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A new species of *Pholidobolus* (Squamata: Gymnophthalmidae) from the Andes of southern Ecuador

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***Abstract.*—We describe a new species of *Pholidobolus* lizard from the Amazonian slopes of the Andes of southern Ecuador. Among other characters, the new species differs from other species of *Pholidobolus* in having a distinct diagonal white stripe extending from the fourth genial scale to the fore limb. We present a phylogeny based on mitochondrial DNA sequence data as additional evidence supporting delimitation of the new species, which is sister to all other species of *Pholidobolus*. Our phylogeny further supports the south-to-north speciation hypothesis proposed for other lizard clades from the northern Andes.**

Key words. Clade *Pholidobolus*, DNA, lizard, phylogeny, South America, systematics

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Introduction

The gymnophthalmid lizard clade *Pholidobolus* was recently defined by Torres-Carvajal and Mafla-Endara (2013) as the largest crown clade containing *Pholidobolus montium* Peters, 1863, but not *Macropholidus ruthveni* Noble, 1921. This phylogenetic definition (de Queiroz and Gauthier 1994) is based on a phylogenetic tree obtained from analyses of mitochondrial DNA nucleotide sequence data (Torres-Carvajal and Mafla-Endara 2013), and is in conflict with previous non-phylogenetic definitions of both *Pholidobolus* and *Macropholidus* (Montanucci 1973; Reeder 1996) based on morphological data. As defined by Torres-Carvajal and Mafla-Endara (2013), *Pholidobolus* contains four species—*P. affinis*, *P. macbrydei*, *P. montium*, and *P. prefrontalis*. Contrary to previous taxonomic arrangements (Montanucci 1973; Reeder 1996), "*P.*" *annectens* was shown to be part of the clade (traditionally ranked as a genus) *Macropholidus*. In addition, Torres-Carvajal and Mafla-Endara (2013) concluded that the controversial generic allocation of *P. anomalus* from southern Peru (Montanucci 1973; Reeder 1996) still remains to be established.

Pholidobolus lizards occur between 1,800 and 4,100 m along the southern part of the northern Andes (i.e., Ecuador and southern Colombia). Only one species, *P. macbrydei*, occurs also in the Huancabamba Depression in extreme southern Ecuador and possibly northern Peru. Herein, we describe a new species of *Pholidobolus* from the Andes in southern Ecuador using data on morphology and color pattern. We also present molecular evidence supporting recognition of the new species by performing phylogenetic analyses of nucleotide sequence data.

Methods

Morphological data: Type specimens and additional specimens examined (Appendix 1) were deposited in the herpetological collection at Museo de Zoología, Pontificia Universidad Católica del Ecuador, Quito (QCAZ). The following measurements were taken with a digital caliper and recorded to the nearest 0.1 mm, except for tail length, which was taken with a ruler and recorded to the nearest millimeter: head length (HL), head width (HW), shank length (ShL), axilla-groin distance (AGD), snout-vent length (SVL), and tail length (TL). Sex was determined by dissection or by noting the presence of everted hemipenes. We follow the terminology of Reeder (1996) for description of the holotype and scale counts. Data for other species of *Pholidobolus* were taken from Montanucci (1973).

The left hemipenis of two type specimens of the new species (QCAZ 4998 and 4999) were prepared following the procedures of Manzani and Abe (1988), as modified by Pesantes (1994) and Zaher (1999), where the retractor

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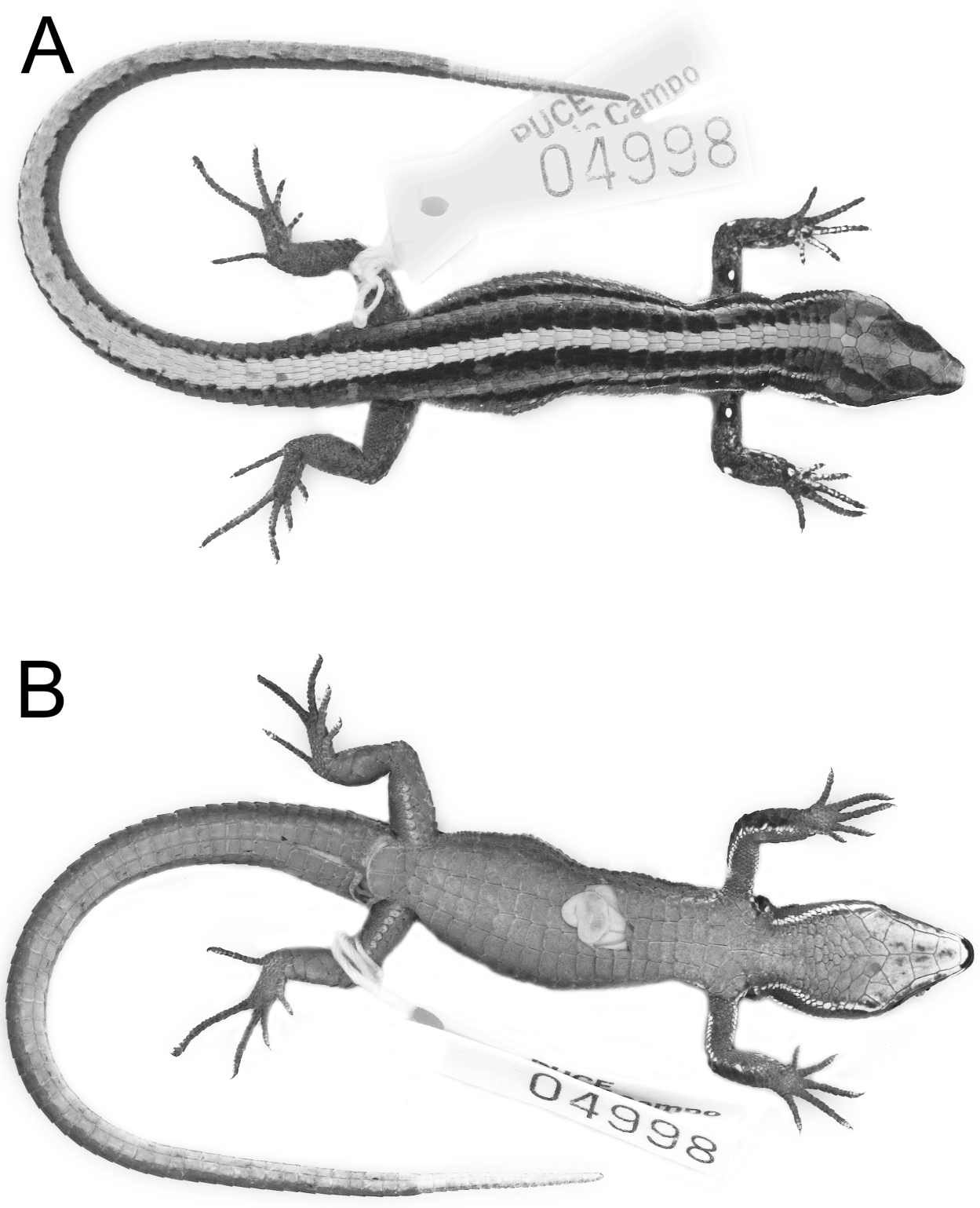


Fig. 1. Holotype (QCAZ 4998; SVL = 45.52 mm) of *Pholidobolus hillisi* sp. nov. in dorsal (**A**) and ventral (**B**) views. *Photographs by OTC.*

muscle is manually separated and the everted organ is filled with stained petroleum jelly and paraffin. In addition, the hemipenial calcareous structures were stained in an alcoholic solution of Alizarin Red, following the adaptation of the procedures of Uzzell (1973) proposed by Nunes et al. (2012). Description of the hemipenes follows the terminology of Dowling and Savage (1960), Savage (1997), Myers and Donnelly (2001, 2008), and Nunes et al. (2012).

