

A NEW SPECIES OF THE *PRISTIMANTIS CONSPICILLATUS* GROUP
FROM THE PERUVIAN AMAZON (ANURA: CRAUGASTORIDAE)

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ABSTRACT

We name and describe a **new species** of Anura, *Pristimantis iiap*, from the lowlands of the Peruvian Amazon, and allocate it to the *Pristimantis conspicillatus* group (sensu Padial et al. 2014). The new species was collected along the Sepahua River, a small tributary of the Urubamba River (Departamento Ucayali, Peru) running west from the slopes of the Fitzcarrald Arch. Individuals were found active at night in the understory of evergreen lowland forest with high density of bamboo (*Guadua* spp.). The new species is characterized by having complete and conspicuous dorsolateral folds, a slightly granular belly, a first finger slightly shorter than second, with large discs on fingers and toes (especially Fingers III and IV), a bright orange groin, and by lacking well-defined orange spots on the back of thighs and shanks. The advertisement call is composed of a single pulsed note with an average of 15 pulses/note, a pulse rate of 205 pulses/s, an average call length of 75 ms, and average fundamental and dominant frequencies of 1857 Hz and 3690 Hz, respectively. *Pristimantis iiap* occurs in sympatry with three other species of the group, *P. buccinator* (Rodríguez, 1994), *P. fenestratus* (Steindachner, 1864), and *P. skydmainos* (Flores and Rodríguez, 1997). Although only known from two close localities, we expect *P. iiap* to occur in similar forests along the Fitzcarrald Arch and on the eastern slopes of Cordillera Vilcabamba and Cordillera del Sira.

KEY WORDS: Alto Purus National Park, Brachycephaloidea, Fitzcarrald Arch, *Guadua* forest, terraranas, Urubamba River basin.

INTRODUCTION

The slopes of the Fitzcarrald Arch in southeastern Peru constitute some of the less explored areas of the Amazon Basin. The arch is a low rise in western South America that expands across ca. 400,000 km² and forms the divide between the northern, southern, and eastern limits of the Amazonian foreland basin (Roddaz et al. 2005; Espurt et al. 2007; Regard et al. 2009). Four main hydrographic systems, the Madre de Dios-Madeira, the Purus, the Jurua (or Yuruá), and the Ucayali (Lipa et al. 1998; Espurt et al. 2007; Regard et al. 2009), originate on the slopes of the arch. The area is also distinctive from an ecological perspective. The slopes, which in some areas reach 635 m elevation (Pitman 2003), are covered with primary terra firme forest with a high density of bamboo of the genus *Guadua* spp. (Pitman et al. 2003). These bamboo-dominated forests occur across ca. 160,000 km² (Nelson 1994; Silman 2003; Carvalho et al. 2013) and present a markedly different structure and ecological dynamics with respect to

adjacent forests of the lower Amazon (Silman 2003; Carvalho et al. 2013) despite tree species diversity that seems to be similar (Pitman et al. 2003; Silman, 2003).

Little information exists about the herpetofauna of the Fitzcarrald Arch. During the 1960s and 1970s some surveys were performed around the village of Balta on the Curanja River in the headwaters of the Purus River Basin. These collections were used to produce preliminary lists of amphibians and reptiles by Duellman and Thomas (1996) and Rodríguez (2003). A few other studies (Rodríguez and Cadle 1990; Rodríguez 1992) provided species data for an area on the Manu River (Pakitza and Cocha Cashu biological stations) on the southern limit of the arch (see also Catenazzi et al. 2013). In addition, a few taxonomic studies described new species of Anura from the arch and adjacent areas, which seem to be absent from other parts of Amazonia. These include *Ameerega macero* (Rodríguez and Myers, 1993); *Chiasmocleis superciliaribus* Morales and McDiarmid, 2009; *Pristimantis buccinator* (Rodríguez, 1994) (Flores and Rodríguez 1997); *P. skydmainos* (Flores



Fig. 1.—Life specimens of *Pristimantis iiap*, sp. nov., from the Sepahua River, Ucayali, Peru. **A–C**, adult male holotype (MHNC 14833, SVL 28.5 mm); **D–F**, adult male (CM 158381, SVL 27.8 mm); **G–I**, adult male paratype (CM 158378, SVL: 24.2 mm); **J–L**, juvenile paratype (MHNC 14829, SVL 23.10 mm).

and Rodríguez, 1997); and *Ranitomeya vanzolinii* (Myers, 1982). These studies show that although still poorly explored the Fitzcarrald Arch constitutes an interesting area for the study of amphibians and reptiles.

In 2013 we started a series of expeditions to the Alto Purus National Park, the Communal Reserve of Purus, and their areas of influence. We surveyed several new localities within the Fitzcarrald Arch. Preliminary analyses reveal a much richer fauna of amphibians and reptiles than previously known, including several new species that are under the process of description (see Padial et al. 2016). During our second expedition to the area in 2014, we surveyed the Sepahua River from its mouth at the Urubamba River to its headwaters near the Piedras River. In two lo-

calities we found a population of a distinctive species of *Pristimantis* that shares a number of traits with species of the *Pristimantis conspicillatus* group (sensu Padial et al. 2014) but that according to our comparisons with pertinent material represents a new species that is named and described herein.

MATERIAL AND METHODS

Collecting procedures.—Specimens collected were photographed alive, euthanized with anesthetic (Lidocaine), fixed in 10% formalin, and preserved in 70% ethanol. Coordinates were obtained by means of a Garmin PSMAP 62sc Handheld Navigator Global Positioning System

