

A new species of *Pristimantis* (Anura: Strabomantidae) from the Amazonian lowlands of northern Peru

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Abstract. We describe a new species of *Pristimantis* from the vicinity of Puerto Almendras, ca. 17 km straight southwest of Iquitos, Provincia Maynas, Region Loreto, Peru. With seven other species (*P. carvalhoi*, *P. croceoinguinis*, *P. divnae*, *P. lirellus*, *P. minutulus*, *P. toftae*, *P. variabilis*) from the Amazonian lowlands and lower eastern Andes in Peru, the new species shares a yellow groin and broadly expanded discs on fingers and toes. However, the new species can be distinguished by the following combination of characters: snout–vent length 14.8 mm in the single male, 20.0–22.0 mm in females, strongly tubercular dorsal skin, absence of dorsolateral folds, areolate venter, indistinct discoidal fold, lack of tympanic membrane and annulus, lack of lateral fringes in fingers and toes, presence of ulnar and tarsal tubercles, presence of vocal slits in males, reddish brown or greenish brown dorsal coloration, pale grey to white venter with dark flecks or mottling, and bright yellow groin in life. The new species is most similar to *P. carvalhoi* and *P. croceoinguinis*. However, vocal slits are present in males of the new species (absent in *P. carvalhoi* and *P. croceoinguinis*), and both *P. carvalhoi* and *P. croceoinguinis* lack a tubercle on the tip of the snout (present in the new species). The new species is tentatively assigned to the *Pristimantis unistrigatus* group. It inhabits primary or disturbed lowland rainforest along large rivers.

Key words: Amazonian lowlands, Amphibia, Peru, *Pristimantis academicus* sp. n.

Introduction

Strabomantid frogs of the genus *Pristimantis* represent one of the most species-rich anuran groups in the Neotropical region. Of the 115 species of *Pristimantis* recorded in Peru, 44 (38%) are known from the Amazon basin (humid tropical forests in lowlands below 500 m elevation), and 28 (64%) of those species also occur above 500 m elevation (DUELLMAN & LEHR 2009, this paper). Clearly, the majority of species of *Pristimantis* (72%) are restricted to Andean habitats. However, recent investigations (e.g., ELMER & CANNATELLA 2008, LEHR et al. 2009, LEHR & VON MAY 2009, PADIAL & DE LA RIVA 2009) indicate that the species diversity of *Pristimantis* in lowland rainforest might be underestimated due to unexplored areas and cryptic species.

There are 28 species of *Pristimantis* known from the Iquitos area (Region Loreto) (DUELLMAN & LEHR 2009, this paper) with *Pristimantis orcus* being the latest addition (LEHR et al. 2009). Fieldwork by JM in Loreto in 2001 and 2002 led to the discovery of several new species of hylid and microhylid anurans (FAIVOVICH et al. 2006, MORAVEC & KÖHLER 2007, MORAVEC et al. 2009), and a review of the strabomantid collection and comparisons with newly obtained material (specimens, photos) from Loreto to the recognition of several unnamed species of *Pristimantis*. Herein we describe one of the new species.

Material and methods

The format for the description follows LYNCH & DUELLMAN (1997), and diagnostic characters of DUELLMAN & LEHR (2009). Specimens were stored in 70% ethanol, and were sexed externally by the presence or absence of vocal slits and internally by the condition of the gonads. Measurements, taken with digital callipers under a microscope by the senior author and rounded to the nearest 0.1 mm, are: snout–vent length (SVL), tibia length, foot length (distance from proximal margin of inner metatarsal tubercle to tip of Toe IV), head length (obliquely from angle of jaw to tip of snout), head width (at level of angle of jaw), eye diameter, interorbital distance, upper eyelid width, internarial distance, eye–nostril distance (straight line distance between anterior corner of orbit and posterior margin of external nares). Fingers are numbered preaxially to postaxially from I–IV. Comparative lengths of Toes III and V were determined when both were adpressed against Toe IV; lengths of Fingers I and II were estimated when adpressed against each other. All drawings were made by JM using a Leica MS 5 stereomicroscope with a drawing tube attachment. Coloration in life descriptions are based on photos taken by JM. Specimens examined are listed in the Appendix. Abbreviations of collections are: KU = Natural History Museum, University of Kansas, Lawrence, Kansas, USA;

MUSM = Museo de Historia Natural Universidad Nacional Mayor de San Marcos, Lima, Perú; NMP6V and NMP6F = National Museum Prague (V = vertebrates, F = photographs).