DNA sequence data: Total genomic DNA was digested and extracted from liver or muscle tissue using a guanidinium isothiocyanate extraction protocol. Tissue samples were first mixed with Proteinase K and a lysis buffer and digested overnight prior to extraction. DNA samples were quantified using a Nanodrop® ND-1000 (NanoDrop Technologies, Inc), re-suspended and diluted to 25 ng/ul in ddH2O prior to amplification.

Using primers and amplification protocols from the literature (Pellegrino et al. 2001; Torres-Carvajal and Mafla-Endara 2013) we obtained 1,573 nucleotides (nt) representing mitochondrial genes 12S (344 nt), 16S (549 nt), and ND4 (680 nt) from three individuals of the new species described herein (GenBank accession numbers KP090167-KP090175).

Chronophylogenetic analyses: We added the three sequences generated in this study to the mtDNA dataset of Torres-Carvajal and Mafla-Endara (2013). Editing, assembly, and alignment of sequences were performed with Geneious ProTM 5.3 (Biomatters Ltd. 2010). Genes were combined into a single dataset with three partitions, one per gene. The model of evolution for each partition was obtained in jModeltest 2 (Darriba et al. 2012) under the Akaike information criterion. Chronophylogenetic analyses were performed in Beast 2.1.3 (Bouckaert et al. 2014) as described in Torres-Carvajal and Mafla-Endara (2013), except that we performed four independent 108 generation runs with random starting trees, sampling every 10,000 generations. The resultant 36,000 trees were used to calculate posterior probabilities (PP) for each bipartition in a maximum clade credibility tree in TreeAnnotator 2.1.2 (Rambaut and Drummond 2014).

Systematics: The taxonomic conclusions of this study are based on the observation of morphological features and color pattern, as well as inferred phylogenetic relationships. We consider this information as species delimitation criteria following a general lineage or unified species concept (de Queiroz 1998, 2007).

Pholidobolus hillisi sp. nov.

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Proposed standard English name: **Cuilanes of Hillis**
Proposed standard Spanish name: **Cuilanes de Hillis**

Holotype: QCAZ 4998 (Figs. 1, 2), adult male, Ecuador, Provincia Zamora-Chinchipe, near San Francisco Research Station on Loja-Zamora road, 3°57'57"S, 79°4'45"W, WGS84, 1,840 m, 21 July 2012, collected by Santiago R. Ron, Andrés Merino, Fernando Ayala, Teresa Camacho, and Martin Cohen.

Paratypes (5): ECUADOR: Provincia Zamora-Chinchipe: QCAZ 4999 (adult male), 5000 (juvenile female), same data as holotype; QCAZ 6840 (adult female), 6842 (adult female), 6844 (adult male), San Francisco Research Station, 3°58'14"S, 79°4'41"W, WGS84, 1,840 m, 29 October 2004, 9 June 2005, and 29 September 2005, respectively, collected by Kristin Roos, Alban Pfeiffer, Andy Fries, Ulf Soltau, and Florian Werner.

Diagnosis: *Pholidobolus hillisi* is unique among species of *Pholidobolus* in having a distinct diagonal white stripe on each side of the chin, extending from the fourth genial to the fore limb (Fig. 3). It further differs from all species of *Pholidobolus*, except *P. affinis*, in having three supraoculars (two in *P. macbrydei*, *P. montium*, and *P. prefrontalis*). *Pholidobolus affinis* differs from the new species by having flanks with black reticulations on a reddish orange ground color (flanks brown in *P. hillisi*; Fig. 4).

The new species also can be distinguished from *P. montium* and *P. macbrydei* by the presence of prefrontal scales (absent in the last two species). While *P. hillisi* shares with *P. affinis* and *P. prefrontalis* the presence of prefrontal scales, it differs from them in having a dark brown dorsum with a conspicuous light brown vertebral stripe (dorsum pale brown without a vertebral stripe in *P. affinis* and *P. prefrontalis*; Fig. 4). Furthermore, *P. hillisi* has fewer dorsal scales in transverse rows (28–31) than *P. affinis* (45–55), *P. montium* (35–50), *P. prefrontalis* (37–46), and P. *macbrydei* (31–43).

Pholidobolus hillisi shares with all other recognized species of *Pholidobolus* the absence of a single transparent palpebral disc and the presence of a ventrolateral fold between fore and hind limbs. These characters distinguish members of *Pholidobolus* from members of its sister clade *Macropholidus* (Torres-Carvajal and Mafla-Endara 2013).

Characterization: (1) Three supraoculars, anteriormost larger than posterior one; (2) prefrontals present; (3) femoral pores present in both sexes; (4) two to five opaque lower eyelid scales; (5) scales on dorsal surface of neck striated, becoming keeled from fore limbs to tail; (6) two or four rows of lateral granules at midbody; (7) 28–31 dorsal scales between occipital and posterior margin of hind limb; (8) lateral body fold present; (9) keeled ventrolateral scales on each side absent; (10) dorsum dark brown with a conspicuous narrow, pale brown, vertebral stripe that becomes grayish brown towards the tail; (11) labial stripe white; (12) sides of body dark brown;

