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A NEW SPECIES OF *CHIASMOCLEIS* MÉHELŸ, 1904 (ANURA, MICROHYLIDAE) FROM THE ATLANTIC RAINFOREST OF BAHIA, BRAZIL

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ABSTRACT: We describe a new species of *Chiasmocleis* from the municipality of Una, in the Atlantic Rainforest of southern Bahia, northeastern Brazil. The new species is the smallest member of the genus and is characterized by having an ovoid body; a truncate snout in dorsal view, rounded snout in profile; no webbing on hands and feet; fingers lacking disks, toe tips slightly expanded; fingers and toes weakly fringed (less fringed in females), with few lateral dermal spines in males and none in females; the dorsal surface of body and limbs with dermal spines in males, absent in females; in preservative, color on dorsum uniformly grayish brown, paler brown on dorsal surface of limbs; posterior surface of thighs with a white, longitudinal line; and belly boldly marbled in brown and pale cream.

Key words: Amphibia; Anura; Atlantic Rainforest; *Chiasmocleis*; Microhylidae; Taxonomy

THE GENUS *Chiasmocleis* Méhelÿ, 1904 currently contains 15 species, distributed from Panama to South America, occurring north and east of the Andes (Caramaschi and Cruz, 2001). In the Atlantic Rainforest of eastern Brazil, six species are currently recognized (Cruz et al., 1997, 1999). These species were separated into two morphologically distinct species groups by Cruz et al. (1997): the *leucosticta* group—characterized by the presence of well developed webbing on the feet, including *C. capixaba* Cruz, Caramaschi, and Izecksohn, 1997, *C. cordeiroi* Caramaschi and Pimenta, 2003, *C. crucis* Caramaschi and Pimenta, 2003, and *C. leucosticta* (Boulenger, 1888); and the *schubarti* group—with webbing on the feet vestigial or absent, including *C. alagoana* Cruz, Caramaschi, and Freire, 1999, *C. atlantica* Cruz, Caramaschi, and Izecksohn, 1997, *C. carvalhoi* Cruz, Caramaschi, and Izecksohn, 1997, and *C. schubarti* Bokermann, 1952 (Cruz et al., 1997, 1999).

In 1980, an area of 11,400 ha of a remnant forest in the Municipality of Una, State of Bahia, was declared under protection by the Brazilian government as the Reserva Biológica de Una. Recently, the RestaUna Project was designed to investigate the effect on several biological groups by forest fragmentation. During this study a new species of the genus *Chiasmocleis* was collected. Herein, we describe this new species and assign it to the *C. schubarti* species group.

MATERIALS AND METHODS

Specimens used in the description or examined for comparisons (Appendix I) are deposited in the Célio F. B. Haddad collection, Universidade Estadual Paulista, Campus Rio Claro, Brazil (CFBH); Jorge Jim collection, Universidade Estadual Paulista, Campus Botucatu, Brazil (JJ); Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP); and Museu Nacional, Rio de Janeiro, Brazil (MNRJ).

Abbreviations used are: 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 in millimeters and were taken with an ocular micrometer in a stereomicroscope, except for SVL, which was measured with a caliper with 0.05 mm precision; measurements follow Cei (1980) and Duellman (2001). Drawings of the holotype were made using a stereomicroscope with a drawing tube. Specimens were collected using a series of pitfall traps placed in different habitats during a survey of the herpetofauna of

