Colorado: Pueblo County: Pueblo, between Jerry Murphy (previously Overton) Road and Fountain River S Colorado Hwy. 47 and 0.6 km N Taos St. [21 June 1963 (UCM 21579; n = 1)].

Sample 2 (Pueblo-Salt Creek, Colorado)

Colorado: Pueblo County: Pueblo, confluence of Arkansas River and Salt Creek [21 June 1963 (UCM 21580, 21581; n = 2)].

Colorado: Pueblo County: Pueblo, 0.4 km SE confluence of Arkansas River and Salt Creek [21 June 1963 (UCM 21556; n = 1)].

Sample 3 (Lime-St. Charles River, Colorado)

Colorado: Pueblo County: Lime, 17.4 km S Pueblo, then 2.1 km E Interstate Hwy. 25 on Lane 25, then 300 m to abandoned Lime townsite and St. Charles River [20 June 1963 (UCM 21572, 21573; n = 2); 6 June 1990 (UADZ 4131-4154, 4156, 4157; n = 26); 9 August 1990 (UADZ 4279-4293; n = 15); 15 September 1990 (UCM 56240-56245; n = 6); 22 September 1990 (UCM 56246-56250; n = 5)].

Colorado: Pueblo County: St. Charles River, 20 km S Pueblo at Interstate Hwy. 25 [20 June 1963 (UCM 21559–21571; n = 13)].

Herpetologica, 53(2), 1997, 259-268 © 1997 by The Herpetologists' League, Inc.

REDESCRIPTION OF CHIASMOCLEIS ALBOPUNCTATA (BOETTGER) AND DESCRIPTION OF A NEW SPECIES OF CHIASMOCLEIS (ANURA: MICROHYLIDAE)

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ABSTRACT: We present the redescription and the geographical distribution of *Chiasmocleis albopunctata* (Boettger). *Chiasmocleis mehelyi* sp. nov., a small, related species, is described from Miranda, State of Mato Grosso do Sul, Brazil. Comparisons are made between these two species and *Chiasmocleis centralis* Bokermann.

Key words: Anura; Microhylidae; Chiasmocleis; Chiasmocleis albopunctata; Chiasmocleis mehelyi sp. nov.; Taxonomy

THE genus Chiasmocleis Méhely, 1904. currently contains 12 species, which are distributed in Panama and in South America, north and east of the Andes (Frost. 1985). One species occurs in Panama and five occur in northern South America, associated with the Amazon Forest; four species occur in eastern Brazil, associated with the Atlantic Rain Forest; two species inhabit the open areas or "cerrados" of central and southeastern Brazil and adjacent countries. These open-area species are Chiasmocleis albopunctata and C. centralis, readily distinguished from one another by differences in the structure of the shoulder girdle (Bokermann, 1952; Parker,

1934), external morphological features, and color.

We examined a series of frogs treated as *Chiasmocleis albopunctata* in several collections and identified two distinctive populations that clearly represent a new species. Herein, we describe the morphology and geographical distribution of *C. albopunctata*, the type species of the genus *Chiasmocleis*, and describe a new, morphologically similar species.

MATERIALS AND METHODS

Museum codes of the collections housing the specimens examined are taken from Leviton et al. (1985); in addition, the fol-

TABLE 1.—Range, mean (\bar{x}) and standard deviation (SD) of the measurements of *Chiasmocleis albopunctata* and *C. mehelyi*.

