

A NEW SPECIES OF THE *BOKERMANNOHYLA MARTINSI* GROUP FROM CENTRAL BAHIA, BRAZIL WITH COMMENTS ON *BOKERMANNOHYLA* (ANURA: HYLIDAE)

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ABSTRACT: A new species of the *Bokermannohyla martinsi* group is described from Chapada Diamantina, State of Bahia, northeastern Brazil. It is differentiated from the other two species in the group by the combination of slender body (quite robust in *B. langei* and *B. martinsi*), non-bifid distal prepollex (bifid in *B. langei* and *B. martinsi*), squared shape of the posterior portion of the distal prepollex (pointed process in *B. langei* and *B. martinsi*), large size and lateral inclination of the tympanum (quite reduced in *B. langei*, almost parallel to the longitudinal axis in both *B. langei* and *B. martinsi*), absence of dark bars in hidden areas of thighs (dark bars present on anterior, dorsal and posterior surfaces of thighs in *B. martinsi*), and shape of the supratympanic fold. We report for the first time the occurrence of a mental gland in 16 species of *Bokermannohyla*.

Key words: Amphibia; *Bokermannohyla juiju*; Cophomantini; Hylidae; Mental gland; Taxonomy

BOKERMANNOHYLA has recently been erected to accommodate the former *Hyla circumdata*, *H. claresignata*, *H. martinsi*, and *H. pseudopseudis* species groups (Faivovich et al., 2005). Based on the individual monophyly of the available exemplars of two of these species groups and hypotheses by previous authors, Faivovich et al. (2005) kept recognizing these groups in *Bokermannohyla*. The genus currently comprises 27 species that are distributed only in Brazil, where they occur in the Atlantic Forest and Cerrado formations.

The monophyly of *Bokermannohyla* is supported by molecular data, and a thorough morphological study of the genus still remains to be done. Evidence for the monophyly of the *B. circumdata* and *B. pseudopseudis* groups is mostly restricted to molecular data resulting from the analysis of Faivovich et al. (2005). Species of the former *H. claresignata* group were unavailable to Faivovich et al. (2005), but they were tentatively associated with *Bokermannohyla* on the basis of previous association of this group with the former *H.*

circumdata group (Bokermann, 1972; Jim and Caramaschi, 1979). Faivovich et al. (2005) included only one of the two species of the *B. martinsi* group, but its monophyly was recognized on the basis of the presence of a well-developed humeral spine and a bifid distal element of the prepollex in adult males, a character state first noticed by Bokermann (1965). The *B. martinsi* group currently includes the nominal species, which is mostly restricted to mountain stream habitats in Minas Gerais, and the elusive *B. langei*, known only from four specimens from a very small area in NE State of Paraná. In this paper we describe a third species of the *B. martinsi* group and present some comments on the systematics of *Bokermannohyla*. A single specimen is known of the distinctive new species, which has been seen and collected only once in three years of fieldwork at the type locality.

MATERIALS AND METHODS

The collection abbreviations follow Leviton et al. (1985), with the exception of CFBH (Célio F. B. Haddad collection, housed in

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Departamento de Zoologia, Universidade Estadual Paulista, Rio Claro, São Paulo, Brazil), MCNAM (Museu de Ciências Naturais, Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil) and MZUEFS (Museu de Zoologia da Universidade Estadual de Feira de Santana, Feira de Santana, Bahia, Brazil). The webbing formula follows Savage and Heyer (1967), as modified by Myers and Duellman (1982). Measurements of adult specimens were taken to the nearest 0.05 mm with a Mitutoyo digital caliper under a stereomicroscope, and follow Duellman (1970), with the exception of thigh length. Abbreviations used in the measurements are SVL (snout-vent length), HL (head length), HW (head width), TD (tympanum diameter), ED (eye diameter), EN (eye to nostril distance), IN (internarial distance), IO (interorbital distance), THL (thigh length), TL (tibia length), and FL (foot length). Sex was determined by presence or absence of secondary sexual characters (humeral spine, prepollical spine, vocal slits) or by direct observation of the gonads.

