

A new species of *Brachycephalus* (Anura: Brachycephalidae) from Atlantic Rain Forest of southeastern Brazil

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Abstract. A new species of *Brachycephalus* is described from Serra da Bocaina, State of Rio de Janeiro, Brazil. The new species is characterized by having, in preservative, body uniformly pale cream, dermal ossification of the vertebrae composed of a bulge forming a row, and absence of ossified warts on the body.

Introduction

Frogs of the family Brachycephalidae Günther, 1858, are endemic to the Atlantic Rain Forest extending from the State of Espírito Santo to the State of Paraná, in southeastern and southern Brazil (see Pombal et al., 1998). Two genera are recognized, *Brachycephalus* Fitzinger, 1826 and *Psyllophryne* Izecksohn, 1971 (Frost, 1985; Duellman, 1993). Diagnoses for these two genera were provided by Izecksohn (1971) and commented by Pombal et al. (1998). Currently, the genus *Psyllophryne* has two species: *P. didactyla* Izecksohn, 1971 and *P. hermogenesi* Giaretta and Sawaya, 1998. *Brachycephalus* has three species: *B. ephippium* (Spix, 1824), *B. nodoterga* Miranda-Ribeiro, 1920, and *B. pernix* Pombal, Wistuba and Bornschein, 1998 (Frost, 1985; Duellman, 1993; Pombal et al., 1998). Life history is poorly known for the species in this family; breeding behavior and development in *B. ephippium* were reported by Pombal et al. (1994) and Pombal (1999).

Herein, I describe a new species of the genus *Brachycephalus* from Atlantic Rain Forest of the State of Rio de Janeiro, southeastern Brazil.

Material and methods

Specimens used in the description or examined for comparisons are in AL-MN (Adolpho Lutz Collection, deposited in the Museu Nacional, Rio de Janeiro, Brazil), CFBH (Célio F. B. Haddad Collection, deposited in the

Universidade Estadual Paulista, campus de Rio Claro, São Paulo, Brazil), MHNCI (Museu de História Natural Capão da Imbuia, Curitiba, Paraná, Brazil), MNRJ (Museu Nacional, Rio de Janeiro, Brazil), MZUFV (Museu de Zoologia “João Mojeen de Oliveira”, Universidade Federal de Viçosa), ZUEC (Museu de História Natural, Universidade Estadual de Campinas, São Paulo, Brazil), and ZUFRJ (Coleção de Anfíbios do Departamento de Zoologia, Universidade Federal do Rio de Janeiro).

For measurements I used an ocular micrometer in a Zeiss stereomicroscope, except for SVL which was measured with calipers. Drawings were made using a Zeiss stereomicroscope with a drawing tube. Abbreviations used are as follows: SVL (snout-vent length), HL (head length), HW (head width), ED (eye diameter), IOD (interorbital distance), END (eye-nostril distance), THL (thigh length), TBL (tibia length), and FL (foot length). All measurements are expressed in millimeters and follow Duellman (1970) and Cei (1980). Two paratopotypes (MNRJ 11099 and 11130) were cleared and double stained for observation of the pectoral girdle and phalanges.

***Brachycephalus vertebralis* sp. nov. (figs. 1-3)**

Holotype. MNRJ 11098, adult female, collected at Pedra Branca in Serra da Bocaina (between 23°09′-23°13′S; 44°45′-44°48′W), Municipality of Parati, State of Rio de Janeiro, Brazil, on 11-12 November 1946 by Antenor L. Carvalho and Herbert F. Berla.

Paratopotypes. CFBH 3415-3418, MNRJ 11094-096, 11100-102, 11105-107, 11112, 11114, 11116-118, 11120, 11122, 11123, 11125-129, 11131, 11132, all collected with the holotype; MNRJ 2053, 10599, collected in November or December 1941; MNRJ 11099 and 11130, collected with the holotype are cleared and double stained.

Diagnosis. A medium-sized species of *Brachycephalus* (SVL 10.2-15.1 mm), characterized by having, in preservative, body uniformly pale cream; dermal ossification dorsal to the vertebrae composed of a bulge forming a row; a dermal ossification of similar size and parallel to the fourth vertebral ossification in both sides of the body; absence of ossified warts on the body.

The pectoral girdle is completely ossified; the epicoracoids are closely juxtaposed and articulating throughout their lengths, and omosternum and sternum are absent. The phalangeal formula in the hands 2-3-4-2, and in the feet 2-3-4-5-2.