	C. albopunctata		C. mehelyi
Char- acter	Males $(n = 34)$ $\bar{x} \pm SD$ (range)	Females $(n = 11)$ $\bar{x} \pm SD$ (range)	Males $(n = 8)$ $\vec{x} \pm SD$ (range)
SVL	27.6 ± 1.91	32.6 ± 3.49	19.0 ± 0.73
	(23.2-32.2)	(28.2-38.0)	(18.3-20.3)
HL	6.8 ± 0.51	7.2 ± 0.72	4.5 ± 0.07
	(5.6-7.9)	(6.4 - 8.2)	(4.4-4.6)
HW	7.5 ± 0.50	8.0 ± 0.48	5.5 ± 0.20
	(6.7 - 8.4)	(7.3 - 8.7)	(5.3-5.8)
IND	2.0 ± 0.15	2.1 ± 0.16	1.4 ± 0.07
	(1.7-2.4)	(1.9-2.4)	(1.4-1.6)
END	2.3 ± 0.13	2.5 ± 0.17	1.5 ± 0.05
	(2.1-2.6)	(2.2-2.8)	(1.5-1.6)
ED	2.1 ± 0.12	2.3 ± 0.15	1.6 ± 0.06
	(1.9-2.3)	(2.0-2.5)	(1.5-1.7)
IOD	3.6 ± 0.33	3.9 ± 0.30	2.5 ± 0.07
	(3.1-4.7)	(3.1-4.2)	(2.4-2.6)
THL	9.6 ± 0.58	10.4 ± 0.84	6.9 ± 0.23
	(8.4-10.7)	(9.4-11.9)	(6.5-7.2)
TL	9.3 ± 0.56	10.3 ± 0.90	6.4 ± 0.30
	(8.2-10.1)	(8.9-11.5)	(5.7-6.6)

lowing codes are used: CFBH (Célio F. B. Haddad Collection, Universidade Estadual Paulista, Rio Claro); IB (Instituto Butantan, São Paulo); UNB (Universidade de Brasília). Specimens examined are listed in Appendix I.

Measurements were taken with calipers and are given in millimeters. Abbreviations used are: SVL (snout-vent length); HL (head length, from the tip of the snout to the angle of the jaw); HW (head width, between the angles of the jaw); IND (internarial distance, between the internal borders of nares); END (eve-to-nostril distance, between the anterior corner of the eve and the posterior border of nostril); ED (eye diameter, measured horizontally between the corners of eye); IOD (interorbital distance, measured transversally between the internal limits of the ocular globes); THL (thigh length, from the midvent to the knee); and TL (tibia length, from the knee to the heel).

RESULTS

Chiasmocleis albopunctata (Boettger)

Engystoma albopunctatum Boettger, 1885; Boulenger, 1894; Budgett, 1899; Peracca, 1904; Miranda-Ribeiro, 1920, 1926.

Chiasmocleis albopunctata—Méhelÿ, 1904; Nieden, 1926; Parker, 1934, 1940; Dunn et al., 1948; Dunn, 1949; Bokermann, 1952; Carvalho, 1954; Walker, 1973; Gorham, 1974; Harding, 1983; Frost, 1985; Zweifel, 1986.

Gastrophryne albopunctata—Stejneger, 1910.

Diagnosis.—A large species of Chiasmocleis (male SVL 23.2-32.2 mm; female SVL 28.2–38.0 mm), diagnosed by the following characters: (1) trunk of body elongate; (2) snout short, rounded in lateral and dorsal profiles; (3) fingers and toes free, lacking discs and only slightly fringed, with scarce, small dermal spines; (4) occipital fold absent; (5) postorbital fold present; (6) dorsum with scattered dermal spines; (7) color on dorsum dark gray, with a whitish bar on snout, extending along canthus rostralis, superior palpebra, and fragmented in irregular blotches on shoulder; scattered, irregularly distributed, whitish blotches on dorsum, arms and legs; venter gray with large, well delimited, and irregularly distributed whitish blotches.

Chiasmocleis albopunctata can be distinguished from C. centralis by differences in the pectoral girdle. The clavicles are widely separated medially and in contact with the coracoids in C. albopunctata, whereas in C. centralis the clavicles are in contact medially and widely separated from the coracoids laterally. In addition, C. albopunctata is more slender than C. centralis. The fingers and toes are only slightly fringed in C. albopunctata but fringes are well developed in C. centralis. Chiasmocleis albopunctata bears a white or whitish bar on the snout, canthus rostralis, and upper eyelid; the bar is absent in C. centralis. In C. albopunctata, the venter bears large, whitish blotches on a gray background, whereas in C. centralis the venter is brown with dark brown vermiculations.