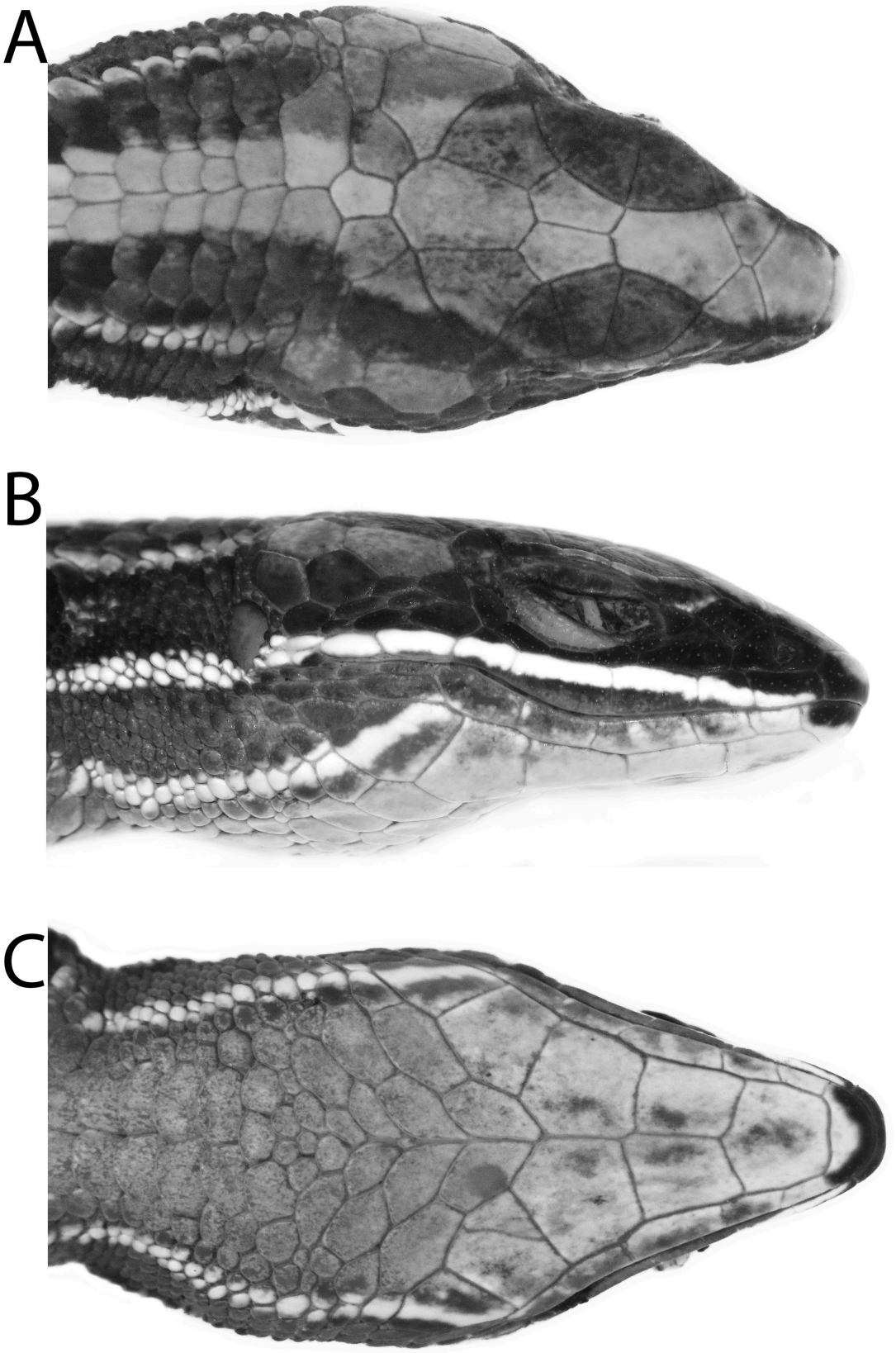


Fig. 2. Head of the holotype (QCAZ 4998) of *Pholidobolus hillisi* sp. nov. in dorsal (**A**), lateral (**B**), and ventral (**C**) views. *Photographs by OTC.*

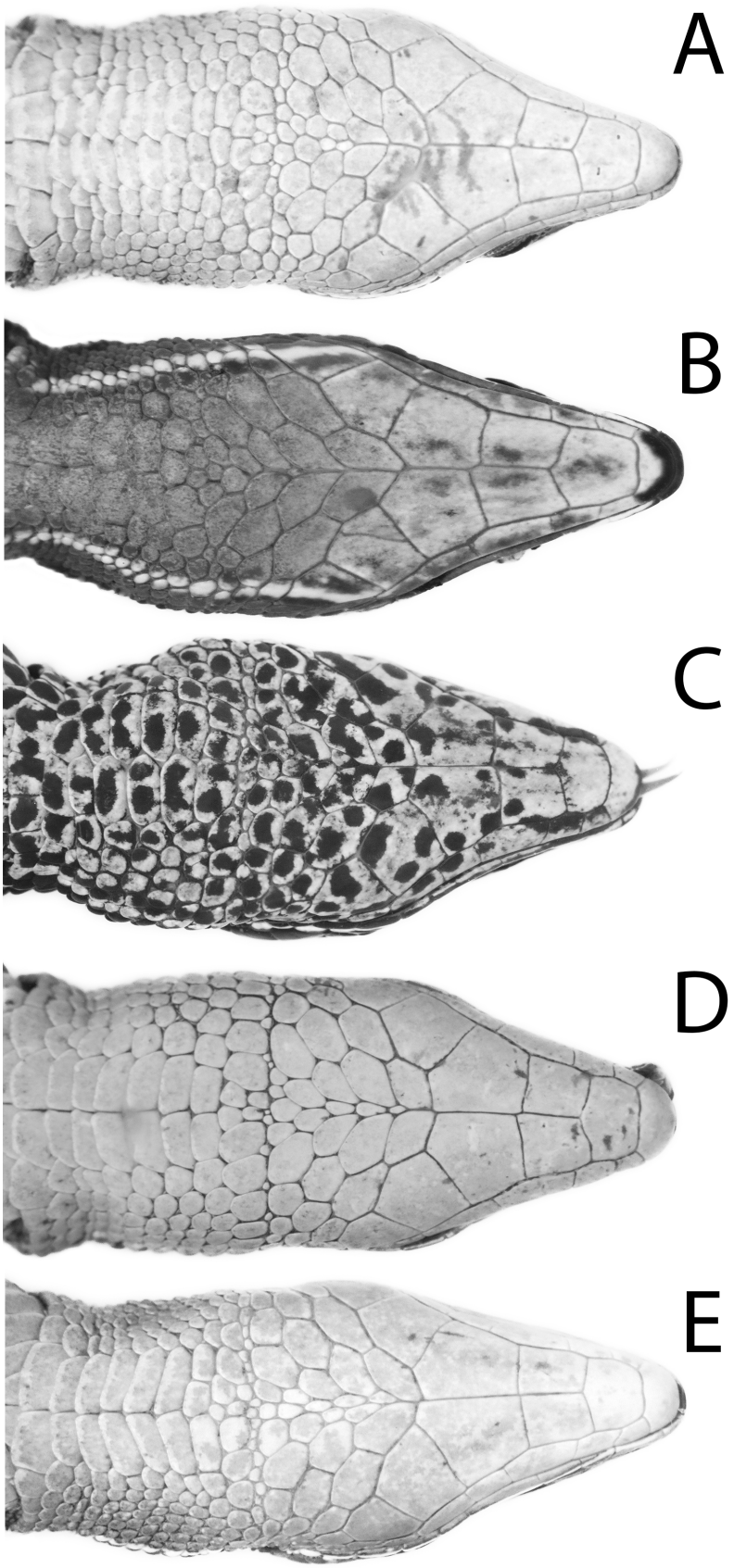


Fig. 3. Head of five species of *Pholidobolus* in ventral view. (A) *P. affinis*; (B) *P. hillisi* sp. nov.; (C) *P. macbrydei*; (D) *P. montium*; (E) *P. prefrontalis*. *Photographs by OTC.*

(13) white stripe along fore limb present; (14) a distinct diagonal white stripe on each side of the chin, extending from the fourth genial to the fore limb; (15) adult males with red flecks and ocelli (black with white center) dorsal to insertion of fore and hind limbs.

Description of holotype: Adult male (QCAZ 4998); snout-vent length 45.52 mm; tail length 104 mm; dorsal and lateral head scales juxtaposed, finely wrinkled; rostral hexagonal, 2.09 times as wide as high; frontonasal pentagonal, wider than long, laterally in contact with nasal, smaller than frontal; prefrontals pentagonal, nearly as wide as long, with medial suture, laterally in contact with loreal and first superciliary; frontal hexagonal, longer than wide, slightly wider anteriorly, in contact with the prefrontals and supraoculars I and II on each side; frontoparietals pentagonal, longer than wide, with medial suture, each in contact laterally with supraoculars II and III; interparietal roughly hexagonal, lateral borders parallel to each other; parietals slightly smaller than interparietal, tetragonal and positioned anterolaterally to interparietal, each in contact laterally with supraocular III and dorsalmost postocular; postparietals three, medial scale smaller than laterals; supralabials seven, fourth longest and below the center of eye; infralabials five, fourth below the center of eye; temporals enlarged, irregularly hexagonal, juxtaposed, smooth; two large supratemporal scales, smooth; nasal divided, irregularly pentagonal, longer than wide, in contact with rostral anteriorly, first and second supralabials ventrally, frontonasal dorsally, loreal posterodorsally and frenocular posteroventrally; nostril on ventral aspect of nasal, directed lateroposteriorly, piercing nasal suture; loreal rectangular; frenocular enlarged, in contact with nasal, separating loreal from supralabials; supraoculars three, with the first being the largest; four elongate superciliaries, first one enlarged, in contact with loreal; palpebral disk divided into two scales, pigmented; suboculars three, elongated and similar in size; three postoculars, medial one smaller than the others; ear opening vertically oval, without denticulate margins; tympanum recessed into a shallow auditory meatus; mental semicircular, wider than long; postmental pentagonal, slightly wider than long, followed posteriorly by four pairs of genials, the anterior two in contact medially and the posterior two separated by postgenials; all genials in contact with infralabials; gulars imbricate, smooth, widened in two longitudinal rows; gular fold incomplete; posterior row of gulars (collar) with four scales, the medial two distinctly widened.