Systematics

Pristimantis academicus sp. n. (Figs. 1–2)

Holotype: MUSM 27634, adult female (Figs. 1–2), from the vicinity of Puerto Almendras ($03^{\circ} 49' S$, $073^{\circ} 22' W$; ca. 120 m a.s.l.), ca. 17 km straight southwest of Iquitos, Provincia Maynas, Region Loreto, Peru (Fig. 3), collected by J. MORAVEC on 9 April 2002.

Paratypes: NMP6V 73189/1–2, two adult females, MUSM 27635, one adult male, collected at the type locality along with the holotype by J. MORAVEC on 9–10 April 2002.

Referred specimens (Photo Vouchers): Adult male and female (photo numbers NMP6F 8–10) from the left bank of Río Buncuya ($06^{\circ} 48' S$, $74^{\circ} 57' W$; ca. 145 m a.s.l.), Region Loreto, Peru, photographed by L. A.G. GAGLIARDI URRUTIA.

Diagnosis: A small species of *Pristimantis* tentatively assigned to the *P. unistrigatus* species group (sensu LYNCH & DUELLMAN 1997, as modified by DUELLMAN & PRAMUK 1999, HEDGES et al. 2008, DUELLMAN & LEHR 2009), having the following combination of characters: (1) skin on dorsum tubercular with tubercles coalescing laterally in short ridges, dorsolateral folds absent; venter areolate; discoidal fold indistinct; (2) tympanic membrane and annulus absent; (3) snout long, rounded in dorsal view, protuberant in lateral view; (4) upper eyelid with small, conical tubercles; upper eyelid slightly shorter or equal to interorbital distance; cranial crests absent; (5) dentigerous processes of vomers small, oblique, narrowly separated; (6) males with vocal slits, nuptial pads absent; (7) Finger I shorter than Finger II; discs on outer fingers broadly expanded, truncate; (8) fingers without lateral fringes; (9) ulnar and tarsal tubercles present; (10) heel with minute tubercles; inner tarsal fold absent; (11) inner metatarsal tubercle oval, four times the size of the conical outer metatarsal tubercle, elevated, conical in lateral view; distinct supernumerary plantar tubercles present; (12) toes without lateral fringes; basal webbing absent; Toe V longer than Toe III; toe discs smaller than discs of fingers, truncate; (13) in life, dorsal coloration reddish brown or greenish brown; venter pale grey to white with dark brown flecks or mottling more dense on throat; groin yellow; iris golden to bronze with fine black vermiculation; (14) SVL in females 20.0–22.0 (mean = 21.1 mm \pm 1.0, n = 3), in single male 14.9 mm.

Pristimantis academicus and seven other species (*P. carvalhoi*, *P. croceoguineus*, *P. divnae*, *P. lirellus*, *P. minutulus*, *P. toftae*, *P. variabilis*) from the Amazonian lowlands and lower eastern Andes in Peru have a yellow groin and broadly expanded discs on fingers and toes (Table 1). *Pristimantis academicus* easily can be distinguished from the larger *P. toftae* (female SVL 18.9–27.4 mm) and *P. variabi-*

lis (subadult to adult female SVL 10.0–26.8 mm), which have a shagreen dorsal skin (tubercular in *P. academicus*) and a tympanum present (absent). *Pristimantis minutulus* is smaller (female SVL 17.0–20.1 mm vs. 20.0–22.0 mm in *P. academicus*) and has a smooth dorsum (tubercular), and males that lack vocal slits (present). Males of *P. academicus* and *P. lirellus* have vocal slits and lack nuptial pads, but *P. lirellus* (male SVL 14.1–17.0) is slightly larger, has a discoidal fold (absent in *P. academicus*) and has a shagreen dorsum with small scattered tubercles (tubercular). *Pristimantis divnae* males are much larger than *P. academicus* males (SVL 22.8–23.4 mm vs. 14.9 mm), have a shagreen

