidence as well.

The identification of superciliaries and supraoculars in gymnophthalmid lizards has not been consistent. Herein we follow the terminology of Kizirian (1996), who defines the superciliaries as those scales between the supraoculars and the ciliaries, in a continuous or discontinuous series, and in *Petracola ventrimaculata* the anteriormost supraocular is fused with the first superciliary. Doan and Castoe (2005) consider that *P. ventrimaculata* has three supraoculars and Köhler and Lehr (2004) consider that *P. labioocularis* has four supraoculars. Following Kizirian (1996), the anteriormost “supraocular” in both *P. ventrimaculata* and *P. labioocularis* is the first superciliary. Thus, *P. ventrimaculata* has two supraoculars and two discontinuous superciliaries, of which the anteriormost extends onto the dorsal surface of head (Uzzell 1970;

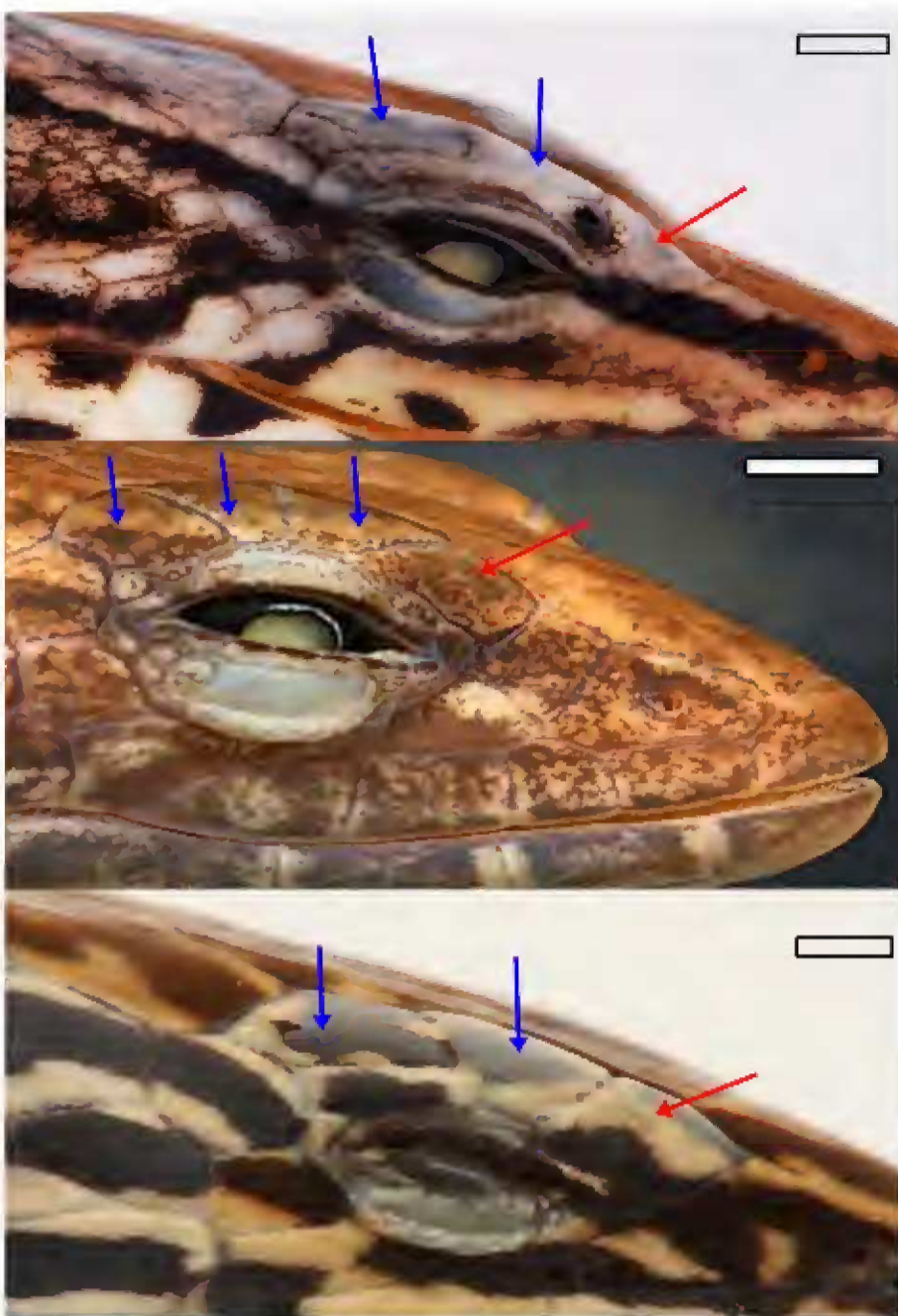


Fig. 5. Close-up of the heads of *Petracola angustisoma* sp. nov. (A), *P. labioocularis* (SMF 80113) (B), and *P. ventrimaculata* (CORBIDI 03630) (C), showing the anteriormost superciliary (red arrows) and supraoculars (blue arrows). Scale bar = 1 mm. Photographs by D. Quirola, G. Köhler, and J.C. Chavez, respectively.

Kizirian et al. 2008), a condition shared with *P. labioocularis*, *P. waka*, and the species described herein (Fig. 5).

We found conspicuous differences between *Petracola labioocularis* and all other species of *Petracola*, such as the presence of three supraoculars, supralabial-subocular fusion, and precloacal pores in males and females (or no scales between femoral pores; Fig. 6), a rare condition in Gymnophthalmidae, also present in some *Riama* species (Kizirian 1996). It also has a disjunct distribution being the only species of the genus present in central Peru which makes its allocation in the genus doubtful. We tentatively assigned the new species to the genus *Petracola* due to overall similarities with other species of

the genus, especially the presence of two supraoculars, anteriormost superciliary extended onto dorsal surface of head (or fused with anteriormost supraocular), and its distribution in the Andes of northern Peru (Fig. 4). Increased taxon sampling in a molecular phylogeny is needed to resolve the phylogenetic relationships among *Petracola angustisoma*, *P. labioocularis*, and other species currently recognized as *Petracola*.

