

A NEW SPECIES OF THE *PRISTIMANTIS FRATER* GROUP (ANURA: STRABOMANTIDAE) FROM THE EASTERN EVERGREEN LOWLAND FORESTS OF ECUADOR

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ABSTRACT: We describe a new species of *Pristimantis* from evergreen lowland forest in the Amazon Basin of Ecuador. We observed all specimens to be active at night, located over leaves of shrubs in both primary forest and in the edge of forest clearings. The new species is tentatively assigned to *Pristimantis (Pristimantis) frater* group based on its small size (17.0–22.1 mm in snout–vent length of four males and 24.1 mm in a single female), relatively narrow head, short and subacuminate snout, lack of canthal stripes and labial bars, moderately long limbs, Finger I shorter than Finger II, and Toe V longer than Toe III. The new species differs from other congeneric species in Amazonia by possessing dense black reticulations on upper and lower borders of the iris, a dorsum that is orange or dark reddish brown without distinct pattern in life, a tympanic membrane not differentiated but ventral part of the tympanic annulus visible, and a small tubercle on each heel and eyelid.

RESUMEN: Una nueva especie de *Pristimantis* es descrita de los bosques siempreverde de tierras bajas de las Cuenca Amazónica de Ecuador. Todos los especímenes fueron observados durante la noche localizados sobre hojas de arbustos, tanto en áreas de bosque primario y en los bordes con áreas abiertas. La nueva especie es tentativamente asignada al grupo *Pristimantis (Pristimantis) frater*, por su tamaño pequeño (17.0–22.1 mm en la longitud hocico-cloaca de cuatro machos; 24.1 mm en una hembra), con la cabeza relativamente angosta, rostro corto subacuminado, carece de líneas cantales o barras en los labios y extremidades moderadamente largas; con el dedo I más corto que el dedo II en las manos, y el dedo V más largo que el dedo III en el pie. La nueva especie difiere de otras especies congénéricas de la Amazonía por poseer densas reticulaciones negras en el borde superior e inferior del iris, exhibir el dorso anaranjado o café rojizo uniforme en vida, con la membrana timpánica no diferenciada pero la parte ventral del anillo timpánico visible, y por presentar un pequeño tubérculo en los párpados y talones.

Key words: Amazonia; Anura; Ecuador; Lowland forest; *Pristimantis matidiktyo*; Strabomantidae; Systematics

THE *Pristimantis (Pristimantis) frater* group is composed of 14 named species (Hedges et al., 2008; Duellman and Lehr, 2009) and is loosely characterized by several morphological and molecular traits (Hedges et al., 2008; Duellman and Lehr, 2009). Species of this group occur in humid lowland and montane forests, the Pacific lowlands, the Cauca and Magdalena valleys, the Sierra de Macarena (*P. paisa*, *P. miyatai*, *P. ptochus*, *P. suetus*, *P. frater*, *P. viejas*, and *P. zophus*); the eastern slopes of the Andes (*P. pecki*, *P. incomptus*, and *P. ockendeni*); and the Amazon Basin (*P.*

librarius, *P. martiae*, and *P. quaquaversus*) in Colombia, Ecuador, Peru, and Bolivia (Duellman and Lehr, 2009; Frost, 2011). Only *P. taeniatus* is known from the Pacific lowlands from Colombia through central Panama (Duellman and Lehr, 2009; Frost, 2011). In Ecuador, there are 139 recognized species of *Pristimantis* (Coloma, 2010), five of which belong to the *Pristimantis (Pristimantis) frater* group (*P. librarius*, *P. martiae*, *P. quaquaversus*, *P. pecki*, and *P. incomptus*).

The Amazon Basin is one of the most diverse ecosystems in the world (Santos et al., 2009). Although Amazonia is one of the best-studied parts of South America (Duellman, 1979, 1999, 2005; Lynch, 1979; Cisneros-Heredia, 2006; Ron, 2009), this vast region still includes unexplored areas from which

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new species (Duellman and Mendelson, 1995; Faivovich et al., 2006; Guayasamin et al., 2006; McCracken et al., 2007; Elmer and Cannatella, 2008), range extensions (Cisneros-Heredia, 2007; Cisneros-Heredia and Reynolds, 2007; Cisneros-Heredia et al., 2009; Ortega-Andrade, 2009; Ortega-Andrade and Valencia, 2010), and unidentified specimens are frequently described (Duellman and Mendelson, 1995; Vigle, 2008). Herpetological explorations of Central Amazonia in Ecuador have resulted in the discovery of at least seven undescribed species of *Pristimantis* (H. Mauricio Ortega-Andrade, personal observation). Here, we describe one of these new species from evergreen lowland forest in the Amazon Basin of Ecuador.

MATERIALS AND METHODS

We have examined five specimens of the new species collected from the Upper Amazon Basin of Ecuador, as well as additional comparative material housed in following institutions (Appendix I): Fundación Herpetológica Gustavo Orcés in Quito, Ecuador (FHGO); Museo Ecuatoriano de Ciencias Naturales in Quito, Ecuador (DHMECN); Museo de Zoología–Pontificia Universidad Católica del Ecuador in Quito, Ecuador (QCAZ); American Museum of Natural History in New York, USA (AMNH); and National Museum of Natural History in Washington, DC, USA (USNM). We followed the characters, terminology, and numbered sequence of diagnostic characters proposed by Duellman and Lehr (2009). We took the following measurements (in millimeters) with dial calipers (0.05-mm accuracy): (1) snout–vent length (SVL), distance from tip snout to posterior margin of vent; (2) head width (HW), greatest wide of the head measured at the level of the jaw articulation; (3) head length (HL), distance from the tip of snout to the posterior angle of the jaw articulation; (4) horizontal eye diameter (ED), distance between anterior and posterior borders of eye; (5) interorbital distance (IOD), shortest distance between left and right eyelids; (6) eye-to-nostril distance (EN), distance from posterior margin of the nostril to anterior margin of the eye; (7) tympanic diameter (TD), distance between anterior and posterior margins of the tympanic annulus; (8) femur length (FL), length of the