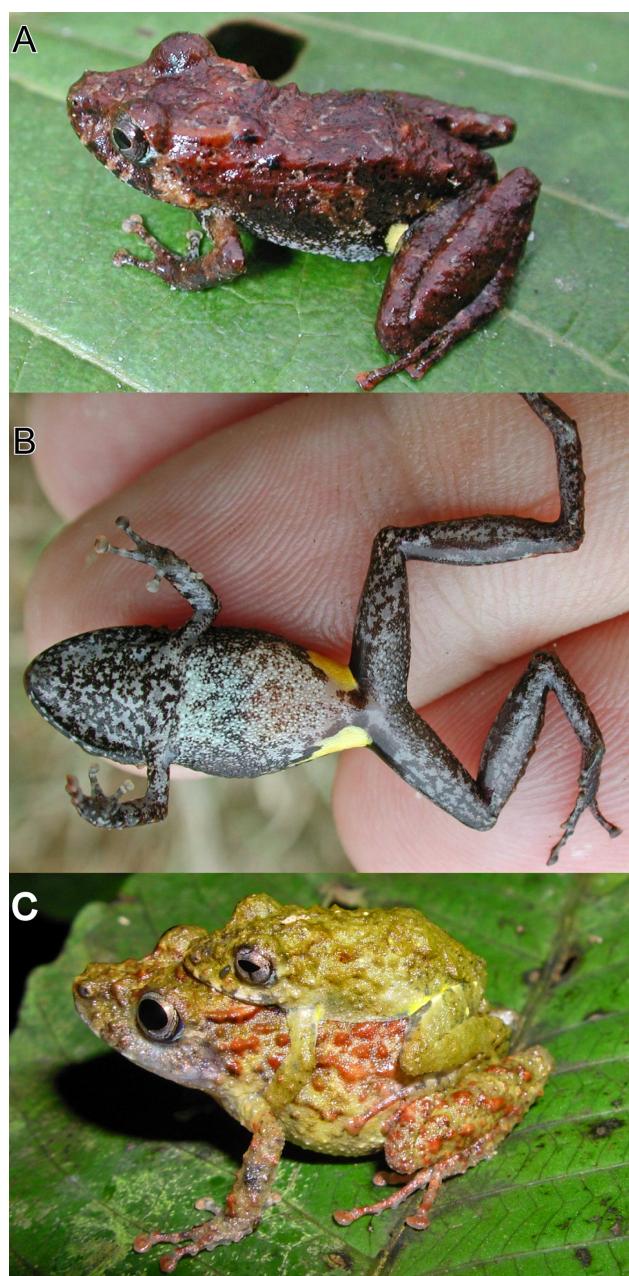


Figure 1. Live *Pristimantis academicus* sp. n. (MUSM 27634, female holotype, SVL 20.0 mm) in dorsal (A) and ventral (B) views, (C) couple of *Pristimantis academicus* (NMP6F 8, not collected) in amplexus from the left bank of Rio Buncuya.

Table 1. Comparisons of *Pristimantis academicus* with other species of the *P. unistrigatus* species group from the Amazonian lowlands. Characters were taken from original species description and the examined material. Presence of a character is indicated by “+”, its absence by “—”.

Species	<i>P. academicus</i>	<i>P. carvalhoi</i>	<i>P. croceoinguinis</i>	<i>P. divnae</i>	<i>P. lirellus</i>	<i>P. minutulus</i>	<i>P. toftae</i>	<i>P. variabilis</i>
Source	this paper	LYNCH (1980)	LYNCH (1968)	LEHR & VON MAY (2009)	Dwyer (1995)	DEULLMAN & HEDGES (2007)	DEULLMAN (2005)	LYNCH (1968)
Male SVL [mm]	14.9	13.5–14.8	13.9–18.2	22.8–23.4	14.1–17.0	13.1–17.6	17.0–22.8	13.7–22.0
Female SVL mm]	20.0–22.0	17.4–24.0	17.4–23.0	unknown	19.4–24.5	17.0–20.1	18.9–27.4	10.0–26.8
Dorsal skin texture	tubercular	shagreen with small scattered conical tubercles	tubercular	shagreen with scattered minute tubercles	shagreen with small, scattered tubercles and low longitudinal dermal ridges	smooth	shagreen	shagreen
Tympanic annulus	—	barely distinguishable under skin	—	barely distinguishable under skin	—	—	+	+
Tympanic membrane	—	—	—	—	—	—	+	+
Discoidal fold	—	—	—	+	+	—	+	+
Vocal slits	+	—	—	—	+	—	+	+
Nuptial pads	—	—	—	—	—	—	—	—
Life colouration in groin	yellow	yellow	yellow or orange, confluent or not with another spot on the anterior face of the thigh	yellow with brown markings	yellow to orange-yellow	yellow	yellow to pale orange spot often extends onto the proximal anterior surface of the thigh	yellow, outlined with black