Scales on nape similar in size to dorsals, except for the anteriormost that are widened; scales on sides of neck small and granular; dorsal scales elongated, imbricate, arranged in transverse rows; scales on dorsal surface of neck striated, becoming keeled from fore limbs to the tail; number of dorsal scales between occipital and posterior margin of hind limbs 28; dorsal scale rows in a transverse line at midbody 30; one row of smooth, enlarged ventrolateral scales on each side; dorsals separated from ventrals by three rows of small scales at the level of the 13th row of ventrals; lateral body fold present; ventrals smooth, wider than long, arranged in 20 transverse rows between the collar fold and preanals; six ventral scales in a transverse row at midbody; subcaudals smooth; limbs overlap when adpressed against body; axillary region composed of granular scales; scales on dorsal surface of fore limb striated, imbricate; scales on ventral surface of fore limb granular; two thick, smooth thenar scales; supradigitals (left/right) 3/3 on finger I, 6/6 on II, 8/8 on III, 9/9 on IV, 6/6 on V; supradigitals 3/3 on toe I, 6/6 on II, 9/9 on III, 11/12 on IV, 8/8 on V; subdigital lamellae of fore limb single, 5/5 on finger I, 8/9 on II, 13/13 on III, 14/14 on IV, 8/9 on V; subdigital lamellae on toes I and II single, on toe III paired on the distal half, on toe IV all paired, on toe V paired at the base; number of subdigital lamellae (pairs when applicable) 6/5 on toe I, 9/9 on II, 13/14 on III, 19/20 on IV, 12/12 on V; groin region with small, imbricate scales; scales on dorsal surface of hind limbs striated and imbricated; scales on ventral surface of hind limbs smooth; scales on posterior surface of hind limbs granular; six femoral pores on each leg; preanal pores absent; cloacal plate paired, bordered by four scales anteriorly, of which the two medialmost are enlarged.

Measurements (mm) and proportions of the holotype: HL 12.6; HW 9.3; ShL 5.2; AGD 24.6; TL/SVL 1.72; HL/SVL 0.25; HW/SVL 0.18; ShL/SVL 0.10; AGD/SVL 0.48.

Hemipenial morphology (Fig. 5): Both organs extend along approximately nine millimeters in length. The lobes of the organs are fully everted and each hemipenis is fully expanded.

The hemipenial body is roughly conical in shape, with the base distinctly thinner than the rest of the organ, ending in two small lobes with apical folds in the apex. The sulcus spermaticus is central in position, originating at the base of the organ, which bears a fleshy fold partially overlapping the sulcus spermaticus. From this point on, the sulcus proceeds in a straight line towards the lobes, and acquires an S-shape at the first third of the body. The sulcus becomes broader at halfway the length of the hemipenial body, and returns to its regular width at the apical region; it gets divided in two branches at the lobular crotch. Just before the crotch, the central region of the sulcus bears a tiny fleshy fold, which is not part of the sulcus division. From this point on, the two branches of the sulcus run on the medial regions of the lobes among conspicuous lobular folds. The sulcate face of the hemipenial body presents two nude areas, parallel to the sulcus spermaticus, which run throughout the hemipenial body, getting thinner and encircling the base of the lobes.

The lateral and asulcate faces of the hemipenial body are ornamented with 28–30 rows of roughly equidistant flounces with calcareous spinules. The first four rows are

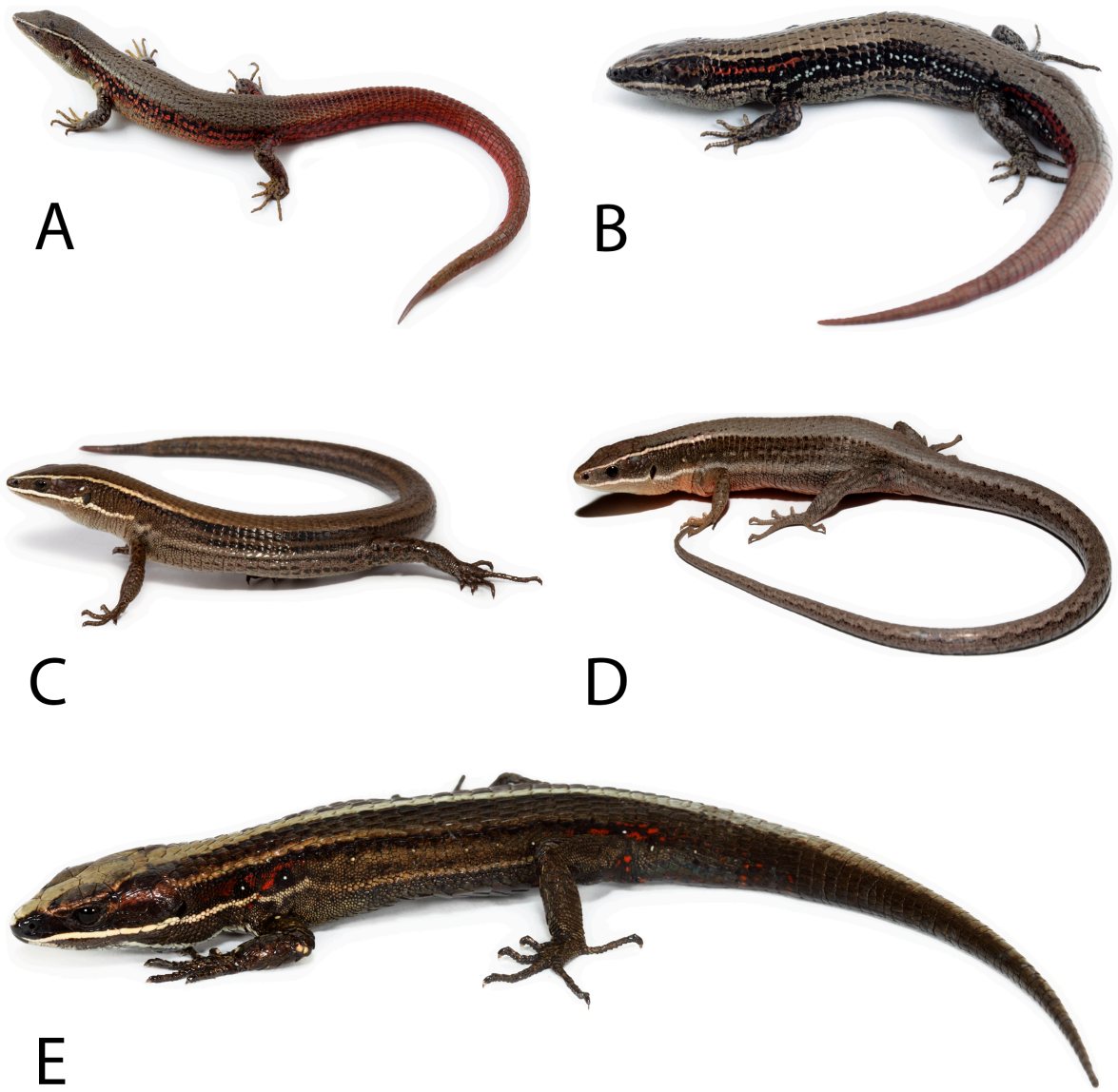


Fig. 4. Five species of *Pholidobolus* from Ecuador. (**A**) *P. affinis*; (**B**) *P. macbrydei*; (**C**) *P. montium*; (**D**) *P. prefrontalis*; (**E**) *P. hillisi* sp. nov. *Photographs by OTC (A, B, C, D) and S. R. Ron (E).*

straight, with a large series of spinules on the central aspect of the asulcate face, and small isolated series of 5-6 spinules bordering the nude areas parallel to the sulcus spermaticus. A V-shaped nude area at the central asulcate face of the body separates the remaining flounces. The fifth and sixth flounces are also interrupted laterally by an extension of the basal nude area. From the seventh to the apical-most one, the flounces cross the lateral aspects of the organ from the sulcate to the asulcate face, initially in roughly straight lines, gradually assuming chevron-shapes and getting reduced in length towards the apex of the organ.