femur from groin to knee; (9) tibia length (TL), length of flexed leg from knee to heel; and (10) foot length (FoL), distance from the heel to the tip of Toe IV. We also identified the sex in all specimens and recorded the testis coloration for all males. Information on amphibian conservation status is based on IUCN (2011) global threatened categories. Geographic coordinates are provided in decimal degrees, based on the WGS84 datum. The research authorization (001-IC-FAU/FLO-DRFN-P/MA) was issued by the Ministerio del Ambiente de Ecuador, and access to Pastaza Basin was allowed by Nacionalidad Achuar del Ecuador, Nacionalidad Shiwiar del Ecuador, and Nacionalidad Sápapa del Ecuador since 2006.

DESCRIPTION

Pristimantis matidiktyo sp. nov.

(Figs. 1–3; Table 1)

Eleutherodactylus librarius, (Elmer, 2004) in part.

Pristimantis sp. F, (Ortega-Andrade, 2010).

Holotype.—DHMECN 4437 (Figs. 1–3), an adult male collected at Juyuintza, 2.11°S, 76.19°W, 200-m elevation, Pastaza province, Republic of Ecuador, on 22 May 2007 by H. Mauricio Ortega-Andrade, Miguel Cachay, Jorge Santi, and Tseremp Timias.

Paratypes.—Three adult males (FHGO 7744; QCAZ 10653, 39447) and a single gravid female (QCAZ 25851) collected from four localities along Amazonian lowlands of Ecuador. Male specimen FHGO 7744 was collected at Dayuma, Campo Marginal Pindo, Orellana province, Ecuador, 0.66052°S, 76.81455°W, 299-m elevation, on 11 June 2010 by Raquel Betancourt and Roberto Zambrano. Male specimen QCAZ 10653 was collected at Jatun Molino, Pastaza province, Ecuador, 1.83°S, 77.32°W, 417-m elevation, on 12 February 1997 by Morley Read. Male specimen QCAZ 39447 was collected at Tigüino, Bataburo Lodge, Pastaza province, Ecuador, 1.21°S, 76.72°W, 241-m elevation, on 12 October 2008 by S. D. Padilla and C. Meyer. Female specimen QCAZ 25851 was collected at Serena, Río Jatun Yacu, Napo province, Ecuador, 1.095°S, 77.924°W, 560-m elevation, on 1 May 2003 by K. Elmer and T. Sugahara.

Diagnosis.—This new species can be distinguished clearly from all other known

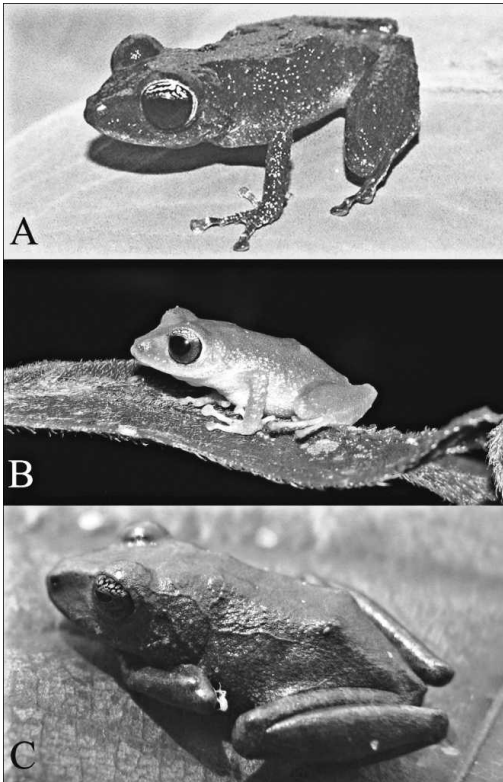


FIG. 1.—*Pristimantis matidiktyo* in life. (A) Holotype, DHMECN 4437, male;. (B) FHGO 7744, male. (C) QCAZ 25851, gravid female. Note the color variation among the holotype and female paratype photographed during the day (A, C), and the male (B) photographed at night.

species of *Pristimantis* in Amazonia by the presence of the following characters: combination of dense black reticulations on upper and lower borders of iris, dorsal color in life of orange or dark reddish brown without a distinct pattern, a prominent tympanic annulus, and small tubercle on each eyelid and each heel. Among members of the *Pristimantis frater* group, *P. matidiktyo* is most likely to be confused with *P. librarius* and *P. quaquaversus*. *Pristimantis librarius* can be distinguished from new species (whose characters are given in parenthesis) by having smooth skin on the dorsum and limbs (shagreen [sensu Duellman and Lehr, 2009] with scattered tubercles); tan to olive or brown dorsum with two to five chevrons on the back (uniform orange or reddish brown); orange posterior thigh color in life (uniform brownish tan); and an iris that is

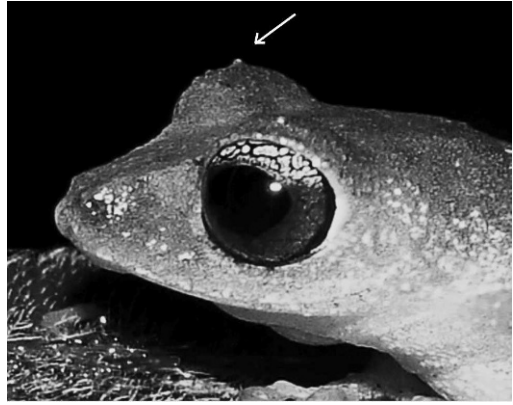


FIG. 2.—Detail of the head of *Pristimantis matidiktyo* in life (FHGO 7744). Note the distinctive, heavily reticulated pattern of the iris, and the small tubercle on upper eyelid (indicated by the arrow). These characters may not be visible on preserved specimens.

