Copeia, 2003(2), pp. 379–383

New Species of *Phrynohyas* from Atlantic Rain Forest of Southeastern Brazil (Anura, Hylidae)

José P. Pombal Jr., Célio F. B. Haddad, and Carlos Alberto Gonçalves Cruz

A new species of hylid frog is described from south of the State of São Paulo, southeastern Brazil in Atlantic rain forest. The new species is a member of the genus *Phrynohyas* and is characterized by snout rounded in dorsal view and nearly truncate in lateral view, small adhesive disks, fingers slightly webbed, nasal bones widely separated, and frontoparietals without medial articulation.

Uma nova espécie de hilídeo é descrita do sul do Estado de São Paulo, na Floresta Atlântica no sudeste do Brasil. A nova espécie é membro do gênero *Phrynohyas* e é caracterizada pelo focinho redondo em vista dorsal e levemente truncado em vista lateral, discos adesivos pequenos, dedos levemente palmados, ossos nasais largamente separados e frontoparietais sem articulação medial.

THE genus *Phrynohyas* Fitzinger, 1843, was ressurected for the hylid frog *Hyla venulosa* (Laurenti) and close related species (Duellman, 1956). McDiarmid (1968), in a detailed analysis of populations, shows the great morphological variation of *Phrynohyas venulosa*, and Duellman (1971) recognized only four species for this genus. Further, Lescure (1976) and Zimmerman and Hödl (1983) recognized *Phrynohyas resinifictrix* (Goeldi) as distinct from *P. venulosa*. Treefrogs of the genus *Phrynohyas* occur from the lowlands of Mexico and Central and South America east of the Andes, south to northern Argentina (Duellman, 1971; Frost, 1985). The species of *Phrynohyas* presently recognized are: *Phrynohyas coriacea* (Peters, 1867), *Phrynohyas imitatrix* (Miranda-Ribeiro, 1926), *Phrynohyas mesophaea* (Hensel, 1867), *P. resinifictrix* (Goeldi, 1907), and *P. venulosa* (Laurenti, 1768) (Frost, 1985). Herein, we describe a new species of *Phrynohyas* from the Atlantic rain forest of south São Paulo State, Brazil.

Materials and Methods

Specimens used in the description or examined for comparison are in AL-MN (Adolpho Lutz collection, deposited in Museu Nacional, Rio de Janeiro, Brasil), CFBH (Célio F. B. Haddad collection, deposited in Departamento de Zoologia, Universidade Estadual Paulista, Rio Claro, Brasil), MNHN (Museo Nacional de Historia Natural, Uruguay), MNRJ (Museu Nacional, Rio de Janeiro, Brasil), MZUSP (Museu de Zoologia, Universidade de São Paulo, São Paulo, Brasil), WCAB (Werner C. A. Bokermann collection, São Paulo, Brasil, now in MZUSP), ZUEC (Museu de História Natural, Universidade Estadual de Campinas, Brasil).

Abbreviations used are as follow: SVL (snout–vent length), HL (head length), HW (head width), ED (eye diameter), IOD (interorbital distance), END (eye–nostril distance), TD (tympanum diameter), THL (thigh length), TBL (tibia length), and FL (foot length). All measurements are expressed in millimeters and were made with calipers following mainly Cei (1980) and Duellman (1970). Webbing formula notation follows Savage and Heyer (1967). Drawings of the holotype and cranium were rendered using a Zeiss stereomicroscope with a drawing tube.

Phrynohyas lepida sp. nov.

Holotype.—MNRJ 17464, adult male, collected at the Carmo, Parque Estadual de Intervales (approximately 24°00′S, 48°20′W), Municipality of Capão Bonito, State of São Paulo, Brasil, on 4 March 1994 by Caio G. Machado.

Paratype.—CFBH 2447 (cleared and stained), adult female, collected at the Parque Estadual Carlos Botelho (between 24°00′S and 24°15′S; 47°45′W and 48°10′W), Municipality of Sete Barras, State of São Paulo, Brasil, on December 1993 by F. L. Souza and C. B. Hermanson.

Diagnosis.—A small species of *Phrynohyas* (SVL male 49.1; female 58.7 mm) characterized by snout rounded in dorsal view and nearly truncate in lateral view; small adhesive disks; fingers slightly webbed; skin on dorsum tuberculate; nasal bones widely separated; frontoparietals without medial articulation.