The region between the asulcate and the lateral surfaces is marked by a conspicuous unevenness forming a bulge, which is shared by closely related species, such as *Macropholidus annectens*, *M. huancabambae*, *M. ruthveni*, *Pholidobolus affinis*, *P. macbrydei*, *P. montium*, and *P. prefrontalis* (Nunes, 2011).

Color of holotype in preservative: Dorsal background uniformly dark brown with a narrow light brown vertebral stripe extending from occiput onto tail; vertebral stripe slightly wider anteriorly; dorsal surface of head light brown medially (rostral, frontonasal, prefrontals, frontal and frontoparietals) and dark brown laterally (including supraoculars); white supralabial longitudinal stripe extending from first supralabial to fore limb; lateral aspect of neck dark brown with a dorsolateral light brown stripe that extends posteriorly along the flanks to the hind limbs; ventrolateral aspect of head and neck with a longitudinal white stripe extending posteriorly from fourth genial to insertion of fore limb and then laterally along

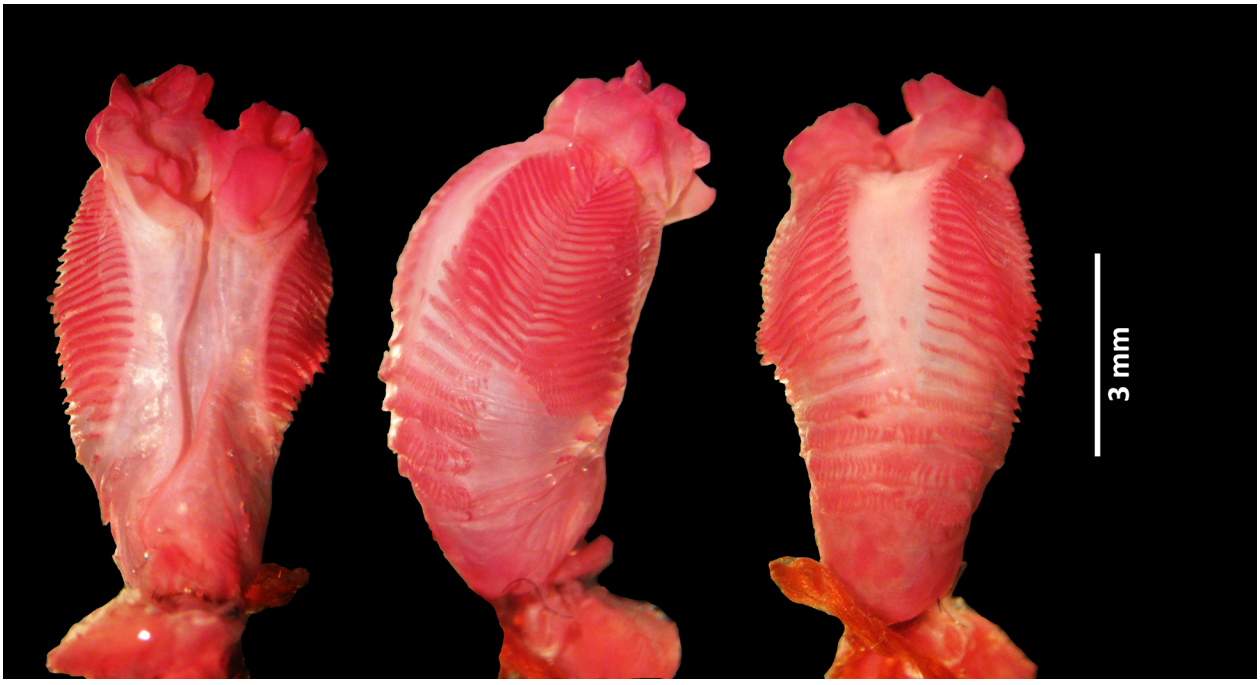


Fig. 5. Left hemipenis of *Pholidobolus hillisi* sp. nov. (QCAZ 4999) in sulcate (left), lateral (middle), and asulcate (right) views. *Photographs by P. Nunes.*

upper arm; fore limbs with scattered ocelli (black with white center); flanks grayish brown with two dorsolateral stripes, the dorsal one light brown and the ventral one dark brown; tail light brown dorsally and dark brown on the sides; two and three well-defined, small ocelli (black with white center) dorsal to insertion of fore and hind limbs, respectively; ventral surface of head gray, with dirty cream genials and scattered brown marks; chest, belly and ventral surface of limbs and tail dark gray.

Variation: Measurements and scale counts of *Pholidobolus hillisi* are presented in Table 1. Superciliaries usually four, five in QCAZ 6840; supralabials usually seven (eight of left side of specimen QCAZ 6840). Rows of lateral granules at midbody two (QCAZ 4999, 6844) to four (QCAZ 6842). Three specimens including the holotype, with a ventrolateral row of smooth enlarged scales (QCAZ 4999, 6840). Specimen QCAZ 6842 has a tiny scale separating the cloacal scales posteriorly; all four scales bordering the cloacal plate anteriorly are similar in size in two specimens (QCAZ 4999, 6844), whereas the lateralmost scales overlap the cloacal scales in one specimen (QCAZ 6840).

No variation was observed in color pattern in preservative among adult males. They can be distinguished from females by the presence of ocelli and pale flecks around insertion of fore and hind limbs. Moreover, the characteristic diagonal white stripe on each side of the chin that extends from the fourth genial to the forearm is more conspicuous in males than in females. Females are larger (maximum SVL 55.7 mm, *n*=3) than males (maximum SVL 51.1 mm, *n*=3).

Coloration in life of an adult male paratype (QCAZ 4999) was similar to the holotype's coloration in preservative described above, except that specimen QCAZ 4999 had small red flecks both at insertion of fore limbs

Table 1. Sexual variation in lepidosis and measurements of *Pholidobolus hillisi* sp. nov. Range followed by mean ± standard deviation are given.

Character	Males (*n*=3)	Females (*n*=3)
Dorsal scales between occipital and posterior margin of hind limb	28-30 (29±1)	29-31 (30±1)
Dorsal scale rows in a transverse line at midbody	27-34 (30.33±3.51)	29-35 (31±3.46)
Ventral scales between collar fold and preanals	18-20 (20.33±1.15)	18-19 (18.67±0.58)
Ventral scale rows in a transverse line at midbody	6-7 (6.67±0.58)	6
Subdigital lamellae on Finger IV	14-15 (14.33±43.0)	13-15 (13.67±1.15)
Subdigital lamellae on Toe IV	19-20 (19.33±0.58)	19
Femoral pores	5-8 (6.33±1.52)	2-5 (3.5) (*n*=2)
Maximum SVL	51.1	55.7
TL/SVL	1.86 (*n*=1)	1.84-2.14 (1.99) (*n*=2)