silvery in the upper half and red in the lower half, both with fine black reticulations (iris bicolor, yellowish silver heavily reticulated with black in upper and lower borders, and a median dark reddish stripe). *Pristimantis quaquaversus* differs from *P. matidiktyo* in having a spur on each heel (small tubercle), upper eyelid bearing conical tubercles (small tubercles that are barely visible or absent in preservative), tympanic annulus absent or evident only ventrally (ventral part of the tympanic annulus visible), less acuminate snout, and unicolor gray to cream iris in life. Males of *P. ptochus* and *P. suetus* are somewhat smaller than those of *P. matidiktyo*, with a large male of *P. ptochus* being 19.8 mm in SVL (Lynch and Ardila-Robayo, 1999; in contrast to larger males of 17–22 mm SVL in *P. matidiktyo*); males of *P. ptochus* and *P. suetus* also have rounded snouts in dorsal and lateral views (subacuminate snout). An elongate fold-like tubercle is present on the tarsus in *P. miyatai*, *P. paisa*, and *P. viejas*, (tarsal tubercles lacking). *Pristimantis zophus* specimens are brown with dark brown markings on the dorsum (Lynch and Ardila-Robayo, 1999; in contrast to the uniform deep reddish brown or orange dorsum of *P. matidiktyo*). *Pristimantis ptochus*, *P. suetus*, *P. paisa*, and *P. zophus* occur on the slopes and central Andes of Colombia, and *Pristimantis taeniatus* occurs along the Pacific Choco forests, which contrast with the lowland distribution (Table 2) of *P. matidiktyo*. *Pristimantis incomptus* lacks the small tubercles

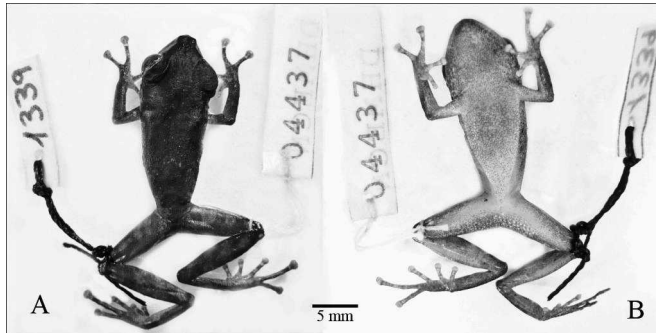


FIG. 3.—Dorsal (A) and ventral (B) views of the holotype of *Pristimantis matidiktyo* (DHMECN 4437).

on the eyelid and on the heel that are present in *P. matidiktyo*. *Pristimantis frater* differs from *P. matidiktyo* by having a pale gold iris with thin black reticulations, a distinct tympanic membrane, and a wide black canthal stripe.

Among the many small and brown *Pristimantis* frogs in the Upper Amazon Basin that have shagreen dorsal skin with scattered tubercles, *P. ventrimarmoratus*, *P. martiae*, *P. croceinguinis*, and *P. carvalhoi* all differ from *P. matidiktyo* by lacking both a visible tympanic membrane and a tympanic annulus. Furthermore, *P.*

ventrimarmoratus and *P. martiae* have dark diagonal marks or mottling in the groin, whereas *P. croceinguinis* and *P. carvalhoi* have a large orange or yellow spot in the groin. *Pristimantis pecki* and *P. altamazonicus* bear small tubercles on the eyelid and the heel, but they exhibit mottling or bars in the groin and anterior surfaces of thighs (Duellman and Lynch, 1988; Duellman and Lehr, 2009); *P. diadematus* differs from new species by having a smooth belly and dark diagonal marks in the groin. *Pristimantis altamnis*, *P. achuar*, *P. kichwarum*,

TABLE 1.—Measurements (in millimeters) and proportions of specimens of *Pristimantis matidiktyo* from the eastern Amazonian lowlands of Ecuador. Abbreviations for characters are SVL, snout–vent length; HW, head width; HL, head length; ED, horizontal eye diameter; IOD, interorbital distance; EN, eye to nostril distance; TD, tympanic annulus diameter; FL, femur length; TL, tibia length; and FoL, foot length. Abbreviations for museums are FHGO, Fundación Herpetológica Gustavo Orcés in Quito, Ecuador; DHMECN, Museo Ecuatoriano de Ciencias Naturales in Quito, Ecuador; and QCAZ, Museo de Zoología–Pontificia Universidad Católica del Ecuador in Quito, Ecuador.

Character	DHMECN 4437 ^a	QCAZ 10653	QCAZ 39447	FHGO 7744	QCAZ 25851
Sex	Male	Male	Male	Male	Female (gravid)
SVL	19.6	20	22.1	16.97	24.1
HL	8.1	8.3	9.3	6.43	9.1
HL/SVL	0.41	0.42	0.42	0.38	0.38
HW	7.5	8.2	8.3	5.94	8.7
HW/HL	0.93	0.99	0.89	0.92	0.96
FL	9.4	9.8	10.2	7.76	11.3
FL/SVL	0.48	0.49	0.46	0.48	0.47
TL	10.4	10.7	11.3	5.16	12.4
TL/SVL	0.53	0.54	0.51	0.3	0.51
FoL	13.6	14.1	14.3	7.33	16.1
FoL/SVL	0.69	0.71	0.65	0.43	0.67
EN	2.7	2	3.3	2.08	3
EN/HL	0.33	0.24	0.35	0.32	0.33
ED	3.3	3.3	3.3	2.87	4.1
ED/HL	0.41	0.4	0.35	0.47	0.45
TD	1.1	0.8	1.1	1.01	1.3
TD/ED	0.33	0.24	0.33	0.35	0.32
IOD	3.2	3.1	3.2	3.34	3.4
IOD/HW	0.43	0.38	0.39	0.56	0.39

^a Holotype.

