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HYLA LUCTUOSA, A NEW TREEFROG FROM SOUTHEASTERN BRAZIL (AMPHIBIA: HYLIDAE)

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ABSTRACT: A new species of treefrog, *Hyla luctuosa*, is described from the Serra do Japí in southeastern Brazil. The new species is a member of the *Hyla circumdata* group characterized by large size, large tympanum, and rounded subarticular tubercles on the fingers. Descriptions of the tadpole and advertisement call and information on natural history are provided.

Key words: Anura; Atlantic Forest; Advertisement call; *Hyla luctuosa* new species; Southeastern Brazil; Tadpole

TREEFROGS in the *Hyla circumdata* group are considered as restricted to southeastern Brazil (Frost, 1985). This group is characterized by species with a well developed prepollex, posterior face of thigh with dark vertical stripes (Heyer, 1985), head generally wider than long, and hypertrophied forearm in males. The species presently allocated to the *H. circumdata* group are: *Hyla astartea* Bokermann, *H. carvalhoi* Peixoto, *H. circumdata* (Cope), *H. fernandoi* Caramaschi and Bernardes, *H. gouveai* Peixoto and Cruz, *H. hylax* Heyer, *H. ibitiguara* Cardoso, *H. ibitipoca* Caramaschi and Feio, *H. izecksohni* Jim and Caramaschi, *H. martinsi* Bokermann, *H. nanuzae* Bokermann and Sazima, and *H. sazimai* Cardoso and Andrade (Caramaschi and Feio, 1990).

During a survey of the anuran fauna of the Serra do Japí in the State of São Paulo, in southeastern Brazil, we collected specimens of a new species of the *Hyla circumdata* group, described herein.

MATERIALS AND METHODS

Vocalizations were recorded with a Uher 4000 report monitor tape recorder and a Uher M538 microphone at tape speed of 19 cm/s. The tapes were analyzed on a UNISCAN II sound spectrograph. Specimens used in the description or examined for comparisons are in JJ (Jorge Jim collection, Departamento de Zoologia, UNESP "Campus de Botucatu", São Paulo, Brazil); MN (Museu Nacional, Rio de Janeiro, Brazil); MZUSP (Museo de Zoologia, Universidade de São Paulo, São Paulo, Brazil); WCAB (Werner C. A. Bokermann collection, São Paulo, Brazil); and ZUEC (Museu de História Natural, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil). Webbing formula notation follows Savage and Heyer (1967); tooth row formula notation of tadpole follows Altig (1970). Measurements are in millimeters.

Abbreviations used in the account are: SVL (snout–vent length), HL (head length), HW (head width), IND (internarial distance), ED (eye diameter), IOD (interorbital distance), END (eye–nostril distance), TD (tympanum diameter), THL (thigh length), TBL (tibia length), and FL (foot length).

Hyla ***luctuosa*** sp. nov.

Holotype.—ZUEC 9159, an adult male, collected near a water reservoir of the Departamento de Águas e Esgotos (DAE) in the Serra do Japí, município de Jundiaí (approximately 23°13′ S, 46°48′ W; 870 m above sea level), São Paulo, Brazil, on 29 November 1987 by José P. Pombal, Jr. and Célio F. B. Haddad.

Paratypes.—MNRJ 15458, adult male, collected on 5 December 1988 by C. F. B. Haddad; MZUSP 68945, adult male, collected on 8 December 1983 by C. F. B. Haddad and J. P. Pombal, Jr.; ZUEC 5949,

adult male, collected at Fazenda da Cava, Serra do Japí, municipality Cabreúva, on 21 November 1984 by J. P. Pombal, Jr., G. V. Andrade, and N. Figueiredo; ZUEC 9160, adult male, collected with the holotype; ZUEC 9161, adult female, collected on 18 December 1981 by J. P. Pombal, Jr. and I. Sazima; ZUEC 9171, adult female, collected on 5 December 1988 by C. F. B. Haddad.