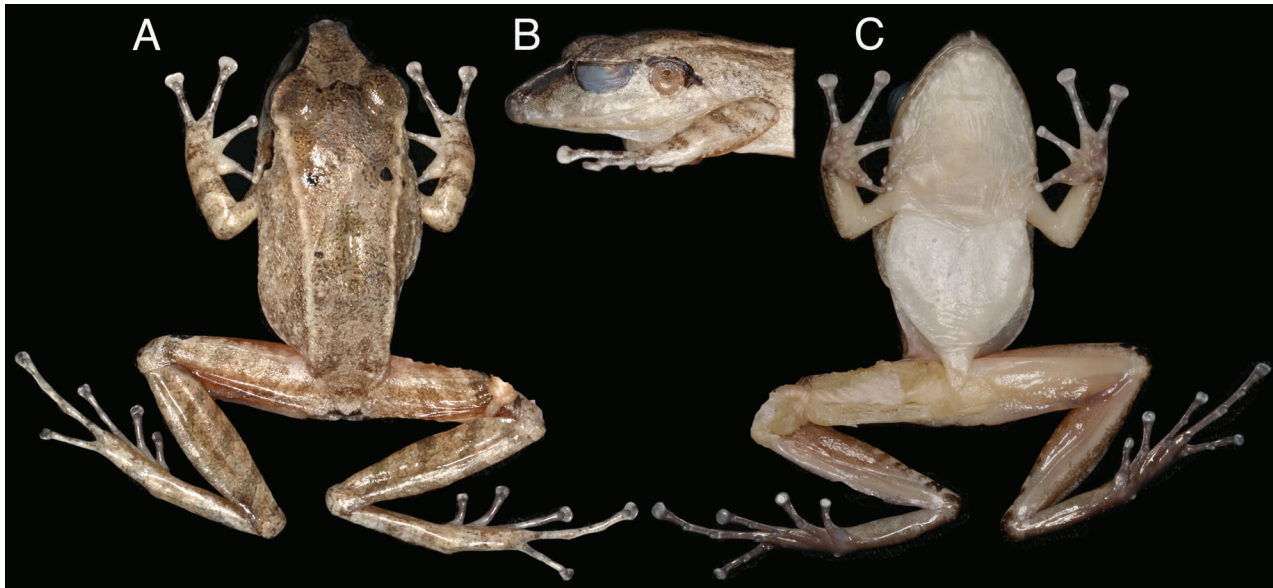


Fig. 2.—Details of a paratype of *Pristimantis iiap*, sp. nov. (CM 158381, SVL: 24.2 mm), in preservative.

(GPS), and further assessments and geographical data and elevation were performed in Google Earth (GOOGLE EARTH PRO 2013).

External morphology.—For morphometrics, a single person (JCC) took measurements with a digital caliper to the nearest 0.01 mm but in order to avoid pseudo precision, we rounded all measurements to only one decimal. Abbreviations are as follows: snout–vent length, SVL; head length (from posterior margin of lower jaw to tip of snout), HL; head width (measured at level of rictus), HW; eye length (measured horizontally), EL; eye to nostril distance, EN; internarial distance, IND; eye–eye distance, EE; tympanic membrane height, TYH; tympanic membrane length, TYL; width of disc of Finger III, F3; width of disc of Finger IV, F4; arm length (from posterior margin of thenar tubercle to elbow), FA; tibia length, TL; thigh length, TH (from vent to knee); foot length (from proximal border of inner metatarsal tubercle to tip of fourth toe), FL; width of disc of Toe IV, T4. We do not include values of interorbital distance (IOD) and upper eyelid width (EW) as our experience indicates that these parameters are usually of scarce utility because the preservation condition of the specimen highly influences the measurements and makes it difficult to have precise and comparable values for large series. Lengths of fingers were compared by adpressing them against each other. Color characteristics were noted in life and in alcohol. We determined age and sexual condition by dissection or by observation of external secondary sexual characters. For character states definitions, we followed Duellman and Lehr (2009). Diagnosis and description format follows Padial and De la Riva (2009).

Museum acronyms are those cited by Frost (2015), ex-

cept that MHNC refers to Museo de Historia Natural de Cusco, Cusco, Peru (MHNCP in Frost 2015). Specimens examined are listed in Appendix I. They include type material of 22 species of cis-Andean species of the *Pristimantis conspicillatus* group, that is, those inhabiting the Amazon Basin, the Cerrado, and the Guianas. Only the types of *P. avicuporum* (Duellman and Pramuk, 1999) and *P. gutturalis* (Hoogmoed et al., 1977) were not available for study and we relied on data provided in their respective original descriptions.

Bioacoustics.—Calls were recorded with a TASCAM DR-07MKII portable digital recorder at 44.1 KHz and 16 bit resolution in wav format. All calls were edited with Audacity 1.2.2 for MacOS X (Free Software Foundation Inc., 1991). Praat 4.2.22 for MacOS X (Boersma and Weenink 2005) software was used to generate audiospectrograms and oscillograms. Frequency information was obtained using a Hanning window function through Fast Fourier Transformations (FFT) (width, 1024 points). Air temperature was measured immediately after sound recording. Digitized calls are deposited at the Fonoteca Zoológica of the Museo Nacional de Ciencias Naturales (Madrid). We analyzed the following quantitative parameters: number of notes per call, number of pulses per call, pulse rate, call duration (ms), fundamental frequency (Hz), and dominant frequency (Hz). Terminology in call descriptions follows Padial and De la Riva (2009); The call of the new species was compared with described calls of other species in the *Pristimantis conspicillatus* group (Heyer and Muñoz 1999; Padial and De la Riva 2009, Heyer and Barrio-Amorós 2009; Maciel et al. 2012).

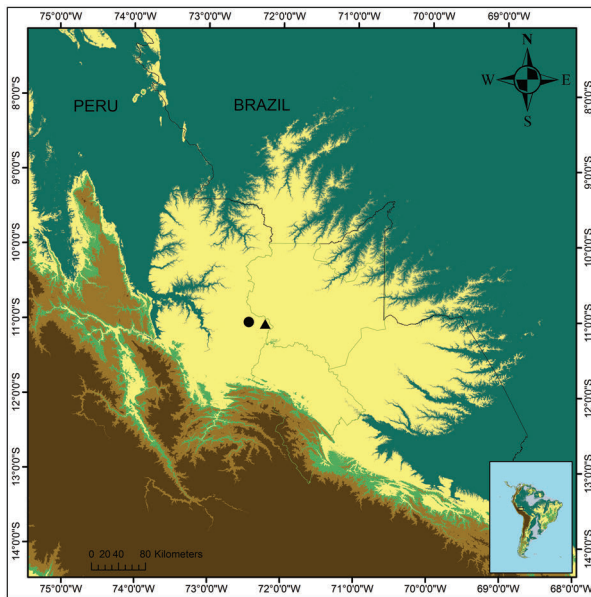


Fig. 3.—Map of southeastern Peru showing the distribution of *Pristimantis iiap*, sp. nov. The triangle indicates the type locality while the circle indicates another locality where additional paratypes were collected.