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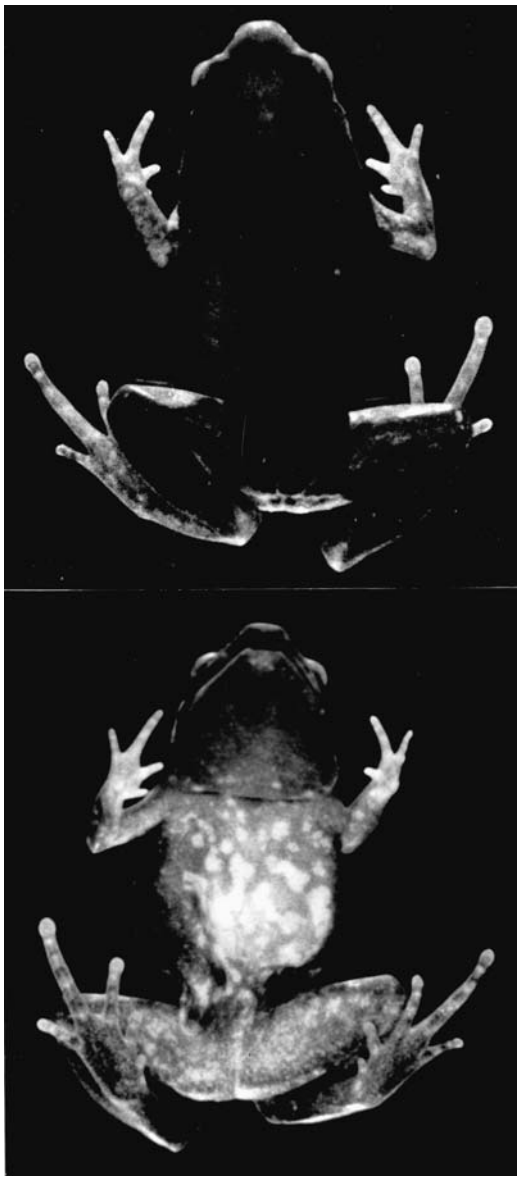

FIG. 1.—*Chiasmocleis gnoma*, MNRJ 28628 (holotype, SVL 14.2 mm), in dorsal and ventral views.

Reserva Biológica de Una and surrounding areas. Specimens were killed in 20% alcohol, fixed in 10% formalin, and preserved in 70% alcohol. Five specimens were cleared and stained for observation of the pectoral girdle (MNRJ 32626, 32628, 32631, 32912, 32915).

Chiasmocleis ***gnoma*** sp. nov.

Holotype.—MNRJ 28628, adult male (Figs. 1, 2), collected at Municipality of Una (15° 10′ S, 39° 03′ W), State of Bahia, Brazil, on 6 October 1999 by Marianna Dixo.

Paratopotypes.—All collected by M. Dixo at type locality. Adult males: MNRJ 28629–30, 32621–26, 32628–30, 6–8 October 1999; MNRJ 32631–32, 10 October 1999; MNRJ 28632, 32635, 32638, 32643–44, 32649–52, 32656–57, 32899, 12–13 October 1999; MNRJ 32658–59, 32662, 15–16 October 1999; MNRJ 32664, 26 October 1999; MNRJ 32666, 3 November 1999; MNRJ 28635, 32917, 16–17 November 1999; MNRJ 32668, 21–23 November 1999; MNRJ 28637, 21 February 2000; CFBH 6016, 29 February 2000. Adult females: MNRJ 28625–27, 28631, 32616–20, 32627, 32892–95, 6–7 October 1999; MNRJ 32633–34, 32636–37, 32639–42, 32645–48, 32653–55, 32660–61, 32663, 32896–98, 32900–05, 12–17 October 1999; MNRJ 32906–09, 26 October 1999; MNRJ 32910, 28 October 1999; MNRJ 28633, 32911, 30–31 October 1999; MNRJ 28634, 32665, 32912, 1 November 1999; MNRJ 32667, 32913–14, 3–5 November 1999; MNRJ 32915–16, 32918, 17 November 1999; MNRJ 32919, 19 November 1999; MNRJ 32920–21, 21 November 1999; MNRJ 32669, 23 November 1999; MNRJ 28636, 32670–71, 32922, 25–26 November 1999; MNRJ 28638, 23 February 2000; CFBH 6017–19, MNRJ 28640–41, 2 March 2000; MNRJ 32889–90, without date. Sex unknown: MNRJ 32891, 6 October 1999.