SPECIES ACCOUNT

Bokermannohyla juiju sp. nov.

Holotype.—MZUEFS 1900, adult male. Brazil: Bahia: Município de Palmeiras: Caeté-Açú: Stream Gerais da Fumaça, approx 1300 m. Collected on 29 July, 2001 by Luciana Lugli and Robson G. Haj. Figs. 1, 2A, 3.

Diagnosis.—A species of the *Bokermannohyla martinsi* group characterized by a slender body, simple (non-bifid) distal element of prepollex, squared shape of the posterior portion of the distal prepollex, large tympanum size with medial inclination, perpendicular bars covering only dorsal surface of thighs, and small spots over a dark brown background in anterior and posterior surface of thighs.

The presence of a ventral humeral crest developed as a spine in males promptly distinguishes *Bokermannohyla juiju* (Fig. 1) from all species of the *B. circumdata*, *B. claresignata*, and *B. pseudopseudis* groups. The new species differs from the species in the *B. martinsi* group, by being relatively slender (*B. langei* and *B. martinsi* are robust), the simple, non-bifid spine of the distal

prepollex (Fig. 2; bifid in *B. langei* and *B. martinsi*), the square-shaped posterior portion of the distal prepollex (Fig. 2; with a pointed process in *B. langei* and *B. martinsi*), the perpendicular bars on thighs restricted mostly to the exposed upper surface (present on anterior, upper, and posterior surfaces of thighs in *B. martinsi*), large tympanum size, 6% SVL (quite reduced in *B. langei*, 3.3% SVL), and its medial inclination (almost parallel to the longitudinal axis in *B. langei* and *B. martinsi*). The supratympanic fold in the new species curves sharply before the insertion of the arm, while in *B. langei* and *B. martinsi* it extends backwards, passing above the insertion of the arm. The dorsal pattern in *B. juiju* with large, irregular light brown blotches of diffuse margins differs from the one occurring in *B. langei* (large inverted triangle extending from the upper eyelids back to suprascapular region) and in *B. martinsi* (two common patterns: the dorsum densely covered with small light brown mottling, or with some sparse, diffuse darker brown blotches).

Description of holotype.—Body robust. Head barely wider than long; head as wide as body; head width 35% SVL; head length 34% SVL. Snout rounded in dorsal view and truncate in profile; canthus rostralis rounded. Loreal region concave. Lips not flared. Nares slightly protuberant, directed dorsolaterally, and posterior to anterior margin of lower jaw. Internarial region and top of head flat. Interorbital distance slightly shorter than upper eyelid. Eye prominent; its diameter larger than eye-nostril distance. Tympanum rounded and slightly deflected posteriorly towards the longitudinal body axis and inclined medially, such that almost the complete tympanum is visible from above; its diameter 60% eye diameter. Supratympanic fold heavy, starting behind the eye and extending to the anterior margin of the insertion of the arm, covering dorsal margin of tympanic membrane. Region between head and suprascapulae quite depressed.

Vomerine teeth in two slightly curved series posteriorly and between the choanae; each series bears eight (right) and six (left) teeth. Choanae kidney-shaped; separated by a distance slightly larger than two times maximum



FIG. 1.—Dorsal and ventral view of the holotype of *Bokermannohyla juiu*, MZUEFS 1900. Adult male from the stream Gerais da Fumaça, Caeté-Açú, Município de Palmeiras, Bahia, Brazil. SVL 54.4 mm.

diameter. Tongue ovoid, attached overall (narrowly free around lateral and posterior margin). Vocal slits present, longitudinal, originating on the sides of the tongue and extending to the corner of the mouth. Vocal sac not evident, but apparently single and subgular. Macroscopically evident glandular tissue irregularly distributed on the mental area, extending backwards up to the beginning of the gular region.