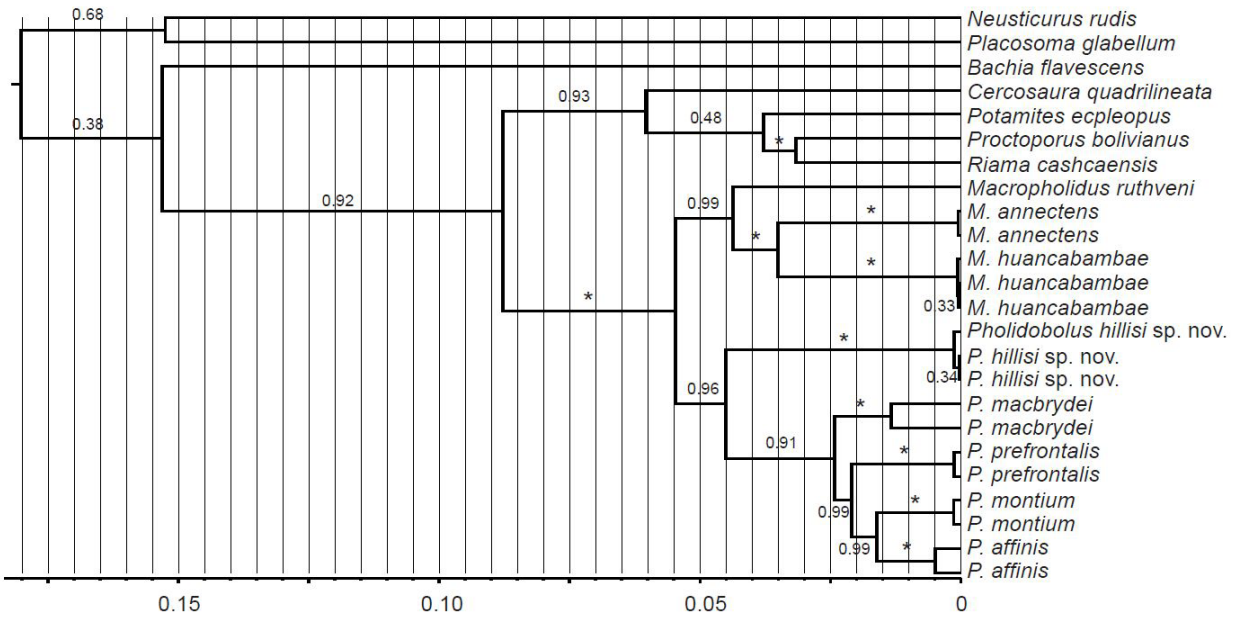


Fig. 6. Maximum clade credibility tree inferred from the analysis of a dataset containing three mitochondrial genes under uncorrelated, log normally distributed rates; branch lengths are in substitutions per site. Posterior probability values are shown above branches; asterisks correspond to values of 1.

extending onto sides of neck and at insertion of hind limbs extending onto base of tail. In addition, the lateral white stripe that starts on first supralabial extends further posteriorly along flanks in specimen QCAZ 4999 (Fig. 4).

Phylogenetic relationships: The maximum clade credibility tree resulting from the chronophylogenetic analysis supports inclusion of the new species within the *Pholidobolus* clade (Torres-Carvajal and Mafla-Endara 2013) with strong support (PP = 0.96; Fig. 6). Phylogenetic relationships among other species of *Pholidobolus* and species of *Macropholidus* are identical to those obtained by Torres-Carvajal and Mafla-Endara (2013). *Macropholidus ruthveni* is sister (PP = 0.99) to a clade containing both *M. annectens* and *M. huancabambae* (PP = 1). *Pholidobolus macbrydei* is sister (PP = 0.91) to a clade with the three remaining species of *Pholidobolus*; the latter clade included *P. prefrontalis* as sister (PP = 0.99) to a clade containing *P. affinis* and *P. montium* as sister taxa (PP = 0.99). In contrast to the results reported by Torres-Carvajal and Mafla-Endara (2013), the chronophylogenetic tree inferred in this paper suggests that the diversification of the clades *Macropholidus* and *Pholidobolus* occurred at about the same time (Fig. 6).

Distribution and ecology: *Pholidobolus hillisi* inhabits low montane forests in the eastern slopes of the Andes of southern Ecuador. This area represents a weather divide between the humid Amazon and the dry Inter-Andean regions (Beck et al. 2008). The new species is known from Provincia Zamora-Chinchipe, at 1,840 m (Fig. 7), in the deep valley of the Zamora river. The only gym-

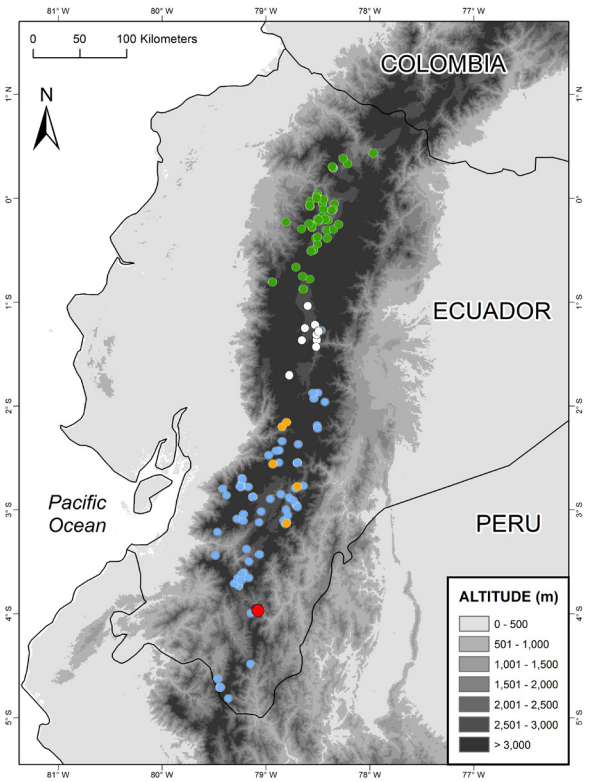


Fig. 7. Distribution of *Pholidobolus* in Ecuador. *P. affinis* (white circles); *P. macbrydei* (blue circles); *P. montium* (green circles); *P. prefrontalis* (orange circles); *P. hillisi* sp. nov (red circle).

nophthalmid species known to occur in sympatry with *P. hillisi* is *Alopoglossus buckleyi*, although *P. macbrydei* is parapatrically distributed (Fig. 7). Two specimens (QCAZ 4998, 4999) were found under logs and rocks next to the Zamora river between 1130 hrs and 1145 hrs,

whereas another specimen (QCAZ 5000) was basking on a rock next to the road at 1200 hrs. Other specimens (QCAZ 6840, 6842, 6844) were found and captured by a domestic cat around the San Francisco Research Station in pasture with interspersed shrubs.

Etymology: The specific epithet *hillisi* is a noun in the genitive case and is a patronym for David M. Hillis, who has had a great impact in the development of the field of molecular systematics (e.g., Hillis et al. 1996). In particular, he published a classic paper on evolutionary genetics of *Pholidobolus* lizards, where he compared some phylogenetic tree reconstruction techniques and emphasized the importance of phylogenetics in biogeography (Hillis 1985).

Remarks: The Andes of southern Ecuador and northern Peru between 4°S and 7°S consist of relatively low-elevation mountains that create a mixture of environments. This region, known as the Huancabamba Depression, has long been recognized as a major biogeographic barrier for Andean organisms (e.g., Cadle 1991; Duellman 1979; Vuilleumier 1969). Although all species of *Pholidobolus*, except *P. macbrydei*, are restricted to the southern part of the northern Andes (i.e., Ecuador and southern Colombia), the new species described herein occurs on the northern limit of the Huancabamba Depression.

The Huancabamba Depression seems to have influenced the radiation of several Andean lizard clades, such as *Stenocercus*, *Riama*, *Macropholidus*, and *Pholidobolus* (Doan 2003; Torres-Carvajal 2007; Torres-Carvajal and Mafla-Endara 2013). Except for *Macropholidus*, these clades have diversified along the northern Andes, suggesting that common geological or climatic events have influenced these radiations. The phylogenetic tree presented in this paper further supports the idea of a south-to-north sequence of speciation events (Doan 2003; Torres-Carvajal 2007) which is congruent with the recent south-to-north uplift of the northern Andes (Simpson 1979; Aleman and Ramos 2000).