Diagnosis.—A species member of the genus *Chiasmocleis* (procoracoid cartilages and clavicles present but reduced, the latter do not reach coracoids [Fig. 3]; lacking occipital fold; quadratojugal and maxilla separated; alary process of premaxilla slightly sloping forward; anterior prevomer present and posterior and neopalatines absent; four distinctive fingers and five toes; eight presacral vertebrae; see Wild, 1995; Zweifel, 1986). A small species of *Chiasmocleis* (SVL males 13.4–15.4 mm, females 14.9–17.0 mm), diagnosed by the following combination of characters: (1) body ovoid, (2) snout truncate in dorsal view and round in profile, (3) hands and feet not webbed, (4) fingers lacking disks and toe tips slightly expanded, (5) fingers and toes weakly fringed (less so in females than males), (6) fingers and toes with few lateral dermal spines in males, absent in females, (7) dorsal surface of body and limbs with dermal spines in males,

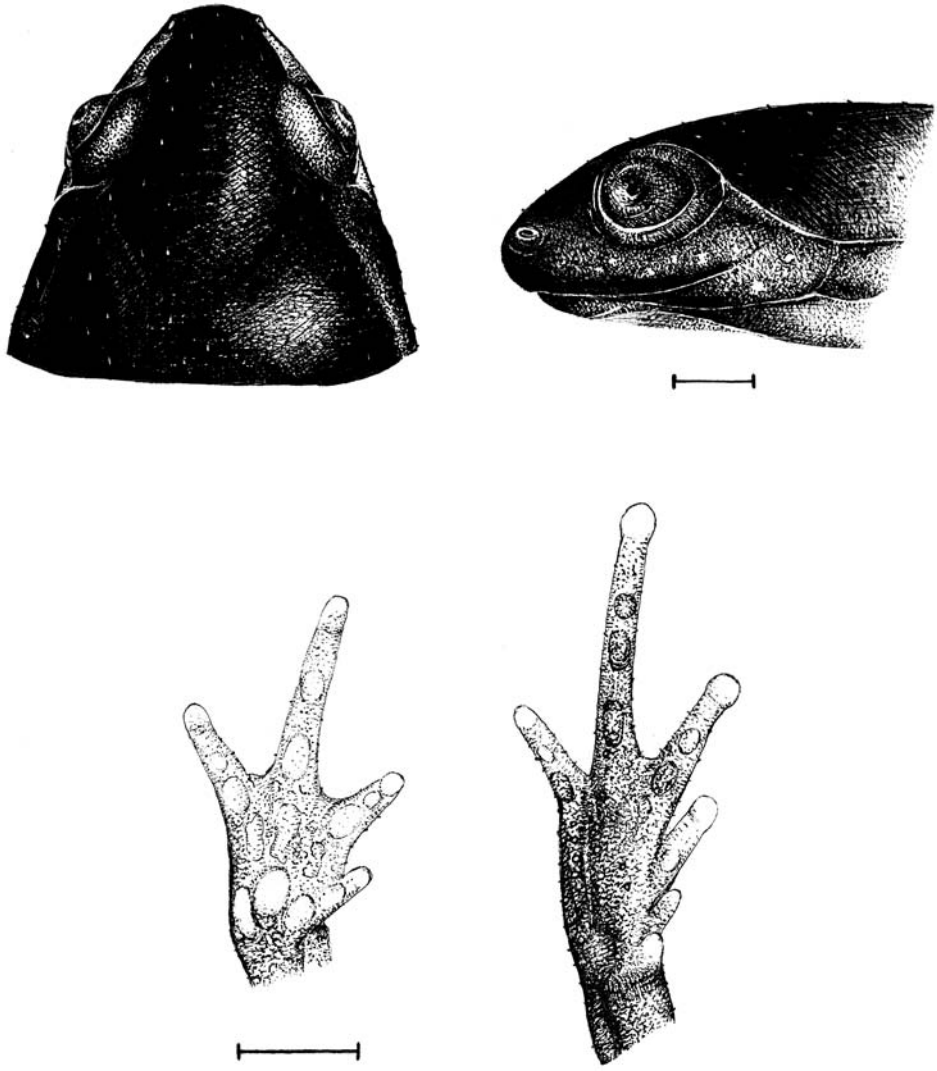

FIG. 2.—*Chiasmocleis gnoma*, MNRJ 28628 (holotype). (A) Dorsal and (B) lateral views of head; ventral views of (C) hand and (D) foot; scale bars represent 1 mm.

absent in females, (8) in preservative, color on dorsum uniformly grayish brown, paler brown on dorsal surface of limbs, (9) posterior surface of thighs with cream, longitudinal line, and (10) belly boldly marbled in brown and pale cream.

