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New Species of *Crossodactylus* (Anura: Leptodactylidae) from the Atlantic Rain Forest of Southeastern Brazil

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A new species of leptodactylid frog, *Crossodactylus caramaschii*, is described from the southern part of the state of São Paulo, southeastern Brazil. The new species, a member of the *Crossodactylus gaudichaudii* group, is characterized by having a short snout, a distinct and straight canthus rostralis, and reticulated belly.

THE genus *Crossodactylus* Duméril and Bibron, 1841, occurs from northeastern to southern Brazil and northern Argentina (Frost, 1985; Carcerelli and Caramaschi, 1993). Caramaschi and Sazima (1985) recognized three species groups in the genus *Crossodactylus*: *C. gaudichaudii* group, *C. trachystomus* group, and *C. schmidti* group (*Crossodactylus schmidti* was consistently misspelled in Caramaschi and Sazima, 1985). The species of the *Crossodactylus gaudichaudii* group are as follows: *C. gaudichaudii* Duméril and Bibron, *C. aeneus* Müller, *C. bokermanni* Caramaschi and Sazima, *C. lutzorum* Carcerelli and Caramaschi, and *C. dantei* Carcerelli and Caramaschi. *Crossodactylus trachystomus* (Reinhardt and Lütken), *C. dispar* A. Lutz, and *C. grandis* B. Lutz belong to the *C. trachystomus* group, and *C. schmidti* Gallardo is the only known species of its group (Carcerelli and Caramaschi, 1993; Duellman, 1993). Herein, we describe a new species of the *Crossodactylus gaudichaudii* group (as defined in Caramaschi and Sazima, 1985) from the Atlantic rain forest of the state of São Paulo, southeastern Brazil.

MATERIALS AND METHODS

Vocalizations were recorded with a Nagra-E tape recorder and Senheiser ME 80 microphone at 19 cm/sec. Tapes were analyzed on a Macintosh classic coupled to MacRecord® Sound System 2.05 (64 points). Institutional abbreviations follow Frost (1985), except for CFBH (Célio F. B. Haddad collection, deposited in the Universidade Estadual Paulista, "campus" de Rio Claro, São Paulo, Brazil), and ZUEC (Museu de História Natural, Universidade Estadual de Campinas, São Paulo, Brazil). Measurements are in millimeters.

Abbreviations are as follows: SVL (snout–vent length), HW (head width), HL (head length), ED (eye diameter), IOD (interorbital distance), END (eye–nostril distance), NSD (nostril–snout distance), TD (tympanum diameter), THL (thigh length), TBL (tibia length), and FL (foot length).

Crossodactylus caramaschii sp. nov.

Holotype.—ZUEC 9190, adult male, collected at the Caverna do Diabo (24°35'S; 48°35'W, 450 m above sea level), Município de Eldorado, Estado de São Paulo, Brazil, on 11 Feb. 1993 by J. P. Pombal Jr., R. P. Bastos, and O. C. Oliveira.

Paratypes.—CFBH 339–40, adult males, BR 116, S.E.A.R.A., Município de Pariquera-Açu, Estado de São Paulo, collected in Sept. 1988 by E. Leonel; CFBH 1850, adult male, Fazendinha São Luis, Município de Ribeirão Branco, Estado de São Paulo, collected on 18–21 Jan. 1993 by C. F. B. Haddad and J. P. Pombal Jr; MNRJ 16671, ovulated adult female, collected with the holotype; MZUSP 21894–96, three adults, collected at the Gruta dos Caboclos, Município de Apiaí, Estado de São Paulo by P. E. Vanzolini and R. Brandão; MZUSP 30628, adult, collected at the type locality on 13 Feb. 1962 by D. Camargo; MZUSP 51665–66, ovulated adult female and unsexed adult, collected at the Bairro da Serra, Município de Iporanga, Estado de São Paulo, on 3–5 March 1977 by C. Duchêne; WCAB 49670, adult male collected with the holotype; ZUEC 9191, adult male, collected with the holotype; ZUEC 1695, adult male, collected at the type locality on 28 Dec. 1971 by I. Sazima and M. Sazima; ZUEC 8255–8258, adult males, collected at the type locality on 12–13 Jan. 1980 by A. J. Cardoso, V. Oliveira and E. Schechtmann.