SYSTEMATIC ZOOLOGY

Class Amphibia Blainville, 1816

Order Anura Fischer von Waldheim, 1813

Family Craugastoridae Hedges, Duellman, and Heinicke, 2008

Subfamily Ceuthomantinae Heinicke, Duellman, Trueb, Means, MacCulloch, and Hedges, 2009

Genus *Pristimantis* Jiménez de la Espada, 1870

Pristimantis iiap, new species

(Figs. 1A–L, 2A–C)

Holotype.—MHNC14833 (field number CM 70428, Figs. 1A–C), an adult male collected at Campamento 4 on the Sepahua River, between Quebrada Zungaro and Quebrada Esther, Distrito Sepahua, Provincia Atayala, Departamento Ucayali, Peru (11.07441° S, 72.22856° W) at 415 m above sea level, on March 06, 2015, by José M. Padiá and Luis A. Giusseppe Gagliardi Urrutia.

Paratypes.—CM 158381 (field number CM 70427, Figs. 1D–F, Figs. 2A–C), an adult male collected with the holotype by José M. Padiá and Luis A. Giusseppe Gagliardi Urrutia. MHNC 14832 (field number CM 70426), an adult male collected at “Campamento 2, Rio Sepahua, Distrito Sepahua, Provincia Atayala, Departamento Ucayali, Peru” (11.05002° S, 72.45307° W) at 353 m a.s.l., on February 27, 2015 by José M. Padiá, Luis A. Giusseppe Gagliardi Urrutia, Juan C. Chaparro, and Roberto C. Gutierrez. CM 158378 an adult male (field number CM 70241; Figs. 1G–I) and a juvenile CM 158379 (field number CM 70242) collected at “Track across the river from Campamento 2,

Rio Sepahua, Distrito Sepahua, Provincia Atayala, Departamento Ucayali, Peru” (11.0491° S, 72.44894° W) at 385 m a.s.l., on February 24, 2015 by José M. Padiá, Luis A. Giusseppe Gagliardi Urrutia, Juan C. Chaparro, and Roberto C. Gutierrez. CM 158380 (field number CM 70316) a juvenile collected at “Cocha near Campamento 2, Rio Sepahua, Distrito Sepahua, Provincia Atayala, Departamento Ucayali, Peru” (11.05272° S, 72.45649° W) at 361 m a.s.l., on February 25, 2015 by José M. Padiá, Luis A. Giusseppe Gagliardi Urrutia, Juan C. Chaparro, and Roberto C. Gutierrez. MHNC 14829–31 (field numbers CM 70310–12), three juveniles collected at “Quebrada across the river from Campamento 2, Rio Sepahua, Distrito Sepahua, Provincia Atayala, Departamento Ucayali, Peru” (11.04995° S, 72.45051° W) at 370 m a.s.l., on February 26, 2015 by José M. Padiá, Luis A. Giusseppe Gagliardi Urrutia, Juan C. Chaparro, and Roberto C. Gutierrez.

Diagnosis.—(1) skin on dorsum coarsely shagreen, flanks with larger granules; venter finely granular, smooth only in the middle and anterior part; posterior surfaces of limbs smooth; discoidal fold conspicuous; dorsolateral folds present, low, formed by discontinuous row of granules; postrictal tubercles present; upper eyelid covered by small granules; (2) tympanic membrane and annulus round, large, their length about half eye length; supratympanic fold long, prominent; (3) head longer than wide; snout round in dorsal and lateral views; canthus rostralis straight in dorsal view, sharp in profile; (4) cranial crests absent; (5) dentigerous process of vomers large, situated posteromedial to choanae; (6) males with vocal slits, single and large subgular vocal sac, and nuptial asperities on dorsal surface of thenar tubercle; (7) hands with long and slender fingers, first finger as long as second; subarticular tubercles subconical, prominent; supernumerary tubercles round, smaller than subarticular tubercles; terminal discs of inner two fingers enlarged and round, those of external fingers enlarged, ovate to triangular; circumferential grooves conspicuous, unguis flap slightly indented; lateral fringes and keels on fingers absent; (8) ulnar tubercles present; (9) tubercles on heel and tarsus absent, tarsal fold present, narrow and oblique; (10) inner metatarsal tubercle ovate, prominent, outer subconical, prominent; single, round supernumerary tubercle on Toe IV; (11) toes long and slender (foot length 50% SVL); lateral fringes or keels weak, basal toe webbing absent; fifth and third toes reaching midpoint of penultimate subarticular tubercle of Toe IV; tips of toes rounded to ovate, enlarged, unguis flap not indented; (12) dorsal coloration overall brown, of different shades, with dark brown chevrons on dorsum, arms and legs, and barred lips; dorsolateral folds of the same color as dorsum or lighter; belly yellowish white, throat mottled with tiny grey spots, thighs and shanks orange to reddish brown; posterior surface of thighs reddish brown with small light spots; (13) mating call composed of a single pulsed and amplitude modulated note.

Among the 33 species of the *Pristimantis conspicillatus*

TABLE 1. Measurements and proportions (in mm) of the type series of *Pristimantis iiap*.

	CM 158378 Adult male	MHNC14832 Adult male	CM 158381 Adult male	MHNC14833 Adult male	MHNC14831 juv.	MHNC14830 juv.	CM 158380 juv.	CM 158379 juv.	MHNC 14829 juv.
SVL	24.2	27.4	27.8	28.5	20.2	21.0	23.1	21.5	23.1
HL	11.5	12.2	12.3	13.0	9.1	9.8	10.2	9.9	10.2
HW	10.1	10.5	10.5	11.2	7.6	8.3	8.6	8.3	8.6
EL	3.7	3.7	3.7	3.9	2.5	2.6	2.9	2.8	2.9
EN	3.5	3.6	3.7	3.8	2.6	2.8	3.3	3.1	3.3
IND	2.7	3.1	2.7	2.7	1.8	1.9	2.3	1.9	2.3
EE	5.2	5.5	5.7	6.0	4.1	4.2	5.0	4.2	5.0
TYH	2.1	2.4	2.4	2.5	1.6	1.7	2.0	1.7	1.9
TYL	1.7	2.1	2.2	2.2	1.2	1.4	1.6	1.5	1.6
F3	1.3	1.5	1.5	1.5	1.0	1.0	1.1	0.9	1.1
F4	1.3	1.5	1.5	1.5	1.0	1.0	1.2	0.9	1.2
FA	5.1	5.7	5.7	5.3	3.8	4.6	5.0	4.5	5.0
TL	15.4	16.8	16.0	17.1	12.3	13.5	14.4	12.7	14.4
TH	13.5	15.5	15.1	15.2	10.4	12.1	12.6	12.0	12.6
FL	13.3	15.0	14.6	15.0	9.8	11.6	12.4	10.9	12.4
T4	1.0	1.4	1.4	1.5	0.8	0.9	1.1	0.9	1.1
TL/SVL	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
FL/SVL	0.6	0.6	0.5	0.5	0.5	0.6	0.6	0.5	0.5
HL/HW	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EN/EL	0.9	1.0	1.0	1.0	1.0	1.1	1.0	1.1	1.1
EL/HW	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.3
TYL/TYH	0.8	0.9	0.9	0.9	0.7	0.8	0.9	0.9	0.8