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Key to species of *Petracola*

- 1.a. Supralabial-subocular fusion and precloacal pores present.....*P. labioocularis*
 1.b. Supralabial-subocular fusion and precloacal pores absent.....2
 2.a. Superciliary series complete, genials three, and venter pale with scattered dark brown spots.....*P. waka*
 2.b. Superciliary series incomplete, genials two, and venter pale with black bands or spots.....3
 3.a. Loreal absent, 2–5 femoral pores per hind limb in males and venter pale with bold black transverse band.....*P. ventrimaculata*
 3.b. Loreal present, nine femoral pores per hind limb in males and venter pale with transverse rows of black spots...*P. angustisoma*



Fig. 6. Ventral view of waist of *Petracola labioocularis* (paratype, SMF 80113) showing the precloacal and femoral pores. Scale bar = 1 mm. Photograph by G. Köhler.

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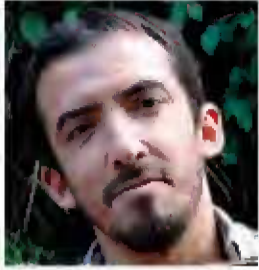
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APPENDIX I

Petracola ventrimaculata.—PERU: CAJAMARCA DEPARTMENT: Celendín province: La Victoria 6° 51' 20.11"S, 78° 18' 25.40"W, 3,449 m, MUSM 26352, 26354–56, 26359; Coñicorgue 6° 50' 0.29"S, 78° 19' 13.40"W, 3,573 m, MUSM 26238–43, 26245, 26353, 26259; Tingo (Sorochocho district) 6° 55' 33.16"S, 78° 18' 59.16"W, 3,410 m, 26357, 27297, 27300, 6° 56' 1.611" S, 78° 20' 34.4862"W, 3,550 m, MUSM 26230; La Chorrera (Sorochocho district) 6° 55' 52.30"S, 78° 18' 55.02"W, 3,267–3,835 m, MUSM 26229, 27295, 27299, 27301; La Encañada 6° 56' 17.02"S, 78° 19' 18.71"W, 3,267 m, MUSM 27298, 27302, 27303; Cerro Las Gordas (Hualgayoc district), MUSM 29879–80; Chugurmayo 6° 53' 35.15"S, 78° 18' 44.17" W, 3,420 m, MUSM 26231–32; Puente Hierba Buena 6° 58' 48.73"S, 78° 22' 44.62"W, 3,360 m, MUSM 26233–35; Jadibamba 6° 50' 17.20"S, 78° 22' 58.54"W, 3,560 m, MUSM 26236; Bajo Quengorio 6° 50' 28.59"S, 78° 25' 52.17" W, 3,410 m, MUSM 26237; Sorochocho y Huasmin 6° 58' 38.98"S, 78° 22' 46.01"W, 3,576 m, MUSM 29504–07, 7° 1' 7.93"S, 78° 18' 46.90"W, 3,466 m, MUSM 29508; NO DATA, MUSM 26260, 26261, 26262; Pampa Grande 7° 1' 42.30"S, 78° 17' 52.69"W, 3,892m, CORBIDI 09239; Michiquillay 7° 1' 41.69"S, 78° 18' 56.09"W, 3,817 m, CORBIDI 9247; Cajamarca province: Laguna Norte 6° 43' 42.8874 S, 78° 42' 57.311" W, 3,593 m; CORBIDI 03630; PIURA DEPARTMENT: Huancabamba province: El Tambo 5° 21' 40.39"S, 79° 33' 9.72"W, 2,981 m, CORBIDI 10482–91, 10498, 10503, 11268–73; 2,700 m, MUSM 15452–56; AMAZONAS DEPARTMENT: Chachapoyas province: Barro Negro 6°42'58.2"S, 77°51'53.8"W, 3,290 m, CORBIDI 11067–75, 11104–26; Leimebamba 6°44'48"S, 77°47'11.6"W, 2,799 m, CORBIDI 11010.



Lourdes Y. Echevarría graduated in biological sciences from Universidad Nacional Agraria La Molina, Lima, Peru, in 2014. As a student, she collaborated constantly in the order and management of the herpetological collections of Centro de Ornitología y Biodiversidad, Lima, developing a great interest in reptiles, especially lizards. For her undergraduate thesis, Lourdes worked on the “Review of the current taxonomic status of *Petracola ventrimaculata* (Cercosaurini: Gymnophthalmidae) using morphological and ecological evidence.” She worked as a researcher of the Museo de Zoología (QCAZ), Pontificia Universidad Católica del Ecuador in Quito during 2015. This manuscript is her first lizard species description. Lourdes is preparing a monograph on the systematics of the *Petracola ventrimaculata* complex based on the results of her undergraduate thesis, as well as other papers about taxonomy of lizards and snakes.



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In accordance with the International Code of Zoological Nomenclature new rules and regulations (ICZN 2012), we have deposited this paper in publicly accessible institutional libraries. The new species described herein has been registered in ZooBank (Polaszek 2005a, b), the official online registration system for the ICZN. The ZooBank publication LSID (Life Science Identifier) for the new species described here can be viewed through any standard web browser by appending the LSID to the prefix “<http://zoobank.org/>.” The LSID for this publication is: urn:lsid:zoobank.org:pub:F1C772A4-E580-4EAA-9BD8-E8A83D276743.

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Citations

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