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Appendix 1

Additional specimens examined

Pholidobolus affinis.—ECUADOR: Provincia Chimborazo: Colta, 1°41’56”S, 78°46’25”W, 3,215 m, QCAZ 9899-01; Sicalpa, 1°42’18”S, 78°46’32”W, 3,212 m, QCAZ 11887. Provincia Cotopaxi: Cutuchi river, San Miguel de Salcedo, 1°2’9”S, 78°35’53”W, 2,640 m, QCAZ 9641. Provincia Tungurahua: 6 km N Mocha to 400 m Panamerican Highway, 1°22’1”S, 78°39’16”W, 3,205 m, QCAZ 9895-97; Ambato surroundings, 1°14’59,8”S, 78°37’33”W, QCAZ 9340-73, 9375-9443; Chamisa on road to Guadalupe, 1°21’44”S, 78°30’39”W, 2,348 m, QCAZ 7266; Cotaló on path to Mucubí Community, 1°25’46”S, 78°31’3”W, 2,626 m, QCAZ 9839; Patate, 1°18’42”S, 78°30’36”W, 2,199 m, QCAZ 9847-50; Poatug Hamlet, Aya Samana, 1°16’58”S, 78°29’29”W, 2,573 m, QCAZ 10005, 10008, 10011-13, 10016, 10018; Poatug Hamlet, Terremoto, 1°16’23”S, 78°29’29”W, 2,547 m QCAZ 9997-10000, 10002-10004; San Miguelito on path to Píllaro, 1°13’12”S, 78°31’31”W, 2,689 m, QCAZ 9844; San Miguelito on path to Terán, 1°12’58”S, 78°31’42”W, 2,741 m, QCAZ 9843.

Pholidobolus macbrydei.—ECUADOR: Provincia Azuay: 10 km S Cutchil, 3°8’2”S, 78°48’47”W, 2,900 m, QCAZ 823-24;1.2 km E Osorancho, 2°46’8”S, 78°38’10”W, 2,390 m, QCAZ 826; 6.2 km S Cutchil, 3°6’32”S, 78°48’4”W, 2,800 m, QCAZ 827; 20 km NE Cuenca, 2°51’0”S, 78°51’14”W, QCAZ 1359; 7 km Sigsig, 2°59’56”S, 78°48’25”W, 2,890 m, QCAZ 1537; 6 km S Oña, 3°29’49”S, 79°9’47”W, QCAZ 3658; 20 km Cuenca-El Cajas, 2°46’39”S, 79°10’12”W, 3,508 m, QCAZ 9932-34, 9936-38, 10020; Cochapamba, 2°47’50”S, 79°24’56”W, 3,548 m, QCAZ 10133-35; Cochapata, 3°25’47”S, 79°3’35”W, 3,074 m, QCAZ 12605-07; Cuenca, Cuenca-Azoguez Panamerican Highway 2°53’43”S, 78°57’30”W, 2,486 m, QCAZ 6985; El Cajas National Park, path to Patul Community, 2°44’28”S, 79°14’5”W, 4,092 m, QCAZ 8010-11; El Cajas National Park, Patul river, 2°41’37”S, 79°13’56”W, 3,610 m, QCAZ 8893; El Cajas National Park, Zhurcay river, 3°2’30”S, 79°12’56”W, 3,766 m, QCAZ 8900-01; El Cajas National Park, 2°42’21”S, 79°13’32”W, 3,600 m, QCAZ 8946; El Capo, 2°46’43”S, 79°14’43”W, 4,100 m, QCAZ 4997; Girón, San Gregorio Community, Quinsacocha paramo, 3°6’22”S, 79°13’4”W, 3,242 m, QCAZ 8510-11; Girón, San Gregorio Community, Quinsacocha paramo, 3°2’30”S, 79°12’56”W, 3,766 m, QCAZ 8894-99, 8902-05, 8907; Girón, San Gregorio Community, Quinsacocha paramo, 3°2’30”S, 79°12’57”W, 3,766 m, QCAZ 8906; Guablid, 2°46’30”S, 78°41’51”W, 2,453 m, QCAZ 9913-17, 9919-20, 9940-41; Gualaceo-Limón road, 2°56’53”S, 78°42’43”, 3,110 m, QCAZ 819-

22; Gualaceo-Limón road, 8.1 km O Azuay-Morona Santiago border, 2°57'50"S, 78°42'7"W, 3,140 m, QCAZ 825; Gualaceo, 2°52'56"S, 78°46'31"W, 2,298 m, QCAZ 9606; Gualaceo-Plan de Milagro road, 2°54'35"S, 78°44'4"W, 2,624 m, QCAZ 10875; Las Tres Cruces, 2°46'30"S, 79°14''53"W, QCAZ 4136; Maylas, Gualaceo-Macas road, 2°58'25"S, 78°41'41"W, 3,100 m, QCAZ 7269; Mazán Protected Forest, 2°52'29"S, 79°7'26"W, 2,700 m, QCAZ 1296-97; Mazán Protected Forest, 2°52'31"S, 79°7'45"W, 3,189 m, QCAZ 8008, 8013; Oña-La Paz road, 3°22'42"S, 79°11'20"W, 2,969 m, QCAZ 6031; Patacocha hill, 3°7'16"S, 79°3'54"W, 3,340 m, QCAZ 6144; Pucara, Tres Chorreras, 3°12'49"S, 79°28'3"W, QCAZ 11038; Quinoas river, 3°5'14"S, 79°16'40"W, 3,200 m, QCAZ 1564-66; San Antonio, 2°51'40"S, 79°22'43"W, 2,943 m, QCAZ 9668; San Vicente-Cruz path, 2°47'43"S, 78°42'53"W, 3,044 m, QCAZ 11416-17, 11420; Sigsig, 3°7'46"S, 78°48'14"W, 2,969 m, QCAZ 5605-08; Sigsig road, 3°3'17"S, 78°47'19"W, 2,574 m, QCAZ 9605; Tarqui, 3°0'57"S, 79°2'40"W, 2,627 m, QCAZ 8512. Provincia Cañar: Cañar, 2°33'39"S, 78°55'51"W, QCAZ 9947; Culebrillas, 2°25'35"S, 78°52'12"W, 4,000 m, QCAZ 1349; Guallicanga ravine, 2°25'56"S, 78°54'8"W, 3,960 m, QCAZ 10048-49; Guallicanga river, 2°28'24"S, 78°58'22"W, 3,048 m, QCAZ 10051-52; Ingapirca, 2°32'43"S, 78°52'28"W, 3,400 m, QCAZ 1551; Juncal, 2°28'24"S, 78°58'22"W, 3,048 m, QCAZ 10050; Mazar Protected Forest, 2°32'48"S, 78°41'54"W, QCAZ 7376-84, 7883; Mazar Reserve, La Libertad, 2°32'45"S, 78°41'46"W, 2,842 m, QCAZ 10970-72. Provincia Chimborazo: Alao, 10 km Huamboya, 1°52'22"S, 78°29'51"W, 3,200 m, QCAZ 1567-68; Atillo Grande, Magdalena lake, 2°11'15"S, 78°30'25"W, 3,556 m, QCAZ 9214; Atillo Grande, Frutatián lake, 2°12'57"S, 78°30'5"W, 3,700 m, QCAZ 9216-18; Culebrillas, Sangay National Park, 1°57'39"S, 78°25'55"W, 3,345 m, QCAZ 9612; Pungalá, Etén Community, Timbo, 1°55'45"S, 78°32'14"W, 3,408 m, QCAZ 9616-21; Pungalá, Melán Community, 1°52'30"S, 78°32'52"W, 3,564 m, QCAZ 9626-29, 9631; Ozogoche, 2°22'7"S, 78°41'20"W, 4,040 m, QCAZ 6006-07; Shulata, 2°20'22"S, 78°50'36"W, 3,228 m, QCAZ 5597-9;. Provincia El Oro: Guanazán, 3°26'24"S, 79°29'13"W, 2,638 m, QCAZ 7891, 7894. Provincia Loja: 17.1 km S Saraguro, 3°43'45"S, 79°15'53"W, 3,150 m, QCAZ 828; 26 km N Loja, Huashapamba Native Forest, 3°39'30''S, 79°16'20''W, 2,894 m, QCAZ 8651; Cordillera of Lagunillas, Jimbura, 4°49'1"S, 79°21'43"W, 3,600 m, QCAZ 3785; Cordillera of Lagunillas, Jimbura, 4°37'42"S, 79°27'49"W, 3,450 m, QCAZ 6145-47; Fierro Urco, 3°42'38"S, 79°18'18"W, 3,439 m, QCAZ 6949-50; Gurudel, 3°39'22"S, 79°9'47"W, 3,100 m, QCAZ 5078-79; Jimbura, Jimbura lake, 4°42'32"S, 79°26'48"W, 3,036 m, QCAZ 6945-48; Jimbura, path to Jimbura lake, 4°42'34"S, 79°26'8"W, 3348 m, QCAZ 10054-62; Military antenna, Saraguro, 3°40'46"S, 79°14'16"W, 3,190 m, QCAZ 3673-75, 9632; San Lucas, 3°43'55"S, 79°15'38"W, 2,470 m, QCAZ 2861; Saraguro, 3°37'13"S, 79°14'9"W, 3,100 m, QCAZ 3606, 3754; Urdaneta, 3°36'6"S, 79°12'31"W, QCAZ 2019. Provincia Tungurahua: Poatug Hamlet, El Corral, 1°16'21"S, 78°28'5"W, 3,468 m, QCAZ 8047, 9995-96. Provincia Zamora Chinchipe: Loja-Podocarpus National Park road, 3°59'44"S, 79°8'28"W, 2,776 m, QCAZ 10870-71; Valladolid, Podocarpus National Park, 4°29'3"S, 79°8'56"W, 1,800 m, QCAZ 3743.