Forearm hypertrophied; ventral humeral crest extremely developed as a triangular spine whose relief under the skin is externally evident (Fig. 1). A row of low tubercles along ventrolateral edge of forearm. Fingers bearing large, ovoid discs, with circumferential groove of each disc clearly defined by the size difference between the disc and the smaller pad; width of disc on finger III equals tympanum diameter. Relative lengths of fingers $1 < 2 < 4 < 3$. Fingers webbed basally, with a slight dermal fringe; webbing formula of outer fingers I-II 2-3 III $3^{-}2^{1/2}$ IV. Subarticular

tubercles large; distal tubercles on fingers I, II, and IV ovoid, distal tubercle of finger III conic. A short row of large supernumerary tubercles, high and round along the axis of fingers II and IV; smaller and more irregularly distributed along fingers I and III; small, irregularly shaped tubercles distributed along the outer margin of the palm. Outer metacarpal tubercle well differentiated, nearly heart shaped and bifid. Inner metacarpal tubercle large, its shape contouring the underlying distal prepollex that is modified into an enlarged, protruding and simple spine (Fig. 2A); a fringe of skin joins the inner margin of the distal free section of the prepollex and the base of finger I at the level of the subarticular tubercle. Nuptial pad absent.

Hind limbs slender; tibia length 52% SVL; foot length 41% SVL. Calcar absent; tarsal fold absent; subtle dermic ridge along the margin of the tarsus, starting in the tibio-tarsal articulation and reaching the base of inner



FIG. 2.—X-rays of hands of the three species of the *Bokermannohyla martinsi* group: (A) holotype of *Bokermannohyla juiju*, MZUEFS 1900; (B) paratype of *B. martinsi*, MZUSP 73667; (C) holotype of *B. langei*, MZUSP 74275. Note the structure of the distal prepollex modified into a single spine, and with a squared posterior

metatarsal tubercle. Inner metatarsal tubercle large, elliptical; outer metatarsal tubercle small, round. Toes short, bearing discs smaller than those on fingers; relative length $I < 2 < 3 = 5 < 4$; webbing formula $I 1^{1/2} - 2 II 1^+ - 2 III 1^+ - 2^+ IV 2 - 1^+ V$. Subarticular tubercles large, round; single rows of smaller supernumerary tubercles along the axis of every toe. Cloacal opening directed posteroventrally, at upper level of thighs; some flat, irregular, whitish tubercles scattered around and below cloaca. Dorsal skin smooth, granular ventrally, including the toe webbing. Pectoral fold absent.

Color in life.—No notes were taken at the time of capture.

Color in alcohol 70%.—Dorsally dark reddish brown, with large irregular light brown blotches of diffuse margins; diffuse light brown mottling on the flanks and snout; two irregular light gray blotches in the depression between head and scapular region. Large blotches with the same lighter hue on dorsum of arms and hands. Light brown bars on dorsum of thigh and exposed surfaces of shank and foot; anterior and posterior hidden areas of thighs dark brown with sparse irregular light brown mottling. Gular area light brown, gradually turning to yellowish grey that predominates in pectoral and abdominal region. Lower surfaces of limbs light brown.

Measurements of holotype.—SVL 54.4; HL 18.6; HW 19.2; IN 4.1; IO 6.3; ED 5.5; EN 5.0; TD 3.3; THL 28.2; TL 28.2; FL 22.2.

Distribution and ecology.—*Bokermannohyla juiju* is known only from the type locality. It was collected at 21.00, in gallery forest, perched on vegetation 70 cm above the ground along the margin of the stream Fumaça por Cima. Air temperature was 15.5, and water temperature 18. The area is characterized by montane stony fields (“Campos rupestres”) with some patches of gallery forest.

The holotype has several clearly visible subepidermal cysts on fingers, abdominal region, lower surface of thighs, and posterior area of vocal sac, just before left clavicle. A

←

portion (arrow) in (A) and compare with the bifid structure and pointed posterior process (arrow) in (B) and (C).