group (Padial et al. 2014), nine species have dorsolateral folds: *P. adistolus* (Duellman and Hedges 2007); *P. avicuporum*; *P. bipunctatus* (Duellman and Hedges, 2005); *P. buccinator*; *P. conspicillatus* (Günther, 1858); *P. malkini* (Lynch, 1980); *P. meridionalis* (Lehr and Duellman, 2007); *P. peruvianus* (Melin, 1940); and *P. skydmainos*. From these, *P. iiap* differs as follows. *Pristimantis adistolus*, a species from humid montane forests of Cordillera Yanachaga (Duellman and Hedges 2007), has continuous dorsolateral folds (not composed of anastomosed granules), slightly enlarged finger discs, Finger I slightly shorter than Finger II, areolate belly, and a small tympanic membrane (less than 50% EL). *Pristimantis avicuporum*, a species of the Andean hills (ca. 1700 m a.s.l.) in Departamento Amazonas (northern Peru) (Duellman and Pramuk 1999), has slightly areolate belly, an interocular dermal fold, basal toe webbing, and a tan belly with brown reticulations. *Pristimantis bipunctatus*, a species from the humid montane forest of the Andean hills of Oxapampa at

ca. 2000 m a.s.l. (Duellman and Hedges 2005), has smooth dorsum, lacks granules on upper eyelids, lacks a tarsal tubercle, and has basal toe webbing. *Pristimantis buccinator*, a species from the southeastern Amazonian lowlands (Rodríguez 1994) and syntopic with *P. iiap*, has continuous, complete, and well-developed dorsolateral folds, a X-shaped and/or V-shaped dorsal fold, an interorbital ridge, smooth dorsal skin, dark brown to black upper lips, and dark brown to bold black posterior surfaces of thighs. *Pristimantis conspicillatus*, a species from the Andean hills in Ecuador and adjacent Peru (Duellman and Lehr 2009), has large and conspicuous orange flecks and spots reticulated with a dark brown to bold black background on posterior surface of thighs, and Finger I is much longer than Finger II. *Pristimantis malkini* a species from the Amazon lowlands in northern Peru and adjacent Colombia and Ecuador (Lynch 1980; Cisneros–Heredia 2005) has incomplete dorsolateral folds composed of elongated warts, has a yellow belly, Finger I is longer than II, has basal toe



Fig. 4.—Bamboo-dominated forest of the Fitzcarrald arch along the Sepahua River (Ucayali, Peru) where *Pristimantis iiap*, sp. nov., was found perching at night on low bushes of the understory.

webbing, and presents yellow spots and flecks against a black background, often reticulated, on the posterior part of thighs. *Pristimantis meridionalis* (Duellman and Lehr 2007), a species from the Pacific versant of the Andes in northwestern Peru at elevations of ca. 2000 m, has finely shagreen dorsal skin, Finger I is shorter than Finger II, has finger and toe fringes and basal toe webbing, lacks a tarsal fold, and has densely mottled belly. *Pristimantis peruvianus*, a species from the low Andean hills of northern Peru and Ecuador and the adjacent lowlands (Padial and De la Riva 2009), has continuous, complete, and well-developed dorsolateral folds, a Finger I much longer than Finger II, finely shagreen dorsal skin, subacuminate snout, and the posterior surface of thighs is homogenously dark brown with well-defined orange spots. *Pristimantis skydmainos* (Flores and Rodríguez 1997), a species from the southeastern Amazonian lowlands and syntopic with *P. iiap*, has continuous, complete, and well-developed dorsolateral folds, an interocular ridge and a middorsal bold black tubercle, Finger I is shorter than Finger II, and the posterior part of thighs is dark brown to black.

Description of the holotype.—An adult male with subgular vocal sac, vocal slits, and nuptial asperities. Head longer

than wide (head length/head width = 1.2); snout round in dorsal view and lateral profile; nostrils slightly protuberant, oriented posterolaterally; canthus rostralis straight in dorsal view, sharp in frontal profile; loreal region flat; lips not flared; upper eyelid without tubercles but covered by small granules; no cranial crests. Supratympanic fold prominent, long, surrounding the tympanic membrane; tympanic membrane and annulus distinct; tympanic membrane nearly round, its length about half of eye length; postictal glands low, subconical. Choanae not concealed by palatal shelf of the maxillary arch when roof of mouth is viewed from below; choanae large, ovate, separated by distance equal to five times diameter of a choana; dentigerous process of vomers large, prominent, triangular in shape and in contact, situated posteromedial to choanae, bearing vomerine teeth; vocal sac subgular, vocal slits placed posterolaterally. Skin of dorsal surfaces and posterior parts of hind limbs coarsely shagreen; throat smooth, belly granular, only smooth in the middle and anterior part; occipital folds absent; dorsolateral folds present, low, formed by a discontinuous row of anastomosed granules; discoidal fold conspicuous.

Arm without round ulnar tubercles; palmar tubercle bifid, flat, equal to elongate, prominent thenar tubercle; a single supernumerary tubercle on the basis of each finger,

low, round, smaller than subarticular; subarticular tubercles prominent, subconical; finger tips enlarged and round on fingers I and II, and large and ovate to triangular on fingers III and IV; fingers lacking lateral fringes; relative length of fingers III>IV>II<I; a single non-spinous white nuptial pad on dorsal surface of each thumb.

Toes long and slender (foot length 50% of SVL); heel and tarsus lacking tubercles; tarsal fold narrow, oblique, almost in contact with inner metatarsal tubercle and smaller than it; inner metatarsal tubercle ovate, prominent, larger than outer; outer metatarsal tubercle round, subconical; supernumerary tubercles low, ovate, inconspicuous; subarticular tubercles conical, prominent; toes with weak lateral fringes; basal toe webbing absent; toe tips round to truncate, moderately developed; unguis not indented, circumferential grooves evident; relative length of toes IV>III>V>II>I; toes III and V reaching midpoint of penultimate subarticular tubercle of Toe IV.

