Zootaxa 1662: 1–14 (2007) www.mapress.com/zootaxa/

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A new species of arboreal *Rhinella* (Anura: Bufonidae) from Yanachaga-Chemillén National Park in central Peru

EDGAR LEHR¹, JENNIFER B. PRAMUK², S. BLAIR HEDGES³ & JESÚS H. CÓRDOVA⁴

¹Staatliche Naturhistorische Sammlungen Dresden, Museum für Tierkunde, Königsbrücker Landstrasse 159, D-01109 Dresden, Germany. E-mail: elehr@ku.edu

²Bronx Zoo/Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460-1068, U.S.A. E-mail: jpramuk@wcs.org

³Department of Biology, Pennsylvania State University, University Park, PA 16802-5301, U.S.A. E-mail: sbh1@psu.edu

⁴Museo de Historia Natural, Departamento de Herpetología, Universidad Nacional Mayor de San Marcos, Av. Arenales 1256, Jesús María, Ap. 14-0434, Lima, Peru. E-mail: jhcordovasantagadea@yahoo.es

Abstract

A new arboreal species of *Rhinella* tentatively assigned to the *veraguensis* Group is described from the National Park Yanachaga Chemillén at 2600 m elevation in central Peru (Departamento de Pasco). The new species is characterized by a maximum snout-vent length of 45.7 mm, a moderate body with relatively long and slim extremities, a dorsum with small tubercles and enlarged tubercles on legs, a distinct tympanum, distinct vertical keel on snout, weak orbitotympanic and postorbital crests, weakly defined row of dorsolateral tubercles, and males with vocal slits, nuptial pads, hypertrophied arms, and a protuberant, ventrally oriented cloaca. The new species is compared with other members of the *veraguensis* Group and is considered most similar to arboreal *R. tacana* from northern Bolivia. The skull of the new species is described and compared to other members of the *veraguensis* Group. Tadpole and call of the new species remain unknown.

Key words: Andes, osteology, Rhinella veraguensis Group

Resumen

Se describe una nueva especie arbórea de *Rhinella* tentativamente asignada al Grupo *veraguensis* procedente del Parque Nacional Yanachaga-Chemillén - parte central del Perú, Departamento de Pasco - y a una altitud de 2600 m. La nueva especie se caracteriza por tener un máximo de longitud naríz-cloaca de 45.7 mm, cuerpo moderado con relativamente largas y delgadas extremidades, pequeños tubérculos en el dorso que son alargados en las patas, tímpano evidente, carena vertical visible sobre la nariz, crestas orbitotimpánicas y postorbitales escasas, hilera tubercular dorso-lateral escasamente definida, y machos con hendiduras vocales, almohadillas nupciales y brazos hipertrofiados. La nueva especie es comparada con otros miembros del Grupo *veraguensis* y es considerada más similar a la arbórea *R. tacana* del norte de Bolivia. Se describe el cráneo de la nueva especie y se lo compara con otros miembros del Grupo veraguensis. El renacuajo y el canto de la especie nueva son aún desconocidos.

Palabras claves: Andes, osteología, Grupo de Rhinella veraguensis

Introduction

Several new species of toads have been described from Andean cloud forests in recent years (Lehr *et al.* 2001, Lehr *et al.* 2005, Padial *et al.* 2006, Chaparro *et al.* 2007). All of which were assigned to the *Rhinella vera*-

guensis species Group as defined by Duellman and Schulte (1992). Including the new species described in this paper, the *veraguensis* Group comprises 14 species. Phylogenetic analyses may demonstrate that this species group is not monophyletic (Chaparro *et al.* 2007).

The Yanachaga-Chemillén National Park is located in eastern central Peru, covering 122,000 ha between 300 and 3644 m elevation. Several new species of amphibians have been described from this national park since its foundation in 1986, including one species of *Phrynopus* (Hedges 1990), five *Pristimantis* (Lehr *et al.* 2004, Duellman & Hedges 2005), one *Gastrotheca* (Duellman *et al.* 2006), and one species of *Melanophryne* (Lehr & Trueb 2007). A series of 29 unidentified specimens of *Rhinella* from the Yanachaga-Chemillén National Park recently were located at the Museo de Historia Natural (Lima, Peru) and represent a new species which we describe herein.

