

A NEW SPECIES OF *TELMATOBIUS* WIEGMANN, 1834,
FROM THE EASTERN CORDILLERA CENTRAL OF THE ANDES, PERU (ANURA: TELMATOBIIDAE),
WITH DESCRIPTION OF ITS TADPOLE, AND RANGE EXTENSION
OF *T. MENDELSONI* DE LA RIVA ET AL., 2012

ALEX TTITO

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ABSTRACT

We describe adult specimens and tadpoles of a **new species** of *Telmatobius* Wiegmann, 1834, *Telmatobius mantaro*, from the central Cordillera of the Andes in Peru. Specimens were collected in humid lower montane forests and dry lower montane forests between 2240–3170 m elevation at the northern parts of the Departments of Huancavelica and Ayacucho. We also report a range extension of 262 km west of the type locality for *Telmatobius mendelsoni* De la Riva et al., 2012, which was found in sympatry with *T. mantaro* in Ayacucho. The new species has a snout–vent length of 48.9–55.8 mm in three adult males, and both sexes have tympanic membrane differentiated and tympanic annulus visible, a feature that distinguishes the new species from the majority of other Peruvian *Telmatobius*. We propose to assign the IUCN category Critically Endangered to this species because of its small area of distribution and its high likelihood of being infected by *Batrachochytrium dendrobatidis*.

KEY WORDS: Amphibia, Andean water frog, Ayacucho, *Batrachochytrium*, Eastern Cordillera, endemism, Huancavelica, larvae, South America, *Telmatobius mantaro*, new species.

RESUMEN

Describimos ejemplares adultos y larvas de una **nueva especie** de *Telmatobius* Wiegmann, 1834, *Telmatobius mantaro*, de la Cordillera Central de los Andes de Perú. Los especímenes fueron colectados en bosque húmedo montano tropical y bosque seco premontano tropical, entre 2240–3170 m de altitud, en el norte de Huancavelica y el norte de Ayacucho, donde la especie es simpátrica con *Telmatobius mendelsoni* De la Riva et al., 2012, cuyo rango de distribución conocido se ve ampliado en 262 km al oeste de su localidad tipo. La nueva especie tiene una longitud hocico–cloaca de 48.9–55.8 mm en tres machos adultos. Ambos sexos presentan una membrana timpánica diferenciada y anillo timpánico visible, característica que la distingue de la mayoría de otras especies de *Telmatobius* peruanos. Consideramos esta especie dentro de la categoría “En Peligro Crítico” de la UICN debido a su distribución restringida y su alta probabilidad de ser infectado por el hongo *Batrachochytrium dendrobatidis*.

PALABRAS CLAVE: Anfibios, Ayacucho, *Batrachochytrium*, endemismo, Cordillera Oriental, Huancavelica nueva especie, rana acuática andina, renacuajo, *Telmatobius mantaro*, sp. nov.

INTRODUCTION

Frogs of the genus *Telmatobius* Wiegmann, 1834, currently include 63 species (Frost 2015) distributed from the Ecuadorian Andes in the north to the Chilean and Argentinean Andes in the south (Cei 1986; Aguilar and Valencia 2009). These mostly aquatic frogs inhabit mountain streams and occasionally lakes at altitudes from 1000 to 5200 m (De la Riva and Harvey 2003; Seimon et al. 2007). In Peru, 27 species have been reported (Lehr 2005; AmphibiaWeb 2015; Catenazzi et al. 2015; Frost 2015), which occur in a variety of habitats, such as dry valleys in the Andean Pacific slopes, montane dry forests, highlands, and wet montane forests in the Amazonian slopes (De la Riva et al. 2005; Lehr 2005; Catenazzi et al. 2015).

While a high diversity of humid paramo and forest-dwelling species exists in northern Peru (nine species: Wiens 1993; Lehr 2005) and in Bolivia (nine species: De la Riva 2005), only a few forest species have been reported from the southern and central parts of Peru. The southern species include the endemic *T. mendelsoni* De la Riva et al., 2012, from the humid montane forests of the Kosñipata Valley (upper part of Manu National Park, Department of Cusco; De la Riva et al. 2012), *T. sanborni* Schmidt, 1954, from the humid montane forests of Puno and western Bolivia (De la Riva 2005; Lehr 2005), and *T. timens* De la Riva et al., 2005, from the humid paramos and upper cloud forests of southern Peru and Bolivia (De la Riva et al. 2005). The central species include *T. brevirostris* Vellard, 1955, and *T. punctatus* Vellard, 1955, from lower elevation and humid forest environments in the Department of Huánuco (Lehr 2005). Thus, it might seem that the Apurímac Andean slopes in central Peru (Departments of Apurímac, Ayacucho, Huancavelica, Huánuco, Junín, and Pasco) represent a gap in the distribution and diversity of *Telmatobius* forest-dwelling species (De la Riva et al. 2005).

Herein, we report a form of *Telmatobius* found in the eastern Cordillera Central of the Peruvian Andes that inhabits the humid lower montane forests and dry lower montane forests of the Mantaro Valley, Department of Huancavelica, and the humid montane forests of Department of Ayacucho. The specimens from Huancavelica were collected recently, while those from Ayacucho were collected in 1971 and deposited (labeled as *Telmatobius* sp.) at The University of Kansas. The comparison of this material with museum specimens and with published descriptions of *Telmatobius* led us to conclude that these frogs possess a combination of traits not found in other Peruvian species. Herein, we describe this new species and its larvae, and report on a new population of *T. mendelsoni* that is sympatric with the new species.

MATERIAL AND METHODS

Specimens were preserved in 10% formalin and stored in 70% ethanol. Sex and maturity of specimens were determined externally by observing sexual characters (nuptial

spines in males). We measured the following variables (Table 1) to the nearest 0.1 mm with digital calipers under a stereomicroscope: snout-vent length (SVL), tibia length (TL), foot length (FL, distance from proximal margin of inner metatarsal tubercle to tip of toe IV), head length (HL, from angle of jaw to tip of snout), head width (HW, at level of angle of jaw), eye diameter (ED), tympanum diameter (TD), interorbital distance (IOD), upper eyelid width (EW), internarial distance (IND), and eye-nostril distance (E-N, straight line distance between anterior corner of orbit and posterior margin of external nares). Fingers and toes are numbered preaxially to postaxially from I–IV and I–V, respectively. We determined comparative lengths of toes III and V by adpressing both toes against toe IV; lengths of fingers I and II were determined by adpressing them against each other. The format of the diagnosis and description follows De la Riva (2005). Besides the material examined (see Appendix), the comparisons between the new species and other forms are based on the information provided by Lehr (2005), De la Riva et al. (2005, 2012), and Catenazzi et al. (2015). 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.

Tadpoles were collected with a fish mesh and euthanized with benzocaine. After death these were fixed and stored in 10% formalin. Tadpoles were sampled with the holotype and no other species of *Telmatobius* were observed in the area. Tadpole measurements were taken to the nearest 0.1 mm, either with an ocular micrometer (eye diameter, interorbital distance, internarial distance, distance between tip of snout and nostrils, distance between nostrils and eye, tail muscle height, tail muscle width, oral disc width) or with digital calipers. The format of tadpole description follows Aguilar et al. (2007b). Terminology of external larval features follows Lavilla (1988) and McDiarmid and Altig (1999). The description is based on two tadpoles at Gosner Stage 35 (Gosner 1960), one of which is poorly preserved and has a damaged oral disc.