In life, the dorsum is overall brown, of different shades, with dark brown chevrons outlined with cream. Arms and legs are barred with bars or chevrons of the same color as those of dorsum, and the same color applies to vertical bars on the upper and lower lips. The dorsolateral folds are cream colored, which make them appear more evident than on other specimens. The groin, underside of shanks and thighs are bright orange. The supratympanic fold, a pair occipital spots and a stripe above the vent are bold black. The canthus rostralis is dark brown to black outlined by cream above. The iris is copper. The posterior surfaces of thighs are reddish brown to orange, with scattered irregular small flecks. The belly is yellowish white, the throat is white but densely mottled with fine brown to gray spots, the lower lip is barred with white and brown, and the sole of feet is dark brown to black. Fingers and toes are barred with dark brown.

In preservative, the overall pattern prevails, but brown colors became lighter or turned grayish brown.

Measurements (in mm) of the holotype.—SVL 27.8, HL 12.3, HW 10.5, EL 3.7, EN 3.7, IND 2.7, EE 5.7, TYH 2.4, TYL 2.2, FIII 1.5, FIV 1.5, FA 5.7, TL 16.0, TH 15.1, FL 14.6, TIV 1.4 (see also Table 1).

Variation.—The coloration is overall brown in all specimens, with specimen CM 158378 being lighter, beige overall. Color pattern is quite constant, the only conspicuous difference is the color of dorsolateral folds. While some specimens have dorsolateral folds of the same color as dorsum, the holotype and CM 158381 have cream dorsolateral fold that contrast with the dark brown background color of the rest of the dorsum. Also, some specimens present more marked bold black irregular spots on knees and forearms (e.g., CM 158378). Adult males range from 24.2–28.5 mm in SVL and are very similar in proportions. The five immature specimens range in size from 20.2–23.1 mm and proportions are similar to those of adult males. For variation in all measurements see Table 1.

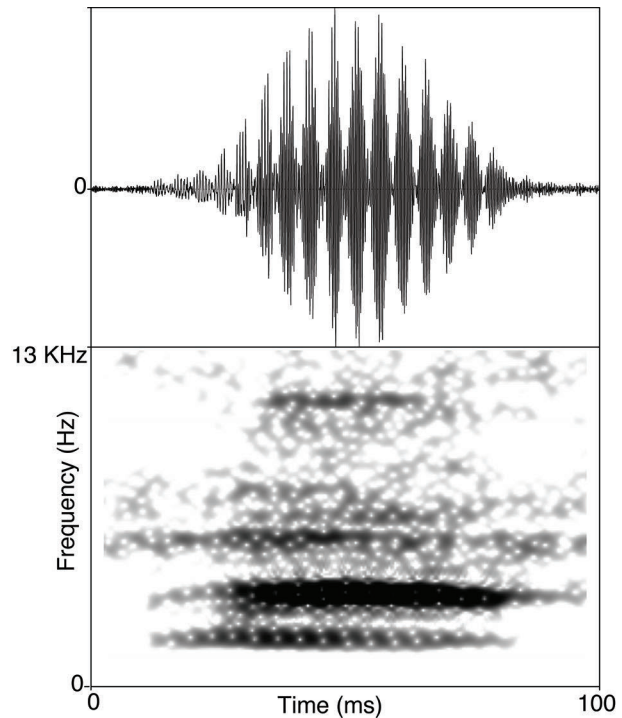


Fig. 5.—Oscillogram and sound spectrogram of the advertisement call of the holotype of *Pristimantis iiap*, sp. nov. (MHNC 14833), recorded on 06 March 2015 at on the Sepahua River, Ucayali, Peru.

Etymology.—The new species is named in honor of the Instituto de Investigaciones de la Amazonía Peruana (IIAP) (Peruvian Amazon Research Institute), based in Iquitos, Peru, in recognition of its efforts to explore the Peruvian Amazon and in preserving its biological diversity. The acronym IIAP is used as a noun in apposition.

Natural history, advertisement call, and distribution.—*Pristimantis iiap* is only known from two close localities along the slopes that surround the course of the Sepahua River. All specimens were found at night during the rainy season, perching on low bushes of the forest understory. The forest was undisturbed primary forest with a high predominance of bamboo (*Guadua* spp.) and a dense understory (Fig. 4). On March 06, 2015, three males were found calling on low bushes near Camp 4, on the headwaters of the Sepahua River. We recorded 30 notes of the mating call of these three specimens, including the holotype (MHNC 14833, CM 158378, and CM 158381). The advertisement call is composed of a single amplitude-modulated and pulsed note with an average of 15 pulses/note (range 13–18), an average pulse rate of 205 pulses/s (range = 157–234), an average call length of 75 ms (range 63–84 ms), and average fundamental and dominant frequencies of 1857 Hz (range 1739–2129 Hz), and 3690 Hz (range 3136–4010 Hz), respectively (Fig. 5). The calls of all species in the *P. conspicillatus* group for which the call has

been described is pulsed and modulated in amplitude, with the highest amplitude centered around the midpoint of the call [*P. buccinator*, *P. dundeei* (Heyer and Muñoz, 1999), *P. fenestratus* (Steindachner, 1864) (Padial and De la Riva 2009), *P. koehleri* Padial and De la Riva, 2009, *P. samaipatae* (Köhler and Jungfer, 1995), *P. vilarsi* (Melin, 1941) (Heyer and Barrio-Amoros 2009)]. Most species emit series of notes rather than single notes (Padial and De la Riva 2009). In sister and parapatric species (e.g., *P. fenestratus* and *P. koehleri*), the number of notes seems to be a key factor preventing interbreeding (Padial and De la Riva 2009). Nevertheless, the number of notes can show some variation. When highly active, *P. samaipatae* emits two notes, switching to a single note when the activity of choruses decreases (Padial, pers. obs). The same seems to apply to *P. buccinator*, which can emit from one up to six consecutive notes (Rodríguez 1994). The number of pulses in *P. buccinator* is considerably higher (17–18), note duration is longer (50–60 ms), and pulse rate is higher (257–283 pulses/s). It is important to note that *P. buccinator* and *P. iiap* occur in sympatry and have similar mating calls in overall structure, though they differ in the number of notes, call length, and pulse rate. Two other species in the *P. conspicillatus* group occurring in syntopy, *P. fenestratus* and *P. skydmainos*, have very distinctive calls. The call of *P. fenestratus* is also pulsed and amplitude modulated, but consists of two to four notes and the notes are longer (157–458 ms) (Padial and De la Riva 2009). The call of *P. skydmainos* has not yet been described but it was recorded in the area and will be analyzed in the future. In contrast to all other species in the group, the call of *P. skydmainos* is not a complexly pulsed note but a short whistle instead.