dorsal skin with scattered tubercles (tubercular), a discoidal fold (absent), and the tympanic annulus barely distinguishable under the skin (absent). *Pristimantis academicus* is most similar to *P. carvalhoi* and *P. croceoinguinis*. However, vocal slits are only present in male *P. academicus* (absent in *P. carvalhoi* and *P. croceoinguinis*), and both *P. carvalhoi* and *P. croceoinguinis* lack a tubercle on the tip of the snout (present in *P. academicus*). *Pristimantis academicus* has prominent tubercles dorsally and laterally in the scapular region, often coalescing and forming prominent lateral ridges (Fig. 1, absent in *P. croceoinguinis*). *Pristimantis academicus* lacks a dark brown W-shaped mark in the scapular region (present in *P. croceoinguinis*). Furthermore, *P. carvalhoi* has a tympanic annulus (absent in *P. academicus*) and *P. croceoinguinis* has the yellow spot in the groin often confluent with another spot on the anterior face of the thigh (yellow spots absent on anterior face of thigh).

Description of the holotype: Head as wide as body, slightly longer than wide; head width 36% of SVL; head length 40% of SVL; rounded in dorsal view (Fig. 2A), protuberant in lateral view; tip of snout bearing a minute tubercle; eye diameter slightly smaller (96%) than eye–nostril distance; nostrils protuberant, directed dorsolaterally; canthus rostralis nearly straight in dorsal view, angular in profile; loreal region weakly concave; lips rounded; upper eyelid bearing small conical tubercles, upper eyelid width 95% of in-

terorbital distance; tympanic annulus and membrane absent; three conical, enlarged postrostral tubercles on right side of head, postrostral tubercles small on left side. Choanae small, oval, not concealed by palatal shelf of maxilla; dentigerous processes of vomers small, oblique, narrowly separated; tongue three times as long as wide, slightly notched posteriorly, posterior half free.

Skin on dorsum tubercular, with tubercles denser and more prominent in the shoulder region, coalescing to form short lateral ridges (Figs. 2A, C); row of conical tubercles from tip of snout medially to interorbital area; dorsolateral folds absent; skin on flanks with more and slightly larger tubercles than on dorsum, coalescing into short ridges; skin on venter weakly areolate; discoidal folds absent; cloacal sheath short; upper corner of cloacal opening each with a conical tubercle. Three ulnar tubercles on each forearm, elongate, low; palmar tubercles slightly elevated, outer palmar tubercle bifid, approximately twice the size of oval, inner palmar tubercle; subarticular tubercles well defined, ovoid in ventral view, round in lateral view; distinct supernumerary tubercles about half the size of subarticular tubercles; fingers without lateral fringes; Finger I shorter than Finger II; discs broadly expanded, more on outer fingers, least on Finger I; disc of Finger III twice the size of digit proximal to it; discs on fingers nearly truncate; ventral pads of fingers, except of Finger I, well defined by circumferential grooves (Fig. 2C).

Hind limbs slender, tibia length 54% of SVL; foot length 39% of SVL; upper surfaces of hind limbs tubercular; posterior and ventral faces of thighs weakly areolate; heel with minute tubercles; outer surface of tarsus with small tubercles, slightly elevated, subconical in lateral view; inner surface of tarsus without fold, but with a small tubercle; inner metatarsal tubercle elevated, elongate in ventral view, subconical in lateral view, about twice the size of ovoid outer metatarsal tubercle; subarticular tubercles well defined, ovoid in ventral view, round, and rounded in lateral view; supernumerary plantar tubercles low, slightly smaller than subarticular tubercles; toes without lateral fringes; webbing absent; discs broadly expanded, truncate, slightly smaller than those on fingers, most prominent on Toe IV; ventral pads on toes well defined by circumferential grooves; relative lengths of toes: 1 < 2 < 3 < 5 < 4 (Fig. 2D).

In preservative, dorsal coloration tan with brown flecks; ventral surfaces tan with small brown spots, throat slightly darker than other ventral faces; iris dark grey. In life (Fig. 1), dorsum reddish brown, three dark brown bars below eye, and a narrow dark brown supratympanic stripe. Dorsal faces of limbs with dark brown diagonal stripes. Flank with a wide dark brown diagonal band. Groin bright yellow. Iris bronze with fine, black vermiculation and a narrow, black vertical streak from the horizontally elliptic pupil to lower margin of eye, forming a "T". Throat and ventral faces of limbs pale grey with dense dark brown flecks. Belly greyish white with dark brown mottling.