Specimens examined are listed in the Appendix; acronyms of collections are: American Museum of Natural History, New York, USA (AMNH); Carnegie Museum of Natural History, USA (CM); herpetological collection of Centro de Ornitología y Biodiversidad, Lima, Peru (CORBIDI); Fundación Miguel Lillo, Argentina (FML); Natural History Museum, The University of Kansas, USA (KU); Louisiana State University, Museum of Natural Science, USA (LSUMZ); Departamento de Herpetología, Museo de Historia Natural de la Universidad Nacional de San Antonio Abad, Cusco, Peru (MHNC); Museo Nacional de Ciencias Naturales, Madrid, Spain (MNCN); and Departamento de Herpetología, Museo de Historia Natural de San Marcos, Lima, Peru (MUSM).

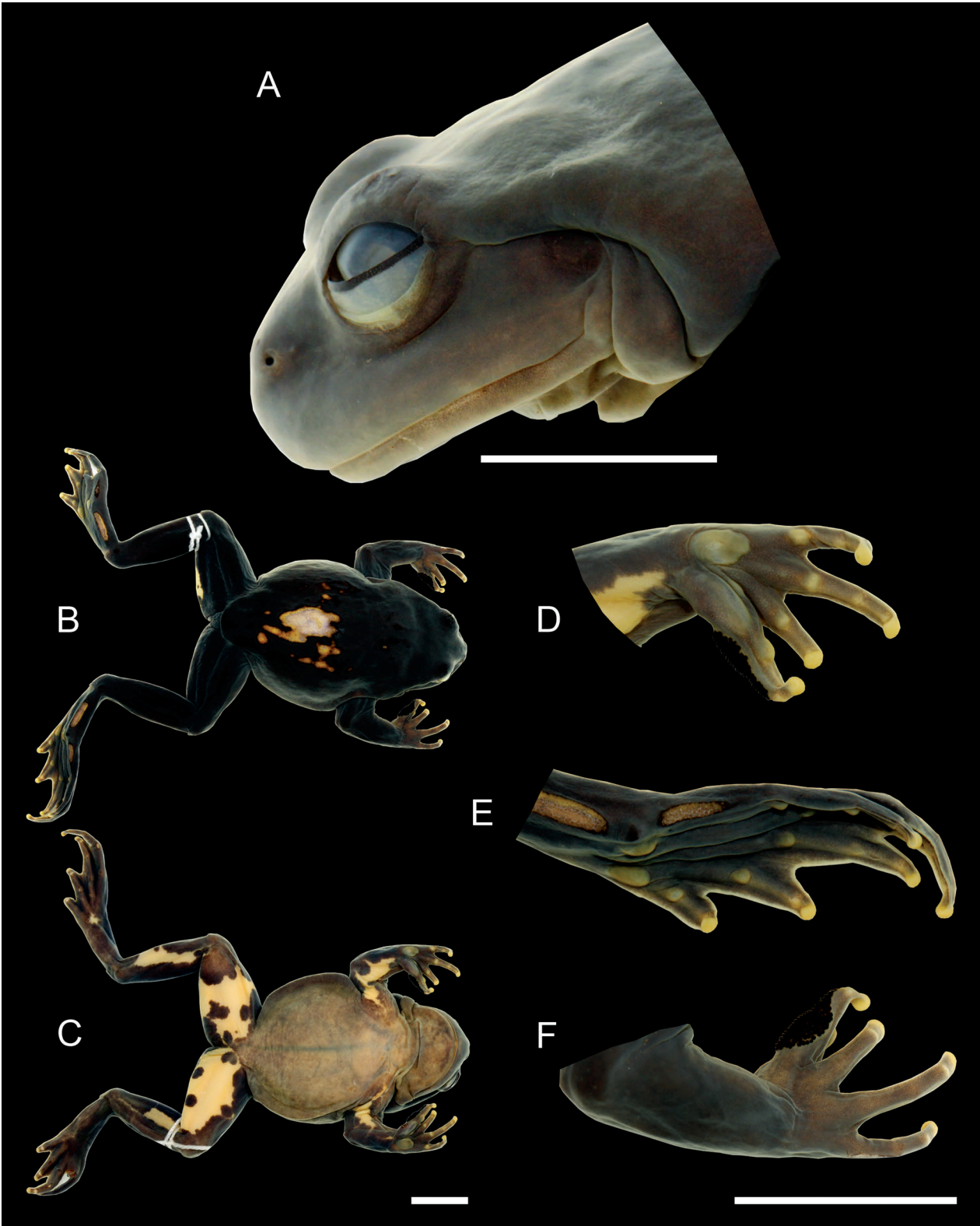


Fig. 1.— *Telmatobius mantaro*, new species, adult male holotype CORBIDI 9925 (SVL = 55.8 mm). **A**, lateral view of head; **B**, dorsal and **C**, ventral views of the body; **D**, ventral view of the hand and **E**, and foot; **F**, dorsal view of the hand, showing the nuptial spine. Scale for **A**; **B**–**C**; and **D**–**F** = 10 mm. Photos by J.C. Chavez.

SYSTEMATIC ZOOLOGY

Class Amphibia Blainville, 1816
Order Anura Fischer von Waldheim, 1813
Family Telmatobiidae Fitzinger, 1843

Genus *Telmatobius* Wiegmann, 1834

Telmatobius mantaro, new species
(Figs. 1–3)

Holotype.—CORBIDI 9925, an adult male (Fig. 1) from Quintao, 3020 m (12° 15' 53.3" S, 74° 40' 17.2" W), District Colcabamba, Province Tayacaja, Department of Huancavelica, Peru, collected on 12 April 2011 by D. Amaya.

Paratypes.—(3 males, 3 juveniles) CORBIDI 9924 and MHNC 14678, adult male and subadult female respectively, from Cedro, 2240 m, Peru (12° 19' 51.4" S, 74° 37' 53.1" W), District Colcabamba, Province Tayacaja, Department of Huancavelica, collected on 4 April 2011 by D. Amaya; CORBIDI 15929–30, subadult male and female respectively (Fig. 2) from Quintao, 3170 m (12° 15' 37.39" S, 74° 40' 8.12" W), District Colcabamba, Province Tayacaja, Department of Huancavelica, Peru, collected on 16 January 2015 by D. Ruelas; KU 196613–14, adult males (Fig. 3) from Ccarapa, below Tambo, on Tambo–Valle del Apurímac road, 2440 m (12° 45' 36.98" S, 73° 59' 27.12" W), District Ayna, Province La Mar, Department of Ayacucho, Peru, collected on 25 May 1971 by Richard Thomas and John P. O'Neill.

Diagnosis.—The new species is characterized by: (1) snout–vent length of three adult males 48.9–55.9 mm; (2) head in profile moderately high, with rounded snout; (3) snout rounded in dorsal view; (4) lips slightly or not flared; (5) postcommissural gland present, rounded; (6) tympanic membrane differentiated and tympanic annulus visible; supratympanic fold present, short, strong; (7) forelimb only moderately robust, males lacking humeral crest or spine; (8) base of prepollex not broadened posteriorly, nuptial pad of males barely in contact with the inner palmar tubercle, bearing medium, black, closely arranged keratinized spicules; (9) toes approximately two-thirds webbed, dermal lateral fringes reaching the base of tips of toes; palmar and plantar surfaces smooth; (10) tarsal fold absent; (11) dorsal skin moderately rugose; (12) dorsum in life dark green; (13) venter in life gray, ventral surfaces of limbs orange, with brown blotches; and (14) iris brown–bronze, with a yellowish–orange ring bordering the mostly vertical pupil.