Material and methods

Taxonomy of bufonids follows Frost et al. (2006) and Chaparro et al. (2007). The format of this description follows that of Duellman and Schulte (1992). Specimens were preserved in 10% formalin, and stored in 70% ethanol. Sex was determined by observation of presence or absence of vocal slits and nuptial pads. Measurements of adults were made with digital calipers and rounded to the nearest 0.1 mm and are as follow: SVL (snout-vent length); TL (tibia length); FL (foot length, distance from proximal margin of inner metatarsal tubercle to tip of fourth toe); HL (head length, from angle of jaw to tip of snout); HW (head width, greatest width, measured between centers of tympana); ED (eye diameter); TY (tympanum diameter, horizontal); IOD (interorbital distance); EW (eyelid width); IND (internarial distance); E–N (eye–nostril distance, straight line distance between anterior corner of orbit and posterior margin of external naris); PL (parotoid length, horizontal); and PW (parotoid width, greatest width). Coloration in life descriptions are based on field notes by S. B. Hedges and refer to specimens collected and photographed by him in 1987. These specimens (and corresponding images) are numbered with field tags (USNMFS = Unites States National Museum Field Series), except for one juvenile (RMNH 27069). As the current whereabouts of these specimens remains unknown, we include them (except RMNH 27069) as referred specimens. The skull of an adult male specimen was skeletonized following Simmons (1986). Our terminology for cranial crests and for webbing formula follows Cei (1980) and Savage and Heyer (1997), respectively. Terminoly of inguinal fat bodies follows Da Silva & Mendelson III (1999). Drawings were made using a stereomicroscope with drawing tube attachment. Comparative data were taken from original species descriptions, and the specimens examined (Appendix I). Museum acronyms are: KU = Natural History Museum, University of Kansas, Lawrence, Kansas, USA; MHNSM = Museo de Historia Natural Universidad Nacional Mayor de San Marcos, Lima, Peru; MTD = Museum für Tierkunde Dresden, Dresden, Germany; RMNH = Nationaal Natuurhistorisch Museum, Leiden, The Netherlands.

Rhinella yanachaga new species

Holotype: MHNSM 19994 (Fig. 1), an adult male from Provincia de Pasco, Departamento de Pasco, National Park Yanachaga-Chemillén, W side of the Cordillera Yanachaga near Río San Alberto (= 2.9 km N, 5.5 km E [airline] Oxapampa), ca. 1 km N, 14 km E. Oxapampa by road on trail, 2600 m elevation, Peru, obtained by J. Icochea on an unknown date in the late 1990s.

Paratypes: 29, all from Provincia de Pasco, Departamento de Pasco, Cordillera de Yanachaga, Peru: 14 females (MHNSM 24510–17, 24519–22, MTD 46896–97), two males (MHNSM 24509, MTD 46895); 12 juveniles (MHNSM 24518, 24523–30, MTD 46898–200), all collected by J. Icochea; one juvenile (RMNH 27069) collected at the type locality between 29 June and 1 July 1987 by S. B. Hedges.



FIGURE 1. Dorsal (A) and ventral (B) views of male *Rhinella yanachaga* (MHNSM 19994, holotype, SVL 38.4 mm). Photos by E. Lehr.

Referred specimens: two (USNMFS 171096: adult male, 171095: adult female) collected at the type locality between 29 June and 1 July 1987 by S. B. Hedges.

Diagnosis. A medium-sized species of *Rhinella* attaining a maximum SVL of 45.7 mm in adult females (MHNSM 24510). The new species is distinguished from all congeners by the following combination of characters: (1) canthus rostralis distinct, orbitotympanic and postorbital crests weak (Fig. 2); prominent vertical keel on snout (2) tympanum distinct, oval; (3) parotoid glands moderately large (about same size as ED), sub-triangular, not contacting eye; (4) numerous small, tubercles (keratin-tipped in males) scattered on dorsal surfaces of body; (5) forearm moderately long, slim in females, hypertrophied in males (Fig. 3); (6) weakly defined dorsolateral row of slightly enlarged, conical tubercles; (7) tarsal fold absent; (8) webbing on hands and feet fleshy (Fig. 4); (9) first finger shorter than second; (10) males with vocal slits and small keratinous spines on Fingers I and II.



