

# BOLETIM DO MUSEU NACIONAL

NOVA SÉRIE  
RIO DE JANEIRO - BRASIL

ISSN 0080-312X

ZOOLOGIA

Nº 440

19 DE FEVEREIRO DE 2001

NEW SPECIES OF *BOTHROPS* WAGLER, 1824  
FROM THE ATLANTIC FOREST OF NORTHEASTERN BRAZIL  
(SERPENTES, VIPERIDAE, CROTALINAE)<sup>(1)</sup>

(With 1 figure)

HEBERT FERRAREZZI<sup>(2)</sup>  
Instituto Butantan

ELIZA MARIA XAVIER FREIRE<sup>(3)(4)</sup>  
Museu Nacional  
Universidade Federal do Rio de Janeiro

The composition of the herpetofauna from the Atlantic Forest remains of Northeastern Brazil is still poorly known. During a field work in the State of Alagoas, one of us (EMXF) had the opportunity to collect three specimens of a species of *Bothrops*, which are here described as new species. In overall appearance this species resembles *Bothrops pirajai* Amaral, 1926, *Bothrops brazili* Hoge, 1953; *Bothrops sanctaerucis* Hoge, 1966 and *Bothrops jararacussu* Lacerda, 1884.

The taxonomic history of the taxa allied to the new species can be briefly summarized as follows: the first described and the better known species is *B. jararacussu*, distributed throughout the Atlantic Forest from the states of Espírito Santo to Santa Catarina, also extending westwards to eastern Paraguay and northeastern Argentina (HOGE & ROMANO-HOGE, 1978; CAMPBELL & LAMAR, 1989). AMARAL (1926) described *B. pirajai* based on two specimens from a restricted locality in Southern Bahia, and *B. neglecta* based on a holotype from Bahia and a paratype from Guyana. AMARAL (1926) stated that *B. pirajai* is close to *B. jararacussu*, for which he restricted the diagnosis of the former, and compared *B. neglecta* only to *B. atrox* (Linnaeus, 1758), a species in which the paratype of *B. neglecta* had been formerly allocated by BOULENGER (1896). HOGE (1953) described *B. brazili* based on two specimens from the Amazon Forest of Pará, stating that it is allied to *B. jararacussu*, and superficially very similar to *B. pirajai* and *B. neglecta*. Soon after, AMARAL (1955) proposed the invalidation of *B. brazili*, claiming that it was conspecific with *B. atrox*. It is now recognized that Amaral's holotype of *B. neglecta* is conspecific with his own *B. pirajai*, while the

<sup>1</sup> Received on 21/09/2000. Accepted on 12/01/2001.

<sup>2</sup> Instituto Butantan, Herpetologia. Av. Vital Brazil, 1500 – São Paulo, SP, 05503-900, Brasil.

<sup>3</sup> Departamento de Zoologia e Museu de História Natural, Universidade Federal de Alagoas. Rua Aristeu de Andrade, 452 – Farol, Maceió, AL, 57021-090, Brasil.

<sup>4</sup> Doutoranda, Programa de Pós-Graduação em Ciências Biológicas – Zoologia, Museu Nacional/UF RJ.

paratype of the former is referable to *B. brazili* (HOGE, 1966; HOGE & ROMANO, 1972; CAMPBELL & LAMAR, 1989). HOGE (1966) described *B. sanctaegrucis* based on a series of specimens from amazonian Bolivia, also stating that it is close to *B. jararacussu*. Considering the somewhat subjective judgment of the early authors, which were based solely on superficial similarity, the species involved in this complex had never been formally clustered together as a natural assemblage, but they have been allied directly or indirectly to each other, and also to *B. atrox*, during their taxonomic history.

#### MATERIAL AND METHODS

The material examined is from the snake collections of the Setor de Herpetologia of the Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ), of the Museu de História Natural, Universidade Federal de Alagoas (MUFAL), and from the Laboratório de Herpetologia of the Instituto Butantan, São Paulo (IB). The specimens examined for external features are cited in Appendix.

Ventral plates were counted following DOWLING (1951); dorsal scale reduction formulae follows the procedure described by THOMAS (1976), which was also adapted for caudal dorsal scale reductions, by substituting the ventral counts for the subcaudals. Head measurements of the type series were made with a calliper, to the nearest a 0.01mm; other measurements with a common ruler. Information on scale counts and color pattern for non examined species of *Bothrops* were obtained from CAMPBELL & LAMAR (1989). The position of a scale character along the body or tail was recorded as the number of its opposite ventral or subcaudal scale. Similarly, the width of a character was measured in units of ventral scales. In order to compensate variations in ventral and subcaudal scales numbers, this was then transformed to ventral scale percentual (% VS) or caudal scale percentual (% CS) position (THORPE, 1975).

#### *Bothrops muriciensis* sp.nov. (Fig.1)

Holotype - BRAZIL: ALAGOAS: Murici, Fazenda Bananeira (9°14'S, 35°48'W, 640m), MNRJ 7036, ♀, 20 April 1995, S.T.Silva leg.

Paratypes - Both from the same locality of the holotype: MUFAL 379, ♀, 24 March 1996, E.M.Gonçalves leg., and MNRJ 7037, young ♂, 07 July 1995, E.M.X.Freire leg.

Diagnosis - *Bothrops muriciensis* sp.nov. can be distinguished from all other species of *Bothrops* by the following combination of features: prelacunal fused with the second supralabial (forming a lacunolabial); eight (sometimes nine) supralabials; canthal scales much larger than internasals; intercanthal and intersupraocular scales smooth; dorsal scales in 25/25/21 rows; 150-155 ventrals; less than 26 interriotal rows; absence of postocular stripe; 13-14 triangular to trapezoidal dark dorsal blotches on body, with no dark spots in the interspaces; gular and labial regions (at least in juveniles) densely pigmented with black in the male, uniformly white in the female.