TABLE 2.—Distributional data on species of strabomantid frogs (arranged alphabetically) in the Amazonian lowlands of Ecuador. Microhabitat: A, arboreal; and T, terrestrial. Distribution: BO, Bolivia; BR, Brazil; CO, Colombia; EC, Ecuador; PE, Peru; and W, wide distribution in more than three countries. The IUCN threatened categories (IUCN) are VU, vulnerable; DD, deficient data; LC, least concern; and NE, not evaluated.

Species	Microhabitat	Distribution	Altitudinal range (m)	IUCN
<i>Hypodactylus nigrovittatus</i> (Andersson, 1945)	T	CO, EC, PE	–1950	LC
<i>Noblella myrmecoides</i> (Lynch, 1976)	T	W	–354	LC
<i>Oreobates quixensis</i> (Jiménez de la Espada, 1872)	T	W	–950	LC
<i>Pristimantis achuar</i> (Elmer and Cannatella, 2008)	A	EC	–690	NE
<i>Pristimantis acuminatus</i> (Shreve, 1935)	A	CO, EC, PE	–1950	LC
<i>Pristimantis altamazonicus</i> (Barbour and Dunn, 1921)	A	W	–1450	LC
<i>Pristimantis altamnis</i> (Elmer and Cannatella, 2008)	A	EC	300–1000	NE
<i>Pristimantis aureolineatus</i> (Guayasamin, Ron, Cisneros-Heredia, Lamar and McCracken, 2006)	A	EC, PE	–350	LC
<i>Pristimantis carvalhoi</i> (Lutz and Kloss, 1952)	A	W	–1050	LC
<i>Pristimantis conspicillatus</i> (Günther, 1858)	A/T	W	–690	LC
<i>Pristimantis croceinguinis</i> (Lynch, 1968)	A	CO, EC	–1172	LC
<i>Pristimantis delius</i> (Duellman and Mendelson, 1995)	A	EC, PE	–1000	DD
<i>Pristimantis diadematus</i> (Jiménez de la Espada, 1875)	A	EC, PE	–1150	LC
<i>Pristimantis kichwarum</i> (Elmer and Cannatella, 2008)	A	EC	–500	NE
<i>Pristimantis lacrimosus</i> (Jiménez de la Espada, 1875)	A	EC, PE	–1180	LC
<i>Pristimantis lanthanites</i> (Lynch, 1975)	A/T	W	–1650	LC
<i>Pristimantis librarius</i> (Flores and Vigle, 1994)	A	EC	–600	DD
<i>Pristimantis luscombei</i> (Duellman and Mendelson, 1995)	A	EC, PE	–400	DD
<i>Pristimantis malkini</i> (Lynch, 1980)	A/T	W	–500	LC
<i>Pristimantis martiae</i> (Lynch, 1974)	A	CO, EC, PE	–1300	LC
<i>Pristimantis matidiktyo</i> sp. nov.	A	EC	–550	VU
<i>Pristimantis orphnolaimus</i> (Lynch, 1970)	A	EC	300	DD
<i>Pristimantis paululus</i> (Lynch, 1974)	A	EC	300–950	LC
<i>Pristimantis peruvianus</i> (Melin, 1941)	A/T	W	–2250	LC
<i>Pristimantis pseudoacuminatus</i> (Shreve, 1935)	A	CO, EC	–570	LC
<i>Pristimantis quaquaversus</i> (Lynch, 1974)	A	EC, PE	–2250	LC
<i>Pristimantis skydmainos</i> (Flores and Rodríguez, 1997)	A	W	–750	LC
<i>Pristimantis trachyblepharis</i> (Boulenger, 1918)	A	EC, PE	–1250	DD
<i>Pristimantis variabilis</i> (Lynch, 1968)	A	CO, EC	–1000	LC
<i>Pristimantis ventrimarmoratus</i> (Boulenger, 1912)	A	BO, PE, EC	–1740	LC
<i>Pristimantis waoranii</i> (McCracken, Forstner, and Dixon, 2007)	A	EC	300	DD
<i>Strabomantis sulcatus</i> (Cope, 1874)	T	W	–1100	LC

and *P. luscombei* have W- or H-shaped dermal folds (following the diagrammatic dorsal views described by Duellman and Lehr, 2009) in the scapular region; furthermore, *P. luscombei* has an orange iris that is finely reticulated with black.

Description.—*Pristimantis matidiktyo* (Fig. 1) is characterized by a combination of the following features: (1) Skin of dorsum shagreen in the males and one female; low scattered pustular tubercles in males commonly present on posterior part of dorsum; dorsolateral folds absent; skin of belly areolate; discoidal fold prominent. (2) Tympanic membrane not differentiated; the ventral part of the tympanic annulus visible, obscured partially in its dorsal and posterodorsal part by supratympanic fold; horizontal diameter of

tympanic annulus 24–35% of eye diameter and separated from the eye by a distance of approximately one quarter of the length of the eye. (3) Snout subacuminate in dorsal view, round in profile; lips flared, canthus rostralis angular in dorsal and lateral views, loreal region concave. (4) Upper eyelid approximately 75% of interorbital distance, bearing a small tubercle in its center that is barely visible or absent in preservative. (5) Dentigerous processes of vomer small and oblique. (6) Males with short vocal slits, extending from midlateral base of tongue to the angles of the jaws; vocal sac and nuptial excrescences absent. (7) Fingers large and slender, with the first shorter than the second; discs on outer fingers expanded, bluntly rounded, approximately twice the width of the digit proximal to the