Comparisons.—*Telmatobius mantaro* is readily distinguished from most other central and northern Peruvian Andean species (*T. atahualpai* Wiens, 1993, *T. brachydactylus* (Peters, 1873), *T. brevirostris*, *T. carrillae* Morales, 1988, *T. intermedius* Vellard, 1951, *T. jelskii* (Peters,

1873), *T. latirostris* Vellard, 1951, *T. macrostomus* (Peters, 1873), *T. marmoratus* (Duméril and Bibron, 1841), *T. mayoloi* Salas and Sinsch, 1996, *T. punctatus*, *T. rimac* Schmidt, 1954, and *T. truebae* Wiens, 1993) by having tympanum and tympanic annulus visible. The new species is superficially similar to two southern species, *T. mendelsoni* and *T. timens*. *Telmatobius mendelsoni* occurs sympatrically with *T. mantaro* in Ayacucho and can be distinguished by its larger size, attaining ~70 mm SVL in males (55.8 mm in males of *T. mantaro*), a broad and flattened head (bufoniform in *T. mantaro*), skin of dorsum with scattered, flat pustules (moderately rugose), greater foot webbing, a proportionally larger external metatarsal tubercle, and longer digits. In addition, males of *T. mendelsoni* have a large humeral spine (absent in *T. mantaro*), large nuptial pads bearing minute and scattered spicules on thumbs and second finger (spicules closely arranged on thumb only), and keratinized spicules on chest, lower jaw, and forearms (absent). From *T. timens*, *T. mantaro* is distinguished by its smaller size (SVL of 61.0 mm in males and 58.3 mm in females of *T. timens*), presence of a tympanum, base of prepollex not broadened posteriorly, and spicules on nuptial pads smaller.

Telmatobius mantaro differs from *T. sanborni*, which occurs in the humid forests of Department of Puno, from its smaller size (SVL *T. sanborni* 66.5 mm in males, 55.2 mm in females), by having a visible tympanum, and by lacking extremely robust forelimbs and large nuptial spicules in males; moreover, tadpoles of *T. mantaro* are easily distinguished from those of *T. carrillae* and *T. mayoloi* by having a rounded snout in dorsal view, instead of pointed like in *T. carrillae*. Furthermore, the tail in tadpoles of *T. mayoloi* has dark brown spots on the third posterior end, while in *T. mantaro*, there are scattered pale brown blotches. Tadpoles of *T. atahualpai* differ from the new species by having the marginal papillae continuous rostrally (interrupted rostrally in *T. mantaro*). Labial tooth row formula in *T. mantaro* is 2(1)/3(1), while in *T. atahualpai* is 3/7(1) (Aguilar et al. 2007a), in *T. brevirostris* 2(2)/3(1) (Aguilar et al. 2010), in *T. mayoloi* 2(2)/3(1) (Aguilar and Lehr 2009), in *T. rimac*, 2(2)/3 (Aguilar et al. 2007b), and in *T. truebae* 2(2)/3 (Aguilar et al. 2007a). Additionally, tadpoles of the new species have the snout inclined anteroventrally in lateral view, while in *T. atahualpai*, *T. brevipes* Vellard, 1951, *T. brevirostris*, *T. ignavus* Barbour and Noble, 1920, *T. rimac*, and *T. truebae* is rounded. Tadpoles of *T. macrostomus* are considerably larger than *T. mantaro*, reaching 200 mm of total length (Lehr 2005).

Two species of *Telmatobius* that occur in puna highlands at altitudes above the treeline (i.e., above the montane forest where *T. mantaro* lives) occur in the Departments of Huancavelica and Ayacucho, *T. jelskii* and *T. ventriferum* Catenazzi et al., 2015. *Telmatobius jelskii* has SVL larger (76.3 mm in males and 84.7 mm in females) than *T. mantaro*, large and conical nuptial spines on thumb (medium-sized in *T. mantaro*), and spines on chest and throat in males (absent). *Telmatobius ventriferum* has

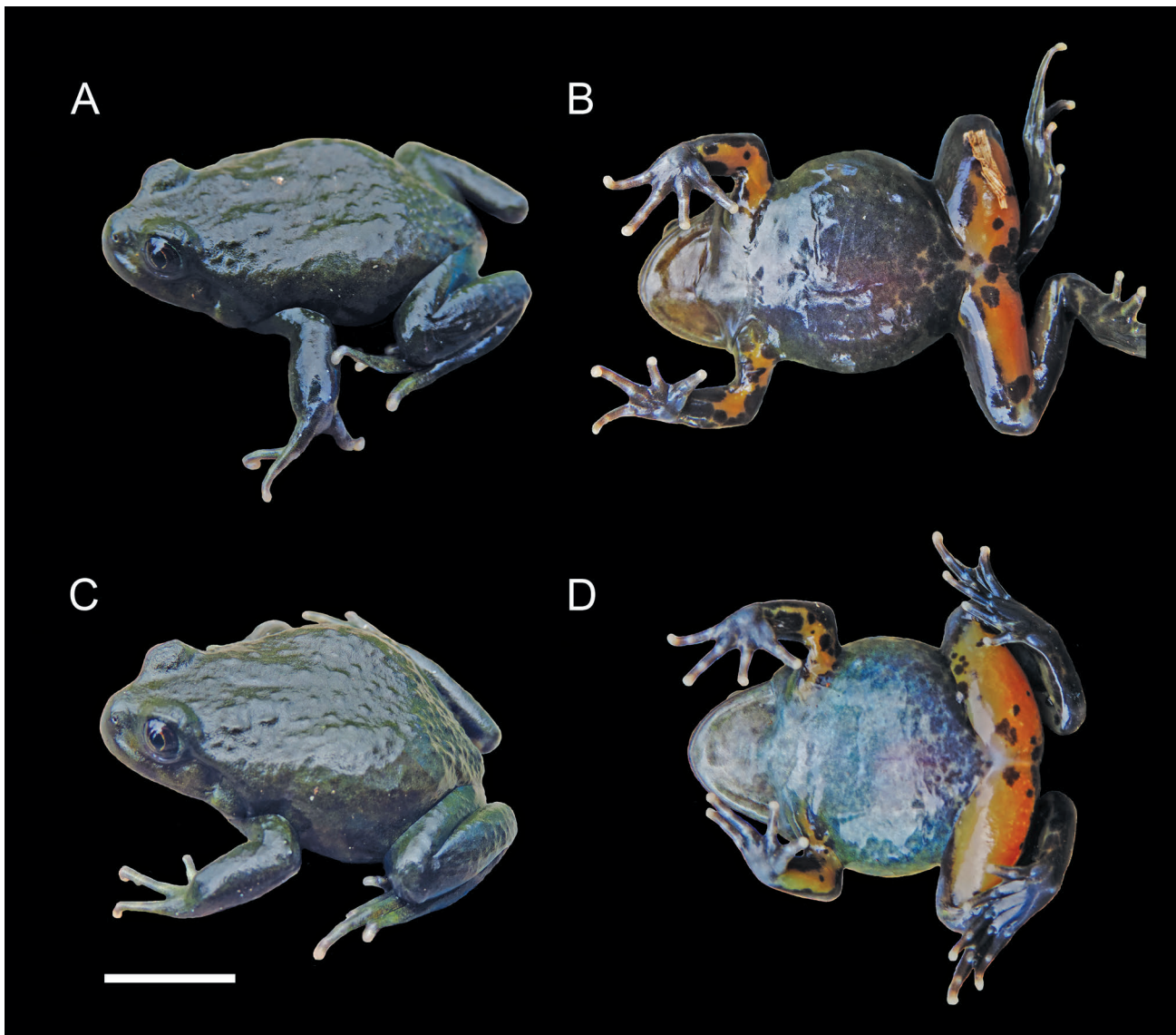


Fig. 2.— *Telmatobius mantaro*, new species. **A**, dorsal and **B**, ventral views of the body of the subadult female paratype CORBIDI 15930 (SVL = 28.5 mm); **C**, dorsal and **D**, ventral views of the body of the subadult male paratype CORBIDI 15929 (SVL = 29.4 mm). Scale = 10 mm. Photos by A. Tito.