FIGURE 2. Dorsal (A) and lateral (B) views of head of holotype of *Rhinella yanachaga*. Gray indicates tympanum. Drawings by E. Lehr.

We assign *Rhinella yanachaga* tentatively to the *veraguensis* Group sensu Duellman and Schulte (1992) based on its distribution and morphological similarities to species in that group. Two species of the *veraguensis* Group are known from cloud forests of central Peru (Fig. 5)—*Rhinella chavin* and *R. multiverrucosa*.

Rhinella yanachaga is easily distinguished from both by being smaller (maximum SVL 45.7 mm vs. 64.9 mm in *R. chavin*, 68.9 mm in *R. multiverrucosa*), by having long, relatively slender extremities with enlarged, conical tubercles (short, stout, with large, flat, elongate warts). Males of *R. chavin*, *R. multiverrucosa*, and *R. yanachaga* have keratinous nuptial pads on Fingers I and II, but *R. yanachaga* has vocal slits (absent in *R. chavin*, and *R. multiverrucosa*) and hypertrophied arms (not hypertrophied in *R. chavin*, and *R. multiverrucosa*). Other arboreal species of *Rhinella* include *R. arborescandens*, *R. manu*, and *R. tacana*. *Rhinella yanachaga* differs from these species by having, a tympanic membrane (absent in *R. arborescandens*), and well developed webbing on hands and feet (absent in *R. arborescandens*). *Rhinella yanachaga* differs from *R. manu*), by having parotoid glands about as large as eye diameter (larger), a tan venter with brown flecks (red with dark blotches), males with vocal slits (absent), and keratinious nuptial pads on Finger I).



FIGURE 3. Dorsal views of male (A, MTD 46895) and female arm (B, MHNSM 24510), and dorsal views of cloacal region in male (MHNSM 19994) and female (MHNSM 24510) *R. yanachaga*. Gray indicates nuptial pads (A) and cloacal region (C–D), and arrows point to cloacal openings. Drawings by E. Lehr.

Rhinella yanachaga is most similar to *R. tacana* from northern Bolivia: both have long, slender extremities, snout with a vertical keel, and males with vocal slits, but *R. yanachaga* is larger (maximum SVL 45.7 mm vs. 34.2 mm in *R. tacana*), has weakly defined dorsolateral rows of slightly enlarged, conical tubercles (dorsolateral row more prominent in *R. tacana*), enlarged tubercles on dorsal surfaces of tibia and tarsus, and outer ventrolateral surface of tarsus (extremities without enlarged tubercles), has webbing between Fingers I and II well developed (basal, almost absent), males with keratinous nuptial pads on Fingers I and II (restricted to Finger I), males with hypertrophied arms (arms not hypertrophied), iris olive brown or bronze with black reticulations (iris green).

Description of the holotype. Body moderate to slender; head slightly broader than long; snout slightly pointed in dorsal profile, protruding in lateral profile (Fig. 2); snout with a distinct vertical keel, bearing two small, keratin-tipped tubercles; canthus rostralis more distinct anteriorly than posteriorly, covered with small tubercles each with single keratinized tip, conical in profile; orbitotympanic and postorbital crests distinct, covered with small keratin-tipped tubercles; dorsum of head flat, skin co-ossified with underlying cranial bones; interorbital distance greater than eyelid width; internarial area concave; nostrils protuberant, directed laterally; loreal region concave; lips rounded; small V-shaped notch at symphysis of upper jaw; oral ricti positioned at level of tympanum; tympanum diameter smaller than eye diameter; tympanic annulus a narrow rim anterolaterally, slightly covered by small tubercles on left side of head, dorsal and posteroventral margins indistinct, not in contact with parotoids or postorbital crests; skin on dorsum with numerous small, round, elevated tubercles, conical in profile, bearing single keratinized tip on anterior half of body; posterior half of dorsum less spinous and with larger tubercles than on anterior half of body; parotoid glands ovoid in dorsal view, subtriangular in dorsolateral view, longer than wide, widest posteriorly, slightly smaller than upper eyelid, descending onto side of head without contacting eye; upper eyelid with conical keratin-tipped tubercles, largest on outer margin.