DISCUSSION

To date there is no identifiable morphological synapomorphy for the genus *Pristimantis* (Hedges et al. 2008) and the assumption of monophyly of the group is based on partial molecular sampling and overall similarity. We have therefore assigned *P. iiap* to this genus based on geography and overall similarity. In the same way, we assign the new species to the *P. conspicillatus* species group, as recently redefined by Padial et al. (2014). As for the genus *Pristimantis*, the monophyly of the *P. conspicillatus* group is partially based on the results of molecular phylogenetic analyses and partially on the observation of morphological similarities (e.g., smooth to slightly granular belly, tarsal fold, a distinct tympanic membrane, Finger I equal or longer than II, and an advertisement call composed of pulsatile and amplitude-modulated notes). The group now includes 34 species and has a broad distribution in the Neotropics, from Costa Rica to southern Bolivia and the Guianas, the Pacific and Amazonian slopes of the Andes up to ca. 2300 m elevation, the Cerrado, the Atlantic Forest of Brazil, and even the Caribbean island of Tobago (see Frost 2015). Twenty-two species are cis-Andean, occurring in the low-

land forests of the Amazon basin, the lower part of the adjacent hills of the Andes, and the Guianas. In other words, most of the diversity of this group is centered on tropical lowland forests. Three species (*P. buccinator*, *P. iiap*, and *P. skydmainos*) were first discovered in Southwestern Amazonia, in the area of the Fitzcarrald Arch, and seem to be restricted to that region. We consider doubtful a record of *P. skydmainos* (Cisneros-Heredia 2006) for southern Ecuador, as there are other species in the area that present similar characteristics (e.g., *P. avicuporum*, *P. metabates* (Duellman and Pramuk, 1999), and *P. peruvianus*). Furthermore, character variation in these species as well as in *P. karcharias* (Flores and Rodríguez, 1997) (considered a junior synonym of *P. skydmainos* by Padial and De la Riva 2005), requires further investigation to determine the taxonomic status of species of the *P. conspicillatus* group from northern Peru.

Pristimantis iiap seems to be restricted to the bamboo-dominated forests of the western versant of the Fitzcarrald Arch, although it may have a broader distribution in similar habitats along the lower hills of the eastern versant of Cordillera del Sira and Cordillera Vilcabamba, as well as the headwaters of the Purus and the Piedras rivers. Our study of museum specimens from large areas of Manu National Park as well as northern Bolivia and our recent surveys in the Upper Purus and Yurua rivers (Padial et al. 2015) failed to find this species. However, our surveys in a different part of the Fitzcarrald Arch revealed several other species of *Pristimantis* new to science, as well as other species of amphibians and reptiles that require further study. Future studies based on this material will be key to assess levels of endemism and diversity for the Fitzcarrald Arch in the context of Amazonia.

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APPENDIX I
Specimens examined
(continued on next page)