Measurements (in mm): SVL 20.0; tibia length 10.8; foot length 7.8; head length 8.0; head width 7.2; eye diameter 2.6; interorbital distance 2.0; upper eyelid width 1.9; internarial distance 1.9; eye–nostril distance 2.7.

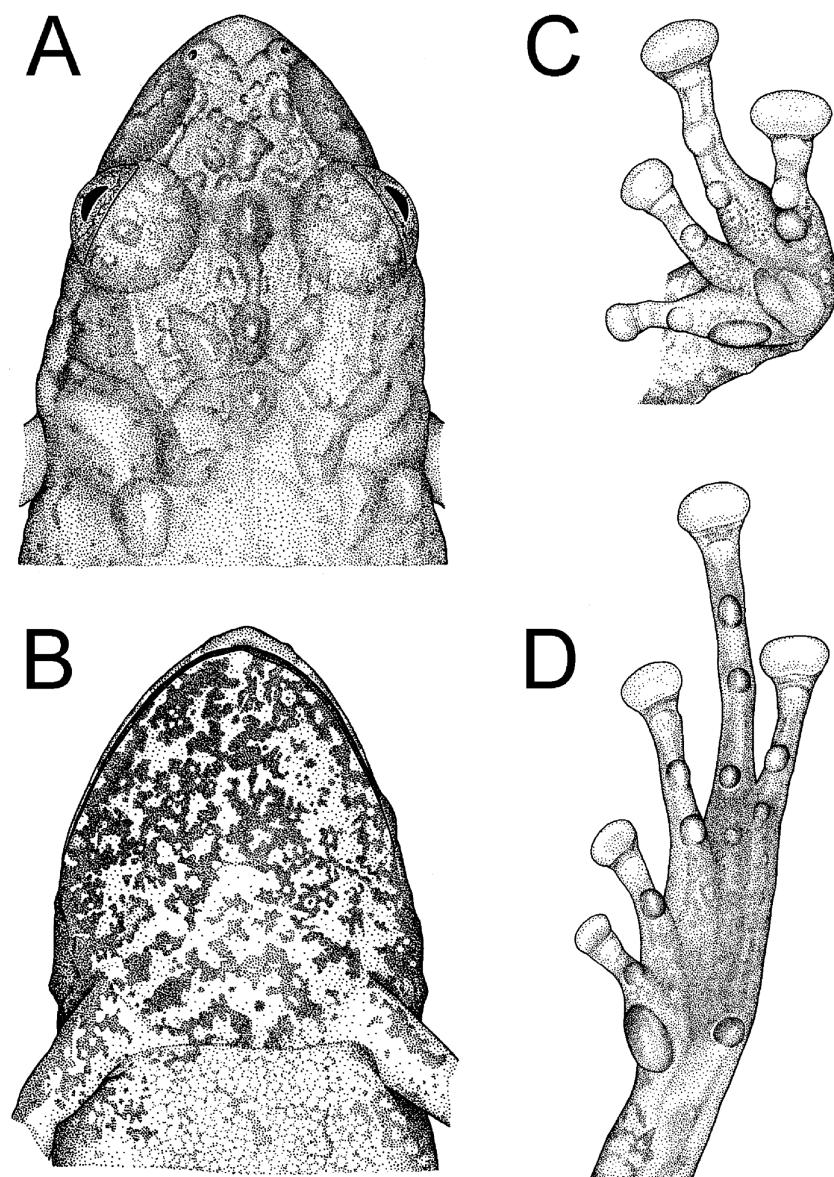


Figure 2. Dorsal (A) and ventral (B) views of head, and ventral views of hand (C) and foot (D) of *Pristimantis academicus* sp. n. (holotype, MUSM 27634). Scale bars equal 5 mm.

Variation: Measurements (in mm) of one male (MUSM 27635) and two female (NMPV 73189/1–2) paratypes are as follows: SVL 14.9, 21.2, 22.0; tibia length 8.4, 10.3, 9.9; foot length 6.7, 8.5, 8.0; head length 6.2, 8.0, 8.3; head width 5.6, 7.5, 7.6; eye diameter 1.9, 2.5, 2.7; interorbital distance 1.6, 2.1, 2.2; upper eyelid width 1.6, 1.8, 1.9; internarial distance 1.3, 1.7, 1.8; eye-nostril distance 2.0, 2.8, 3.0. Some variation is evident in the size, shape and distribution of dorsal tubercles. General colouration of paratypes does not differ from that of the holotype. Dorsal colouration of the two referred specimens has a distinct greenish brown tint, which apparently corresponds to the night colouration of these individuals.