Description.—Range, mean, and standard deviation of the measurements are given in Table 1. Size large for the genus; trunk of body elongate (Fig. 1); head short, broader than long; nostrils at the tip of the snout, not protuberant, and directed laterally; snout short, rounded in lateral and

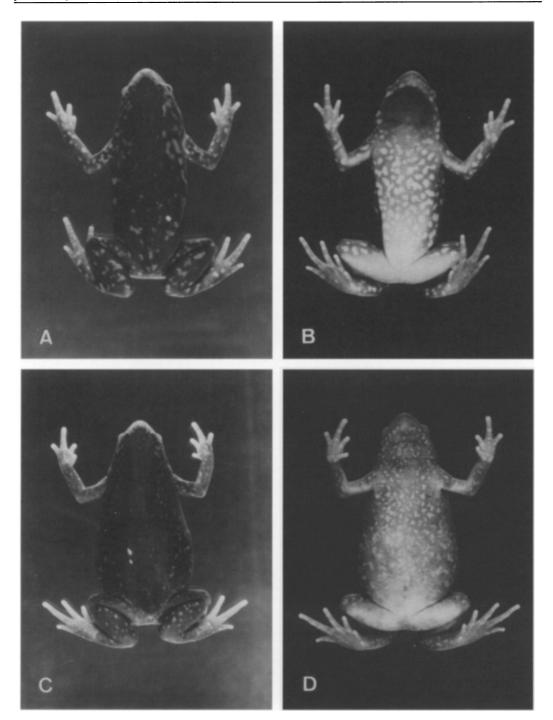


FIG. 1.—Chiasmocleis albopunctata. (A) Dorsal and (B) ventral views of a male (MN 17036; SVL 29.0 mm). (C) Dorsal and (D) ventral views of a female (MN 17038; SVL 38.0 mm).

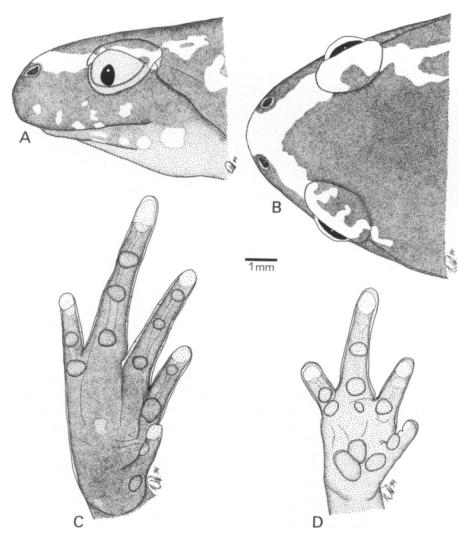


FIG. 2.—Chiasmocleis albopunctata (MN 17036). (A) Lateral and (B) dorsal views of head, and ventral aspect of (C) foot and (D) hand.

dorsal profiles (Fig. 2A, B); IND slightly less than END and ED; ED less than END; canthus rostralis and loreal region rounded in transverse section; lips not flared; eye small, only slightly protuberant; upper eyelid width about half IOD; interorbital area flat; cranial crests and occipital fold absent; postorbital fold present; tympanum absent; upper jaw projecting beyond lower; mandible with truncate, trilobed anterior margin; tongue large, ovoid; choanae large, widely separated; a small, subgular vocal sac present.

Arms slender, lacking tubercles and crests on forearm. Fingers (Fig. 2D) short, free, lacking discs and only slightly fringed, with scarce, small lateral dermal spines; fingers, in increasing order of length, I-IV-II-III; subarticular tubercles well developed, rounded; supernumerary tubercles absent; palmar tubercle large, divided transversely; a well developed, round thenar tubercle at the base of the finger I.

Legs short, robust; knee and heel lacking tubercles; tibial and tarsal ridges absent. Toes (Fig. 2C) short, free, lacking discs and only slightly fringed, with few small, lateral dermal spines; toes, in increasing order of length, I-V-II-III-IV; subarticular tubercles rounded; supernumerary tubercles absent; small, oval inner, but no outer, metatarsal tubercle. Tibia length slightly less than THL; knee and elbow widely separated with limbs adpressed to sides; combined TL and THL approximately 65% of SVL; heels touching only when flexed legs held at right angles to body.