Diagnosis and comparison with other species.—A large, robust species (Fig. 1; males 55.0–60.6 mm SVL) belonging to the *H. circumdata* group, characterized by indistinct vocal sac, large tympanum, hypertrophied forearm in males, and rounded subarticular tubercles on the fourth and fifth fingers.

By its large size, *Hyla luctuosa* is distinguished from *H. astartea, H. fernandoi, H. ibitiguara, H. ibitipoca, H. izecksohni, H. nanuzae,* and *H. sazimai* (SVL = 29.0–47.8, Bokermann, 1967; Bokermann and Sazima, 1973; Caramaschi and Bernardes, in press; Caramaschi and Feio, 1990; Cardoso, 1983; Cardoso and Andrade, 1982; Jim and Caramaschi, 1979). The new species differs further from *H. astartea* by its larger tympanum. From *H. ibitiguara, H. ibitipoca, H. nanuzae,* and *H. sazimai,* it differs by its larger tympanum, smaller vocal sac, and the presence of nuptial pads. *Hyla luctuosa* is distinguished from *H. izecksohni* by the presence of vocal slits, better developed supratympanic fold, hypertrophied forearm, and presence of nuptial pads. From *Hyla carvalhoi,* the new species differs by its larger tympanum, and vertical well defined dark bars on thighs (dark bars fragmented and irregularly arranged in *H. carvalhoi*; Peixoto, 1981). The new species differs from *H. circumdata* by its smaller size (SVL 63.0–64.6 in males of *H. circumdata, n* = 3), tympanum closer to the eye, and rounded subarticular tubercles on fourth and fifth fingers (bilobed in *H. circumdata*). From *H. gouveai,* the new species differs by its smaller size (SVL 58–69 in both sexes of *H. gouveai*: Peixoto and Cruz, in press) and by the presence of vertical stripes on the thighs. From *H. hylax,* the new species differs by its larger tympanum, flanks with indistinct dark vertical stripes (distinct in *H. hylax*), and by differences in the advertisement call (Heyer, 1985). The new species differs from *H. martinsi* by its larger tympanum, differences in the advertisement call, and uniform color on the dorsum (dorsum is mottled in *H. martinsi*: Bokermann, 1964).

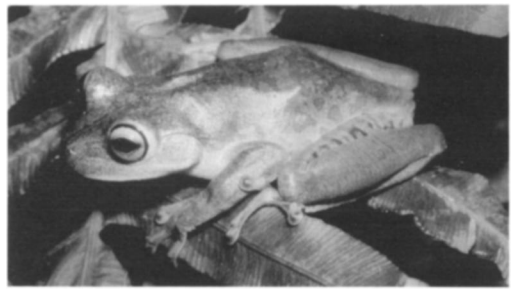

FIG. 1.—*Hyla luctuosa,* adult male in life.

Description of holotype.—Body robust; head slightly wider than long; snout short, its shape rounded in dorsal and lateral views (Fig. 2A,B); nostrils slightly protuberant, directed laterally; canthus rostralis distinct, rounded; loreal region slightly concave; eye large, protruding; tympanum large, nearly elliptical; distinct supratympanic fold from posterior corner of orbit to shoulder; vocal sac not expanded externally; vocal slits present; tongue large, notched behind; vomerine teeth in two contiguous series, chevron-like, between and behind choanae anteriorly; choanae small, separated. Forearm hypertrophied; small crest along lateral edge of forearm to base of disk on fourth finger; prepollex well developed with curved spine not exposed; fingers robust, subarticular tubercles single, rounded; numerous small supernumerary tubercles; finger disks large, nearly rounded; webbing formula, I trace II2^{-}-3^{+} III2½-2^{-}IV (Fig. 2C); brown nuptial pad on base of prepollex and between base of thumb and prepollex. Legs moderately robust; inner tarsal fold distinct; foot with ovoid, inner metatarsal tubercle (Fig. 2D); subarticular tubercles single, rounded; supernumerary tubercles small; webbing formula, I2^{-}-2^{+}II1-2½III1-2^{-}IV2^{+}-1V; toe disks large, nearly rounded, slightly smaller than finger disks. Dor-