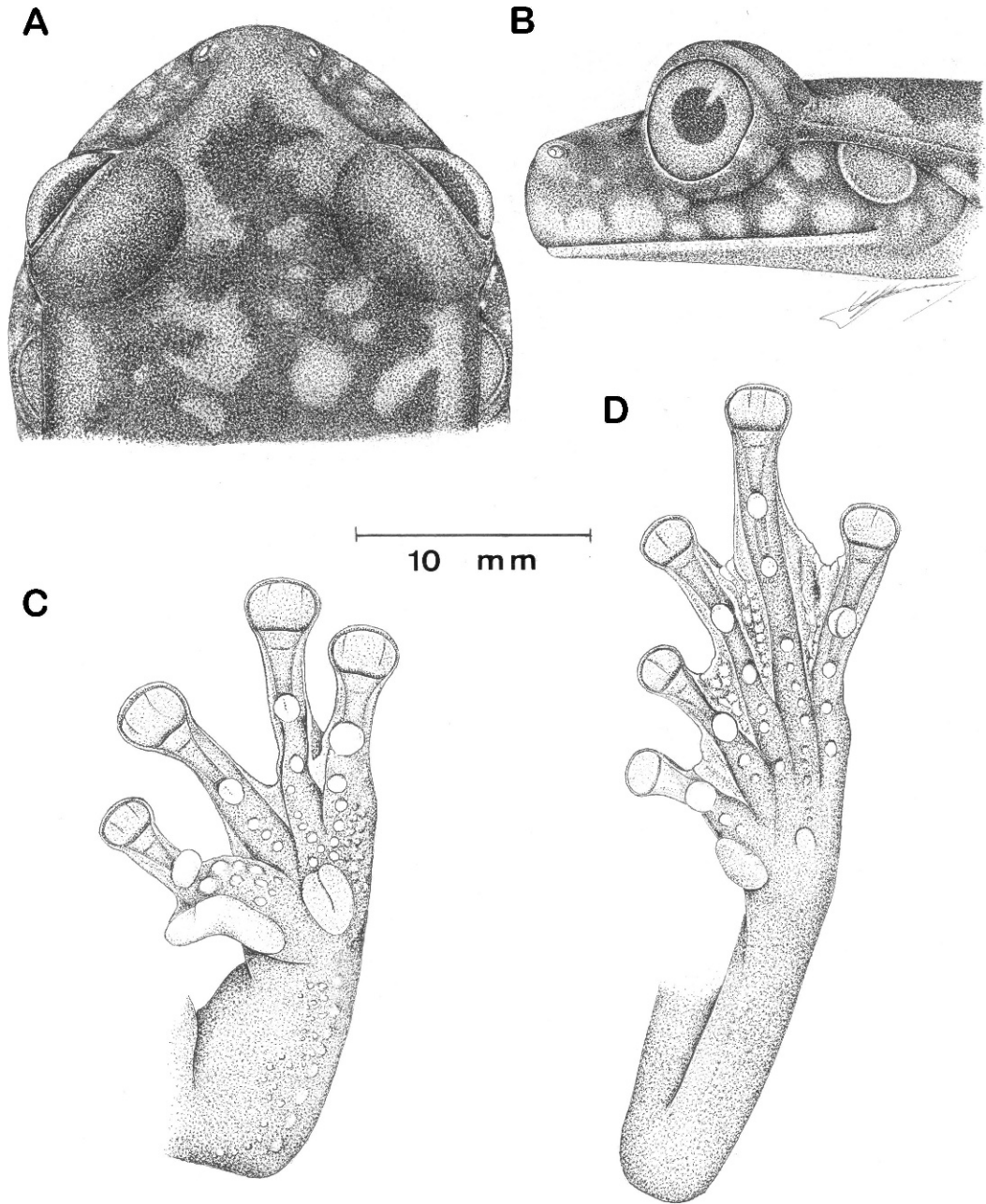


FIG. 3.—Holotype of *Bokermannohyla juiju*, MZUEFS 1900: (A) Head in dorsal view; (B) head in lateral view; (C) left hand in ventral view; (D) left foot in ventral view.

superficial dissection indicated that they are trombiculid mites. The new species was collected sympatrically with *Bokermannohyla itapoty*, *B. oxente*, an undescribed species of the *Scinax ruber* clade, *Rupirana cardosoi*,

Leptodactylus cf. *furnarius*, and *Leptodactylus vastus*.