Diagnosis and comparison with other species.—A medium-sized species (males 21.7–25.8 mm SVL), belonging to the *Crossodactylus gaudichaudii* group, characterized by slender body, broad head, short snout, canthus rostralis distinct and straight, and belly with brown reticulations. *Crossodactylus caramaschii* is distinguished from

C. aeneus and *C. bokermanni* by its broader head and better developed toe discs (see figure in Caramaschi and Sazima, 1985). The new species differs from *C. gaudichaudii* by its narrower head, better developed toe fringes, smaller snout, and by advertisement call (see Weygoldt and Carvalho e Silva, 1992). *Crossodactylus caramaschii* is distinguished from *C. dantei* and *C. lutzorum* by its reticulate belly (not reticulate in *C. dantei* and *C. lutzorum*; Carcerelli and Caramaschi, 1993). The new species further differs from *C. dantei* by the absence of a triangular tubercle below the tympanum. From *C. lutzorum*, *C. caramaschii* further differs in having a snout rounded in dorsal view (the snout is slightly truncate in *C. lutzorum*, Carcerelli and Caramaschi, 1993).

Description of holotype.—Body slender; head longer than wide, snout short, its shape rounded in dorsal view and protruding in lateral view (Fig. 1A–B); nostrils directed laterally, slightly protuberant; canthus rostralis distinct, straight; loreal region weakly concave; tympanum distinct, large, rounded, its diameter about two-thirds of eye diameter; weak supratympanic fold; weakly developed paired subgular vocal sacs; tongue ovoid, medium-sized; no vomerine teeth; choanae small, slightly ovoid. Arms moderately robust; three spines on each thumb; subarticular tubercles single; outer metacarpal tubercle nearly rounded, inner metacarpal tubercle elliptical (Fig. 1C); scutes not developed on upper surfaces of the finger tips; fingers without webbing; finger lengths IV < II − I < III. Legs robust; feet with an elliptical inner metatarsal tubercle, larger than conical outer; subarticular tubercles single, rounded; toe discs small (Fig. 1D), upper surfaces of disks with weakly developed scutes; toes extensively fringed; extensive tarsal fold-flap, continuous distally with toe fringe on outer side of first toe; toe lengths I < II < V < III < IV. Posterior third of upper and lateral surfaces granulate; belly smooth.

Color of holotype in life.—Dorsum dark brown with reddish spots posteriorly; a light stripe extending from tip of snout to scapular region; a dark brown line extending from tip of snout through nostril, eye, and above/behind tympanum; tympanum light brown; upper surfaces of thigh, tibia, and feet brown with dark bars and reddish spots; forearm brown with dark spots; pupil black and iris copper; belly yellowish white with brown reticulations.

Color of holotype in preservative.—Similar to that in life, except for the absence of reddish coloration in dorsum and upper surfaces of thigh, tibia, and feet.

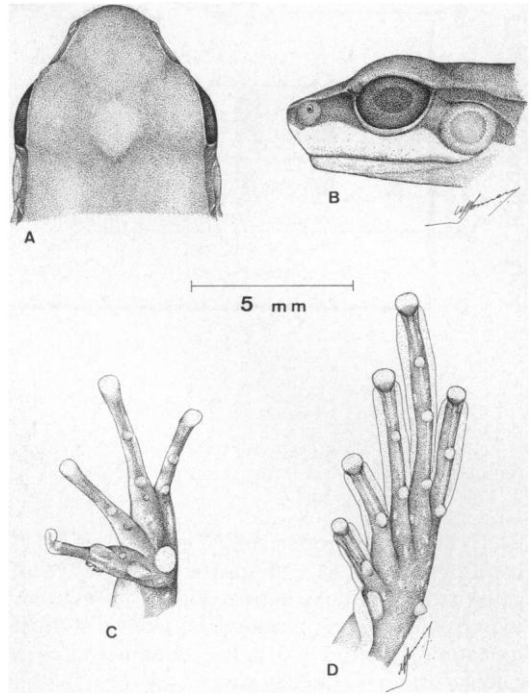

Fig. 1. *Crossodactylus caramaschii* sp. nov., holotype, ZUEC 9019. (A) Dorsal and (B) lateral views of head; ventral view of (C) hand and (D) foot.