Distribution, ecology, and threat status: *Pristimantis academicus* is known from the surroundings of Puerto Almendras, which lies on the right bank of Río Nanay, ca. 17 km straight SW of Iquitos, and from the area of the left bank of the Peruvian Río Buncuya (tributary of Río Ucayali), Región Loreto, Peru (Fig. 3). The type locality corresponds to the area called "Arboretum", which serves as a field study area of the Universidad Nacional de la Amazonía Peruana (UNAP). The territory of the "Arboretum" is covered by disturbed primary lowland rainforest and contains both non-flooded and seasonally flooded growths occurring along the Río Nanay. A permanent grid of trails is maintained within the whole area. The locality at the

Río Buncuya is covered by an original lowland rainforest with old timber trails. All specimens of *P. academicus* were found at night on leaves 100–120 cm above the ground. A pair in amplexus was observed motionless on a fern leaf at the Río Buncuya at night (Fig. 1C). Other strabomantid species found at the type locality in sympatry with *P. academicus* included *Oreobates quixensis*, *Pristimantis altamazonicus*, *P. cf. peruvianus* and *Pristimantis* sp. According to the sparse data available, we here classify *Pristimantis academicus* as "Data Deficient" according to the IUCN red list criteria.

Etymology: The specific name *academicus* is derived from the Latin noun *Academia* meaning an association of learned men. The name refers to the collecting sites of the new species, which are within the Arboretum of the Universidad Nacional de la Amazonía Peruana.

Discussion

Several studies have focused on the herpetofauna in the area around Iquitos: DIXON & SOINI (1986) summarized the reptile species of the Iquitos region, and RODRÍGUEZ & DUELLMAN (1994) the anuran species, ÁLVAREZ et al. (1999) documented the herpetofauna of the Reserva Nacional Alppahuayo-Mishana along the lower Nanay River