Chiasmocleis gnoma can be distinguished from all other species of *Chiasmocleis* by its smaller size, except *C. capixaba* and *C. carvalhoi* that show little overlap in SVL (males 17.0–32.2 mm, females 20.0–38.0 mm; Caramaschi and Cruz, 1997, 2001; Cruz et al., 1997, 1999; Dunn, 1949; Nelson, 1972; Parker, 1940; Rodriguez and Duellman, 1994). Also, the color pattern of the belly in *C. gnoma* is brown with large pale cream blotches (no such blotches in all other species). In comparison to the other species of *Chiasmocleis* of the Atlantic Rainforest, *C. gnoma* can be distinguished from *C. capixaba*, *C. corderoi*, *C. crucis*, and *C. leucostica* by the presence of weakly fringed toes (webbed in *C. capixaba*, *C. corderoi*, *C. crucis*, and *C. leucostica*; see figures in Cruz et al., 1997 and Caramaschi and Pimenta, 2003); from *C. atlantica*, *C. capixaba*, *C. leucosticta*, and *C. schubarti* by the lesser development of the dermal spines

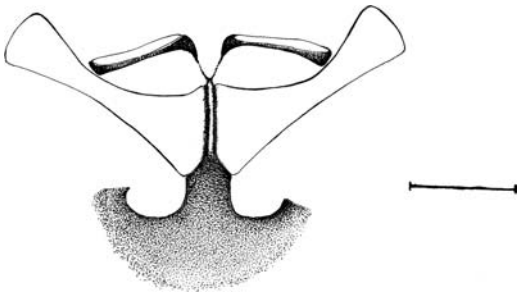

FIG. 3.—*Chiasmocleis gnoma*, MNRJ 32628. Pectoral girdle; scale bar represent 1 mm.

(well developed in these species); from *C. alagoana* and *C. capixaba* by the presence of a well developed supratympanic fold (few developed in *C. alagoana* and *C. capixaba*); and from *C. carvalhoi* and *C. schubarti* by having the snout truncate in dorsal view (rounded in *C. carvalhoi* and *C. schubarti*). Furthermore, *C. gnoma* differs from *C. capixaba* by the absence of a V-shaped line in the pectoral region (only sometimes absent in *C. capixaba*), more slender fingers, and general dorsal color uniformly grayish brown (grayish brown with gray blotches irregularly distributed in *C. capixaba*); and from *C. carvalhoi* by the longer length of Finger III (see Fig. 12 in Cruz et al., 1997).

Description of holotype.—Size small; body ovoid; head nearly triangular, wider than long; snout short, truncate in dorsal view, protruding and rounded in profile; upper jaw projecting beyond lower; nostrils near tip of snout directed laterally; internostril distance smaller than eye diameter and larger than eye–nostril distance; canthus rostralis weakly defined; loreal region nearly vertical, slightly concave; eye small, slightly protruding; occipital fold absent; supratympanic fold developed, oblique and posteriorly horizontal to insertion of arm; no distinct tympanum; vocal slits present; vocal sac small, single, subgular, weakly expanded externally; tongue medium sized, elongate, not notched posteriorly; choanae small, nearly elliptical, widely separated; premaxillary, maxillary, and vomerine teeth absent. Arms slender, tubercles or crests on forearms absent; fingers lacking disks, weakly fringed on inner side of Finger III; fingers with few lateral dermal spines; relative length of fingers, I < II < IV < III; thumb without nuptial asperities; thenar tubercle well developed, ovoid; palmar tubercle large, divided into two parts, one round and other elongate; subarticular tubercles well developed, round; supernumerary tubercles absent. Legs short, moderately robust; tibial and tarsal ridges absent. Feet not webbed, with few lateral dermal spines; toes moderately sized, weakly fringed; toe tips slightly expanded; relative length of toes, I < II < V < III < IV; subarticular tubercles on Toes I, II, and III nearly round, on other toes elongated; supernumerary tubercles absent; inner metatarsal tubercle small, ovoid; outer metatarsal tubercle absent. Dorsal surface of body and limbs with scattered dermal spines; ventral surfaces smooth. Measurements: SVL 14.2; HL 3.8; HW 4.7; ED 1.4; IOD 2.3; END 0.9; IND 1.2; THL 6.1; TBL 6.2; FL 6.1.