- Pristimantis achatinus* (Boulenger, 1898) (1 specimen): **ECUADOR. Esmeraldas:** Cachabé, BM 1947.2.15.69 (holotype, formerly 98.4.28.106).
- Pristimantis adiaxolus* Duellman and Hedges, 2007 (1 specimen): **PERU. Pasco:** 1.5 km NW Cacazú, 1200 m, KU 291681 (holotype).
- Pristimantis bipunctatus* (Duellman and Hedges, 2005) (1 specimen): **PERU. Pasco:** 0.7 km South and 4.5 km East (airline) of Oxapampa, 2120 m elevation, KU 291638 (holotype).
- Pristimantis buccinator* (Rodríguez, 1994) (8 specimens): **PERU. Madre de Dios:** Cocha Cashu Biological Station, Manu National Park, KU 220919 (paratype); MHNSM 3842 (holotype), 3844–7, 3865 (paratypes), USNM 299779.
- Pristimantis caliginosus* (Lynch, 1996) (1 specimen): **PERU. Huánuco:** Cordillera Azul, Pass of Carretera Central, 1650 masl, ZFMK 27634 (holotype of *Pristimantis nebulosus* (Henle, 1992)).
- Pristimantis chiastonotus* (Lynch and Hoogmoed, 1977) (1 specimen): **SURINAM. Brokopondo:** Brownsberg, 500 m, RMNH 17614 (holotype).
- Pristimantis citriogaster* (Duellman, 1992) (1 specimen): **PERU. San Martín:** Cataratas Ahuashiyacu, 14 km NE Tarapoto, 370 m, KU 212277 (holotype).
- Pristimantis condor* (Lynch and Duellman, 1980) (1 specimen): **ECUADOR. Morona-Santiago:** Río Piuntza, Cordillera del Condor, 1830 m, KU 146992 (holotype).
- Pristimantis conspicillatus* (Günther, 1858) (131 specimens): **COLOMBIA. Putumayo:** Puesto de Bombeo Gómez, 1000 m, KU 140299–300; San Antonio, Río Suárez, 400 m, KU 140301; 10 km S of Mocoa, AMNH 84830–1; **ECUADOR.** Andes of Ecuador, BM 1947.2.16.20 (holotype, formerly 58.7.25.24); **Morona Santiago:** Taisha, MCZ 100267; **Napo:** Río Yasuní (150 km upstream from), KU 175106; Río Yasuní (200 km upstream from), KU 175107–10; road to Tivacuno km 9, PUCE, Yasuní, KU 289437; Santa Cecilia, 340 m, KU 104552–63, 106959–60, 106966, 108983–7, 110784–88, 123408–26; 146071–8, 148785–94, 148820–23, 148796–818; 14825–6; 3.1 km S Río Tiputini, KU 297110; 1350 m from topographic trail PUCE, KU 289436; **Pastaza:** Chantoa, KU 119524; Mera, KU 119525; Pastaza River, MCZ 19637 (5 specimens); Sarayacu, KU 119526; 1 km W of Puyo, MCZ 89963–8, 92131, 92133; 10 KM ESE of Veracruz, MCZ 89958–59; **Sucumbios:** Lago Agrio, KU 126154–5, 297111; Limoncocha, KU 183524; **PERU. Loreto:** Explorama Lodge, junction Río Yanamomo and Río Amazonas, KU 220444; Quebrada Grande, ca. Junction Sucusari and Napo rivers, KU 220353, 220569, 222348.
- Pristimantis dundeei* (Heyer and Muñoz, 1999) (18 specimens): **BOLIVIA. Santa Cruz:** Boca del Paucerna, Parque Nacional Noel Kempff Mercado, MNK-A 3124; Flor de Oro, Parque Nacional Noel Kempff Mercado, MNK-A 2811–2, 28189, 2821, 2828, 5596; **BRAZIL. Mato Grosso:** Burity, 30 miles NE of Cuiabá, BM 1928.1.12.9; Casa de Pedra, Chapada dos Guimarães, USNM 507897–90 (paratypes); Chapada, close to Cuiabá, BM 92.4.20.16, 1903.3.26.30–31; Río Coxipozinho, Veú da Noiva, Chapada dos Guimarães, MZUSP 79834 (holotype), 79835–7 (paratypes).
- Pristimantis fenestratus* (Steindachner, 1864) (323 specimens): **BOLIVIA. Beni:** Arroyo Agua Clara, MNK-A 3820; Asunción, MNK-A 4058, 4066, 4070–1; Laguna Azul, MNK-A 4007; Misiones Mosetenes, BM 98.6.9.21; Rurrenabaque, MNK-A 3784–9, 3790–1; San Luis Chico, MNK-A 4013–5, 4032; Serranía del Pilón, Antena de Entel, MNK-A 4150–5, 4175–6, 4199–200; Río Yucumo, MNCN 43149–50, 43838, 43841; **Cochabamba:** Altamachi, CBG 486–7; between Parajiti and El Palmar, ZFMK 66965–6; between El Palmar and Paractito, ZFMK 72545–6, 72536; road to San Onofre from Cochabamba-Villa Tunari road, MNCN 43109, 43119; Chaquisacha, Carrasco National Park, 1500 masl CBG 219; Charuplaya, 1300 m BM 1902.5.29.106–109; Los Guácharos (=El Palmar, 500 m), CBG 301–7, 349–358, MNCN 43031, 43142; ríos Altamachi–Malpaso, CBG 439, 492–8; Santa Anita, Isiboro-Sécure National Park, CBG 744–5, 747–9; Santa Domingo, Isiboro-Sécure National Park, CBG 613–15, 617; Valle de Sajta, MNK-A 3561; Villa Fátima, CBG 556–559; Villa Tunari, MNK-A 1493; **La Paz:** Arroyo Amahuachi, Camino Maderero Bellavista, MNK-A 3801–3; Arroyo Mikai, Camino Maderero el Chaval, MNK-A 3757, 3763–8, 3762; Boquerón, ANMI Pilon-Lajas, 1000 masl, CBG 773; Chalalán, A.N.M.I. Madidi, MNCN 42980, 43057, 43239–40, 43242–44; Chulumani, 1700 m, BM 1940.4.5.59; Huachi, MCZ 10094–5; Juapi, A.N.M.I. Pilon-Lajas, CBG 681–7; La Cascada, MNCN 43037; Sadiri, Arroyo Yariapo, Madidi National Park, MNCN 42982, 42984; Serranía Beu, A.N.M.I. Pilon-Lajas, CBG 901–6; San Ernesto, Mapiri 500 m, BM 1901.8.2.53; San Ignacio, MNK-A 4083–7, 4151; Serranía de Bella Vista, MNCN 43146; Serranía de Chepite, 3730, 3735, 3736, 3746–8; Valle de Zongo, ZFMK 72524–5; **Pando:** Arroyo Capinduro, Santa Rosa del Abuná, MNK-A 6881; Arroyo Tulapa, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 5177; Barraca Hiroshima, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 5193–6; Barraca San Carlos, Madre de Dios, MNK-A 4562; Campamento Malecom, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 6052, 6059; Campamento Serna–Humaita, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 4404; Chivé, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 5011–2, 6124–7, 6883, 6888–9, MNCN 43153–4; Cobija, ZFMK 66795–99; Curichón, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 6894; Florida, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 5084, 5091–4, 5115; Gran Progreso, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 5070; Hiroshima, MNCN 43152; Laguna Bay, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 4945, 6114–7; Mukden, 4620–4628; Nueva España, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 3664, 3668–9, 3673–4; Puerto Loreto, Río Madre de Dios, MNK-A 6882, 6884–7; Reserva Tahuamanu, MNK-A 4629; Río Negro, Federico Román, MNK-A 6909; San Antonio, Reserva Nacional de Vida Silvestre Manuripi, MNK-A 6890, 6892–3, 6895; **Santa Cruz:** Buenavista, 500 m AMNH 34004, 34008, 34010; Lago Caimán, Parque Nacional Noel Kempff Mercado, MNK-A 2810, 2815–7, 2820, 2822–7, 2829; Mataracú, MNK-A 3928, 3930–49, 3951, 3953, 3955–67, 3969–70; Quebrada Tesoro, Parque Nacional Noel Kempff Mercado, MNK-A 169; **BRAZIL. Amazonas:** Borba, NMW 19940:2 (paralectotype); ca. 2 km N of km 70 on Manaos–Itacoatiara road, AMNH 139278; Manaos, AMNH 71437; Matto Grosso: Tumbador, between Mantino and Rosario rivers, 450 m, BM 1928.1.12.10–12; **Rondonia:** Río Mamoré, NMW 1940:1 (lectotype); **PERU. Cusco:** Quincemil, 40 km SE of, 800 m, KU 175097–9, 196462–3; 6.2 km of Puente Fortaleza to Quince Mil, MNCN 43250; Marcapata Valley BM 1902.5.29.196; **Madre de Dios:** Cuzco Amazónico, 15 km E of Pto. Maldonado KU 194906–8, 209174–5, 205109–16, 205118–19, 205121–31, 215463–73; Juliaca, Río Heath, Santuario Nacional Pampas del Heath, MCZ 136344; Tambopata Wildlife Reserve, junction Río La Torre and Río Tambopata, BM 1987.609; **Puno:** between Santa Rosa and San Juan del Oro, MNCN 43245; Juliaca (in error), AMNH 6119–20; La Unión, Río Huacamayo, Carabaya, BM 1907.5.7.14–16, 1911.12.20.40–1; **Ucayali:** Balta, Río Curanja, 200 m, KU 175095; Coengua River, upper Uyalcali River AMNH 42067.

APPENDIX I

Specimens examined

(continued from previous page)

Pristimantis koehleri Padial and De la Riva, 2009 (18 specimens): **BOLIVIA. Santa Cruz:** km 6 of Angostura-Samaipata road, MNK-A 6626 (holotype), MNCN 42990–1, MNK-A 6627 (paratopotypes); Espejillos, MNK-A 7170 7172 and 7174, MNCN 43054 (paratypes); La Chonta, Amboró National Park MNCN 42983, 42985–6, 43014, 43040 (paratypes); Macuñucú, Amboró National Park, ZFMK 80005–6 ZFMK 80007 (paratypes); Mataracú, Amboró National Park, ZFMK 79991 and 79993 (paratypes).