Flanks with lower density of tubercles than dorsum, but with few, slightly enlarged tubercles (left side five tubercles, right side two tubercles) between arm and leg insertion, not forming a distinct dorsolateral fold; skin of throat, chest, and venter granular; granules on venter larger than those on chest and throat; ventrolateral row of enlarged tubercles absent; arms long, hypertrophied (Fig. 3A); hands relatively large with long fingers; relative length of adpressed fingers 1 < 2 < 4 < 3; webbing fleshy; webbing formula of fingers I1–2II2–3III3–3IV (Fig. 4A); lateral fringes broad; tips of digits terminating in indistinct discs; subarticular tubercles ovoid in ventral aspect, flat in profile; supernumerary tubercles numerous, about 25% as large as subarticular tubercles; palmar tubercle large and round, flat in profile, about four times size of thenar tubercle; thenar tubercle ovoid, round in profile; limbs long, slim; tibia length shorter than foot length; tarsal fold absent; inner metatarsal tubercle ovoid, flat in profile; toes relatively long; relative length of adpressed toes 1 < 2 < 3 < 5 < 4; fleshy webbing; webbing formula of toes I1–1II1–11/2III1–21/2IV3–2⁻V (Fig. 4B); broad lateral fringes present; subarticular tubercles ovoid in ventral aspect, flat in profile; toes relatively long; relative length of adpressed toes 1 < 2 < 3 < 5 < 4; fleshy webbing; webbing formula of toes I1–1II1–11/2III1–21/2IV3–2⁻V (Fig. 4B); broad lateral fringes present; subarticular tubercles ovoid in ventral aspect, flat in profile; supernumerary tubercles numerous about 35% as large as subarticular tubercles.

Skin texture of dorsal surface of forearms as on dorsum; dorsal surface of tibia with enlarged tubercles (4– 6 times the size of tubercles on dorsum), ovoid in dorsal view, conical in profile; ventral surface and outer ventrolateral surface of tarsus with many enlarged round to ovoid tubercles, conical in profile; outer dorsolateral margin of foot with numerous enlarged round to ovoid tubercles; cloacal opening protuberant, directed ventrally near lower level of thighs (Fig. 3C); inguinal fat bodies absent; choanae small, ovoid; maxillary, premaxillary, mandibular, and vomerine teeth absent; tongue elongate, three times as long as wide, about equal in width throughout its length, free posteriorly for about two fifths its length; vocal slits nearly straight, located bilaterally at posterior half of mouth floor between tongue and margin of jaw.

Measurements (in mm) of holotype: SVL: 38.4; TL: 12.8; FL: 16.4; HL: 11.3; HW: 12.0; ED: 2.1; TY: 1.2; IOD: 3.6; EW: 2.5; IND: 2.5; E–N: 2.8; PL: 4.0; PW: 2.9.



FIGURE 4. Ventral views of left hand (A) and left foot (B) of holotype of *Rhinella yanachaga*. Scale bar = 5 mm. Drawings by J. B. Pramuk.



FIGURE 5. Map (changed after Lehr *et al.* 2005) illustrating the type localities of *Rhinella yanachaga* (Nationalpark Yanachaga-Chemillén, indicated by a star), *R. chavin* (Palma Pampa, indicated by an open square), *R. multiverrucosa* (Auquimarca, indicated by a triangle), and *R. manu* (Valle de Kosñipata, indicated by a solid square).

Coloration of holotype in preservative: Dorsum brown, parotoids brownish orange; narrow tan middorsal stripe extending from snout to cloaca; broad, tan dorsolateral stripe on each side of flanks extending from parotoids to groin; flanks ventrolaterally with weakly defined broad, brown stripe beginning behind tympa-

num and extending to inguinal region; tympanum dark brown; upper lip cream with dark brown bar below eye, and below tympanum; throat, chest and venter tan with minute grayish-brown spots; ventral surfaces of hands and feet gray. Coloration of holotype in life unknown.