a shorter body size in males (48.5 mm; Catenazzi et al. (2015), and the dorsal surface of body and legs are golden yellow to golden tan, mottled with dark brown; males of *T. ventriflavum* have minute nuptial spicules.

The only two species of *Telmatobius* from central Peru occurring at similar elevations and habitats as *T. mantaro* are *T. brevirostris* and *T. punctatus*, from Department of Huánuco. Besides lacking a visible tympanic membrane and tympanic annulus, *T. brevirostris* differs from *T. mantaro* by being more robust, by having greater foot webbing, and by possessing a prepollex broadened posteriorly in males. Finally, *T. punctatus* differs from *T. mantaro* by

having netlike yellow blotches or small yellow blotches on dorsum, and males bearing a lower number of conical nuptial spines on thumbs than *T. mantaro*.

Description of the Holotype

An adult male with a SVL of 55.8 mm; body slender; head slightly wider than long, its length 27.6% of SVL; head width 43.7% of SVL; head length 63.1% of head width.

Snout rounded in lateral profile and subtriangular in dorsal view; nostrils round, small, not protuberant, oriented dorsolaterally, closer to tip of snout than to eye; in-

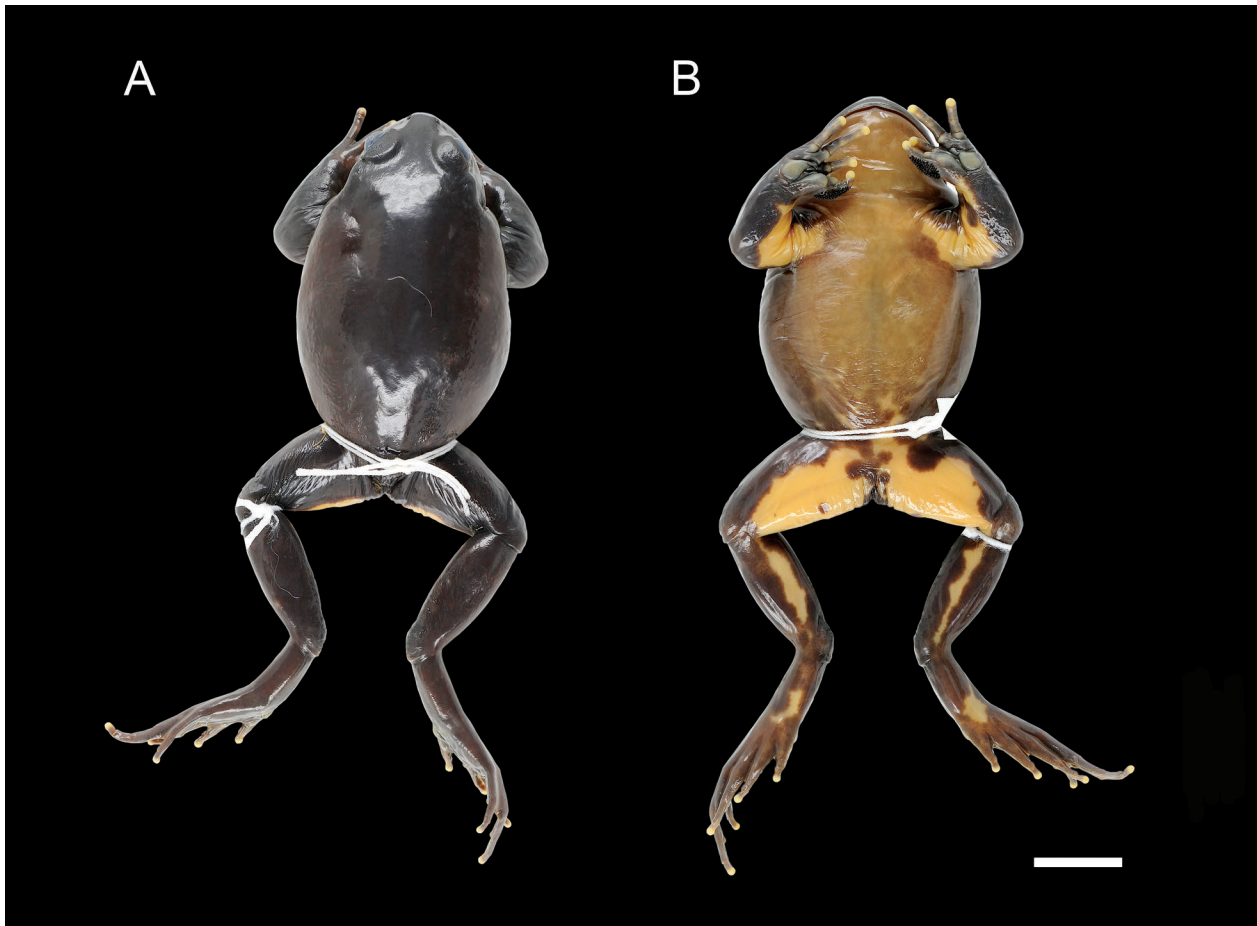


Fig. 3.— *Telmatobius mantaro*, new species, adult male paratype KU 196614 (SVL = 52.7 mm). A, dorsal; B, and ventral views. Scale = 10 mm

ternarial distance 15.6% of head width; internarial region convex; eye large, 40.3% of head length, oriented anterolaterally; canthus rostralis indistinct; loreal region moderately concave; lips not flared; tympanic membrane differentiated and tympanic annulus visible; supratympanic fold well developed, extending from posterior margin of eyelid to level of shoulder; distinct dermal fold from supratympanic fold to postcommissural gland; postcommissural gland large, oval. Maxilla and premaxilla with small pointed teeth, embedded in the labial mucosa; dentigerous processes of vomers straight, each bearing small fang-like teeth, placed between small, oval choana; tongue rounded, attached anteriorly through about one third of its length; vocal slits absent.

Forelimb slender; relative lengths of fingers: $I < II < IV < III$; finger II notably shorter than finger IV; tips of fingers swollen; fingers with short dermal lateral fringes; thenar tubercle large, elliptical; palmar tubercle oval, slightly smaller than thenar tubercle; one subarticular tubercle on the base of each finger and at penultimate phalangeal articulation; supernumerary palmar tubercles absent; palmar surface smooth, without keratinized spicules; base of prepol-

lex not broadened posteriorly, bearing nuptial excrescence composed of keratinized, black, medium-sized conical spicules loosely arranged, barely reaching posterior margin of thenar tubercle, extending dorsally from mid of prepollex to base of distal phalange on finger I (Figs. 1D, F).