Comparison with other species.—*Phrynohyas lepida* is distinguished from *P. coriacea*, *P. imitatrix*, *P. me-*

Fig. 1. Dorsal view of the holotype (MNRJ 17464) of *Phrynohyas lepida*.

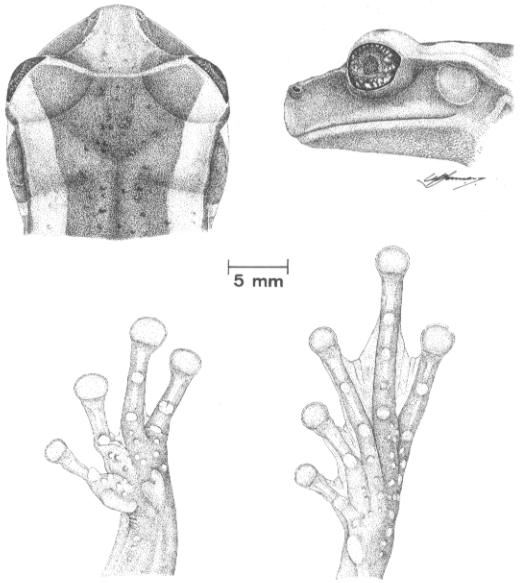

Fig. 2. *Phrynohyas lepida*, MNRJ 17464 (holotype). Upper left dorsal and upper right lateral views of head; bottom left hand and bottom right foot ventral views.

sophaea, *P. resinifictrix*, and *P. venulosa* by its small size (combined SVL male 51.6–92.5 mm, Duellman, 1971; Goeldi, 1907; Lutz, 1973) and by its extensive axillary membrane. *Phrynohyas lepida* is distinguished from *P. coriacea*, *P. imitatrix*, and *P. venulosa* by its largest loreal region and well-marked canthus rostralis. The new species differs from *P. imitatrix*, *P. mesophaea*, and *P. venulosa* by its nasal bones being widely separated (see Duellman, 1971). The new species differs from *P. coriacea* by having few granules on the belly (granules well developed in *P. coriacea*). *Phrynohyas lepida* differs from *P. coriacea*, *P. mesophaea*, and *P. resinifictrix*, by its distinctive color pattern (see figure of *P. coriacea* in De La Riva, 1990 and Rodriguez and Duellman, 1994; *P. imitatrix* in Cochran, 1955; *P. resinifictrix* in Goeldi, 1907). *Phrynohyas lepida* differs from all species of the genus by having more slender fingers, toes, and body; furthermore, its fingers are only slightly webbed (more extensively webbed in others species).

Description of holotype.—Body slender (Fig. 1); head wider than body and slightly wider than long; snout short, rounded in dorsal view and nearly truncate in lateral view (Fig. 2A–B); nostrils protruding, directed laterally; canthus rostralis distinct, rounded; loreal region concave; eye large, protruding; tympanum large, rounded, slightly larger than adhesive disk of finger III; distinct supratympanic fold from posterior corner of orbit to shoulder; vocal sac small, paired, posterolateral to angles of jaws, externally expanded; tongue large, shallow and notched posteriorly, barely free behind; dentigerous processes of prevomers curved, between choanae; choanae large, elliptical, oblique. Forearm robust, arm slender, with extensive axillary membrane (Fig. 1); fingers slender, medium-sized; subarticular tubercle single, conical on fingers I–III; on finger IV, distal tubercle bifid, proximal tubercle elliptical; outer palmar tubercle large, bifid; inner palmar tubercle large, elliptical; numerous palmar supranumerary tubercles; finger disks large, nearly rounded; disk on finger I smaller than others (Fig. 2C); fingers slightly webbed; webbing formula I trace II 2^{-}–2^{+} III 2.2/3–1.2/3 IV. Legs moderately slender; toes moderately long; inner metatarsal tubercle ovoid; outer metatarsal tubercle absent; subarticular tubercles single, rounded on toe I, and conical on the others, slightly smaller than those of fingers; toe disks rounded; disk on toe I smaller than others (Fig. 2D); webbing formula I 1.1/4–1.1/4 II 1.1/4–2^{-} III 1.1/4–2^{-}–IV 2–1 V. Skin on dorsum and tibia tuberculate; undersurfaces granular.