Variation. Descriptions of coloration in life for an adult male, adult female, and a juvenile are based on field notes by S. B. Hedges: The adult male (USNMFS 171096, Fig. 6) was very dark brown dorsally with small, irregular, green spots and markings; most situated just above the dorsolateral row of tubercles and with one large green blotch on the right side just behind the parotoid glands. The sides (below dorsolateral row of tubercles) were reddish brown and the upper lip was reddish brown with green flecks. The ventral surface was orange brown and had small green spots on the chin, darker brown flecks on the belly, and very dark brown or black markings under the limbs. The iris was olive brown. The female (USNMFS 171095) was tan dorsally with light brown markings. The narrow middorsal stripe was yellowish with small irregular black markings on each side. The sides were dark brown with a greenish spot posterior to the tympanum and above the axillary region. The ventral surface was mottled with brown (reddish brown on chest) and had a faint yellowish midventral line. The eyes were bronze.



FIGURE 6. Male Rhinella yanachaga (USNMFS 171096) in life. Photo by S. B. Hedges.

The type series shows some variation in coloration pattern: Four (MHNSM 24520, 24522, 24526, USN-MFS 171095) specimens have a tan middorsal stripe as described for the holotype, and several specimens (e.g., MHNSM 24511, 24514, MTD 46899-900) have small, ovoid black flecks on the dorsum, and others (e.g., MHNSM 24511, 24518, 24525, MTD 46899) a dark brown X-shaped blotch on head and shoulder. Ven-tral coloration varies from tan with few grayish brown flecks (MHNSM 24517) to tan and brown mottled (MTD 46895) to dark brown with tan flecks (MHNSM 24510).

There is obvious sexual dimorphism in skin texture: Dorsal skin of males is spinose because of keratintipped tubercles; skin of females smooth without keratin-tipped tubercles. Furthermore, all males have vocal slits, nuptial pads on dorsal and inner lateral surfaces of thumb and on dorsal surface of second finger, and arms are hypertrophied, whereas arms of females are slim (Fig. 3A, B). The cloaca is more protuberant in males than in females and the opening is directed ventrally in males, whereas in females laterally (Fig. 3C, D). Females are slightly larger than males (maximum SVL in females 45.7 mm vs. 41.6 mm in males).

Crests are more prominent in adult than in juvenile specimens, and are most prominent in an adult female (MHNSM 24513). All have the snout with a distinct vertical keel which is more prominent in adults. The dorsolateral row of tubercles is generally weakly defined or indistinct, as the tubercles do not differ much in size compared to other dorsal tubercles, but in some specimens (MHNSM 24510) is the dorsolateral row is more distinct as the tubercles coalesce. For measurements of the type series of adult *R. yanachaga*, see Table 1; for ranges and proportions see Table 2.

character	MHNSM	MHNSM	MTD	MHNSM	MTD	MHNSM	MHNSM	MHNSM
	24510	24509	40895	24511	40890	24512	24515	24515
Sex	f	m	m	f	f	f	f	f
SVL	45.7	41.6	41.0	37.9	36.9	36.5	36.4	35.8
TL	15.7	14.3	14.5	13.4	12.4	13.4	13.0	12.0
FL	19.4	18.6	18.3	17.6	15.9	16.4	17.2	15.7
HL	14.6	13.4	13.7	12.9	12.1	12.6	13.9	11.9
HW	13.9	13.4	12.6	12.3	11.4	12.3	12.4	11.1
ED	3.2	2.6	2.3	3.1	2.6	2.8	3.2	2.6
TY	2.6	2.1	1.9	1.7	1.8	2.2	2.0	1.7
IOD	4.5	3.9	3.8	4.5	3.9	4.3	4.0	4.0
EW	3.2	3.6	3.7	3.0	3.2	3.5	3.0	3.0
IND	3.3	2.9	3.0	2.9	2.6	3.2	2.9	2.8
E–N	3.6	3.8	3.5	3.9	3.5	3.5	3.6	3.2
PL	3.5	5.0	5.4	3.6	3.7	3.8	3.3	4.0
PW	4.0	3.9	4.2	3.5	3.9	4.3	3.8	3.5

TABLE 1. Measurements (in mm) of selected adult paratypes of Rhinella yanacha	aga.
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continued.