Hind limbs moderately robust; tibia length 44.3% of SVL; foot length 72% of SVL; upper surfaces of hind limbs smooth; relative lengths of toes: $I < II < III < V < IV$ (Fig. 1E); toes moderately webbed, web reaching the level of second subarticular tubercle of toe IV; moderate dermal folds extending to the base of each toe tip, absent on external surfaces on toes I and V; tips of toes spherical, about the same size of those of fingers; inner metatarsal tubercle moderately flattened, elliptical; outer metatarsal tubercle oval, about two-thirds the size of inner metatarsal tubercle; subarticular tubercles round or slightly oval; supernumerary tubercles absent, plantar surface smooth, lacking keratinized spicules; tarsal fold present, short.

Skin on dorsum and dorsal surface of head moderately rugose, with low, flat, poorly marked pustules; keratinized spicules or spines absent from any part of body other than nuptial excrescences; loose folds of skin absent; ventral

TABLE 1. Measurements (in mm) and proportions of type series specimens of *Telmatobius mantaro*, new species, from Department of Huancavelica, Peru. (--- = data were not measured in this individual).

Characters	CORBIDI 9925	KU 196614	CORBIDI 9924	MHNC 14678	CORBIDI 15929	CORBIDI 15930
	Adult male	Adult male	Adult male	Subadult female	Subadult male	Subadult female
SVL	55.8	52.9	49.8	42.7	29.4	28.5
TL	24.7	25.1	24.3	22.7	9.0	8.8
FL	40.2	25.7	36.9	33.6	19.0	18.2
HL	15.4	15.3	17.1	14.9	8.1	8.8
HW	24.4	19.5	19.1	18.9	10.7	10.4
ED	6.2	5.0	6.1	6.3	3.6	3.3
TY	2.4	---	2.5	2.4	1.2	1.1
IOD	4.7	4.3	4.5	4.0	3.5	3.3
EW	4.5	3.6	4.5	3.9	2.2	1.8
IND	3.8	3.5	3.7	3.4	2.4	2.4
E–N	4.6	3.2	3.9	3.8	2.8	2.0
HL/SVL	0.3	0.3	0.3	0.3	0.3	0.3
HW/SVL	0.4	0.4	0.4	0.4	0.4	0.4
E–N/ED	0.7	0.6	0.6	0.6	0.8	0.6
TL/SVL	0.4	0.5	0.5	0.5	0.3	0.3
FL/SVL	0.7	0.5	0.7	0.8	0.6	0.6

skin smooth; cloacal opening approximately at dorsal level of thighs. Measurements of holotype provided in Table 1.

Coloration of Holotype in Alcohol

Dorsal surfaces of head, body, and limbs uniformly dark brown on dorsum; venter and throat pale brown gray; ventral surfaces of limbs dark gray with irregular cream blotches. Palmar and plantar surfaces dark gray, with pale gray tubercles; tips of digits cream.

Coloration of Holotype in Life

The general color of body was dark green, with yellow blotches on limbs; iris brown-bronze, pupil with a yellow-orange ring.

Variation

All specimens, either from Ayacucho or Huancavelica, are uniform in color pattern; the extension of the yellowish-or-

ange blotches of the ventral surfaces of limbs are variable, from almost no blotches to yellowish-orange blotches covering most of the lower surfaces of the thighs. Field notes by D. Amaya from 4 April 2011 and D. Ruelas from 16 January 2015 describe the color pattern of paratypes from Huancavelica as “dorsum dark green, venter dull gray with pale brown pale spots and reticulations; yellow–orange in axilla and on ventral surfaces of thighs; iris dull brown.” Field notes by Richard Thomas on paratypes from Ayacucho describe them as having dorsum uniform dark brown, venter purplish–brown, and orange marbling on undersides of forearms and hindlimbs. Variation in morphometrics is shown in Table 1.

Etymology

The specific name *mantaro* is a toponym and is used in apposition to refer to the type locality and to the name of the Mantaro River that runs near the type locality.

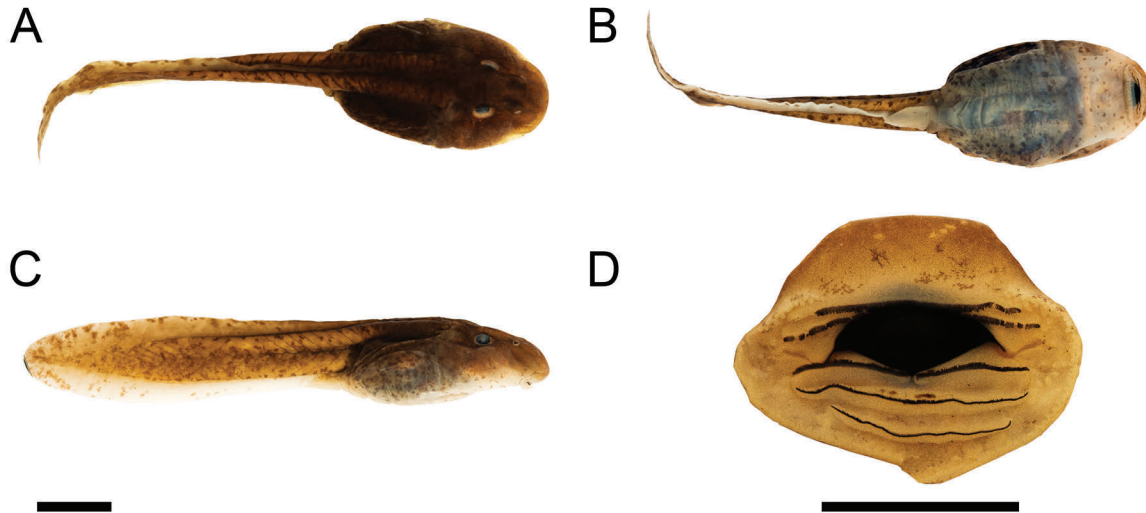


Fig. 4.—Tadpole of *Telmatobius mantaro*, new species, CORBIDI-TP 35 at Gosner Stage 35. **A**, dorsal view; **B**, ventral view; **C**, lateral view; **D**, and ventral view of the oral disc. Scale for **A**–**C**; and **D** = 10 mm. Photos by G. Chávez.

Tadpole

The tadpole of *T. mantaro* belongs to the exotrophic ecomorphological guild, section I, and group B7 (benthic) as defined by Altig and Johnson (1989). This description is based on one specimen of series CORBIDI-TP 35 at developmental Stage 35 (Gosner 1960; Fig. 4) and measuring 74.9 mm in length. Body is slightly depressed (height/body width ratio = 0.7) and oval in dorsal view. The maximum body width is at about mid body, just anterior to the spiracle tube. The snout is rounded in dorsal view and inclined anteroventrally in lateral view (Figs. 4A, C). Lateral line organs are visible at high magnification in dorsal and lateral views. The mouth is located anteroventral and is surrounded by a small oral disc (width of oral disc/body width = 0.5) (Figs. 4B, D). Marginal papillae are interrupted rostrally. Intramarginal papillae are present, uninterrupted laterally and in mental area. Papillae are simple and conical. The suprarostrodont is longer than wide, and convex. The infrarostrodont is U-shaped, convex laterally and concave medially. Both are black and keratinized, with small triangular serrations. Keratodonts are small and the Labial Tooth Row Formula is 2(1)/3(1). Nares are oval, small, without projections and inflexions, and located dorsolaterally, closer to the eyes than to the snout (snout–naris distance/naris–eye distance = 1.9). Eyes are small (eye diameter/body width = 0.1) and oriented dorsolaterally. The spiracle is single, sinistral, and located at about mid body (snout–spiracle distance/body length ratio = 0.6). The spiracular opening is oval and the inner wall is present as a slight ridge. The vent tube is dextral and attached to the lower fin. Fins are concave and the posterior end is rounded, reaching their maximum height at the last third of the tail; the dorsal fin does not extend onto the body. The maximum tail height is reached at about mid length

and is as high as body height (maximum height tail/body height = 1.1). The muscular tail begins at the tail–body junction, where it is slightly higher than wide (muscular height/width ratio = 1.3), and posteriorly tapers to a tip.