Color of holotype in preservative.—Dorsum dark brown with a pale brown dorsolateral band from eyelid to groin; skin on sphenethmoid and nasals pale brown; in posterior part of dorsum, dark brown pattern broken by a pale brown band; laterally a dark brown band from tip of snout through the tympanum, ending on middle of flank; vent dark brown; upper surfaces of arms dark brown; upper surfaces of legs dark brown with pale brown spots on thigh and heel; upper surfaces of feets pale cream on toes I–III

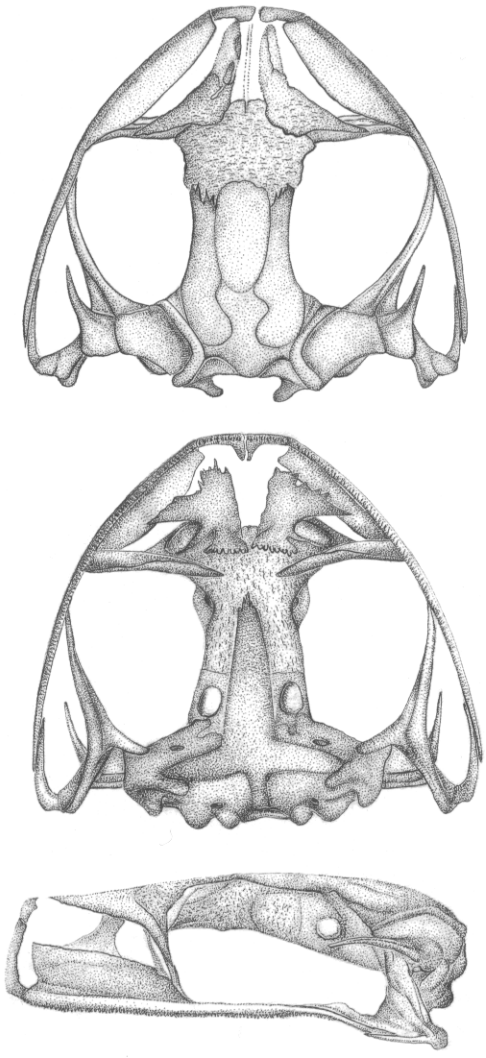

Fig. 3. (Upper) dorsal, (middle) ventral, and (bottom) lateral views of cranium of *Phrynohyas lepida* (paratype CFBH 2447). Scale = 5 mm.

and dark brown on IV–V. Venter pale brown; axillary membrane and undersurfaces of thigh, tibia, fingers, and toes I–III cream; throat, undersurfaces of arms, and external parts of hands and feet brown.

Color of holotype recently preserved.—Dorsum and upper surfaces of arms and legs dark brown; dorsolateral band, posterior band, and spots on thigh and heel silver-grey; upper surfaces of toes I–III red; upper surfaces of finger IV and toes IV–V dark brown. Venter reddish-brown; axillary membrane rose; undersurfaces of thigh, tibia, toes I–III, and fingers red; under surfaces of arms and toes IV–V dark brown; throat reddish-brown.

Measurements.—Male (holotype) followed by female (paratype): SVL 49.1, 58.7; HL 15.9, 20.7; HW 16.7, 20.1; ED 5.2, 6.4; IOD 6.1, 6.5; END 5.7, 5.5; TD 3.4, 3.2; THL 26.2, 32.5; TBL 28.5, 33.1; FL 25.1, 28.8.