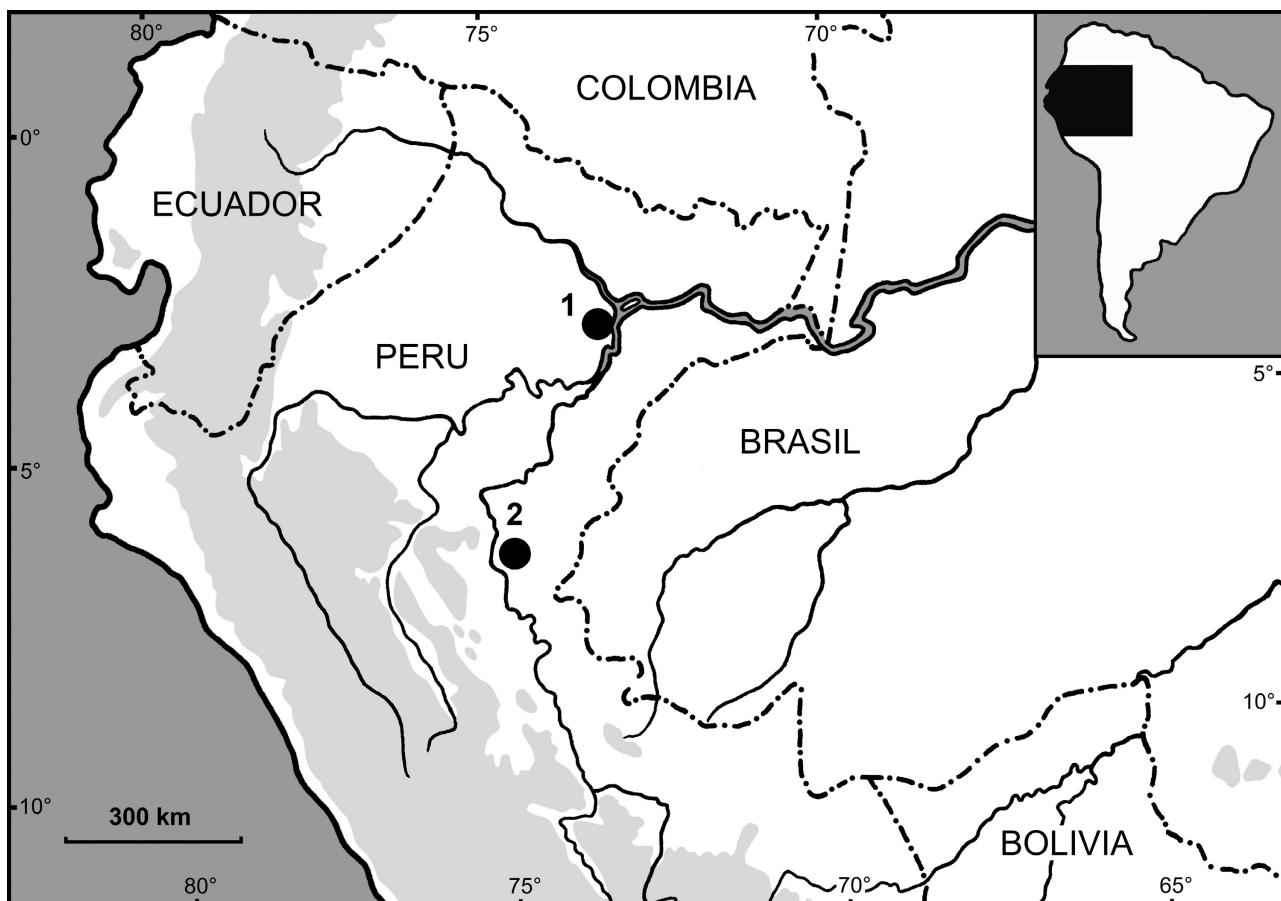


Figure 3. Schematic map showing the collecting sites of *Pristimantis academicus* sp. n.: 1 = Puerto Almendras (type locality), 2 = Río Buncuya. Shaded areas indicate elevations above 500 m a.s.l.

west of Iquitos. DUELLMAN & MENDELSON (1995) reported about the herpetofauna of northern Loreto (headwaters of Tigre and Corrientes rivers), RIVERA et al. (2001) published inventories of amphibian and reptile species in the Pucacuro watershed, CATENAZZI & BUSTAMANTE (2007) published a rapid inventory on the herpetofauna of the upper Nanay, Mazán, and Arabela watersheds; also see LEHR & CATENAZZI (2009). Additional rapid inventories in Loreto, such as those by GORDO et al. (2006), RODRÍGUEZ & KNELL (2003, 2004) and BARBOSA & RIVERA (2006), documented an extremely high amphibian and reptile diversity in the Region Loreto. Thus, it is very likely that species richness of strabomantid frogs of the genus *Pristimantis* still remains considerably underestimated in this Region and further new species will be described from Loreto in the near future.

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Appendix

Comparative specimens examined

Pristimantis altamazonicus: ECUADOR: Napo: Santa Cecilia, 340 m: KU 146060–146062, 148722–148784; Peru: Huánuco: Finca Panguana, Río Llullapichis, 4–5 km upstream from Río Pachitea, ca. 200 m: KU 154759; Loreto: Puerto Almendras, ca. 17 km SW of Iquitos, ca. 120 m: NMP6V 71171; Madre de Dios: 15 km E Puerto Maldonado, 200 m: KU 209956, 215459, 215460.

Pristimantis carvalhoi: PERU: Cusco: Camisea, MUSM 23192, 23199, 23204; Huánuco: Finca Panguana, MUSM 14100, 14155; West slope Serranía de Sira, Casa de Campa, 690 m, KU 154868; Junín: Sabetari, MUSM 24005; Loreto: Colonia, MUSM 3641, 3642; Jenaro Herrera, MUSM 15486; Tarapoto, ca. 21 km W of Iquitos, ca 120 m: NMP6V 71206/1–2; Madre de Dios: Centro Los Amigos, 270 m, MUSM 24095, 24105, 24106; Cocha Cachu, Río Manu, MUSM 2077; Pasco: Nevati, 275 m, KU 144312; San Martín: Rioja-Pucatambo trail, on slope climbing up to Pucatambo, 19 km from Rioja, 1000–1200 m, MCZ 100076, 100077; Ucayali: Pedrera, FMNH 45428.