Color of holotype in preservative.—Dorsum uniformly grayish brown with scattered small white dots; forelimbs grayish cream; hands and feet light grayish cream; palm of hands pale cream; posterior side of thighs with white, longitudinal line; thin white middorsal longitudinal line approximately middle of body to vent; belly boldly marbled in brown and pale cream; throat dark gray, finely marbled in brown and pale cream.

Variation.—In preservative, the dorsal body color varies from brown to grayish brown; some specimens present cream blotches in the arms. In some specimens a white, longitudinal and thin, middorsal line extends from between the arms or from anterior tip of urostyle region to the vent. Approximately 18% of the specimens examined have a weakly marbled belly (the others are boldly marbled as the holotype). Females are slightly larger than males; measurements (mean, SD, range) of 33 males and 73 females are given in Table 1.

Distribution and ecology.—*Chiasmocleis gnoma* is known only from the type locality in the Municipality of Una, State of Bahia, northeastern Brazil, at Reserva Biológica de Una and surrounding areas. At the type locality, the annual precipitation reaches 2000 mm without a distinct seasonality. Primary forest is composed of tall trees, reaching up to 40 m, where palms are especially abundant and a deep leaf litter is present. Most of the forest surrounding the reserve has been selectively cut to accommodate cacao plantations and other crops, or cleared for cattle ranching. A

TABLE 1.—Measurements in millimeters (mean, SD, range) of 33 males and 73 females of the type series of *Chiasmocleis gnoma*.

	Males mean ± SD range	Males mean ± SD range
SVL	13.9 ± 0.7 12.8–15.5	15.9 ± 1.0 13.1–17.9
HL	4.1 ± 0.3 3.5–4.6	4.4 ± 0.3 3.6–5.1
HW	4.8 ± 0.3 4.4–5.3	5.2 ± 0.3 4.6–6.0
ED	1.3 ± 0.1 1.2–1.4	1.3 ± 0.1 1.2–1.4
IOD	2.4 ± 0.1 2.2–2.7	2.5 ± 0.2 2.1–2.9
END	1.0 ± 0.1 0.9–1.2	1.1 ± 0.1 0.9–1.3
IND	1.1 ± 0.1 1.0–1.2	1.2 ± 0.1 1.0–1.3
THL	5.9 ± 0.2 5.3–6.4	6.3 ± 0.4 5.3–7.4
TBL	6.0 ± 0.2 5.5–6.5	6.4 ± 0.4 5.5–7.3
FL	5.7 ± 0.3 5.1–6.4	6.3 ± 0.3 5.6–7.2

TABLE 2.—Number of specimens of *Chiasmocleis gnoma* collected with pitfall traps in different habitats at Una, State of Bahia, between October 1999 and February 2000. Sampling effort was the same for all habitats.

Habitats	*C. gnoma*
Primary forest (core)	529
Primary forest (edge)	33
Forest fragment (core)	63
Forest fragment (edge)	125
Secondary forest	104
Cacao groves ("cabrucas")	1
Total	855

few fragments of primary forest remain. In cacao groves, large emergent trees have been preserved to shade the understory cacao plants. In these shaded cacao plantations, locally known as "cabrucas," leaf litter is abundant and formed predominantly by cacao leaves. Despite its higher degree of disturbance compared to the primary forest, "cabrucas" provide shelter and humidity for forest animals, apparently protecting them from extirpation in open areas (Araújo et al., 1988).