Measurements of selected characters (in mm) of the two tadpoles of *T. mantaro* are (specimen not used in the description in parenthesis): total length 74.9 (76.9), body length 29.6 (30.8), body width 16.2 (18.9), body height 11.4 (15.2), tail length 46.6 (50.6), eye diameter 1.9 (2.3), oral disc width 7.8 (7.4), interorbital distance 5.5 (5.7), internarial distance 4.5 (4.9), maximum tail height 12.2 (10.8), tail muscle high 6.2 (7.2), and tail muscle width 4.7 (6.2).

Coloration of Tadpoles

In preservative, the body is dorsally dark brown with faint darker flecks on the posterior half; the venter is opaque with scattered brown spots and flecks, and guts are not visible; the muscular tail and the posterior thirds of dorsal and ventral fins have small brown spots; the dorsal and ventral fins are brown and almost translucent, anterior and medially, respectively. The coloration is identical in the two specimens examined. Color pattern in life is unknown.

Distribution and Natural History

Telmatobius mantaro is only known from three localities at elevations of 2240–3170 m.a.s.l. in the eastern Cordillera Central of the Andes (Fig. 6). The localities in the Mantaro Valley (Cedro and Quintao), in northeastern Huanacavelica, range from humid lower montane forests to dry lower montane forests (Fig. 5). The locality in Ayacucho (Ccarapa, below Tambo) is in humid montane forest,

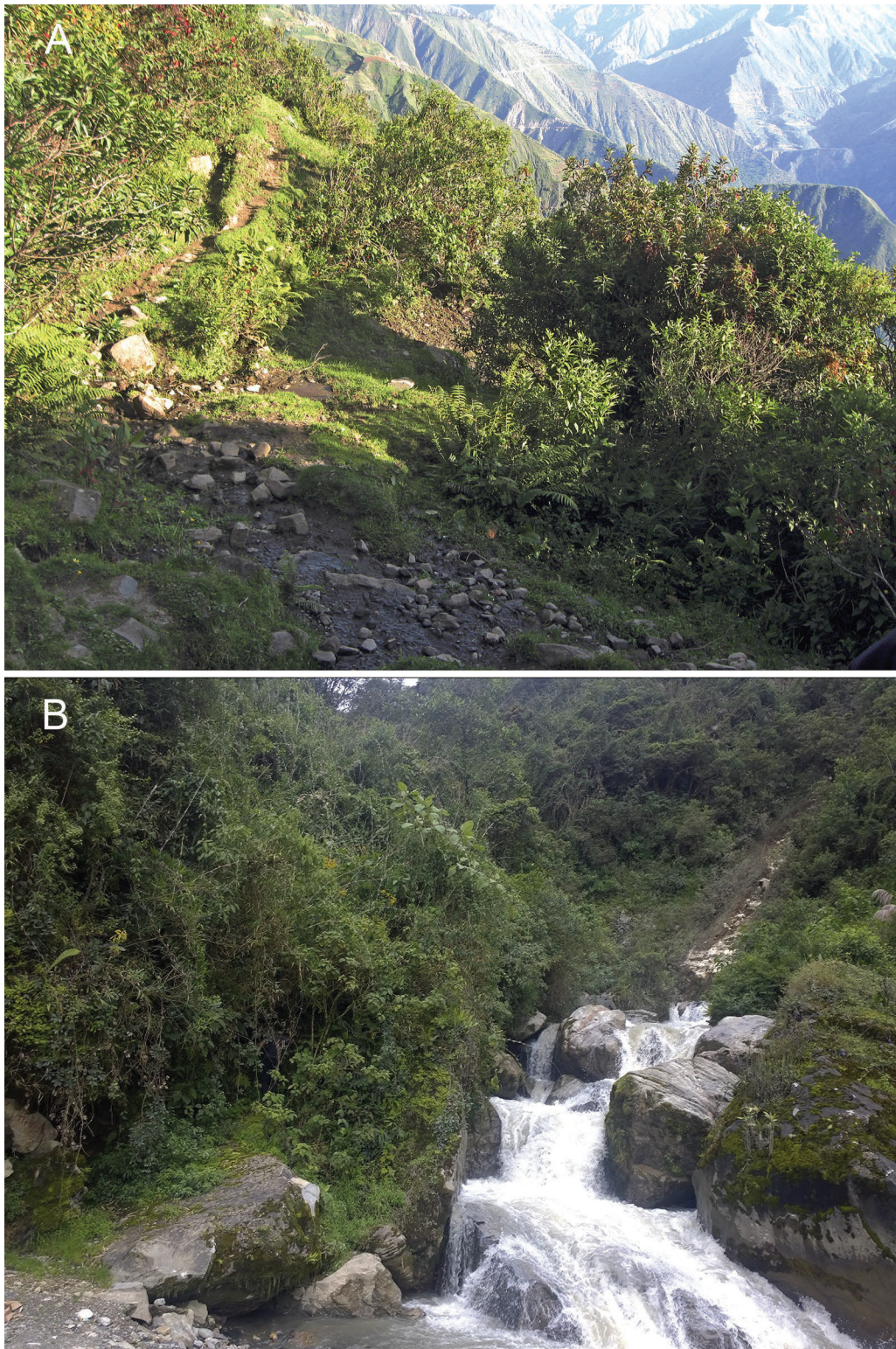


Fig. 5.—**A**, habitat of *Telmatobius mantaro*, new species, from Quintao at 3170 m, Department of Huancavelica. Photo by C.Z. Landauro. **B**, habitat of *Telmatobius mantaro*, new species, and *T. mendelsoni* from Puente Yanamonte near Ccarapa, at 2580 m, Department of Ayacucho. Photo by J.C. Chaparro.