Skin smooth above and beneath; dorsum with scattered, small dermal spines, slightly more numerous on posterior two-thirds of body. Anal opening not modified, lacking para-anal tubercles and glands around anus, in inguinal region, and on posterior surface of thighs.

Color in preservative (70% ETOH).—Dorsum dark to light gray. Whitish bar on snout, extending along canthus rostralis, upper eyelid, and fragmented into irregular blotches on shoulder. Scattered, irregularly distributed whitish blotches on dorsum, arms, and legs. Venter gray to light gray with large, well delimited, and irregularly distributed whitish blotches.

Sexual dimorphism.—Males distinctly smaller than females (Table 1). Small, subgular vocal sac, and throat infuscated in males. Gravid females with pear-shaped body (Fig. 1C,D).

Geographical distribution.—Bolivia, Paraguay, and Brazil, in the Federal District and in the states of Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais and São Paulo (Fig. 3).

Remarks.—Although this species has been relatively well described by some authors (e.g., Boettger, 1885; Méhelÿ, 1904; Parker, 1934), few specimens from few localities have been referenced in the literature, and the external morphology of Chiasmocleis albopunctata was poorly illustrated. Nine specimens have been reported from Paraguay; one is from an unspecified locality (Boettger, 1885), two from Villa Sana (Méhelÿ, 1904), five from Asunción, and one from Chaco (Parker, 1934). Two specimens have been recorded from Carandasinho, State of Mato Grosso, Brazil (Peracca, 1904). Three specimens where recorded from Bolivia; two are from



FIG. 3.—Geographical distributions of *Chiasmocleis albopunctata*, *C. mehelyi* sp. nov., and *C. centralis*. Abbreviations for states of Brazil: BA, Bahia; DF, Distrito Federal; GO, Goiás; MG, Minas Gerais; MS, Mato Grosso do Sul; MT, Mato Grosso; PR, Paraná; SP, São Paulo.

unspecified locality (Walker, 1973), and one from Trinidad, Province of Beni (Zweifel, 1986). The specimen described and figured by Cochran (1955) as *C. albopunctata* (IB 455, currently MZUSP 12573, from Cana Brava, State of Goiás, Brazil) is *C. centralis*.

The only illustration of external morphology depicts a dorsal view of the head of *Chiasmocleis albopunctata* (Méhelÿ, 1904). However, the shoulder girdle (Méhelÿ, 1904; Parker, 1934; Zweifel, 1986) and palatal region (Zweifel, 1986) are well illustrated.

Chiasmocleis mehelyi sp. nov.

Holotype.—MZUSP 65105, adult male (Fig. 4), collected at Estância Caiman, Municipality of Miranda (19°58′ S, 56°19′ W), State of Mato Grosso do Sul, Brazil, on 3 January 1988, by R. I. Crombie.

Paratypes.—MZUSP 65102-104 and MN 17076, adult males, collected with the holotype; CFBH 0199, MN 17077 and ZUEC 6363, adult males, collected at Poconé (16°15′ S, 56°37′ W), State of Mato Grosso, Brazil, on 24-25 September 1986, by G. V. Andrade, C. F. B. Haddad, and C. Strüssmann.

Diagnosis.—A small species of Chiasmocleis (male SVL 18.2–20.3 mm), diagnosed by the following characters: (1) trunk of body ovoid; (2) snout slightly elongate, rounded in lateral and dorsal profiles; (3) fingers and toes free, lacking discs, with numerous lateral dermal spines evident; (4) occipital fold absent; (5) postorbital fold





FIG. 4.—Chiasmocleis mehelyi sp. nov., holotype (MZUSP 65105; SVL 18.4 mm), in (A) dorsal and (B) ventral views.

absent; (6) dorsum with numerous, uniformly distributed dermal spines; (7) color on dorsum dark gray, with a whitish bar on snout, extending along canthus rostralis to superior palpebra; few whitish dots irregularly distributed on dorsum, arms, and legs; venter gray with small, not well delimited, and irregularly distributed whitish blotches.