The RestaUna Project study area comprises primary and secondary forests and cacao groves ("cabrucas"). Specimens of *Chiasmocleis gnoma* were less abundant in cacao groves than in the other habitats (Table 2). These results show that *C. gnoma* is present in the secondary forest and seems to decline with forest transformation into the disturbed areas such as the "cabrucas." All individuals were collected by pitfall traps, and no specimen was found on the forest leaf litter or temporary ponds. Seventy-five percent of the specimens sampled in the primary forest were collected in a single area, in only a few traps, after an 80 mm rain at night, suggesting an explosive breeding strategy.

Etymology.—*Gnomus* or *gnoma* is from new Latin meaning *dwarf*, here used in allusion to the small size of this *Chiasmocleis*. Gnome is also a folklore entity who lives beneath the ground and usually guards precious treasures, which is an appropriate name for a small frog that lives amid leaf litter of the amazing Atlantic Rainforest.

REMARKS

The original forest of south state of Bahia has been suffering the effects of man-made open areas, which were intensified during the last decades by the dissolution of cacao plantations (Alger and Caldas, 1996). Considered as a center of endemicity for plants (Mori et al., 1981; Prance, 1982), insects (Brown, 1991), reptiles (Jackson, 1978), birds (Haffer, 1974), and mammals (Rylands, 1982), the Atlantic Rainforest of eastern Bahia is among the most threatened hotspots of the world (Mittermeier et al., 1999).

The anuran biodiversity of northeastern Brazil is less completely known than that of other Brazilian regions. This is a particularly serious situation because the Atlantic Rainforest is a very threatened domain, especially in northeastern Brazil (Dean, 1997). Some species groups or genera of anurans, including *Chiasmocleis*, traditionally considered to be restricted to the Atlantic Rainforest of southern and southeastern Brazil have been found in northeastern Brazil (e.g., Cruz et al., 1999; Nascimento et al., 2001; Pombal and Madureira, 1997). Currently, *Chiasmocleis capixaba*, *C. carvalhoi*, *C. cordeiroi*, *C. crucis*, *C. gnoma*, *C. schubarti* are known from the Atlantic Rainforest of south Bahia (Caramaschi and Pimenta, 2004; Pimenta and Silvano, 2002; Pimenta et al., 2002; Van Sluys, 1998; this study).

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Appendix I

Specimens Examined

Chiasmocleis alagoana: Brazil: Alagoas: Maceió (MNRJ 21856, holotype; MNRJ 21857); Rio Largo (MNRJ 21858, 21859, 21860–61).

Chiasmocleis albopunctata: Brazil: Distrito Federal: Brasília (MNRJ 16623). Goiás: Arraias e Monte Alegre (MNRJ 17859); Serra da Mesa (MNRJ 20213–22). Minas Gerais: Cristália (MNRJ 17027–39); Uberlândia (MNRJ 17326–27). Mato Grosso do Sul: Aquidauna (MNRJ 17853). São Paulo: Botucatu (MNRJ 16605–17, 16619–22, 16624–28); Iperó (MNRJ 17324).

Chiasmocleis atlantica: Brazil: Rio de Janeiro: Nova Iguaçu (MNRJ 17550, holotype; MNRJ 17549, 17551–54).

Chiasmocleis bassleri: Ecuador: Pastaza: Rio Bobonaza (MZUSP 82298); Napo: Loreto (MZUSP 82319).

Chiasmocleis capixaba: Brazil: Espírito Santo: Aracruz (MNRJ 17514, holotype; MNRJ 17515–29, 17532–34, 17535–37, 17891–95); Cariacica (MNRJ 27896–904, 27907); Linhares (MNRJ 22962–66, 29057–60, 29073–74).