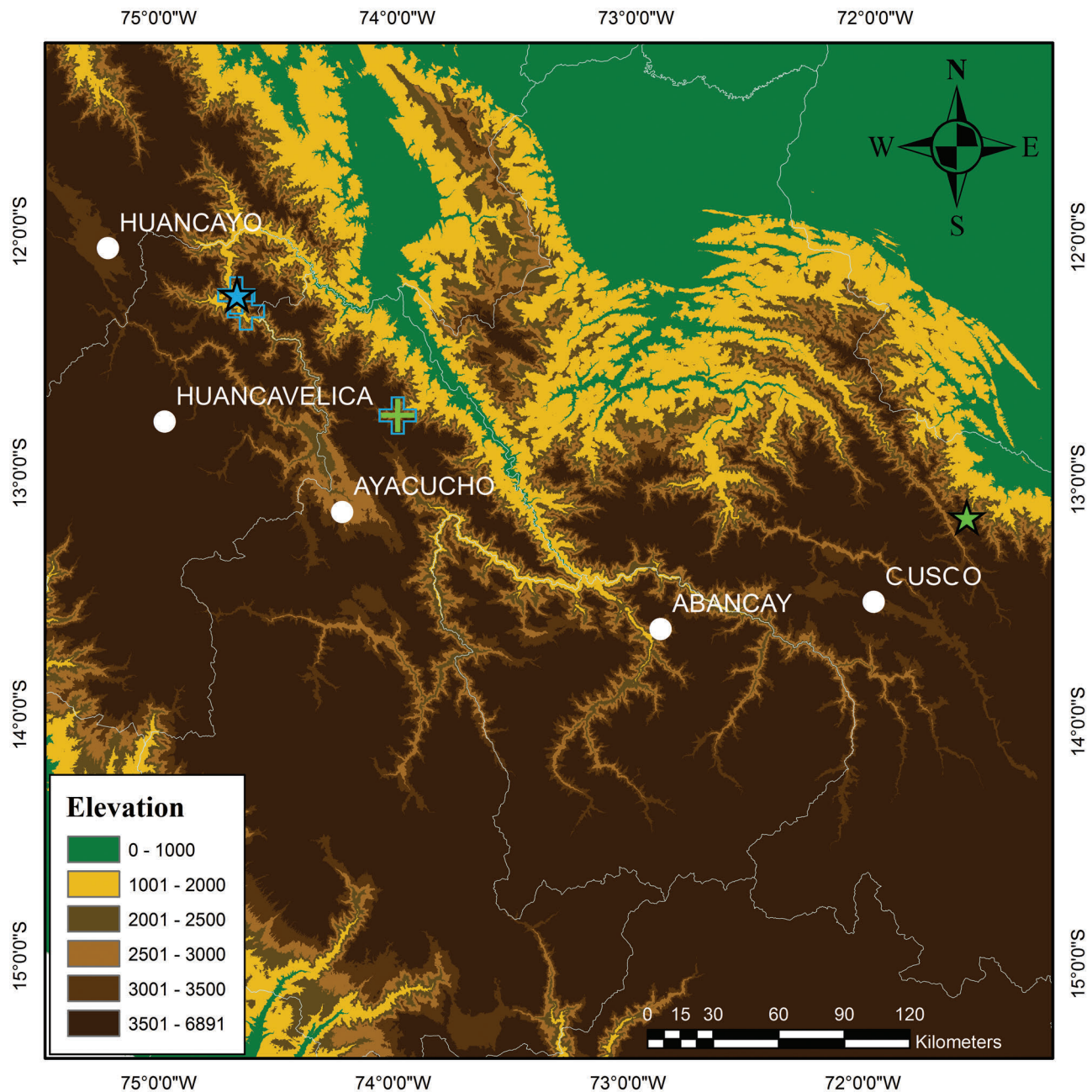


Fig. 6.—Map of the Peruvian Andes showing the distribution of *Telmatobius mantaro*, new species. The blue sky star indicates the type locality, blue sky crosses paratype localities. The green star represent the type locality of *Telmatobius mendelsoni*, green cross represents new additional locality for the distribution of *T. mendelsoni*.

and is located at an airline distance of 85 km southeast of Cedro. The type locality (Quintao) is covered by dense montane shrub surrounded by croplands, mainly of potatoes. The climate in Quintao is humid, with sunny mornings and windy nights. The holotype and tadpoles of *T. mantaro* were found active during midday in a small

stream with a rocky substrate located 300 m from houses. Paratypes KU 196613–14 from Ccarapa were found under rocks in a small stream (2–3 feet wide) tributary to a larger stream, and the habitat was dwarf cloud forest (Richard Thomas in litt.).

Range extension for *Telmatobius mendelsoni*

At Ccarapa, paratypes KU 196613–14 of *T. mantaro* were collected in 1971 by Richard Thomas and John P. O'Neill together with five additional specimens of *Telmatobius*. The entire series was initially deposited at the herpetology collection of Louisiana State University, Museum of Natural Science (LSUMZ), and three specimens were later transferred to The University of Kansas (the specimens remaining at LSUMZ have not been examined by us). Among them was included a large male of *T. mendelsoni*, KU196612. Because both species were unknown at the time of collecting, they were catalogued in the field as *Telmatobius* sp. by Richard Thomas, but already identified as two likely different forms (R. Thomas in litt.). KU 196612 is a large male with flattened head, and bears the large humeral spiny that characterizes *T. mendelsoni*. The locality of Ccarapa represents a northwestern range extension of 262 km for *T. mendelsoni* (approximately 320 km if following the contour of the mountains). This species was originally described from the Kosñipata Valley in Cusco, and was hitherto only known from that area (De la Riva et al. 2012). No specimens have been seen since 2007 in Kosñipata (Catenazzi et al. 2011), and we know nothing about the conservation status of the population from Ayacucho.

DISCUSSION

Besides the new species described herein, two other species of *Telmatobius* occur in different habitats of the Department of Huancavelica (Lehr 2005; Catenazzi et al. 2015): *T. ventriflavum* distributed in arid and hyper-arid environments in the Pacific slopes of the Andes (southern of Huancavelica) and *T. jelskii* distributed in highland environments extending to the Departments of Apurímac, Ayacucho, and Junín (Rodríguez et al. 1993). However, the taxonomic status of certain populations of *T. jelskii* is uncertain, and additional studies on intraspecific variation are needed to determine the distribution of this species. In any case, *T. mantaro* does not overlap with these two species but, as mentioned above, at its southern distribution limit (Ccarapa) is sympatric with *T. mendelsoni*.

The two geographically closer species inhabiting the same kind of habitat as *T. mantaro* are *T. punctatus* and *T. timens*. The former occurs toward the north, at an airline distance of approximately 350 km from the type locality of *T. mantaro*, while the northern limit of *T. timens* lies at an airline distance of ca. 260 km to the southeast of Ccarapa. Thus, the only sympatric species seems to be *T. mendelsoni*, at least at one locality, but the actual degree of range overlapping is unknown.

Although several species of *Telmatobius* are restricted to particular habitats and regions, some species can have moderately large distributions along the Andean slopes when habitat permits (De la Riva et al. 2005). *Telmatobius mantaro* inhabits both humid and dry lower montane

forests in northern Ayacucho and Huancavelica, encompassing a range of less than 100 km, but its distribution is still poorly known. Besides new surveys in appropriate habitats, taxonomic revision of specimens deposited in museums will fill the gaps regarding knowledge of species distribution in the Amazonian slopes of the Andes in central and southern Peru. Severe population declines and possibly species extinctions of *Telmatobius* throughout its range make the task of obtaining new records difficult or impossible.