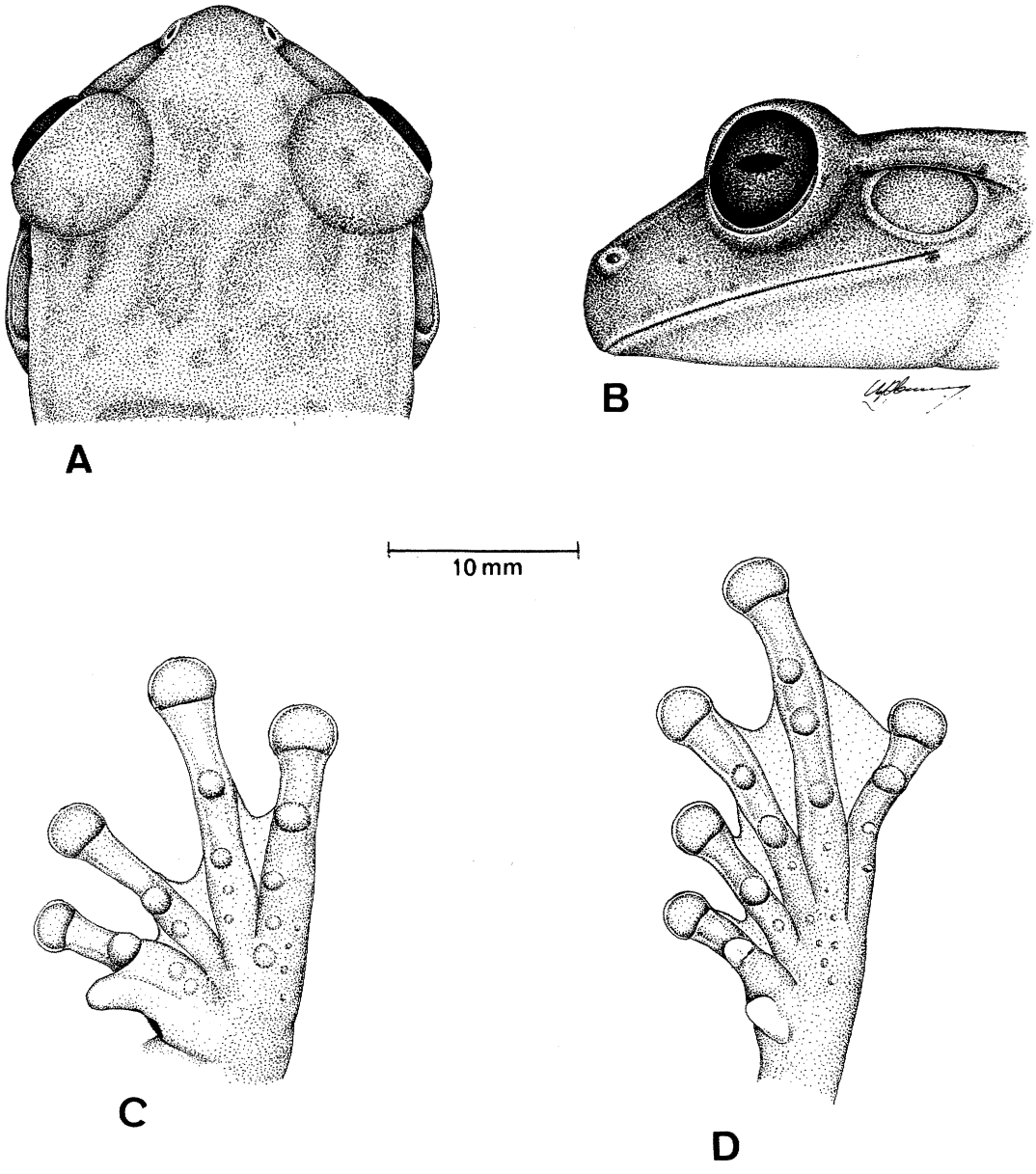

FIG. 2.—*Hyla luctuosa*, ZUEC 9159 (holotype). (A) Dorsal and (B) lateral views of head; ventral views of (C) hand and (D) foot.

sal and throat texture smooth; belly and undersurfaces of thighs, and anal region glandular.