Chiasmocleis carvalhoi: Brazil: Bahia: Mucuri (MNRJ 19380–81); Porto Seguro (MNRJ 28960–61); Una (MNRJ 28605–24). Rio de Janeiro: Seropédica (MNRJ 17505, holotype; MNRJ 17480–90, 17492, 17498, 17500–03, 17565); Niterói (MNRJ 17577–78).

Chiasmocleis cordeiroi: Brazil: Bahia: Camamu (MNRJ 29931, holotype; MNRJ 29932).

Chiasmocleis crucis: Brazil: Bahia: Camamu (MNRJ 29933, holotype; MNRJ 29934–38).

Chiasmocleis jimi: Brazil: Amazonas: Humaitá (MNRJ 15459, holotype; MNRJ 15460–62, 27259; JJ 6029).

Chiasmocleis leucosticta: Brazil: São Paulo: Casa Grande (MNRJ 17564); Ilha Bela (MNRJ 23663); Ribeirão Branco (MNRJ 17900–04). Santa Catarina: Corupá (MNRJ 0525, 5582, lectotype and paralectotype, respectively of *Nectodactylus spinulosus*); Santa Luzia and Araujos (MNRJ 17563).

Chiasmocleis mehelyi: Brazil: Mato Grosso: Poconé (MNRJ 17077). Mato Grosso do Sul: Estância Caiman (MNRJ 17076); Miranda (MNRJ 17041–42).

Chiasmocleis panamensis: Panama: Canal Zone: Miraflores (MZUSP 82324).

Chiasmocleis schubarti: Brazil: Bahia: Guaratinga (MNRJ 29773); Porto Seguro (MNRJ 27256, 28875, 28894–97, 28957–59, 28962); Prado (MNRJ 28907–08); Una (MNRJ 28585–604). Espírito Santo: Aracruz (MNRJ 17538-–47, 17896–99); Cariacica (MNRJ 27894–95, 27905–06); Linhares (MNRJ 17548, 22959–61, topotypes).

Chiasmocleis cf. *schubarti*: Brazil: Bahia: Uruçuca (MNRJ 33778–851, 33976–34013).

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COMMENTS ON *EUSPONDYLUS* AND *PROCTOPORUS* (SQUAMATA: GYMNOPHTHALMIDAE) FROM PERU, WITH THE DESCRIPTION OF THREE NEW SPECIES AND A KEY TO THE PERUVIAN SPECIES

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We describe two new species of *Proctoporus* and a new species of *Euspondylus* (all from central Peru, Departamento de Huánuco, 2545 to 3010 m elevation). The new species are distinguished from all species presently assigned to *Proctoporus* and *Euspondylus* by unique characteristics of pholidosis, morphometrics, and color pattern. A key to the Peruvian species of *Proctoporus* and *Euspondylus* is provided. The current allocation of species to *Proctoporus* and *Euspondylus* may not reflect the phylogenetic relationships of the species under consideration. Based on the available data there appears to be no evidence to justify the separation of these genera. However, because of nomenclatural problems that would arise from synonymizing the two genera (e.g., producing a secondary homonymy in the case of *Proctoporus guentheri* Boettger and *Ecpleopus guentheri* O'Shaughnessy), we chose to retain the two genera until phylogenetic information is available.

Key words: *Euspondylus*; Gymnophthalmidae; New species; Peru; *Proctoporus*; Squamata

IN 1845, Tschudi named the teiid genera *Proctoporus* (type species *Proctoporus pachyurus* Tschudi) and *Euspondylus* (type species *Proctoporus maculatus* Tschudi). The taxonomy of these two genera has always been problematical, particularly with respect to generic diagnoses and species compositions. Traditionally, the two genera have been separated morphologically from each other by the presence (= *Euspondylus*) versus absence (= *Proctoporus*) of prefrontal scales (e.g., Kizirian, 1996), and from other genera by the absence of features that are diagnostic of other genera (Kizirian, 1996; Kizirian and Coloma, 1991; Peters and Donoso–Barros, 1970). The monophyly of neither *Proctoporus*

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