Etymology.—In Tupi indigenous language, *jui* = frog, *ju* = spine, which refers to the prepollical and humeral spines of the new species.

DISCUSSION

The Bokermannohyla martinsi Species Group

Two of the characters originally employed by Bokermann (1965) to define the then *Hyla martinsi* group, the development in males of a humeral crest into a hook-like projection and a bifid prepollex, were considered by Faivovich et al. (2005) as putative synapomorphies of the *Bokermannohyla martinsi* group. Bokermann (1965) further listed the well-developed humeral crests as a diagnostic character, without specifying which was the crest modified as a hook-like projection, and which ones were well-developed. This was accidentally omitted by Faivovich et al. (2005). From the illustration provided by Bokermann (1964) of the humerus of *B. martinsi*, and X-rays of the three species in the group (J. Faivovich and A. C. Calijorne, personal observations) it is clear that the ventral humeral crest is the one that is modified as a spine, while the hypertrophied lateral and medial humeral crests are the ones that Bokermann (1965) referred to as the well-developed humeral crests. There are different levels of hypertrophy in the forearm of *Bokermannohyla*; the taxonomic distribution of the relative development of the lateral and medial humeral crests needs to be assessed to establish whether the level of development seen in the *B. martinsi* group is another putative synapomorphy of this group.

Considering that *Bokermannohyla juiju* lacks the bifid distal element of the prepollex (Fig. 2) but has the ventral humeral crest developed as a spine, we find it more informative to include it in the *B. martinsi* group rather than to leave it unassigned to any group. In this way, the bifid prepollex remains a putative synapomorphy shared by *B. langei* and *B. martinsi*, whereas ventral humeral crest being developed as a spine is the only putative synapomorphy of the *B. martinsi* group, whose monophyly remains to be tested in a quantitative phylogenetic framework.

Species Groups in Bokermannohyla

By the time Faivovich et al. (2005) presented their phylogenetic hypothesis, there were no known synapomorphies of the *Bokermannohyla pseudopseudis* group. At that time *Bokermannohyla alvarengai*, although originally grouped with *B. martinsi* and *B. saxicola*

by Bokermann (1964) and included at one point in the *B. circumdata* group by Duellman et al. (1997), had not been included in any group in the most recent papers (Caramaschi et al., 2001; Eterovick and Brandão, 2001). Faivovich et al. (2005) only had available one undescribed species that was similar to *B. pseudopseudis*, which they called *Bokermannohyla* sp. 6 (aff. *B. pseudopseudis*) and later described as *B. oxente* by Lugli and Haddad (2006a). Similarly, Faivovich et al. (2005) did not have samples of *B. alvarengai*, but from an undescribed species similar to it, which they called *Bokermannohyla* sp. 9 (aff. *B. alvarengai*) and later described as *B. itapoty* by Lugli and Haddad (2006b). The results of Faivovich et al. (2005) indicated that *B. oxente* and *B. itapoty* were monophyletic, and on this basis, they recognized a *B. pseudopseudis* group including *B. alvarengai*—because of its similarity with *B. itapoty*—and all species associated with the former *Hyla pseudopseudis* group by previous authors, that is, *B. ibitiguara*, *B. pseudopseudis*, and *B. saxicola*. The monophyly of the *B. pseudopseudis* group is so far supported solely by molecular data, as no morphological synapomorphies had ever been suggested previously for the group.