Chiasmocleis mehelyi can be distinguished from C. albopunctata and C. centralis by its small size (male SVL in C. albopunctata, 23.2-32.2 mm, female SVL 28.2-38.0 mm; male SVL in C. centralis. 22.5-23.7 mm, female SVL 24.4 mm). Chiasmocleis mehelyi presents numerous, uniformly distributed spines on dorsum, whereas C. albopunctata and C. centralis have reduced number of spines irregularly distributed on dorsum. The presence of numerous, conspicuous spines on lateral sides of fingers and toes of C. mehelyi contrasts with the absence or small number of poorly developed spines in C. albopunctata and C. centralis. The finger II is swollen at the base in C. mehelyi, and normal in C. albopunctata and C. centralis. The postorbital fold is absent in C. mehelyi, whereas present in C. albopunctata and C. centralis. Moreover, C. mehelyi is readily separated from C. centralis by the presence of a whitish bar on snout, canthus rostralis and upper eyelid, absent in C. centralis, and by the structure of the pectoral girdle, with clavicles widely separated medially and in contact with the coracoids, contrary to C. centralis.

Description.—Range, mean, and standard deviation of the measurements are given in Table 1. Size small; trunk of body ovoid (Fig. 4); head short, broader than long; nostrils slightly behind the tip of snout, not protuberant, and directed laterally; snout slightly elongate, rounded in lateral and dorsal profiles (Fig. 5A,B); internarial distance equal to END; eye diameter slightly greater than END; canthus rostralis and loreal region rounded in transverse section; lips not flared; eye small, only slightly protuberant; upper eyelid

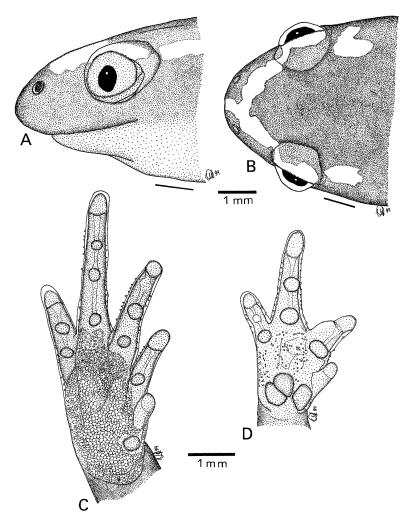


FIG. 5.—Chiasmocleis mehelyi sp. nov., holotype (MZUSP 65105). (A) Lateral and (B) dorsal views of head, and ventral aspect of (C) foot and (D) hand.

width about half of the IOD; interorbital area flat; cranial crests, and occipital and postorbital folds absent; tympanum absent; upper jaw projecting beyond lower; mandible with truncate, trilobed anterior margin; tongue large, ovoid; choanae large, widely separated; a small, subgular vocal sac present.

Arms slender, lacking tubercles and crests on forearm. Fingers (Fig. 5D) short, free, lacking discs and only slightly fringed, with numerous, conspicuous lateral dermal spines; fingers, in increasing order of length, I-IV-II-III; finger I reduced; finger II swollen at the base; subarticular tuber-

cles well developed, rounded; supernumerary tubercles absent; palmar tubercle large, divided transversely; a well developed, subcircular thenar tubercle at the base of finger I.

Legs short, robust; knee and heel lacking tubercles; tibial and tarsal ridges absent. Toes (Fig. 5C) short, free, lacking discs, and only slightly fringed, with numerous, conspicuous dermal spines laterally; toes, in increasing order of length, I-V-II-III-IV; subarticular tubercles round; supernumerary tubercles absent; small, oval inner, but no outer, metatarsal tubercle. Tibia length slightly less than THL; knee and

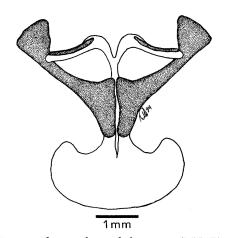


FIG. 6.—Chiasmocleis mehelyi sp. nov. (MN 17041). Ventral view of pectoral girdle.

elbow widely separated with limbs adpressed to sides; combined TL and THL approximately 70% of SVL; heels touching only when flexed legs held at right angles to body.