Pholidobolus montium.—ECUADOR: Provincia Cotopaxi: 2 km S Chugchilán on road to Quilotoa, 0°48'24"S, 78°56'11"W, 2,917 m, QCAZ 8056-58; Latacunga, 0°52'27"S, 78°38'26"W, 2,857 m, QCAZ 873-74, 1411-12, 9642; Mulaló, 0°46'35"S, 78°34'40"W, 3,030 m, QCAZ 9639; San Juan de Pasto Calle, 0°45'4"S, 78°38'51"W, 1,956 m, QCAZ 8053-54; South Illiniza, 0°39'43"S, 78°42'40"W, 3,400 m, QCAZ 858-59, 1454. Provincia Imbabura: Atuntaqui, 0°19'59"N, 78°12'50"W, QCAZ 855; Cotacahi, Peribuela, Cuicocha Lake, Cotacachi-Cayapas Reserve, 0°17'34"N, 78°21'5"W, 3,082 m, QCAZ 9683, 9685-86; 0°23'4"N, 78°15'25"W, 2,900 m, QCAZ 6137, 6139; Cotacachi-Cayapas Reserve, José María Yerovi Islets, 0°18'20"N, 78°21'41"W, 3,093 m, QCAZ 10959-60; El Juncal, 0°26'6"N, 77°57'58"W, QCAZ 6451. Provincia Pichincha: 16 km W Chillogallo, Quito-Chiriboga road, 0°17'46"S, 78°39'30"W, 3,100 m, QCAZ 797; 5 km E Pifo-Papallacta road, 0°15'3"S, 78°17'58"W, 2,800 m, QCAZ 1107-08; Alambi, 0°1'59"S, 78°34'26"W, 2,727–3,800 m, QCAZ 9691; Alangasí, 0°18'24"S, 78°24'40"W, QCAZ 1453, 1469; Amaguaña, Hacienda San Ignacio, 0°22'22"S, 78°30'14"W, QCAZ 1463-64, 5275; Calacalí, Simón Bolívar Street, uphill through secondary road, 0°1'1"N, 78°30'49"W, 3,001 m, QCAZ 11674, 11676, 11678-79; Calacalí Stadium, 0°0'0,3"S, 78°30'38"W, 2,833 m, QCAZ 11682; Carretas, 0°6'25"S, 78°26'46"W, QCAZ 875; Chillogallo, 0°16'48"S, 78°33'25"W, QCAZ 840-43; Cumbayá, La Primavera, 0°12'6"S, 78°25'40"W, QCAZ 7248; Guayllabamba, 0°3'23"S, 78°20'26"W, QCAZ 7905; Inga, 5.5 km SE La Merced, 0°17'51"S, 78°20'52"W, 2,798 m, QCAZ 5278; Lloa, 0°14'52"S, 78°34'33"W, QCAZ 4109; Lloa Stadium, 0°14'39"S, 78°35'12"W, 3,059 m, QCAZ 11661; Loreto, road to Molinuco, Central Stadium, 0°23'4"S, 78°24'30"W, 2,844 m, QCAZ 11663; Machachi, 0°29'50"S, 78°32'25"W, QCAZ 844-48, 1374-77, 1462; Machachi, The Tesalia Springs Company S.A. surroundings, 0°30'27"S, 78°33'57"W, 2,900 m, QCAZ 1465-67, 830-31, 833, 860-61, 1459-61; Nono, 0°4'42"S, 78°34'24"W, 2,843 m, QCAZ 11653-55; Nono School, 0°4'4"S, 78°34'35"W, 2,754 m, QCAZ 11656-58; Pasochoa, 0°26'24"S, 78°30'15"W, 2,850 m, QCAZ 1451-52; Pomasqui, 0°3'3"S, 78°27'21"W, QCAZ 862-68; Pululahua Volcano, 0°2'34"N, 78°30'15"W, QCAZ 1450, 1520; Quito, Bellavista, 0°11'21"S, 78°28'35"W, QCAZ 1099; Quito, Chillogallo, 0°16'26"S, 78°33'23"W, QCAZ 8967; Quito, Itchimbía, 0°13'21"S, 78°29'56"W, QCAZ 834, 1455-58, 1643, 2843; Quito, Garden of the Pontificia Universidad Católica del Ecuador (PUCE), 0°12'33"S, 78°29'28"W, 2,800 m, QCAZ 856-57, 7032, 1295, 2853; Quito, Parque Metropolitano, 0°10'35"S, 78°27'40"W, QCAZ 4051; Quito, Universidad Central del Ecuador, 0°11'59"S, 78°30'19"W, 2,800 m, QCAZ 3727; Río Guajalito Protected Forest, 0°13'44"S, 78°48'22"W, QCAZ 1338-39; San Antonio de Pichincha, 0°0'33"S, 78°26'45"W, QCAZ 580-81, 790-92, 849, 1119-20, 1368, 1393, 2220, 2223, 2653; Tababela, International Airport, 0°6'21"S, 78°21'4"W, QCAZ 8046, 9044, 10064, 10974-76; Quito, Tumbaco, 0°12'34"S, 78°24'2"W, QCAZ 1113-14; Uyumbicho, 0°22'59"S, 78°31'6"W, QCAZ 870.

Pholidobolus prefrontalis.— ECUADOR: Provincia Chimborazo: Alausí, 2°11'54"S, 78°50'42"W, 2359 m, QCAZ 9907-9911; Tixán, 2°9'22"S, 78°48'3"W, 2,908 m, QCAZ 9951-54.



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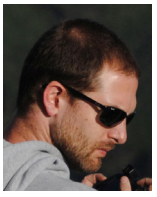
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Paola Mafla-Endara graduated in Biological Sciences from Pontificia Universidad Católica del Ecuador (PUCE) in 2011. Her undergraduate thesis entitled "Phylogeography of Andean lizards *Pholidobolus* (Squamata: Gymnophthalmidae) in Ecuador" provided her a gratifying knowledge about phylogenetics systematics, evolution, statistics, and biogeography. Since this time, she has developed a deep interest in molecular biology. Currently she works mostly in systematics and ecology of fungi. She is convinced that the same knowledge can be useful to solve similar questions in different subjects. This manuscript represents the second lizard species description coauthored by Paola. Others are in preparation.



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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:41593E9F-6F66-4E60-B073-2E8BF643358F.

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Citations

ICZN. 2012. Amendment of Articles 8,9,10,21 and 78 of the International Code of Zoological Nomenclature to expand and refine methods of publication. *Zootaxa* 3450: 1–7.

Polaszek A et al. 2005a. Commentary: A universal register for animal names. *Nature* 437: 477.

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