character	MTD	MHNSM	MHNSM	MHNSM	MHNSM	MHNSM	MHNSM
	46897	24521	24516	24514	24517	24522	24520
Sex	f	f	f	f	f	f	f
SVL	35.5	35.0	34.2	33.8	32.4	31.2	29.1
TL	13.4	13.3	11.6	12.5	11.9	10.5	10.0
FL	16.0	17.3	14.6	17.1	14.9	12.4	12.0
HL	13.4	13.4	11.4	12.3	12.5	10.8	10.1
HW	11.9	12.8	10.6	11.6	11.7	10.2	9.5
ED	3.0	3.5	2.9	2.6	2.5	2.7	2.2
TY	1.7	1.7	1.4	1.7	1.2	1.1	1.0
IOD	3.9	4.6	3.6	3.6	4.4	3.6	3.4
EW	2.7	3.5	2.9	3.3	2.6	2.7	2.3
IND	2.7	3.0	2.6	2.7	2.8	2.3	2.2
E–N	3.7	4.0	3.2	3.1	3.6	3.4	2.8
PL	3.1	4.3	2.7	3.5	3.5	2.8	2.9
PW	3.7	3.6	3.4	3.8	3.9	3.0	2.9

Characters	Females $(n = 14)$	Males (<i>n</i> = 3)
SVL	29.1-45.7 (35.6±3.7)	38.4–41.6 (40.3±1.7)
TL	10.0–15.7 (12.6±1.3)	12.8–14.5 (13.9±0.9)
FL	12.0–19.4 (15.9 ±1.9)	16.4–18.6 (17.8±1.2)
HL	10.1–14.6 (12.3 ±1.2)	11.3–13.7 (12.8±1.3)
HW	9.5-13.9 (11.7±1.1)	12.0–13.4 (12.7±0.7)
ED	2.1-3.2 (2.8±0.3)	2.1-2.6 (2.3±0.3)
TY	1.0–2.6 (1.6±0.4)	1.2–2.1 (1.7±0.5)
IOD	3.4-4.5 (4.0 ±0.4)	3.6-3.9 (3.8±0.2)
EW	2.3-3.5 (3.0±0.4)	2.5-3.7 (3.3±0.7)
IND	2.2-3.3 (2.8±0.3)	2.5-3.0 (2.8±0.3)
E–N	2.8-4.0 (3.4±0.4)	$2.8-3.8(3.4\pm0.5)$
PL	2.9-4.3 (3.5±0.5)	4.0-5.4 (4.8±0.7)
PW	2.9-4.3 (3.6±0.4)	2.9-4.2 (3.7±0.7)
TL/SVL	0.33–0.38	0.33–0.35
FL/SVL	0.40-0.51	0.43–0.45
HL/SVL	0.29–0.38	0.29–0.33
HW/SVL	0.30-0.37	0.31-0.32
HW/HL	0.89–1.06	0.92–1.06
E-N/ED	1.10–1.44	1.33–1.52
EW/IOD	0.68–0.82	0.69–0.97
TY/ED	0.41–0.81	0.57–0.81
PL/ED	0.93–1.90	1.90–2.35

TABLE 2. Ranges (in mm) followed by mean and standard deviation and proportions of adults of Rhinella yanachaga.

Comparative cranial osteology. The skull of *Rhinella yanachaga* generally resembles those of other *R*. veraguensis Group species, but certain cranial features of this taxon are notably different. Detailed comparative osteological descriptions and illustrations for other species in the R. veraguensis Group are provided elsewhere (Lehr et al. 2005, Pramuk 2006, Chaparro et al. 2007). The skull of R. yanachaga is broadly rounded anteriorly and is wider than long with the greatest width being at the level of the quadratojugals (Fig. 7A–C). The dorsal surfaces of the dermal bones are relatively smooth and are not exostosed or ornamented with pits and rugosities (as they are in R. multiverrucosa and to a lesser extent in R. chavin and R. veraguensis). Of the five veraguensis Group species examined osteologically (Appendix 1), the skull of R. vanachaga is most similar in structure to the crania of R. chavin, R. manu, and R. veraguensis and in overall appearance and skull proportions, this species most closely resembles R. manu. Both of these species have similarly broad, rectangular, and flattened frontoparietals broadly contacting the medial surfaces of the otic rami of the squamosals (forming a complete temporal arcade sensu Lynch 1971). In contrast, the frontoparietals of R. veraguensis do not contact broadly the otic rami and are slightly expanded dorsolaterally, creating relatively well-developed supraorbital crests. In R. yanachaga, supraorbital crests are weakly developed. Relative to most other bufonids, species of the R. veraguensis Group have relatively lightly to moderately ossified skulls, a consequence of which is exposure of the dorsal surface of the sphenethmoid. The sphenethmoid of R. yanachaga is exposed to a greater extent than it is in other species of this group. The nasals and frontoparietals barely contact one another laterally whereas they do in all other species examined, yielding a distinctively triangular appearance to the exposed surface of the sphenethmoid. In R. yanachaga, R. manu and R. veraguensis, only the lateral-most edges of the premaxillae are visible in dorsal view (in R. chavin, and R. multiverrucosus, the