Lugli and Haddad (2006b) created the *Bokermannohyla alvarengai* species group for *B. alvarengai* and *B. itapoty*. The recognition of a *B. alvarengai* group is problematic at this stage of our knowledge of the phylogenetic relationships of *Bokermannohyla*. As there are no known synapomorphies of any nature for the remaining species of the *B. pseudopseudis* group (*B. ibitiguara*, *B. oxente*, *B. pseudopseudis*, and *B. saxicola*), a *B. alvarengai* group has the potential of making the *B. pseudopseudis* group paraphyletic. For this reason we prefer to continue recognizing a single group, the *B. pseudopseudis* group, containing all species included by Faivovich et al. (2005) and Lugli and Haddad (2006a) plus *B. itapoty*, until its monophyly can be rigorously tested.

Mental Glands in Bokermannohyla

This is the first report of mental glands in species of *Bokermannohyla*. Mental glands are considered by Brizzi et al. (2003) to be a type of “breeding gland,” that is, cutaneous secre-

tory structures involved in reproductive activities such as courtship and mating. These possible physiological roles in *Bokermannohyla* seem to be supported by the fact that we observed this gland only in males. Until now, mental glands were reported to occur in other Cophomantini, such as the *Hyloscirtus bogotensis* and *H. armatus* species groups (Duellman, 1972; Faivovich and De la Riva, 2006), the *Hypsiboas benitezii* species group (Faivovich et al., 2006), *H. cinerascens* and *H. punctatus* of the *H. punctatus* species group (Hoogmoed, 1979), and *H. heilprini*, a species of the *H. albopunctatus* group (Trueb and Tyler, 1974). The mental gland in *Bokermannohyla* has been observed in the three species of the *B. martinsi* group, and in *B. ahenea*, *B. carvalhoi*, *B. claresignata*, *B. clepsydra*, *B. feioi*, *B. gouveai*, *B. ibitiguara*, *B. itapoty*, *B. lucianae*, *B. nanuzae*, *B. pseudopseudis*, *B. saxicola*, and *B. sazimai*. We have not found a mental gland in males of *B. alvarengai*, *B. astartea*, *B. caramaschii*, *B. circumdata*, *B. diamantina*, *B. hylax*, *B. ibitipoca*, *B. izecksohni*, *B. luctuosa*, *B. oxente*, and *B. ravida*. As was observed by Faivovich et al. (2006) and Faivovich and De la Riva (2006) in the groups of *Hypsiboas benitezii* and *Hyloscirtus armatus* respectively, the glands in *Bokermannohyla* are macroscopically evident as acini spread in the gular area, anterior to the vocal sac, and have a different macroscopic appearance than in most species of the *Hyloscirtus bogotensis* group, in which the acini are tightly packed into a well defined oval structure. A thorough histological study is required to better define these structures and shed some light on its function.