Comparison with other species. *Brachycephalus vertebralis* is distinguished from *B. nodoterga* and *B. pernix* by its pale cream color pattern in preservative (*B. nodoterga* is dark gray, and *B. pernix* is pale cream on the dorsum and black on the flanks; see Heyer et al., 1990, and Pombal et al., 1998). Further, the new species differs from *B. nodoterga* by lacking ossified warts on the body (present in *B. nodoterga*; Miranda-Ribeiro, 1920; pers. obser.). *Brachycephalus vertebralis* is distinguished from *B. pernix* by presence of dermal ossification above the vertebrae, and fifth toe very reduced (absent in *B. pernix*) (Pombal et al., 1998). The new species is distinguished from *B. ephippium* by its smaller size (SVL 12.5-19.7 mm in *B. ephippium*), and by a row of dermal ossification on the vertebrae (two bony shields on the dorsum in *B. ephippium*; fig. 2). *Brachycephalus vertebralis* differs from *Psyllophryne didactyla* and *P. hermogenesi* by its larger size (in *P. didactyla* SVL 10.2, and *P. hermogenesi* SVL 10.5), color pattern (dark brown to brownish yellow on the



Figure 1. Dorsal view of the holotype of *Brachycephalus vertebralis* (MNRI 11098).

dorsum in *P. didactyla* and *P. hermogenesi*), and lack of an omosternum (see Izecksohn, 1971; Giaretta and Sawaya, 1998).

Description of holotype. Body robust, bufoniform (fig. 1); head large; slightly wider than long; snout very short, shape semicircular in dorsal view and rounded in lateral

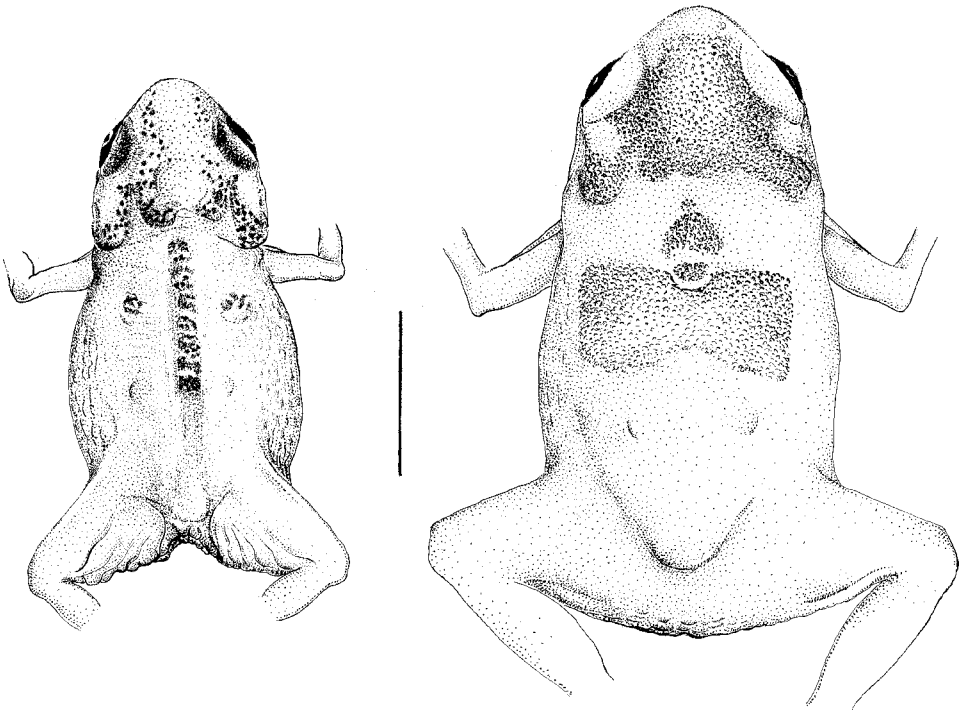


Figure 2. Patterns of dermal ossification dorsal to the vertebrae in (left) *Brachycephalus vertebralis* (MNRJ 11098, holotype), and (right) *B. ephippium* (MNRJ 25346) (scale = 5 mm).

view (fig. 2, 3); nostrils not protuberant, directed anterolaterally; canthus rostralis distinct, straight with corner rounded; eye medium-sized, not protruding dorsally; tympanum not visible; supratympanic fold absent; mouth nearly sigmoid shape; tongue long and narrow; vomerine teeth absent; maxillary teeth absent; choanae small, rounded, anterior to eye. Dermal ossification dorsal to the vertebrae composed by eight bulges forming a row (fig. 2); a dermal ossification of similar size and parallel to the fourth vertebral ossification in both sides of the body; a short pair of postorbital crests, a pair of bulges about equidistant between postorbital crests (fig. 2). Arms slender, forearm moderately slender; fingers robust; fourth finger very reduced, almost absent; third finger longest, first shortest; second and third finger tips pointed; subarticular tubercle absent; inner and outer metacarpal tubercles absent (fig. 3). Legs short, moderately robust; toes robust; first toe not visible externally; fifth toe very reduced, almost absent; subarticular tubercles absent; inner and outer metatarsal tubercles absent; toe length $V < II < III < IV$; toe tips pointed (fig. 3). Head, dorsum and undersurfaces smooth; flanks and posterior surfaces of thighs, wrinkled.