premaxillae and anterodorsal margins of the maxillae are visible throughout their entire length). In dorsal view, the orbits of *R. yanachaga* and *R. manu* are more obliquely ovoid than other species of the *veraguensis* Group (e.g., *R. chavin*, has relatively round orbits).



FIGURE 7. Dorsal (A), ventral (B) and lateral (C) views of skull of male *Rhinella yanachaga* (MHNSM 24509, SVL 41.6 mm). Scale bar = 5 mm. Drawings by J. Pramuk.

In ventral view (Fig. 7B), the premaxillae and maxillae of *R. chavin, R. multiverrucosa,* and *R. yanachaga* are deeper and more robust than those of *R. veraguensis*. Moreover, in dorsal view the maxillae of *R. chavin, R. manu, R. multiverrucosa,* and *R. yanachaga* are angled posterolaterally to a greater degree from their point of contact with the premaxillae than they are in *R. veraguensis* yielding a relatively more rounded appearance to the maxillary arcade of this species. *Rhinella yanachaga, R. chavin R. manu,* and *R. multiverrucosa* have a narrow ridge present on the ventral surface of the parasphenoid that extends from the point of contact of the medial ramus of the pterygoid and parasphenoid to the medial point of the parasphenoid. A ridge on the parasphenoid also is present in *R. veraguensis;* however, it is only present medially and does not extend to the point where the pterygoid contacts the parasphenoid. In ventral view, the anterior edge of the cultriform process of the parasphenoid is dramatically truncated (similar to the condition seen in *R. manu*); in other species it is relatively more acuminate with *R. veraguensis* displaying the most acuminate condition. The vomers are robust in *R. veraguensis* and have distinctive postchoanal and prechoanal processes; whereas, in *R. yanachaga, R. chavin R. manu*, and *R. multiverrucosa*, the vomers are more slender and lack well-developed postchoanal processes.

In lateral view (Fig. 7C), *R. yanachaga* has a relatively shallow braincase similar to that of *R. veraguensis* (compared to the relatively deep skulls of *R. chavin* and *R. multiverrucosa*). As with all members of the *R. veraguensis* Group, the posterior part of the braincase, including the occipital condyles, extends well beyond the posterior edge of the jaw symphysis; columellae are present and columnar. The quadratojugals of *R. yanachaga* are relatively small like those of *R. veraguensis* and *R. manu* (compared to the relatively robust quadratojugals of *R. chavin* and *R. multiverrucosa*). Unlike other members of the *veraguensis* Group, the anteroventral edge of the nasal of *R. yanachaga* abuts the anterior edge of the maxilla.

Distribution and ecology. *Rhinella yanachaga* is only known from the Cordillera Yanachaga in the National Park Yanachaga Chemillén (Fig. 5). This park contains the Cordillera de Yanachaga that reaches an elevation of 3643 m, and descends into the valley of the Río Palcazu. The park extends westward to the Cordillera de Santa Bárbara reaching an elevation of 3400 m and is separated from the Cordillera de Yanachaga by the deep canyon of the Río Huancabamba. Thus, *Rhinella yanachaga* occurs in a protected region that encompasses forested slopes of the Andes. The type locality is reached from Oxapampa by trail, as described in Hedges (1990). Habitat at the type locality is cloud forest with a thick layer of moss covering the ground and tree trunks. Three specimens (RMNH 27069, USNMFS 171095, 1710096), were collected between 29 June and 1 July 1987 at night. One adult male (USNMFS 171096) was found beneath a layer of moss and dirt about 10–20 cm below the surface on the side of the trail. The other (USNMFS 171095) was found resting on the tops of leaves (ca. 50 cm above the ground) along the trail. Other specimens were found in trees (J. Icochea, personal communication). Syntopic species include *Phrynopus bracki, Pristimantis mendax,* and *P. sag-ittulus*.