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LITERATURE CITED

- BOKERMANN, W. C. A. 1964. Dos nuevas especies de *Hyla* de Minas Gerais y notas sobre *Hyla alvarengai* Bok (Amphibia, Salientia, Hylidae). *Neotropica* 10:67–76.
- BOKERMANN, W. C. A. 1965. *Hyla langei*, a new frog from Paraná, southern Brasil. *Journal of the Ohio Herpetological Society* 5:49–51.
- BOKERMANN, W. C. A. 1972. Notas sobre *Hyla clepsydra* A. Lutz (Anura, Hylidae). *Revista Brasileira de Biologia* 32:291–295.
- BRIZZI, R., G. DELFINO, AND S. JANTRA. 2003. An overview of breeding glands. Pp. 253–317. In B. G. M. Jamieson (Ed.), *Reproductive Biology and Phylogeny of Anura*. Science Publishers, Enfield, New Hampshire, USA.
- CARAMASCHI, U., M. F. NAPOLI, AND A. T. BERNARDES. 2001. Nova espécie do grupo de *Hyla circumdata* (Cope, 1870) do Estado de Minas Gerais, Brasil (Amphibia, Anura, Hylidae). *Boletim do Museu Nacional, Nova Série, Zoologia* 457:1–11.
- DUUELLMAN, W. E. 1970. *Hylid frogs of Middle America*. Monographs of the Museum of Natural History, University of Kansas 1–2:1–753.
- DUUELLMAN, W. E. 1972. A review of the neotropical frogs of the *Hyla bogotensis* group. *Occasional Papers of the Museum of Natural History, University of Kansas* 11:1–31.
- DUUELLMAN, W. E., I. DE LA RIVA, AND E. R. WILD. 1997. Frogs of the *Hyla armata* and *Hyla pulchella* groups in the Andes of South America, with definitions and analyses of phylogenetic relationships of Andean groups of *Hyla*. *Scientific Papers of the Natural History Museum, University of Kansas* 3:1–41.
- ETEROVICK, P. C., AND R. A. BRANDÃO. 2001. A description of the tadpoles and advertisement calls of members of the *Hyla pseudopseudis* group. *Journal of Herpetology* 35:442–450.
- FAIVOVICH, J., AND I. DE LA RIVA. 2006. On “*Hyla chlorostea* Reynolds and Foster, 1992, a hylid of uncertain relationships, with some comments on *Hyloscirtus* (Anura: Hylidae). *Copeia* 2006:785–791.
- FAIVOVICH, J., J. MORAVEC, D. F. CISNEROS-HEREDIA, AND J. KÖHLER. 2006. A new species of the *Hypsiboas benitezii* group from the western Amazon basin (Amphibia: Anura: Hylidae). *Herpetologica* 62:96–108.
- FAIVOVICH, J., C. F. B. HADDAD, P. C. A. GARCIA, D. R. FROST, J. A. CAMPBELL, AND W. C. WHEELER. 2005. Systematic review of the frog family Hylidae, with special reference to Hylinae: phylogenetic analysis and taxonomic revision. *Bulletin of the American Museum of Natural History* 294:1–240.
- HOOGMOED, M. S. 1979. Resurrection of *Hyla ornatissima* Noble (Amphibia, Hylidae) and remarks on related species of green tree frogs from the Guiana area. Notes on the herpetofauna of Surinam VI. *Zoologische Verhandlungen* 172:1–46.
- JIM, J., AND U. CARAMASCHI. 1979. Uma nova espécie da região de Botucatu, São Paulo, Brasil (Amphibia, Anura). *Revista Brasileira de Biologia* 39:717–719.
- LEVITON, A. E., R. H. GIBBS, JR., E. HEAL, AND C. E. DAWSON. 1985. *Standards in Herpetology and Ichthy-*