Cranial osteology.—Based on CFBH 02447 (paratype; adult female, cleared and stained; Fig. 3): cranium length 18.6; cranium width 21.1; cranium height 10.8. Cranium 1.13 times wider than long, widest at posterior end of maxillae. Premaxillae straight; maxillae slightly curved; pedicellate teeth; premaxillae with alae well-developed, projecting dorsally; premaxillae articulated, not fused medially; pars dentalis of each premaxillae bears approximately 15 teeth; alary process approximately equals premaxilla length; each maxilla bears approximately 70 pedicillate teeth; pars facialis of maxilla expanded in its first half; each maxilla not articulating with maxillary process of nasal; laterally, posterior terminus of maxilla invests on approximately on half of length of quadratojugal. Neopalatines long, slender, bearing a ventral crest, not meeting medially; distal one-third of each neopalatine invests on ventral surface of sphenethmoid and terminates in a slender tip; lateral terminus of each neopalatine dorsally invests on pars palatine of maxillae. Vomers paired, ventrally invests with the nasal capsules and the anterior sphenethmoid; vomers positioned obliquely with respect to the midline of cranium and not articulated along their medial margins; ventral surfaces of anterior and lateral processes of each vomer not invested with pars palatine of premaxilla and maxilla, but lateral process invests with pars facialis of maxilla; each vomer with a triangular dentigerous process bearing approximately 9–11 teeth, projecting ventrally anterior to margin of sphenethmoid; vomer not articulate with neopalatines. Sphenethmoid weakly ornamented; its anterior margins lie under approximately midlevel of nasals dorsally and under vomer dentigerous processes ventrally; posterodorsally, sphenethmoid bordered by frontoparientals and fontanella; posteroventrally, the sphenethmoid terminates at about mid-level of orbit. Parasphenoid tetraradiate terminates anteriorly in fragmented tip, and its anterior half ventrally invests half way under sphenethmoid; lateral alae approximately half length of cultriform process length; alae laterally invest medial to prootic; posteriorly, parasphenoid with an extension to edge of foramen magnum. Exoccipital and prootic fused,

without visible sutures; anterodorsally form posterior margin of fontanella and invest under posterior half of frontoparietal; anterolaterally these form posterior border of optic capsule and laterally its crista parotica is fused with the otic plate of squamosal; occiptical condyles developed and oriented to fit the type I (Trueb, 1973). Frontoparientals slender, separated by fontanella; anteriorly its fragmented end invests on sphenethmoid. Nasals slender, curved and fragmented anteriorly, weakly ornamented; each nasal overlies nasal capsule, as well as anterior sphenethmoid; posterior margin of nasals forms anterior margin of orbit. Optic ramus of squamosal not developed; zygomatic ramus developed, not articulate; ventral ramus moderately developed; distally articulated with quadratojugal laterally and posterior ramus of pterygoid ventrally. Anterior ramus of pterygoid articulates with pars palatina of maxilla at level of first third of orbit; the relatively short medial ramus not touch the otic capsule, these two elements are attached by connective tissue; the long posterior ramus projects posterolaterally to articulate ventrally with ventral ramus of squamosal and quadratojugal. Quadratojugal moderately sized, extends anteriorly for approximately half-length of pterygoid fossa; anteriorly it broadly overlaps posterior end of maxilla.

Natural history.—The two known specimens of *P. lepida* were collected in the Atlantic rain forest of the southern State of São Paulo. The female was dead on the bank of a rivulet inside the forest. The male was in an epiphytic bromeliad (*Canistrum* sp.) 10 cm above the ground. Tadpoles and vocalizations are unknown.

Etymology.—The specific name is a Latin adjective (*lepidus*), meaning elegant, fine.

Comments.—Some features observed in the new species, like frontoparietals without articulation, body slender, axillary membrane (also present in *P. imitatrix*), and reduced web in hands, are absent in the genus *Phrynohyas* (Duellman, 1971; pers. obs.).

Additional specimens examined.—*Argenteohyla siemersi*: MNHN 5425; WCAB 3379, 3389. *Osteocephalus langsdorffii*: CFBH 0847–48, 1062–66, 1093, 1385, 1390–91, 1443, 2098, 2102, 0068, 2647 (skeleton). *Osteocephalus subtilis*: CFBH 0057 (topotype). *Phrynohyas coriacea*: MNRJ 18672–73; MZUSP 60165, 63810–11. *Phrynohyas imitatrix*: MNRJ 0154 (lectotype), 5129 (paralectotype); MZUSP 52946–47, 34650. *Phrynohyas mesophaea*: CFBH 0067–69, 1067–68, 1161, 1435–38, 1767–68, 1822, 2645 (cleared and stained); MZUSP 3732–35, 12873–74, 15656–58, 54388–89, 63545–46. *Phrynohyas resinifictrix*: MZUSP 57345, 60119–22, 69929–31. *Phrynohyas venulosa*: CFBH 584, 0961–62, 939, 1338, 1492, 2212, 2497, 2646 (skeleton); MNRJ 4054 (holotype *Hyla adenoderma*); MZUSP 32017–33, 35736, 54796, 58662, 65626, 68636–37, 68732, 69854. *Trachycephalus atlas*: WCAB 30711, 33939 (paratypes); ZUEC 3747, 3915. *Trachycephalus nigromaculatus*: ZUEC 2892–94.