Pectoral girdle (Fig. 6) with procoracoid cartilages and clavicles; clavicle overlies 80% of the procoracoid cartilages length laterally; clavicles broadly separated medially, and in contact with coracoids laterally; omosternum absent; sternum large, cartilaginous.

Skin smooth above and beneath; dorsum with numerous, uniformly distributed dermal spines. Anal opening not modified, lacking para-anal tubercles and glands around anus, in inguinal region, and on posterior surface of thighs.

Color in preservative (70% ETOH).—Dorsum dark to light gray. Whitish bar on snout, extending along canthus rostralis to upper eyelid. Few scattered, irregularly distributed whitish dots on dorsum, arms, and legs. Throat infuscated. Venter gray to light gray with small, not well delimited, and irregularly distributed whitish blotches.

Measurements of holotype.—SVL 18.4; HL 4.5; HW 5.4; IND 1.4; END 1.5; ED 1.6; IOD 2.4; THL 6.9; TL 6.3.

Geographical distribution.—Known only from two localities in the states of Mato Grosso and Mato Grosso do Sul, Brazil (Fig. 3).

Etymology.—The name of the species, a noun in the genitive case, honors the late Prof. Ludwig von Méhelÿ (1862–1952?; Adler, 1989), the first to recognize and describe the genus *Chiasmocleis*.

Remarks.—Specimens of Chiasmocleis mehelyi were misidentified as C. albopunctata in the MZUSP and MN collections. The similar color patterns and partial sympatry of the distributions of the species probably obscured the identity of C. mehelyi. Old specimens (MZUSP 9887, MN 17041-42) were excluded from the type series of C. mehelyi because they are faded and do not exhibit all of the diagnostic characters for the species.

DISCUSSION

The complex assemblage of species composing Chiasmocleis has not been reviewed recently (Frost, 1985). The genus may not be monophyletic, and it is probable that some regrouping will be necessary when several species currently referred to Chiasmocleis become more completely known with regard to the structure of the skull and vertebrae (Walker and Duellman, 1974). However, C. mehelyi resembles other *Chiasmocleis* externally. Moreover, the species is identified as a member of this genus by both Parker's (1934) and Carvalho's (1954) artificial keys for microhylid genera; these keys are based mainly on conditions of the pectoral girdle. For these reasons, C. mehelyi was included in the genus Chiasmocleis.

The eight species of Chiasmocleis that occur in Brazil are consistently associated with large morphoclimatic domains. These include Amazonia (C. shudikarensis), the Atlantic Rain Forest (C. bicegoi, C. leucosticta, C. schubarti, and C. urbanae), and the Cerrados (C. albopunctata, C. centralis, and C. mehelyi). The geographical distribution of Chiasmocleis albopunctata is one of the most extensive of the genus and, although no one specific area of sympatry was detected, its range includes the distributions of C. centralis and C. mehelyi. Each of these two species are known only from two localities, and

the localities are widely separated from one another.

RESUMO

A redescrição e a distribuição geográfica de *Chiasmocleis albopunctata* (Boettger) são apresentadas. *Chiasmocleis mehelyi* sp. nov., uma espécie morfologicamente relacionada, de pequeno porte, é descrita de Miranda, Estado do Mato Grosso do Sul, Brasil. São feitas comparações entre essas duas espécies e *Chiasmocleis centralis* Bokermann.

Acknowledgments.—We acknowledge P. E. Vanzolini (Museu de Zoologia, Universidade de São Paulo), E. Izecksohn (Universidade Federal Rural do Rio de Janeiro), C. F. B. Haddad (Universidade Estadual Paulista, Rio Claro), A. J. Cardoso and J. P. Pombal Jr. (Universidade Estadual de Campinas), and A. Sebben and C. A. Schwartz (Universidade de Brasília) for allowing specimens for study; Humberto César (Corlocal, Rio de Janeiro) by the photographs. The authors were partially supported by CNPq grants.