Color in preservative of holotype. Uniformly pale cream; eyes and a thin line on the upper eyelids, black; dermal ossification on the head and body, cream brownish.

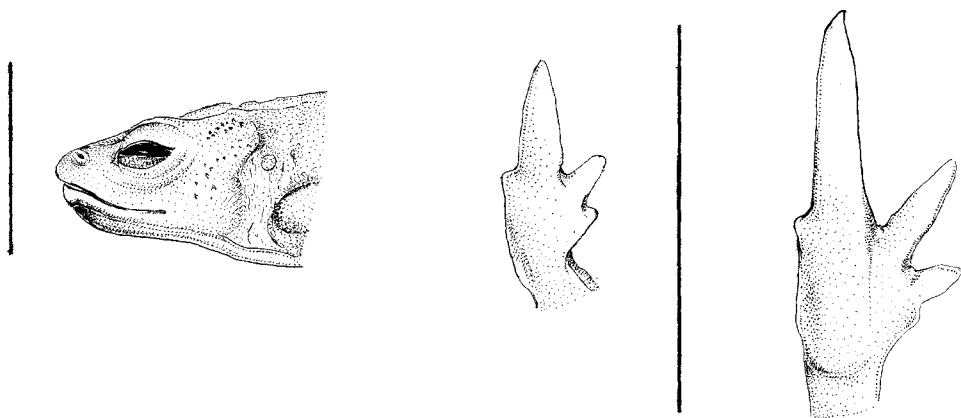


Figure 3. Holotype of *Brachycephalus vertebralis* (MNRJ 11098). (Left) Lateral view of head; ventral views of (middle) hand and (right) foot (scale = 5 mm).

Measurements of holotype. SVL 14.6; HL 5.7; HW 6.4; ED 1.4; IOD 2.2; END 0.7; THL 5.2; TBL 4.8; FL 4.3.

Variation. Dermal ossification of the vertebrae are less developed and absent on the sides of the body in the smaller specimens. I was unable to determine the sex in the most of the specimens of *Brachycephalus vertebralis*; however, apparently the females are larger and more robust. Measurements are given in table 1.

Distribution. *Brachycephalus vertebralis* is known from the type locality and from the Municipality of Cunha, State of São Paulo, southeastern Brazil. In the type locality the new species is sympatric with *B. ephippium* but probably both species are not syntopic because they were not collected together.

Etymology. The specific name is an allusion to the characteristic dermal ossification dorsal to the vertebrae.

Natural history. Pedra Branca is a name of a general area; the altitude ranges from 200 m to 1545 m above sea level; the annual mean temperature is 20°C, and annual precipitation is above to 2000 mm. The region has very irregular ground. In the present time, the forest is well preserved and the region above 500 meters is inside the National Park of Serra da Bocaina (S.M. Vaz, personal communication). The type locality, at the time of the collection of the type series, was composed by Atlantic Rain Forest after 60 years of regeneration, “capoeira” (forest cut off or burned with few years of regeneration), and cleared ground for plantation (Berla, 1944).

A female (MNRJ 11095) possesses a few, large, unpigmented ovarian eggs. *Brachycephalus ephippium* has direct development of terrestrial eggs (Pombal et al., 1994; Pombal, 1999), which probably also occurs in the new species.

Comments. Miranda-Ribeiro (1920) described four varieties of *B. ephippium*: *B. e. atelopide*, *B. e. nodoterga*, *B. e. garbeana*, and *B. e. bufonoides*. These forms were considered

Table 1. Measurements of *Brachycephalus vertebralis* ($n = 27$; $\bar{x}$ = mean; s = standard deviation).