Measurements of holotype.—SVL 24.3; HL 8.9; HW 7.9; ED 2.9; IOD 2.5; END 1.4; NSD 2.9; TD 2.0; THL 12.5; TBL 13.1; FL 13.0.

Variation.—In some specimens, the dorsum is smooth and/or without dark spots. The number of spines on the thumb of males varies between two and four, generally three. The two females studied do not have thumb spines. The light supralabial stripe is sometimes incomplete. Measurements (mean ± SD, range) of 11 males, followed by one female in parentheses are as follows: SVL 24.5 ± 0.99, 21.7–25.8 (27.4); HW 7.94 ± 0.21, 7.5–8.2 (8.4); HL 9.21 ± 0.45, 8.1–9.8 (9.7); ED 2.92 ± 0.11, 2.76–3.16 (2.88); IOD 2.54 ± 0.15, 2.35–2.88 (2.40); END 1.49 ± 0.28, 0.75–1.81 (1.44); NSD 0.49 ± 0.14, 0.23–0.75 (0.52); TD 1.89 ± 0.20, 1.44–2.19 (1.7); THL 11.84 ± 0.65, 10.8–12.7 (12.0); TBL 12.69 ± 0.50, 11.8–13.3 (14.0); FL 12.31 ± 0.50, 11.3–13.0 (13.3).

Advertisement call.—The call duration is 5.50 ± 0.54 sec (range = 4.71–6.09 sec, n = 6) at air temperature of 24 C and water temperature of

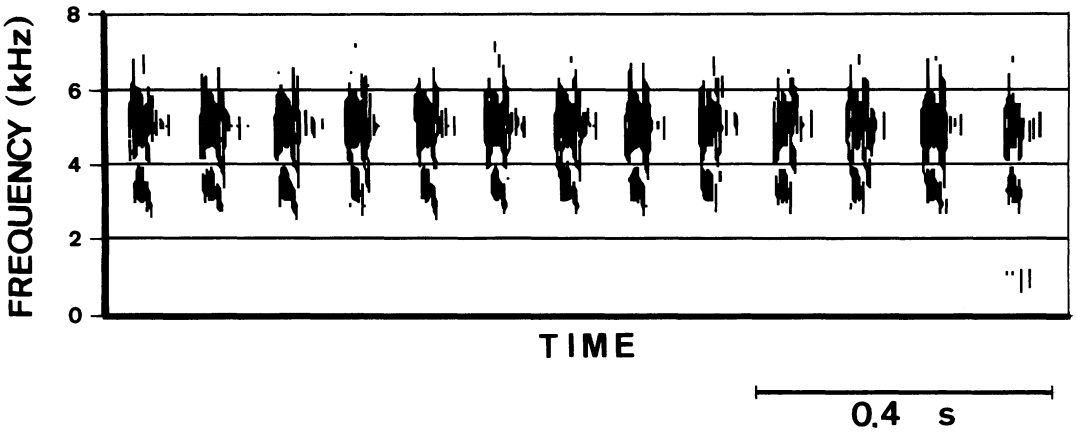

Fig. 2. Advertisement call of *Crossodactylus caramaschii* sp. nov. recorded on 11 Feb. 1993 at 1430 h, air temperature 21 C and water temperature 24 C.

21 C; 49–69 notes per call ($\bar{x}$ = 56.83 ± 5.41, n = 6) given at a rate of approximately 10/sec; call with harmonic structure (Fig. 2); notes modulated with the dominant frequency (= third harmonic) around 5.0 kHz, fundamental frequency about 1.6 kHz.

The advertisement call of the genus *Hylodes* shows the dominant frequency in the third harmonic (Vielliard and Cardoso, In Press; Haddad and Pombal, 1995). *Crossodactylus caramaschii* also has the dominant frequency in the third harmonic, which permits better sound propagation because of the noise produced by the stream (as in the genus *Hylodes*; see Vielliard and Cardoso, In Press). Three genera are contained in the subfamily Hylodinae: *Crossodactylus*, *Hylodes*, and *Megaelosia* (Lynch, 1971; where Hylodinae was called Elosiinae). Species of the genus *Megaelosia* do not call (Giaretta et al., 1993); the similarity in advertisement calls of *C. caramaschii* and species in the genus *Hylodes* may be evidence of close relationships between these two genera (if not convergence).