Color in preservative of the holotype.—Dorsum brown with darker transverse bars and blotches without distinct pattern; distinct grayish brown spots on dorsum and stain on elbow, heel, and above anus; flanks pale cream, without distinct dark vertical stripes; posterior face of thigh brown with distinct black vertical stripes; belly cream; throat slightly grayish.

Measurements of the holotype.—SVL 55.0; HL 19.2; HW 20.5; ED 5.2; IND 4.0; IOD 6.5; END 4.5; TD 4.4; THL 29.6; TBL 29.8; FL 25.5.

Variation.—In preservative, dorsum brown to grayish brown; some specimens

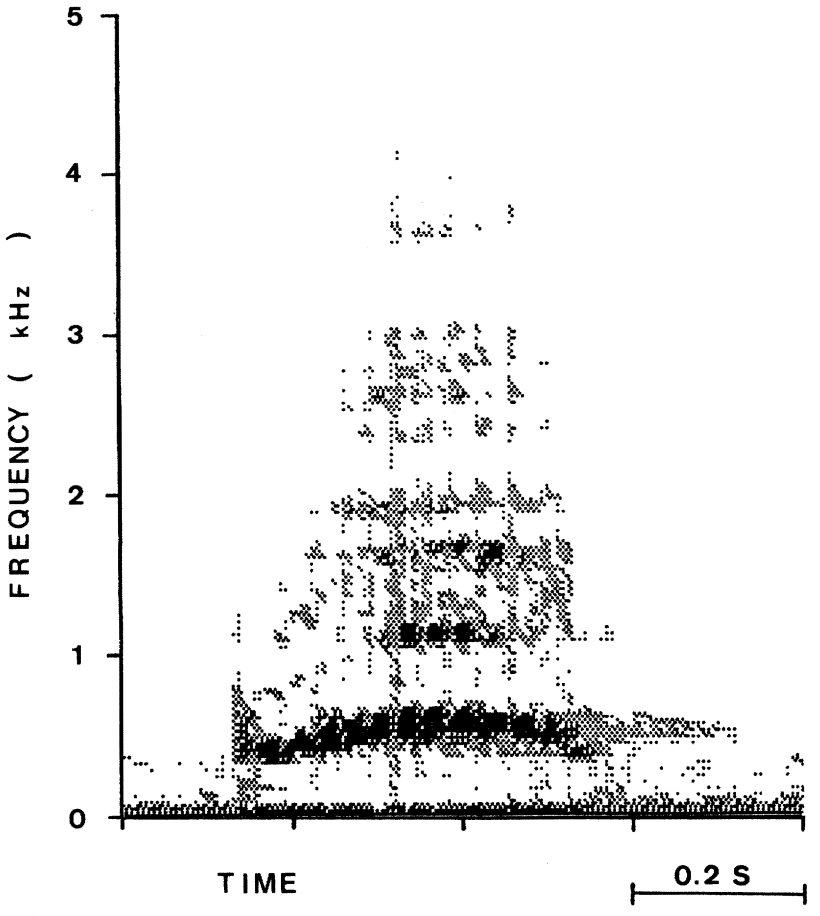

FIG. 3.—Advertisement call of *Hyla luctuosa*, recorded in the laboratory on 30 December 1988; air temperature = 24 C.