pad; supernumerary tubercles prominent and rounded. (8) Fingers bearing lateral keels. (9) A single, small ulnar tubercle on forearm. (10) One small conical tubercle on heel; inner and outer border of tarsus smooth; tarsal folds absent. (11) Two metatarsal tubercles; inner one elliptical and about three times the diameter the outer tubercle; supernumerary plantar tubercles small. (12) Toes with lateral fringes; webbing rudimentary, basal, and barely evident between Toes III–V; discs equal in size or slightly smaller than those on fingers; Toe V longer than Toe III. (13) In life, dorsum uniform deep reddish brown or orange; groin and anterior surfaces of thighs uniformly pale yellowish white; ventral surfaces brownish tan; iris bicolor, yellowish silver heavily reticulated with black in upper and lower borders, and a median dark reddish stripe. In preservative, dorsum dark brown, anterior and posterior surfaces of thighs uniformly tan; venter cream and densely stippled with minute brown flecks in the males, dark brown and flecked in the female. (14) SVL in adult males 17.0–22.1 mm; SVL in one adult female 24.1 mm.

Description of Holotype.—Body slender; head wider than body, slightly longer than wide, HW approximately 40% of SVL; snout moderately long, subacuminate in dorsal view, rounded in lateral view; distance from nostril to corner of eye slightly shorter than diameter of eye; canthus rostralis weakly curved in dorsal view, angular in cross section, sloping gradually to lips; lips not flared; internarial area not depressed; nostrils slightly protuberant, directed anterolaterally, situated about three quarters of the distance from the eyes to the tip of the snout; interorbital area flat, interorbital distance 43% of head width; eye large, protuberant, its diameter approximately twice the depth of the lip below the eye and approximately 40% of the head length; upper eyelid approximately 75% of interorbital distance, bearing a small, central tubercle in life, but this character disappeared after preservation; no interocular fold; cranial crests absent. Tympanic membrane absent; tympanic annulus partially obscured by supratympanic fold in its dorsal and posterodorsal margins, but prominent in ventral view; horizontal diameter of tympanic annulus 33% of eye diameter, separated from the eye by a distance of half the

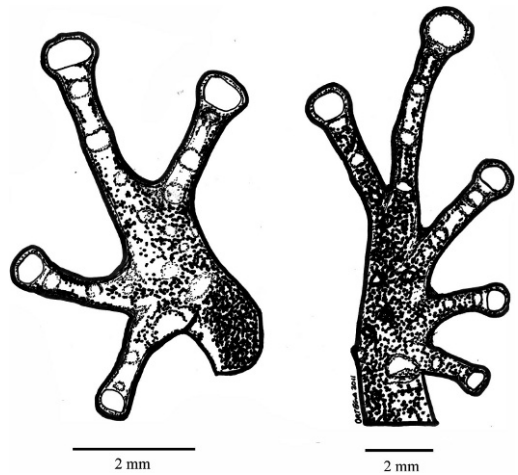


FIG. 4.—Hand and foot of the holotype of *Pristimantis matidiktyo* (DHMECN 4437).

tympanic annulus length; prostrictal tubercles compressed and fused so as to form a short and barely visible ridge that extends ventrolaterally from the tympanic annulus; choana large, rounded, not concealed by the palatal shelf of maxillary arc; dentigerous processes obliquely angled posteromedially and narrowly separated, bearing two to three small teeth; tongue elliptical, posterior border not notched, not adherent to the floor of the mouth for approximately 40% of its length; short vocal slits, extending from midlateral base of tongue to the angles of the jaws; vocal sac and nuptial excrescences absent.

Skin on dorsum shagreen with scattered tubercles; no W-shaped occipital ridges or dorsolateral folds; skin on flanks shagreen with minute tubercles; ventral surfaces of belly, chest and throat areolate; skin on ventral surfaces of thighs shagreen; discoidal folds prominent; no thoracic fold. Forearm slender. Fingers large and slender, all with oval (broader than long) pads; Fingers III and IV with very large pads, all fingers with large discs; pad on Finger III approximately 2 times wider than narrowest portion of penultimate phalanx; disc on Finger I distinctive, smaller than those on other fingers; relative length of Fingers $I < II < IV < III$ (Fig. 4); subarticular tubercles large, subconic; supernumerary tubercles prominent, elliptical, 25% of disc size on Finger III. Palmar tubercle bifid, 1.5–2 times size of oval thenar tubercle.

Antebrachial tubercle small; a single ulnar tubercle is present on the anterior part of forearm, forming a small fold in left hand; outer edge of forearm shagreen with three small, rounded tubercles. Knee lacking tubercles; heel bearing a single, small, conical tubercle; outer and inner edge of tarsus shagreen. Hind limbs moderately slender; heels broadly overlapping when hind limbs flexed at right angles of the axis of body; tibia length is approximately 53% of SVL; foot length is approximately 69% of SVL; no outer tarsal tubercles; inner tarsal fold absent; inner metatarsal tubercle oval, 6–8 times size of round outer one; four supernumerary tubercles, rounded, small; subarticular tubercles subconical, rounded; toes with well-developed, noncrenulate lateral fringes; webbing absent between Toes I and II; rudimentary, basally webbed between Toes III–V; pads of Toes III–V large; all other pads and discs of toes like those of fingers; relative lengths $I < II < III < V < IV$; Toe III extends to distal edge of penultimate subarticular tubercle on Toe IV; Toe V extends to the distal subarticular tubercle on Toe IV (Fig. 4). Vent opening puckered, shagreen, not extended, lacking tubercles on its border, located at upper level of thighs. Testis unpigmented.