Natural history.—Specimens of *Crossodactylus caramaschii* were collected in Sept., Dec., Jan., Feb., and March (wet season). Adults of *Crossodactylus caramaschii* are diurnal and are observed on the ground near or in the water. Two ovulated females (MZUSP 51665 and MNRJ 16671) show creamy white ova, without pigmentation. Eggs without pigmentation may signal sheltered egg clutches, in the absence of light (Duellman and Trueb, 1986). Weygoldt and Carvalho e Silva (1992) observed oviposition of *C. gaudichaudii* in captivity, in crevices under rocks or stones. The eggs were creamy white and without pigmentation.

Distribution.—The new species is known from the type locality in the Caverna do Diabo, Municipality of Eldorado, and in the municipalities of Capão Bonito, Ribeirão Branco, Apiaí, Iporanga, and Pariquera-Açu (all localities in the southern part of the state of São Paulo, Atlantic rain forest, southeastern Brazil).

Etymology.—The specific name honors Ulisses Caramaschi, for his contribution to the knowledge of the Brazilian herpetofauna.

Additional specimens examined.—*Crossodactylus aeneus* MZUSP 69085, 69087–92 (topotypes). *Crossodactylus bokermanni* ZUEC 2200, 2456–2458, 2470, 3349 (paratypes). *Crossodactylus dispar* MZUSP 4066–69, 23460–61, 23465–70 (topotypes); ZUEC 672, 2268, 2374, 3500, 8310–8313. *Crossodactylus dantei* MZUSP 67088–89 (paratypes). *Crossodactylus gaudichaudii* MZUSP 3129, 9819–22, 9824, 9826–27, 9829–30, 9832, 9834, 20835–39, ZUEC 3485–3488, 3714 (topotypes, according to Bokermann, 1966). *Crossodactylus grandis* MZUSP 7941, 8058, ZUEC 010, 949, 991 (topotypes). *Crossodactylus lutzorum* MZUSP 67090–91 (paratypes). *Crossodactylus trachystomus* MZUSP 59906–07, ZUEC 3485–3488, 3714.

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Citharichthys mariajorisae, a New Flatfish from the Shallow Coastal Waters of the Eastern Tropical Pacific (Pleuronectiformes: Paralichthyidae)

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***Citharichthys mariajorisae* n. sp. is described from specimens collected along the southeastern coast of the Gulf of California, Mexico, southward to the Bay of Panama, Panama. It is characterized by the following combination of characters: a deep, very laterally compressed body (maximum depth more than 50% of standard length); small head; large, deciduous scales; first dorsal-fin ray usually about as long as or longer than upper jaw; 79–90 dorsal-fin rays; 59–69 anal-fin rays; 39–45 lateral-line scales; 3 – 8 + 13 – 19 rakers on the first gill-arch; usually 5 pelvic-fin rays on the ocular side, very rarely 6 (6 on blind side); numerous dark pigment blotches on the dorsal and anal fins. The species is compared to its congeners and most closely resembles the larger *C. gilberti* Jenkins and Evermann, 1889. It inhabits shallow coastal waters (11–44 m) apparently without penetrating brackish or fresh water as does *C. gilberti*.**

THE most recent reviews of the genus *Citharichthys* are Parr (1931) and Norman (1934). Norman recognized 14 species, six of them occurring in the eastern Pacific. The only *Citharichthys* species subsequently described from this area is *C. gordae* (Beebe and Tee-Van, 1938). In addition, five new species were described, three from the western North Atlantic Ocean (Dawson, 1969; Gutherz and Blackman, 1970) and two from the Caribbean Sea (Cervigón, 1982, 1986). We describe a new species of *Citharichthys* from the eastern tropical Pacific and compare it to its closest congeners.

MATERIALS AND METHODS

Counts and measurements were made according to the specifications of Hubbs and Lagler (1958), except that all ray bases in the dorsal and anal fins were counted as individual rays. Scales were taken from the center of the body, on the ocular side, immediately above or below