without distinct brown grayish spots on dorsum and stain on elbow, heel, and above anus; slight variation in webbing formula and size and shape of supernumerary tubercles. Measurements (mean, range) of five males, followed by two females in parenthesis: SVL 57.5, 55.0–60.6 (53.75, 52.5–55.0); HL 19.74, 19.2–20.5 (18.55, 17.9–18.7); HW 21.18, 20.5–21.8 (18.6, 18.1–19.2); IND 3.98, 3.7–4.4 (3.9, 3.7–4.1); ED 5.2, 5.1–5.3 (5.25, 5.2–5.3); IOD 7.14, 6.5–7.8 (6.05, 5.2–6.4); END 5.46, 4.5–5.7(4.7, 4.7); TD 4.78, 4.4–5.0 (4.45, 4.2–4.7); THD 30.64, 28.8–33.3 (27.3, 25.5–29.1); TBL 30.72, 28.9–34.0 (27.3, 25.6–29.0); FL 26.26, 25.2–28.5 (23.2, 21.9–24.5).

Advertisement call.—Calls are given sporadically. Analysis of one recording reveals a duration of about 0.60 s, pulsed, pitch of approximately 0.3–4.0 kHz, and dominant frequency of 0.3–1.8 kHz, apparently with harmonic structure and frequency modulation (Fig. 3).

Karyotype.—Two males from the type locality had 2N = 24, and two other males and one female had 2N = 25 (one supernumerary chromosome) (*Hyla* sp. in Baldissera et al., 1991). The karyotype is characterized by metacentric and submetacentric chromosomes, and there is a secondary constriction near the telomere of the long arm of pair 11 (Baldissera et al., 1991). Meiotic analysis of males with 2N = 24 showed 12 bivalent chromosomes, and males with 2N = 25 had 12 bivalent chromosomes and one univalent supernumerary chromosome (Baldissera et al., 1991).

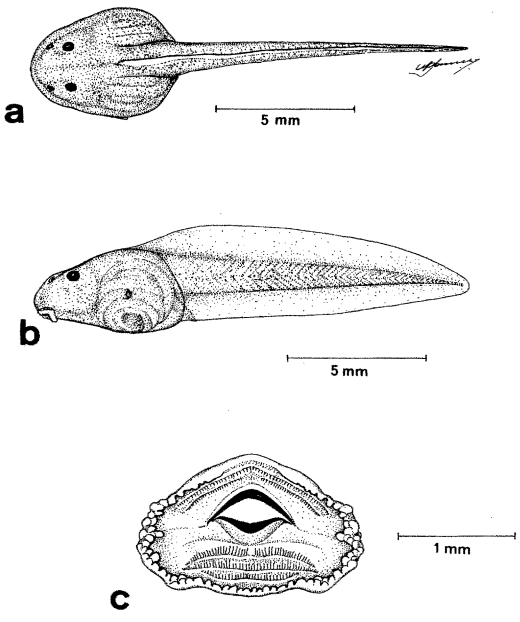

FIG. 4.—Larval *Hyla luctuosa*, stage 25: (a) dorsal and (b) lateral views; (c) mouth.

Tadpoles.—Larvae reared in the laboratory were obtained from eggs collected in a small water-filled depression (7 cm diameter). The following description is based on a tadpole in developmental stage 25 (Gosner, 1960).

Total length 14.9 mm; body length 5.0 mm; body in dorsal view (Fig. 4a) ovoid, widest posteriorly; body in lateral view elliptical (Fig. 4b); body wider than high; snout rounded; eyes small, lateral; nostrils about midway between the eyes and tip of snout, directed upwards; spiracle sinistral, its opening on midline at posterior part of body; cloacal tube short, conical, opening dextral. Caudal musculature robust, gradually tapering to pointed tip; dorsal fin originating on body; dorsal fin higher than the ventral.

Oral disc large (Fig. 4c), directed ventrally and bordered by one or two rows of small papillae, interrupted on a small area on the anterior border; tooth row formula 2 (2)/3 (1); upper and lower beaks moderately heavy, finely serrate; lower beak v-shaped.