Acknowledgments

C. G. Machado, F. L. Souza, and C. B. Hermanson for collected the holotype and paratype; U. Caramaschi, P. Passos, and H. R. da Silva for constructive comments on the manuscript; J. Somera and P. R. Nascimento for the line drawings of the Figures 2 and 3, respectively; W. C. A. Bokermann, A. J. Cardoso, A. M. M. Ramos-Costa, and P. E. Vanzolini loaned and/or permitted the study of the material under their care. For financial support, we are grateful to the CNPq, FAPERJ, and FAPESP.

Literature Cited

Cei, J. M. 1980. Amphibians of Argentina. Monit. Zool. Ital. (N.S.). Monogr. 2:1–609.

Cochran, D. M. 1955. Frogs of southeastern Brazil. U.S. Nat. Mus. Bull. 206:1–423.

de la Riva, I. 1990. Lista preliminar comentada de los anfibios de Bolivia com datos sobre su distribución. Boll. Mus. reg. Sci. Nat. Torino 8:261–319.

Duellman, W. E. 1956. The frogs of the hylid genus *Phrynohyas* Fitzinger, 1843. Misc. Publ. Mus. Zool. Univ. Michigan 96:1–47 + 6 pl.

———. 1970. The hylid frogs of Middle America. Monog. Mus. Nat. Nat. Hist. Univ. Kans. 1:1–53.

———. A taxonomic review of South American hylid frogs, genus *Phrynohyas*. Occ. Pap. Mus. Nat. Hist. Univ. Kans. 4:1–21.

Frost, D. R. (ed.). 1985. Amphibian species of the world. A Taxonomic and Geographical Reference. Allen Press Inc., and Association of Systematics Collections, Lawrence, KS.

Goeldi, E. A. 1907. Description of *Hyla resinifictrix* Goeldi, a new Amazonian tree-frog peculiar for its breeding habitats. Proc. Zool. Soc. Lond. 1907:135–140.

Lescure, J. 1976. Contribution à l'étude des amphibiens de Guyane française. VI Liste préliminaire des anoures. Bull. Mus. Nat. Hist. Nat. 377 (Zool. 265):475–525.

Lutz, B. 1973. Brazilian species of *Hyla*. Univ. of Texas Press, Austin.

McDiarmid, R. W. 1968. Populational variation in the frog genus *Phrynohyas* Fitzinger in Middle America. Contrib. Sci. Los Angeles Co. Mus. 134:1–25.

Rodríguez, L. O., and W. E. Duellman. 1994. Guide

to the frogs of the Iquitos region, Amazonian Peru. Univ. Kans. Nat. Hist. Mus. Special Publ. 22:1–80 +12 pls.

SAVAGE, J. M., AND W. R. HEYER. 1967. Variation and distribution in tree-frog genus *Phyllomedusa* in Costa Rica, Central America. Beitr. Neotrop. Fauna 5: 111–131.

TRUEB, L. 1973. Bones, frogs, and evolution, p. 65–132. *In*: Evolutionary biology of the anurans. Contemporary research on major problems. J. L. Vial (ed.). Univ. of Missouri Press, Columbia.

ZIMMERMAN, B., AND W. HÖDL. 1983. Distinction of *Phrynohyas resinifictrix* (Goeldi, 1907) from *Phrynohyas venulosa* (Laurenti, 1768) based on acoustical and behavioural parameters (Amphibia, Anura, Hylidae). Zool. Anz. 211:341–352.

(JPP, CAGC) DEPARTAMENTO DE VERTEBRADOS, MUSEU NACIONAL/UFRJ, QUINTA DA BOA VISTA, 20940-040 RIO DE JANEIRO, RIO DE JANEIRO, BRASIL; AND (CFBH) DEPARTAMENTO DE ZOOLOGIA, INSTITUTO DE BIOCIÊNCIAS, UNIVERSIDADE ESTADUAL PAULISTA, C.P. 199, 13506-900 RIO CLARO, SÃL PAULO, BRASIL. E-mail: (JPP) pombal@acd.ufrj.br. Send reprint requests to JPP. Submitted: 23 May 2002. Accepted: 1 Nov. 2002. Section editor: C. Guyer.