Pristimantis croceoinquinis: ECUADOR: Sucumbíos: Santa Cecilia, KU 104577 (male paratype), 104580 (female paratype), 104581 (male paratype), 104584 (female paratype), 104615 (male paratype), 109078 (male paratype), 109080 (female paratype), 109083 (male paratype), 109084 (female paratype), 110791 (male paratype), 110792 (male, paratype), 110793 (female paratype), 123449 (female), 123451–53 (males), 123454 (female), 123455 (female), 123457 (female), 123458 (female); Napo: Río Aguarico at Río Due, KU 123459 (female), Bermejo No. 4, 15 km ENE Umbaqui, KU 123460 (female), 123461 (male), Puyo, FMNH 172643 (male).

Pristimantis diadematus: PERU: Amazonas: Ayendama, Río Cenepa, AMNH 42038; Quebrada Chinganaza, Cordillera del Cóndor, MUSM 91301; Quebrada Pastasillo, Río Santiago, 0.5 km S La Poza, MVZ 173817; mouth of Río Santiago, AMNH 43298; Cusco: Camisea, MUSM 23202, 23206; Cashiriari-2 (Armihuari), Escarchate, MUSM 23932–23933, 24012, 24014; Huánuco: Divisoria, FMNH 56278; Junín: Sabetari, MUSM 24000, 24001; Loreto: Quebrada Vásquez, north side lower Río Tahuayo, KU 220445, 220570; Headwaters of Río Caterpisa (Serranía de Manseriche), 463 m, AMNH 42435; Río Yuracyacu, MCZ 24450; San Jacin-

to, 175 m, KU 221996; Madre de Dios: Aguas Calientes, 1 km downstream from Shintuya, Río Alto Madre de Dios, USNM 298744, 298745; Avispas, FMNH 130426, 140405, 140663, 140685, 140785, 140820; Cocha Cashu, Río Manu, 365 m, MUSM 9137, 9139, 91340, USNM 306756; Hacienda Amazónia, Río Alta Madre de Dios, ca. 3 km NW Atalaya, 500 m, USNM 346138; Ucayali: Pampa del Sacramento, between Río Aguaytía and Cerro Azul, MCZ 24437; Tapiche-Utoquinia (Brazil border), AMNH 43376.

Pristimantis divnae: PERU: Madre de Díos: Los Amigos Conservation Concession, CICRA Station, 250–270 m, MUSM 19990 (holotype), 27277, 27281; Tambopata (> 5km SE from CICRA), 300 m, MUSM 27283; Los Amigos Conservation Concession, CM2 Station, 260 m, MUSM 27276, all paratypes.

Pristimantis eurydactylus: PERU: Huánuco: Finca Panguana, Río Llullapichis, 200 m, KU 218292; Loreto: Río Pastaza, Alto Amazonas, MUSM 22216; Ucayali: Bolognesi, MUSM 20374.

Pristimantis flavobrachatus: PERU: Pasco: Km 34 on road from Oxapampa to Yaupi, Provincia de Oxapampa, 1770 m, MUSM 19848, 19871 (holotype), MTD 45716, 45717, 45908.

Pristimantis nigrovittatus: PERU: Loreto: Tarapoto, ca. 21 km W of Iquitos, ca 120 m: NMP6V 71205/2.

Pristimantis ockendeni: PERU: Loreto: Tarapoto, ca. 21 km W of Iquitos, ca 120 m: NMP6V 71210/1–2.

Pristimantis ventrimarmoratus: PERU: Cusco: Cashiriari-3, S of Río Camisea, USNM 537770; Huánuco: Finca Panguana, Río Llullapichis, 4–5 km upstream from Río Pachitea, 200 m, KU 154801; ca. 30 km [airline] NE Tingo María, 1330 m, AMNH 91577, 91578; Loreto: Headwaters of Río Caterpisa (Serranía de Manseriche), 463 m, AMNH 42435; Río Nanay, Mishana, MCZ 89081; Tipishca, across Río Ucalayi from Contamana, AMNH 42938; Madre de Dios: Cocha Cachu, Río Manu between Río Panagua and Río Cachin, 365 m, AMNH 153040, KU 154803, MUSM 9133–9136, 9138, 9141, 10069, USNM 306757; Colpa de Guacamayo, Río Tambopata, USNM 332454–332456; Cusco Amazónico, 15 km E Puerto Maldonado (P); Manu, 365 m, KU 154802; Pakitza, 57 km NW [airline] from mouth of Río Manu, USNM 342616, 345282, 345891, 345892; Pasco: Pozuzo, 970–1100 m, MUSM 20383, 20384, 20392, SMF 80410; Yulitunqui, 930 m, MUSM 20393; Ucayali: Iparia, MCZ 75051, 75052.