Color in preservative: dorsum of body brown; throat and belly transparent. Caudal musculature with scattered brown pigmentation; fins translucent.

In the *H. circumdata* group, only the following five tadpoles are described: *H. carvalhoi*, *H. circumdata* (Peixoto, 1981), *H. ibitiguara* (Cardoso, 1983), *H. nanuzae* (Bokermann and Sazima, 1973), and *H. sazimai* (Cardoso and Andrade, 1982). The tooth row formula and the configuration of the marginal disc papillae distinguish the tadpole of *H. luctuosa* from those of *H. carvalhoi*, *H. ibitiguara*, *H. nanuzae*, and *H. sazimai*. There are two color patterns for tadpoles in the *H. circumdata* group. *Hyla circumdata* and *H. luctuosa* present grayish-brown tadpoles and the others present blackish tadpoles. The tadpole of *H. luctuosa* is distinguished from those of *H. circumdata* by the absence of lateral lines and by larger caudal fins.

Natural history.—Adults were reproducing in December 1988 and January 1989. They were observed at night on vegetation near temporary ponds or, rarely, on the ground near the water reservoir. Males were on the ground or perched on the vegetation ranging 150 cm above the ground ($\bar{x}$ = 66.18 cm, SD = 58.66, n = 11). Males vocalized sporadically, most reproductive activity was after midnight. When handled, young frogs emitted distress calls with mouth opened widely. Males, females, and young were observed during the night on vegetation, near fast rivulets after the reproductive season. Males jabbed their prepollical spine into the collector's hand when handled.

One egg clutch was in a water filled depression in the ground, approximately 0.5 m from the water reservoir; a second clutch was in a temporary pond near a rivulet. The ova ($\bar{x}$ = 1.79 mm in diameter, SD = 0.08, n = 8) in large gelatinous capsules ($\bar{x}$ = 4.95 mm in diameter, SD = 0.26, n = 8), are free and submerged. Numbers of mature ovarian eggs in two females were 396 and 613. The occurrence of mature ovarian eggs with small eggs suggests two or more clutches per female during the reproductive season.

Distribution.—The new species is known from the type locality in the Serra do Japí in the municipalities of Jundiaí, Cabreúva, and Campinas, São Paulo, in southeastern Brazil. One specimen from the municipality of Ribeirão Branco, São

Paulo, is like the new species, except by its larger size (SVL = 65.6 mm).

Etymology.—The specific name, a Latin adjective (luctuosus = sad), is an allusion to the mournful calls heard late in the night.

Additional specimens examined.—*Hyla astartea* MZUSP 2820–21, 22511, 34585–87, 34592–93, WCAB 1019 (holotype); *H. carvalhoi* MZUSP 60594 (topotype), ZUEC 7191 (topotype); *H. circumdata* MZUSP 3871–94, 30904, 34574–75, WCAB 1578, 2463, 7823, 7824, 17303, 34884 (topotypes); *H. gouveai* ZUEC 6902 (holotype) 5250–53, 6896–901, 6903–05 (paratypes); *H. hylax* MZUSP 59937 (holotype), 2357, 2535–41, 4030–31, 54499–501 (paratypes), ZUEC 6421 (topotype), 6467, 7043, 8422; *H. ibitiguara* ZUEC 4207–4211 (paratype); *H. ibitipoca* MZUSP 66100–01 (paratypes), ZUEC 6823–6824 (paratypes); *H. izecksohni* JJ 1284, 1288, 1290, 3403 (paratypes), MZUSP 50178 (holotype), 50179 (paratype); *H. martinsi* ZUEC 3439; *H. nanuzae* ZUEC 1552 (ex. WCAB 47536), 1679 (ex. WCAB 47537) (paratypes); *H. sazimai* ZUEC 4194–4196, 4199, 4200, 4212, 4213 (paratypes).

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