Measurements (in Millimeters) of Holotype.—Specimen DHMECN 4437 is an adult male with the following measurements: SVL = 19.6; HL = 8.1; HW = 7.5; FL = 9.4; TL = 10.4; FoL = 13.6; EN = 2.7; ED = 3.3; TD = 1.1; IOD = 3.2. Proportions: HL/SVL = 0.41; HW/HL = 0.93; FL/SVL = 0.48; TL/SVL = 0.53; FoL/SVL = 0.69; EN/HL = 0.33; ED/HL = 0.41; TD/ED = 0.33; IOD/HW = 0.43.

Coloration in Life.—Body coloration is darkest in specimens observed by day, and brightest in specimens observed at night (Fig. 1). By day, the holotype has uniform deep reddish brown dorsum and flanks; interorbital bar, canthal stripe, subocular stripes, scapular and sacral marks absent; sides of head colored as dorsum, upper lip slightly lighter than head; a narrow and well-defined white line is present along the border of eyelid; three transverse greenish brown stripes were barely visible on the dorsal surfaces of the shanks; groin and anterior surfaces of thighs yellowish

white; posterior surfaces of thighs uniform brownish tan. Venter cream, densely stippled with minute brown flecks. Dorsal surfaces of pads on Fingers II and III distinctively yellow. Iris bicolor, yellowish silver, heavily reticulated with black on upper and lower border, separated by a horizontal median reddish stripe.

Coloration in Preservation (Fig. 3).—Dorsum brown, stippled with minute white flecks; four diffuse blackish spots present on scapular region; dark brown but diffuse chevron on inguinal region; sacral chevron absent. Sides of head slightly lighter than dorsum; labial bars absent; a narrow white line is present along the border of the eyelid; flanks brownish cream; anterior and posterior surfaces of thighs uniform brown; groin immaculate cream. Forearms and hind limbs with barely defined dark brown marks. Venter, throat, chest, ventral surfaces of limbs, and palms, cream and densely stippled with minute brown flecks (visible under magnification); posterior surfaces of tarsus and plantar surfaces uniform brown.

The female paratype (QCAZ 25851) has throat, chest, and limbs densely stippled with dark brown flecks. In all three male specimens, these surfaces are lightly stippled with brown. A narrow cream line is present along the outer border of the eyelid in the holotype, but it is absent or barely visible in all other specimens.

Variation.—Measurements and proportions of type series are detailed in Table 1. The three adult males are slightly smaller (17.0–22.1 mm in SVL, mean = 19.7 mm, $n = 4$) than the single gravid adult female (24.1 mm in SVL). Vomerine teeth are variable in number among the specimens; there are five or six vomerine teeth in the male paratypes, whereas the adult female has two or three, which is similar in number to the holotype. A single tubercle was clearly seen on eyelid of specimen FHGO 7744 in life (Fig. 2), but it disappeared in preservative; this change occurred in all specimens from the type series.

Etymology.—The specific name is derived from the Greek μάτι meaning eye and diktyó meaning net or reticular and alludes to the presence of heavily reticulated eyes in this species.

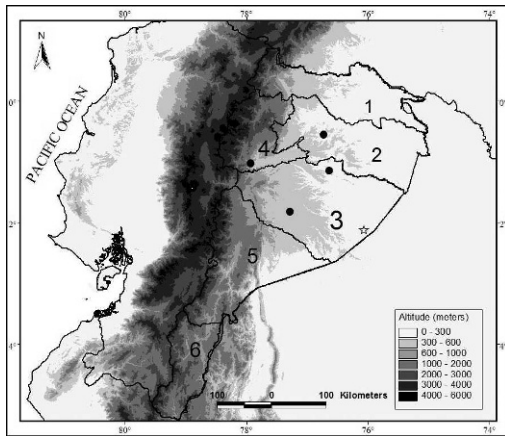


FIG. 5.—Map of the distribution of *Pristimantis matidiktyo* (circles) in eastern Ecuador. The star indicates the type locality. Numbers correspond to names of provinces: (1) Sucumbios, (2) Orellana, (3) Pastaza, (4) Napo (5) Morona Santiago, and (6) Zamora Chinchipe.

Natural History and Distribution.—*Pristimantis matidiktyo* is known from five scattered localities in the Amazonian evergreen lowlands of Ecuador in Napo, Orellana, and Pastaza provinces, up to 560 m in elevation (Fig. 5). The occurrence area is calculated to be approximately 14,700 km² of lowland evergreen forest in eastern Ecuador, but a wider distribution is probable in the Upper Amazon Basin. According to field notes and database records, specimens of *P. matidiktyo* were found active at night on leaves of low vegetation, 0.3–3.1 m above ground. A gravid female QCAZ 25851 was collected the night of 1 May 2003, whereas male QCAZ 10653 was heard calling from a *Heliconia* leaf on 12 February 1997 (QCAZ database records); three individuals were recorded from secondary forest, and two others from primary and natural open forest, near flooded areas. Other species recorded from primary evergreen forests at Juyuintza were *Pristimantis achuar*, *P. delius*, *P. croceinguinis*, *P. carvalhoi*, and *P. acuminatus*.

DISCUSSION

Misidentifications are common in genus *Pristimantis* (Padiá and De la Riva, 2009), with unidentified specimens being difficult to place into any of the several groups of divergent lineages or cryptic species. Hence,

the real diversity of these frogs in the Neotropics is probably currently underestimated (Elmer, 2006; Guayasamin et al., 2006; Bortolus, 2007; Elmer and Cannatella, 2008; Duellman and Lehr, 2009). The paratype of *P. matidiktyo*, QCAZ 25851, was reported as *Pristimantis librarius* (formerly *Eleutherodactylus librarius*) from Serena, Río Jatun Yacu, Napo province, Republic of Ecuador (Elmer, 2004). This specimen is clearly distinguished from *P. librarius* by its uniform deep reddish brown coloration on the dorsum and chest, its throat and belly being densely stippled with brown flecks, and its shagreen dorsal skin.