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Accepted: 31 May 1996 Associate Editor: Linda Trueb

APPENDIX I

Specimens Examined

Chiasmocleis albopunctata: BRAZIL: Distrito Federal: Brasília, Fazenda Água Limpa (MN 16623, UNB s/no. 5 spec.); Brasília (UNB s/no. 1 spec.). Goiás: Arraias, ponte sobre o rio Bezerra, na estrada que liga Arraias a Monte Alegre de Goiás (MN 17859); Minaçu, Serra da Mesa (UNB s/no. 2 spec.). Mato Grosso: Chapada dos Guimarães, Manso (UNB s/no. 2 spec.); Chapada dos Guimarães (UNB s/no. 1 spec.).

Mato Grosso do Sul: Aquidauana, Vale das Bruxas (MN 17858); Bela Vista, Fazenda Barreiro (EI 1393), Fazenda Costa Peron (EI 1220); Maracajú (EI 4375-77). Minas Gerais: Belo Horizonte, Lagoa Seca (AL-MN 858); Cristália (MN 17027-39, 17040 [cleared-and-stained]); Uberlândia (MN 17326-27). São Paulo: Botucatu, Rubião Júnior (MN 16605, 16606-17, 16619-22, 16624-28, 16618 [cleared-and-stained], EI 4374); Iperó, Fazenda Ipanema (MN 17324).

Chiasmocleis centralis: BRAZIL: Goiás: Aruanã (MZUSP 7547 [holotype], MZUSP 7548 [paratype]); Cana Brava (MZUSP 12573).

Chiasmocleis mehelyi: BRAZIL: Mato Grosso: Poconé (MN 17077, ZUEC 6363, CFBH 0199 [paratypes]). Mato Grosso do Sul: Miranda, Estância Caiman (MZUSP 65105 [holotype], MZUSP 65102–104, MN 17076 [paratypes]); Miranda (MN 17041–42, MZUSP 9887).

Herpetologica, 53(2), 1997, 268-286 © 1997 by The Herpetologists' League, Inc.

A NEW SPECIES OF TOAD (ANURA: BUFONIDAE) FROM OAXACA, MEXICO WITH COMMENTS ON THE STATUS OF BUFO CAVIFRONS AND BUFO CRISTATUS

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ABSTRACT: I review the status of the populations of toads referred to Bufo cavifrons that occur in lower montane areas west of the Isthmus of Tehuantepec, Mexico. The populations in the Sierra de Juárez and Sierra Mixe, Oaxaca are described herein as a new species. The name B. cavifrons is restricted to the topotypic population in the isolated volcanic Sierra de los Tuxtlas, Veracruz. The poorly known species Bufo cristatus, from the Sierra Madre Oriental, is rediagnosed with respect to these other species. The natural history of all three species is briefly reviewed; all seem to inhabit primary forest, and B. cristatus and B. cavifrons breed in streams.

 $\textit{Key words:} \quad \text{Systematics; Mexico; New species; Bufonidae; } \textit{Bufo cavifrons; Bufo cristatus; Bufo spiculatus}$

THERE has been considerable confusion associated with the identity of the quite distinctive, but poorly known, toads of the forests of the lower montane areas of southern Mexico. Firschein (1950) described Bufo cavifrons from the isolated Sierra de los Tuxtlas in Veracruz, Mexico, and resolved over 100 yr of confusion associated with the name Bufo cristatus Wiegmann. Porter (1963) reviewed the taxonomic status and distribution of these toads and several others including the rather ubiquitous *Bufo valliceps* Wiegmann. Since these classic works, new material has been collected that now allows further clarification of the species-level diversity of these crested toads of the wet forested slopes of southern Mexico.

According to Porter's (1963) taxonomy, the name B. cristatus is applicable to a few specimens with massive cranial crests from the southern Sierra Madre Oriental. and the name B. cavifrons is applicable to the populations with variably hypertrophied cranial crests from three distinct cloud forest areas: the Sierra de los Tuxtlas. the Selva Negra area on the Atlantic versant of the Chiapas highlands, and the Sierra de Juárez of Oaxaca, Mexico, Mendelson (1997) demonstrated that the population of the Selva Negra and many other populations along the Atlantic slopes of Oaxaca and Chiapas, Mexico, and Guatemala are referable to Bufo macrocristatus Firschein and Smith. The recognition of B. macrocristatus as distinct from