Among the 27 species of *Telmatobius* that occur in Peru, 20 of them are categorized as threatened (IUCN 2015). These taxa have experienced dramatic population declines in recent decades (Angulo 2008; Aguilar et al. 2010; Catenazzi et al. 2011). The main threats to conservation of these species are canalization and loss of stream habitats, domestic, agricultural, and industrial pollution, over-harvesting for food and traditional medicine, and the introduction of trout. But, above all, chytridiomycosis, caused by the chytrid fungus *Batrachochytrium dendrobatidis* (*Bd*), has been the coup de grace for *Telmatobius* frogs, especially those from humid forests, causing declines and species extinctions throughout the Andes (Merino-Viteri et al. 2005; Barrionuevo and Mangione 2006; Seimon et al. 2007; Barrionuevo and Ponssa 2008; Catenazzi et al. 2011, 2013, De la Riva and Burrowes 2011). In addition to *Bd*, co-infection of *Ranavirus* has been recently reported in *T. marmoratus* from Cusco (Warne et al. 2016). Little is known about the situation of northern and central Peruvian *Telmatobius*, but population declines of *T. jelskii*, *T. marmoratus*, *T. mendelsoni*, *T. timens*, and *T. ventriflavum* have been reported (Seimon et al. 2007; von May et al. 2008; Catenazzi et al. 2011, 2013, 2015).

Most species of *Telmatobius* are highly endemic and mostly restricted to particular habitats, like mountain forest, puna, paramo, and more or less dry inter-Andean valleys. Nevertheless, some species inhabit more than one kind of habitat, such as wet paramos and adjacent upper cloud forests or, less often, dry montane and humid montane forests. The favorable conditions for the growth of *Bd* are moderate temperatures and wet environments (Piotrowski et al. 2004). This can then explain the high susceptibility of wet paramo and humid forest species of *Telmatobius*, while species from the dry puna and dry or temperate forests persist even with high *Bd* infection loads (De la Riva and Burrowes 2011). Among the few species of *Telmatobius* inhabiting both humid and temperate forests are the Bolivian endemic *T. simonsi* Parker, 1940 (De la Riva and Harvey 2003) and the new species described herein, *T. mantaro*. It seems that *T. simonsi* became extinct in Bolivian humid forests but it is still found in dry forests (A. Muñoz personal communication). These putative refugia from disease are similar to refugia hypothesized for *Litoria lorica* Davies and McDonald, 1979, in Australia (Puschendorf et al. 2011) or *Craugastor ranoides* (Cope, 1886) in Costa Rica (Puschendorf et al. 2009). Refugia maintain hope for the survival and persistence of these species

despite the likely extirpation of populations outside of refugia caused by *Bd*. Thus, we consider that *Bd* threatens populations of *T. mantaro* in humid environments, and we recommend this species to be categorized as Critically Endangered following the criteria of the IUCN A1 c, e; B1 bi, bii, biii; and C1, D.

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APPENDIX
Specimens examined

- Telmatobius atacamensis* Gallardo, 1962 (2 specimens): **ARGENTINA. Jujuy:** Sey, CM 65008–9.
- Telmatobius ceiorum* Laurent, 1970 (3 specimens): **ARGENTINA. Catamarca:** Proximidades de la Banderita, km 50, FML 1372 (holotype). **Tucumán:** Laguna del Tesoro, CM 65012–13.
- Telmatobius hauthali* Koslowsky, 1895 (5 specimens): **ARGENTINA. Cafayate:** km 78, ruta Tafi del Valle, FML 2255, 2418. km 93, ruta Tafi del Valle, FML 2442, 2443. **Catamarca:** Río Aguas Calientes, Tinogasta, FML 3264 (neotype).
- Telmatobius hintoni* Parker, 1940 (1 specimen): **BOLIVIA. Cochabamba:** Chapare, CM 4519
- Telmatobius hypselocephalus* Lavilla and Laurent, 1989 (2 specimens): **ARGENTINA. Jujuy:** El Angosto, 6 km S de El Moreno, FML 3768 (holotype), FML 3767 (allotype).
- Telmatobius jelskii* (Peters, 1873) (6 specimens): **PERU. Ayacucho:** Tambo, La Mar, MUSM 7646; Seccelambra, MUSM 28511; Abra Toccto, MUSM 28513–14, Vinchos, MUSM 28517; **Huancavelica:** Huancavelica, MUSM 7639.
- Telmatobius laticeps* Laurent, 1977 (2 specimens): **ARGENTINA. Tucumán:** Quebrada del Varón, km 84 ruta Tafi del Valle, Amaicha del Valle, CM 68428–29
- Telmatobius marmoratus* (Dumeril and Bibron, 1841) (2 specimens): **PERU. Junin:** Solavana, CM 2634–35.
- Telmatobius mendelsoni* De la Riva et al., 2012 (11 specimens): **PERU. Ayacucho:** Ccarapa, below Tambo, 2440 m, KU196612; **Cusco:** Kosñipata Valley, AMNH 157036–37 (paratypes), KU 173385 (holotype), KU 162962, KU 173386–88, MHNC 4568 (paratype), MUSM 20980–81, 20965.
- Telmatobius necopinus* Wiens, 1993 (3 specimens): **PERU. Amazonas:** Abra Pardo de Miguel, 39 km ENE Pomacochas, KU 212482 (holotype), KU 212481, KU 212483 (paratypes).
- Telmatobius oxycephalus* Vellard, 1946 (4 specimens): **ARGENTINA. Salta:** Cerro La Escalera, Departamento Orán, FML 225 (holotype). Sierra de Calilegua, cerca del monumento de la ruta de Calilegua a Valle Grande, FML 1369. **Jujuy:** Ruta provincial #3, near Monolito, Calilegua, CM 65006–7.
- Telmatobius platycephalus* Lavilla and Laurent, 1989 (1 specimen): **ARGENTINA. Jujuy:** San Jose de Chañi, FML 3764 (allotype). El angosto, 6 km al sur de El Moreno, FML 3763 (holotype).
- Telmatobius pinguiculus* Lavilla and Laurent, 1989 (2 specimens): **ARGENTINA. Catamarca:** La Ciénaga, Tinogasta, FML 3910 (holotype), FML 3920 (allotype).
- Telmatobius sanborni* Schmidt, 1954 (18 specimens): **BOLIVIA. La Paz:** Pelechuco, MNCN 43523–28, 43758. **PERU. Puno:** Limbani, FMNH 40247 (holotype), 67435–38 (paratypes); 6 km SW Ollachea, USNM 299017–22.
- Telmatobius schreiteri* Vellard, 1946 (3 specimens): **ARGENTINA. La Rioja:** Aimogasta, FML 216 (holotype). Quebrada de Anjullon, CM 65010–11.
- Telmatobius scrocchii* Laurent and Lavilla, 1986 (1 specimen): **ARGENTINA. Catamarca:** Campo El Arenal, Departamento Andalgalá, FML 3532 (holotype).
- Telmatobius stephani* Laurent, 1973 (2 specimens): **ARGENTINA. Catamarca:** Río Encrucijada, +/-2000 m cerca de Las Juntas, FML 1743 (holotype). Cerro Manchao, FML 1744 (allotype)
- Telmatobius timens* De la Riva, Aparicio, and Rios, 2005 (17 specimens): **BOLIVIA. La Paz:** Valle de Tojoloque, CBF 5679 (holotype), 5672–5675, 5677, 5680, MNCN 42017–18 (paratypes). **PERU. Cusco:** Acjanacu, KU 139040–41, 162958–59 (paratypes), MHNC 4378, 4653, 4270, 4272.
- Telmatobius truebae* Wiens, 1993 (8 specimens): **PERU. Amazonas:** Pomacochas, KU 181528 (holotype), 181529–35 (paratypes).
- Telmatobius yuracare* De la Riva, 1994 (2 specimens): **BOLIVIA. Cochabamba:** Incachaca, CM 4230, 4232