- ology: Part I. Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology for Institutional Resource Collections in the Herpetology and Ichthyology. *Copeia* 1985:802–832.
- LUGLI, L., AND C. F. B. HADDAD. 2006a. A new species of the *Bokermannohyla pseudopseudis* group from central Bahia, Brazil (Amphibia, Hylidae). *Herpetologica* 62:453–465.
- LUGLI, L., AND C. F. B. HADDAD. 2006b. New species of *Bokermannohyla* (Anura, Hylidae) from central Bahia, Brazil. *Journal of Herpetology* 40:7–15.
- MYERS, C. W., AND W. E. DUELLMAN. 1982. A new species of *Hyla* from Cerro Colorado, and other tree frog records and geographical notes from Western Panama. *American Museum Novitates* 2752:1–32.
- SAVAGE, J. M., AND W. R. HEYER. 1967. Variation and distribution in the tree-frog genus *Phyllomedusa*. *Beiträge zur Neotropischen Fauna* 5:111–131.
- TRUEB, L., AND M. J. TYLER. 1974. Systematics and evolution of the greater Antillean hylid frogs. *Occasional Papers of the Museum of Natural History, University of Kansas* 24:1–60.
- tina*: MZUEFS 1781, MZUEFS 1785 *Bokermannohyla feioi*: MNRJ 21356 (holotype), MNRJ 21347, MNRJ 21350, MNRJ 21352, MNRJ 21364–21366, MNRJ 24826–24828 (paratypes), MNRJ 46350–46354. *Bokermannohyla gouveai*: CFBH 16675, MNRJ 1459–1460, MNRJ 1463, MNRJ 18825–18827. *Bokermannohyla hylax*: MNRJ 45210, MNRJ 24294–24296. *Bokermannohyla ibitiguara*: CFBH 6255 (ex ZUEC 4209, paratype), MNRJ 1040, MNRJ 4152–4153 (paratypes), MNRJ 50443. *Bokermannohyla ibitipoca*: MNRJ 4460 (holotype), MNRJ 4421–4425, MNRJ 4453–4471 (paratypes), MNRJ 24829–24836. *Bokermannohyla itapoty*: CFBH 5644–5647, 5652 (paratypes) MZUEFS 1140–43. *Bokermannohyla izecksohni*: MNRJ 14231–14232, MNRJ 19051. *Bokermannohyla langei*: USNM 217701, MZUSP 74275 (Ex WCAB 30428, holotype), MZUSP 74276 (Ex WCAB 30429, paratype), MNRJ 24050. *Bokermannohyla lucianae*: MNRJ 26276 (holotype), MNRJ 29676 (Paratype), MNRJ 40482–40484. *Bokermannohyla luctuosa*: MNRJ 15458 (paratype), MNRJ 18862. *Bokermannohyla martinsi*: MNRJ 24639–MNRJ 24643, MNRJ 24649, MNRJ 30619–30620, MNRJ 49670, MNRJ 49673, MNRJ 49675, MZUSP 73667 (ex WCAB 14759, holotype), MZUSP 73757, MZUSP 74174 (paratypes), CFBH 19287–19288. *Bokermannohyla nanuzae*: MNRJ 4583 (paratype), MNRJ 21368–21371, MNRJ 24037, MNRJ 24045, MNRJ 36954–36955, MNRJ 36991. *Bokermannohyla oxente*: CFBH 5634, 5636–5638, 5642 (paratypes), MZUEFS 1395–1397, MZUEFS 1506–1509, MNRJ 50291–50305. *Bokermannohyla pseudopseudis*: CFBH 6800, MNRJ 17023, MNRJ 18339, MNRJ 35096. *Bokermannohyla ravida*: MNRJ 13721–13726, 13834–13838 (Paratypes), MNRJ 13720 (Holotype). *Bokermannohyla saxicola*: CFBH 17312–17313, MNRJ 0579 (paralectotype), MNRJ 5711–5712 (paralectotypes), MNRJ 3974, MNRJ 14204, 17303, MCNAM 3085, MCNAM 3089, MCNAM 3649–3650, MCNAM 3732, MCNAM 3739, MCNAM 3744. *Bokermannohyla sazimai*: CFBH 18417–419, MNRJ 19026–19028, MNRJ 22078–22089.

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Associate Editors: Paul Chippindale and Brad Moon

APPENDIX I

Specimens examined.—*Bokermannohyla ahenea*: CFBH 18112, MNRJ 45437–45439 (paratype). *Bokermannohyla alvarengai*: MCNAM 3165, MNRJ 3669, MNRJ 8546–8547. *Bokermannohyla astartea*: CFBH 11167, 11169, MNRJ 4052 (paratype). *Bokermannohyla caramaschii*: MNRJ 35473–35476. *Bokermannohyla carvalhoi*: MNRJ 16983, MNRJ 51489. *Bokermannohyla circumdata*: MNRJ 48472–48488. *Bokermannohyla claresignata*: MNRJ 24028. *Bokermannohyla clepsydra*: MZUSP 112613–212625. *Bokermannohyla diamant-*