The heavily reticulated eyes and presence of a small tubercle on the upper eyelid and on the heel are key characters of the new species. However, it is necessary to highlight that these characters are difficult to detect in preserved specimens; even the tubercles seem to disappear in ethanol. Therefore, field notes and well-documented photographs of live specimens are indispensable for the identification of this species.

The morphological characters described for *P. matidiktyo* indicate that it belongs to the rather poorly defined *Pristimantis* (*Pristimantis*) *frater* species group (Flores and Vigle, 1994). The recognition of this species group was proposed on the basis of size and two features of coloration: the lack of canthal stripes and labial bars and the presence of uniformly brown coloration on the posterior surfaces of thighs. Lynch and Ardila-Robayo (1999) stated that these characters could be irrelevant in grouping the species of the genus *Pristimantis*. Despite that they could not identify synapomorphies for the *P. frater* group, they suggested that it is monophyletic. Subsequently, only one species of the *P. frater* group (*P. ockendeni*) was included in the largest molecular phylogeny of *Terrarana* (Hedges et al., 2008); the results suggested that this is a phenetic group that is not monophyletic, and is imbedded in a section of the *P. unistrigatus* group. New data and a more comprehensive phylogenetic analysis are necessary for understanding the systematics of the species included in the *P. frater* group, including their relationships with *P. matidiktyo*.

In past 50 yr, only five specimens of *P. matidiktyo* have been collected. It seems that

this species is difficult to detect with standard collecting methods, given the intense sampling along Ecuadorian Amazon Basin and nearby areas (Duellman, 1978; Almendáriz, 1987; Duellman and Mendelson, 1995; Elmer and Cannatella, 2008; Vagle, 2008). For example, in Sapara and Shiwiar territories in the Pastaza Basin, after 937 h per person spent in transect and visual-encounter surveys, and more than 3731 observed amphibian specimens, only one specimen (the holotype) of this species was captured. Further investigation, including long-term monitoring and improving sampling techniques (perhaps including canopy sampling), is required to assess the status of *P. matidiktyo* in the Upper Amazon Basin.

Based on criteria B1b(iii)D2 of the IUCN (2001, 2003), and the apparent absence of records of the species in the Ecuadorian National Protected Areas System (SNAP, from Spanish acronym), we consider *P. matidiktyo* to be Vulnerable.

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APPENDIX I

Specimens Examined

Pristimantis achuar.—ECUADOR: MORONA SANTIAGO: Ashuara village on Rio Macuma, ca. 10 km above Rio Morona (ca. 83 km ESE Macas), AMNH 94635–40, 94642–44, 94646–53, 94655; Cusuimi, Río Cusuime (=Cusime), AMNH 93518–9, 93521–25, 93527–29, 93532–40, 93542–55, 93557, 93559, 93561, 93563, 93566, 93568–9, 93571–2, 93574, 93576, 93580, 93582; Kapawi Jungle Lodge, QCAZ 10070, 25454, 25456–63, 25490–2, 25523–30, 25532, 25534, 25538, 25545, 25547, 9661; PASTAZA: Balsaura, DHMECN 4672–3, 4680, 4684, 4687; Conambo, DHMECN 4740, 4742; Montalvo, EPN 247–9, 251, 253–62; Nuevo Corrientes, QCAZ 29147, 29149, 29709; Pozo Garza 1, QCAZ 12693, 12706; Pozo Misión, EPN 252, 283–4, 286, 291; Pozo Shionayacu, EPN 250, 282, 285; Tigüino, Bataburo Lodge, DHMECN 1819; Villano, FHGO 573. ***Pristimantis acuminatus***.—ECUADOR: MORONA SANTIAGO: Cusuimi, Río Cusuime (=Cusime), AMNH 93437; PASTAZA: Juyuintza, DHMECN 4428; Tigüino, Bataburo Lodge, DHMECN 1656, QCAZ 39438, 39445; Villano, FHGO 341, 494. ***Pristimantis altamazonicus***.—ECUADOR: MORONA SANTIAGO: Ashuara village on Rio Macuma, ca. 10 km above Rio Morona (ca. 83 km ESE Macas), AMNH 94613; Cusuimi, Río Cusuime (=Cusime), AMNH 93438–47; Kapawi Jungle Lodge, QCAZ 11186; Miazal, USNM 204710; PASTAZA: 4.4 km SE de Jatun Molino, QCAZ 10651; near Arajuno, USNM 204677; Balsaura, DHMECN 4697; Canelos, USNM 204690; Chichirota, USNM 204701; 130 km S of Coca, Nuevo Golandrina, on trail W toward Rio Curaray, USNM 320933–4; 130 km S of Coca, stream 1 km ENE of Tigüino (UNOCAL Base Camp), USNM 320939; 130 km S of Coca, Tigüino (UNOCAL Base Camp), USNM 320924–32, 320935, 320938, 320940–42, 320957; Jatun Molino, pista de aviación, QCAZ 10652; Montalvo, USNM 204702; Pindoyacu, DHMECN 4763; Pozo Danta, FHGO 1307; headwaters of Rio Capahuari, USNM 204687, 204691; Rio Conambo near mouth of Rio Romarizo, USNM 204685–6; Rio Lipuma, tributary of Rio Villano, USNM 204680; Rio Oglán, Rio Curaray, USNM 204695–6; upper Rio Oglan, USNM 204693–4; mouth of Rio Ollaguanga (unable to locate), tributary of Rio Conambo, USNM