Pristimantis lymani (Barbour and Noble, 1920) (1 specimen) **PERU. Cajamarca:** Bellavista, USNM 118189 (paratype).

Pristimantis malkini (Lynch, 1980) (18 specimens): **PERU. Loreto:** Estirón, Río Ampiyacu, AMNH 94228 (holotype), AMNH 94229 (paratopotype); Yagua Indian Village, headwaters of Río Loretoyacu AMNH 94230–34 (paratypes); Olalla, Río Pastaza, AMNH 94219 (paratype). **ECUADOR.** Eastern Ecuador, AMNH 94213–7 (paratypes); **Morona Santiago:** Cusuine, Río Cusuine, 320 masl, 60 km airline SE of Macas AMNH 93686–87, 93690 (paratypes); **Pastaza:** Olalla, Intuto, Río Tigre, AMNH 94250 (paratype); Santa Rosa, Río Tigre, AMNH 94218 (paratype).

Pristimantis medemi (Lynch, 1994) (1 specimen): **COLOMBIA. Meta:** Quebrada Salinas, Las Salinas de Upín 750–760 m, ICN 21213 (holotype).

Pristimantis metabates (Duellman and Pramuk, 1999) (1 specimen): **PERU. Amazonas:** 20 km (by trail) SW of Chiriaco, KU 186904 (holotype).

Pristimantis peruvianus (Melin, 1941) (248 specimens): **BRAZIL. Amazonas:** Igarapé Belém, near Río Solimoes, ca. 70 km E from Leticia, AMNH 96903–97042; **ECUADOR. Morona Santiago:** Ashuara Village on Río Macuma, 300 m, ca. 10 km above Río Morona (ca. 83 km ESE Macas), AMNH 94656–78; Cusuine, AMNH 93583–655; Río Piuntza, 1830 m, KU 147034–38; **Napo:** Río Azuela, 1700 m, AMNH 22202–4, KU 143502–3; Río Salado, 1 km from Río Coca, 1410 m, KU 165859–65; southern slope of Cordillera del Dué, above Río Coca, 1150 m, KU 123446, 123502; 3.2 km NNE, Oritiyacu, 1910 m, KU 165860; 16 km NNE of Santa Rosa, 1700 m, KU 143498–501; **Pastaza:** Río Pastaza, from Canelos to Marañón, MCZ 19635, 89314, 19639; **PERU. Huánuco:** Cordillera Azul, La Divisoria, Río Azul, AMNH 86496–7; **Loreto:** Teniente López, 200 m, KU 222030; Yagua Indian Village, headwaters of Río Loretoyacu, AMNH 96303–30; 1.5 km N Teniente López, 310–340 m, KU 222024–9; **San Martín:** Río Cainasache, 33 km NE Tarapoto on road to Yurimaguas, KU 209475–77; Roque, NHMG 490 (holotype); 15.4 km SW Zapateros, 950 m, KU 217313; 20 km NE Tarapoto on road to Yurimaguas, KU 209473–4; 48 km NE Tarapoto, KU 217312.

Pristimantis samaipatae (Köhler and Jungfer, 1995) (25 specimens): **BOLIVIA. Santa Cruz:** El Fuerte, Samaipata, ZFMK 59600 (holotype); Espejillos, MNK-A 6444, 6448; Estancia Cuevas, 101 km from Santa Cruz de la Sierra to Samaipata, MNK-A 672, ZFMK 66882–3; Km 6 Angostura-Samaipata road, MNCN 42987–9; Río Parabano, MNK-A 6689–91; Río Seco, 40 km W of, ZFMK 67073; Río Seco, 45 km W of, ZFMK 67071–2; Road to Bella Vista from Santa Cruz-Samaipata road, MNCN 43048–51, ZFMK 71998–9; Samaipata, ZFMK 83086; Serranía del Toce, Los Vidrios, MNK-A 3497; 7 km from Samaipata to Santa Cruz de la Sierra, MNK-A 1744–5.

Pristimantis skydmainos (Flores and Rodríguez, 1997) (38 specimens): **BOLIVIA. Pando:** Río Negro, MNKA 6911–12; **BRAZIL. Acre:** Humaitá, at km 29 on Río Blanco to Pto. Acre road, AMNH 139279–81; **PERU. Amazonas:** Alva, btw. Chachapoyas and Bagua Grande, 1000 masl, MCZ 89074–80 (type series of *Pristimantis karcharias* (Flores and Rodríguez, 1997)); **Huánuco:** Río Llullapichis, Panguana, 220 m, KU 218292 (paratype); **Madre de Dios:** Cocha Cashu Biological Station, Manu National Park, AMNH 134165–6 (paratypes), 139010–6 (paratypes), MCZ 88304 (holotype), 88305–9 (paratypes), MHNSM 9090–1 (paratypes); Colpa de Guacamayos, Río Tambopata, 700 masl, USNM 324334–6 (paratypes); La Colpa, Río Tambopata, MHNSM 9081 (paratype); vicinity of Cocha Cashu, approx. 70 km (airline) NW of mouth of Río Manu, on Río Manu, USNM 298914–5 (paratypes); **Pasco:** Bosque Castilla, Oxapampa, MHNSM 11176–7; **Puno:** ridges above mouths of Candamo and Guacamayo rivers, MHNSM 9080 (paratype).

Pristimantis ventrigranulosus Maciel, Vaz-Silva, Oliveira, and Padial, 2012 (7 specimens): **BRAZIL. Goiás:** Fazenda Macaúba, MNRJ 75886 (holotype) MNRJ 75887–89, ZUFG 5893–95 (paratopotypes).

Pristimantis vilarsi (Melin, 1941) (4 specimens): **BRAZIL. Amazonas:** Taracuá, Río Urapés, GNM 491 (2 syntypes); **VENEZUELA. Amazonas:** Teniche, Monte Marahuaca, MCZ 30397 (holotype of *Pristimantis conspicillatus ileamazonicus* (Rivero, 1961)); Upper Cunncuma River, MCZ 28568 (holotype of *Pristimantis brachypodius* (Rivero, 1961)).

Pristimantis zeuctotylus (Lynch and Hoogmoed, 1977) (1 specimen): **SURINAM. Nickerie:** west slope, Vier Gebroeders Mountain, Sipaliwini, RMNH 17701 (holotype)