One gravid female (MHNSM 24510, SVL 45.7 mm) was dissected and contained 136 (left ovary: 66; right ovary: 70) unpigmented eggs, which are pale orange in preservative, similar to those of *Pristimantis* or *Phrynopus*. The call and tadpole of *R. yanachaga* are unknown.

Etymology. The specific name *yanachaga* is derived from Quetchuan and means black. The name is used as a noun in apposition and refers to the Cordillera Yanachaga where the new species was found.

Discussion

Although new species are frequently discovered and tentatively assigned to the *veraguensis* Group, there is still a distributional gap of about 400 km separating species from central and southern Peru (see Fig. 2 in Lehr et *al.* 2001), and a gap of about 450 km separating *R. arborescandens* in northern Peru from members in central Peru. Therefore, it is very likely that additional new species will be discovered when the herpetological

diversity of this region is thoroughly surveyed. *Rhinella yanachaga* shares with other members of the *vera-guensis* Group (e.g., *R. chavin, R. multiverrucosa*) the presence of unpigmented, yolky eggs. Eggs usually lack pigmentation when they are not exposed to sunlight (Duellman & Trueb 1986). Reproductive mode is unknown for most of the species of the *veraguensis* Group and tadpoles have not been described except for *R. veraguensis* (Cadle & Altig 1991), whose tadpole develops in streams and has typical adaptations such as ventral suctorial disk and high density of labial teeth with no broken rows (Cadle & Altig 1991). The absence of tadpoles for other species of the *veraguensis* Group may indicate possible direct development.

In male *R. yanachaga* the cloaca is more protuberant and ventrally oriented, whereas females have a laterally oriented, less protuberant cloaca. This may indicate internal fertilization, which has been reported in several species of bufonids including *Mertensophryne micranotis, Metaphryniscus sosae, Nimbaphrynoides liberiensis,* and *N. occidentalis,* as well as several species in the genus *Nectophrynoides. Mertensophryne micranotis* males have modified cloacas that may have an intromittent function (Grandison, 1980). Another sexually dimorphic character which has not been recorded for any other member of the *veraguensis* Group is hypertrophied arms in *R. yanachaga* males (Fig. 3). Hypertrophied arms are known for males of several anuran genera (e.g., *Hypsiboas, Leptodactylus*) and are used in male combat or amplexus.

Acknowledgments

The senior author thanks J. C. Chaparro, I. De la Riva, and J. Padial for permitting us to review their specimens and for providing information. We thank J. R. Mendelson III for reviewing our manuscript. Portions of this research were supported by a postdoctoral research grant given to E. Lehr by the Alexander von Humboldt-Foundation. S. B. Hedges is grateful to Antonio, Cecilia, and Willi Brack for their hospitality and logistical support during his stay in Peru. Pedro Aguilar and Luis Vajda assisted in the field; Nelly Carrillo, Anthony Luscombe, Victor Morales, and Antonio Salas gave assistance while in Lima. Lily Rodríguez was instrumental in providing the opportunity to visit Parque Nacional Yanachaga-Chemillén. Collecting and export permits were obtained from the Direccion General Forestal y de Fauna, Ministerio de Agricultura de Peru; and Roy McDiarmid offered helpful advice.

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Appendix: Specimens examined

Rhinella chavin: PERU: HUÁNUCO: Palma Pampa, 3010 m: MHNSM 20028 (holotype), MTD 42758–61, 44318, 44753, 43788–801, SMF 80001–008 (paratypes).

Rhinella manu: PERU: CUZCO: near Tres Cruces, 2750 m: MHNC 3005 (holotype).

Rhinella multiverrucosa: PERU: PASCO: NW Auquimarca, 2900 m: MHNSM 17820 (holotype), MHNSM 17836, MHNSM 20653–56, MTD 44747–49, 44751 [skeleton], all paratypes.

Rhinella veraguensis: KU 164084: PERU: CUZCO (skeleton).