	$\bar{x}$	s	Range
SVL	12.9	1.4	10.5-15.1
HL	5.2	0.3	4.8-6.0
HW	5.3	0.3	4.8-6.4
ED	1.2	0.1	1.1-1.5
IOD	1.9	0.1	1.6-2.2
END	0.5	0.1	0.4-0.7
THL	5.0	0.5	4.4-6.0
TBL	4.5	0.5	3.6-5.3
FL	4.2	0.4	3.2-4.8

synonyms of *B. ephippium* by Cochran (1955). Further, Heyer et al. (1990) revalidated, as full species, *B. nodoterga*. Thus, four species are currently recognized in the genus *Brachycephalus*. As mentioned in Pombal et al. (1998), the status of the varieties *B. ephippium* (i.e. *B. ephippium atelopoides*, *B. e. garbeana*, and *B. e. bufonoides*) described by Miranda-Ribeiro (1920) requires reevaluation. *Brachycephalus vertebralis* differs from these forms by presence of dermal ossification dorsal to the vertebrae composed by bulges forming a row (absence in *B. ephippium atelopoides*, *B. e. garbeana*, and *B. e. bufonoides*; Miranda-Ribeiro, 1920).

Additional Specimens examined

Brachycephalus ephippium. Estado de Minas Gerais: Serra do Brigadeiro MZUFV 2887. Estado do Rio de Janeiro: Angra dos Reis MNRJ 17457-58; Itatiaia AL-MN 114, 666-668, 2178, MNRJ 2155, 10789, 17455, 23581-86; ZUEC 0008, 7149-54; Lidíce MNRJ 25353-54; Mangaratiba MNRJ 578, 2540, 3073, 11573-82, 13261, 13264-70, 13272; Mauá MNRJ 17456-57; Nova Friburgo MNRJ 17432, 17433, 17440, 17441, 25390-25400; Petrópolis AL-MN 1344-46, 1362-66, 1367-68, 4141-42; Rio de Janeiro (Floresta da Tijuca e Pedra Branca) AL-MN 78, 78a, 313-318, 2197, 3696-3698, MNRJ 640, 1757, 1870, 3327, 3959, 9356, 9388-95, 9397-16, 10205, 10215, 13818, 15332, 17431, 17451, 17453, 25346, 25369-25371, 25408-09, 25412-25414; ZUEC 971; Serra do Tinguá MNRJ 1495, 8157-69; Teresópolis EI 1196, MNRJ 02091, 02764, 03311, 12471-72, 17434-39, 17445-50, 17452, 17454, 25355-66, 25377-84, ZUEC 8099-100, ZUF RJ 3396, 3421, 3836-40, 3906, 3908, 3911-13, 3915, 4009, 4026, 4181, 4255-57, 4265-66, 4357-62, 4601-02, 4744-45, 5227-32, 6733; Estado de São Paulo: Atibaia MHNCI 2495-504; Campinas CFBH 374, 994-97, 1343, 2565-69, MNRJ 25347-52, 25372 (cleared and stained), ZUEC 5992, 6866, 6889, 9002, 9149-58; Cotia MHNCI 2611-16, MNRJ 18405-09, ZUEC 1457-58, 1496-97; Jundiá CFBH 1070-71, ZUEC 6852; Santo André MNRJ 25367; Serra da Bocaina AL-MN 865, 894-99, 2230, 2261-99, 2516 (3 specimens), MNRJ 2143, 10783-86, ZUF RJ 0058-59.

Brachycephalus cf. *ephippium*. Estado do Rio de Janeiro: Sacra Família do Tinguá MNRJ 25373-76, 25387-89, 25401; Sacra Família do Tinguá MNRJ 21675, 25385.

Brachycephalus nodoterga. Estado de São Paulo: Ilha Bela, MNRJ 23633-36, 23637 (cleared and stained), 23638-40, 23641 (cleared and stained); Boracéia ZUEC 6073.

Brachycephalus pernix. Estado do Paraná: Quatro Barras MNRJ 17349 (holotype), CFBH 2597-98, MHNCI 3000-04, MNRJ 17328-42, MNRJ 17427-28, ZUEC 9433-37, MHNCI 1818019 (paratypes); Morretes MHNCI 0125, 0128.

Brachycephalus vertebralis. Estado de São Paulo: Cunha MNRJ 17443-44.

Psyllophryne hermogenesi. Estado de São Paulo: Ubatuba MNRJ 18907; 18662-63, 18624-625 (paratypes).

Psyllophryne didactyla. Estado do Rio de Janeiro, Guapimirim ZUF RJ 2310-12, 2327-31, 3416; Teresópolis ZUF RJ 3207; Sacra Família do Tinguá, MNRJ 4062-73 (paratypes), MNRJ 17460-63, 25402-04, 25415-21, ZUF RJ 483.

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