204678–9; Rio Pucayacu, USNM 204697–99; Rio Rutuno, tributary of Rio Bobonaza, USNM 204683–4; Rio Tigre, near of village, Rio Pindo, USNM 204692; Rio Villano, USNM 204671–5. ***Pristimantis altamnis***.—ECUADOR: PASTAZA: Montalvo, AMNH 93334. ***Pristimantis aureolineatus***.—ECUADOR: PASTAZA: Pozo Garza 1, QCAZ 12688. ***Pristimantis carvalhoi***.—ECUADOR: MORONA SANTIAGO: Kapawi Jungle Lodge, QCAZ 25452, 25465, 25510, 25542, 25543; PASTAZA: Balsaura, DHMECN 4696; Bufo, DHMECN 4443; Juyuintza, DHMECN 4414, 4426, 4427; Nuevo Corrientes, QCAZ 29120, 29148, 29711, 29757; Pozo Danta, FHGO 1327; Rio Villano, USNM 211528. ***Pristimantis delius***.—ECUADOR: MORONA SANTIAGO: Cusuimi, Río Cusuime (=Cusime), AMNH 93672; Makuma, Centro Amazonas, FHGO 5061, 5125; PASTAZA: Bufo, DHMECN 4445–6, 4452; Juyuintza, DHMECN 4421; Pozo Shionayacu, EPN 281. ***Pristimantis diadematus***.—ECUADOR: MORONA SANTIAGO: Cusuimi, Río Cusuime (=Cusime), AMNH 93489; Kapawi Jungle Lodge, QCAZ 25535–6; PASTAZA: Bufo, DHMECN 4451, 4453; Kurintza, DHMECN 4367; Lorocachi, QCAZ 10023; Moretecocha, FHGO 784; Pozo Danta, FHGO 1330; Pozo Garza 1, QCAZ 1177; Rio Huiracasi, 4 km S de Rio Pingullo, QCAZ 10647; Tigüino, Bataburo Lodge, QCAZ 20087. ***Pristimantis kichwarum***.—ECUADOR: MORONA SANTIAGO: Ashuara village on Rio Macuma, ca. 10 km above Rio Morona (ca. 83 km ESE Macas), AMNH 94641, 94645, 94654; Cusuimi, Río Cusuime (=Cusime), AMNH 93520, 93526, 93530–1, 93541, 93556, 93558, 93560, 93562, 93564–5, 93567, 93570, 93573, 93575, 93577–79, 93581; PASTAZA: Pozo Garza 1, QCAZ 12704. ***Pristimantis lacrimosus***.—ECUADOR: MORONA SANTIAGO: Ashuara village on Rio Macuma, ca. 10 km above Rio Morona (ca. 83 km ESE Macas), AMNH 94630; Cusuimi, Río Cusuime (=Cusime), AMNH 93490; NAPO: 2 km W of hacienda of George Kiederle, on S bank of Rio Napo, Puerto Napo, USNM 167365–6; Tena, 1 mi NE of Rio Misahualli, USNM 167367–70; ORELLANA: Loreto, USNM 211982–6; region of Loreto, USNM 211987; Rio Cotopino (=Cotapino), USNM 211988; PASTAZA: Don Tomas, Montalvo, 5 km S of, USNM 167371; Rio Villano, USNM 167380, 211979–81. ***Pristimantis librarius***.—ECUADOR: NAPO: S side of Rio Napo, 6.5 km ESE of Puerto Misahualli at La Cruz Blanca on Jatun Sacha Biological Reserve, AMNH 129476 (Paratype). ***Pristimantis luscombei***.—ECUADOR: PASTAZA: Bufo, DHMECN 4448; Lorocachi, QCAZ 10131. ***Pristimantis martiae***.—ECUADOR: MORONA SANTIAGO: Ashuara village on Rio Macuma, ca. 10 km above Rio Morona (ca. 83 km ESE Macas), AMNH 94632–4; Cusuimi, Río Cusuime (=Cusime), AMNH 93492–508; PASTAZA: Pozo Garza 1, QCAZ 1179; Tigüino, Bataburo Lodge, QCAZ 20074. ***Pristimantis orphnolaimus***.—ECUADOR: PASTAZA: Montalvo, USNM 233207. ***Pristimantis paululus***.—ECUADOR: PASTAZA: Pozo Garza 1, QCAZ 1179; Tigüino, Bataburo Lodge, QCAZ 20074. ***Pristimantis quaquaverus***.—ECUADOR: MORONA SANTIAGO: Cusuimi, Río Cusuime (=Cusime), AMNH 93656; ORELLANA: Sumaco Mountains, AMNH 22338; PASTAZA: Finca km 6 vía San Ramón-El Triunfo, Cooperativa La Mariscal Sucre, QCAZ 36947, 36950–2, Puyo; AMNH 114832–3. ***Pristimantis trachyblepharis***.—ECUADOR: MORONA SANTIAGO: Cusuimi, Río Cusuime (=Cusime), AMNH 93668,

93669; PASTAZA: Balsaura, DHMECN 4721, 4724; Conambo, DHMECN 4737, 4741; Montalvo, EPN 289; Moretecocha, FHGO 774; Nuevo Corrientes, QCAZ 29150; Río Shionayacu, salida al Río Conambo, EPN 288b, 290; Tigüino, Bataburo Lodge, DHMECN 1913.

Pristimantis ventrimarmoratus.—ECUADOR: MORONA SANTIAGO: Ashuara village on Río Macuma, ca. 10 km above Río Morona (ca. 83 km ESE Macas), AMNH 94685–6.
Pristimantis waoranii.—ECUADOR: PASTAZA: Pozo Danta, FHGO 1325.