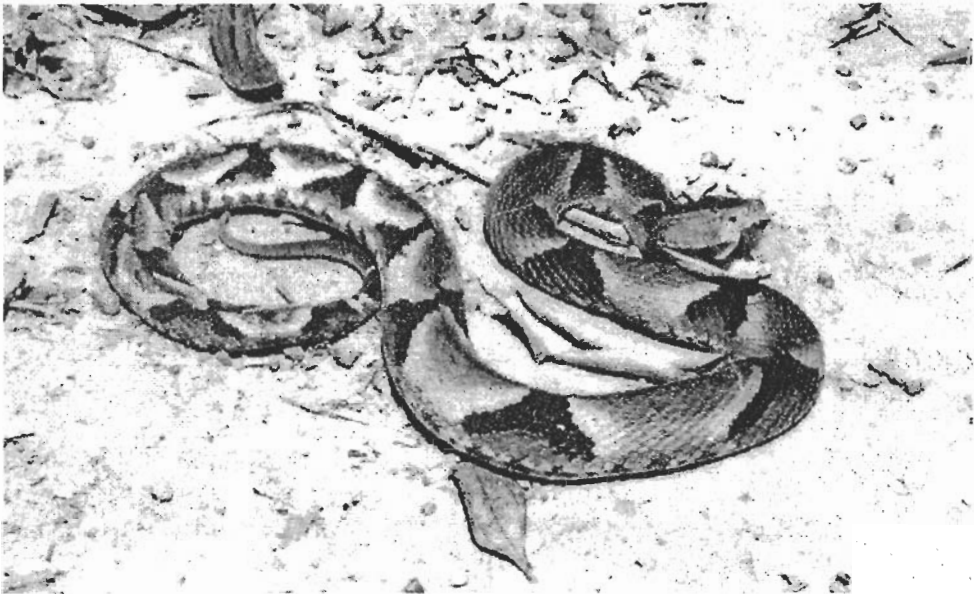


Fig. 1- *Bothrops muriciensis* sp. nov., freshly killed female paratype (MUFAL 379); snout vent length 770mm+114mm tail. Photo by Edelmo M. Gonçalves.

Description of the holotype – Body relatively short, stout and cylindrical, head broad, and moderate non-prehensile tail. Rostral subtriangular, distinctively higher than broad, visible from above. Nasal completely divided. Loreal single, contacting canthal. Posterior nasal separated from lacunolabial by two small prefoveal scales, the lower the largest and in contact with first labial. Subfoveal row absent. Two preoculars, the lower distinctly small and elongated, the upper large, reaching the top of head and contributing to canthus. Two postfoveal scales between the lower preocular and the third labial; two elongate suboculars, separated from the labials by one small medial scale, and two scales at the level of both the anterior and posterior vertical lines of eye; two small postoculars. A longitudinal series of relatively enlarged and smooth temporal scales in contact with the last supralabials, grading into smaller series of keeled scales towards the top of head. Eight supralabials on each side, the second fused to the prelacunal to form a lacunolabial scale; the first four and the last supralabials longer than high, the former increasing in size backwards, the fifth, sixth and seventh supralabials distinctly higher than long, the seventh in the left side very small (but not allowing upper contact of adjacent labials). Ten infralabials on each side, the first pair in contact behind mental, the first, fourth and fifth shields larger; gular scales disposed in nine (anterior) to twelve (posterior) longitudinal rows, and four transversal rows between genials and preventrals. Four rows of gulars separating the first ventral from infralabials; anterior genial elongated, nearly twice as long as broad, contacting the first three infralabials; posterior genial small and nearly undifferentiated from gulars. A pair of large internasals, forming an antero-medial

suture with each other; a pair of extremely large and broad canthals, well differentiated from internasals; three transversal rows of almost rounded and smooth intercanthal shields, the first and second rows with respectively two and three larger shields, and the third (between the extreme posterior end of canthals and immediately anterior to the intersupraoculars) with six smaller shields. Upper surface of head covered with small imbricate scales, weakly to strongly keeled on temporal, occipital and parietal regions, grading to unkeeled scales in the intersupraocular region; supraoculars large, longer than wide, separated by five longitudinal rows (four in front) of intersupraocular scales. Dorsal scales keeled, except the paraventral row, without apical pits, in 25/25/21 rows; dorsal keels low, as long as the scale; dorsal scales smaller and three times as long as wide anteriorly becoming wider posteriorly, to only about 1.5 times as long as wide on tail; scales of paraventral row distinctly larger than that of adjacent row; supra-anal dorsal scale in 16 rows; ventrals 155, preceded by a large preventral; anal single; two para-anal scales; subcaudals 48/48, all divided; tail spine short and rounded, a little longer than last subcaudal, and only slightly visible from above, being in its most part covered by dorsals.

Color (in preservative) – Head uniformly light gray, paler than the ground body color, with no concentration of dark pigmentation on both upper and under surfaces. There are no labial spots nor any vestige of a postorbital stripe. Dorsal ground coloration nearly uniform light gray, unspotted; a lateral series of thirteen conspicuous dark blotches on body; the shape of the first blotch on the neck region is nearly losangular, while the others are almost triangular; blotches on each side of the body anteriorly have a nearly alternate disposition, tending to approach each other on midbody, and becoming confluent in the mid-dorsal line posteriorly; dorsal blotches dark gray with sharply contrasting black outer edges, that are lighter at the center; no light edge external to dark dorsal blotches; the area occupied by the dorsal blotches is nearly equivalent to that occupied by its lighter interspaces; no distinct paravertebral or vertebral dark spots on the interspaces between blotches, but in the posterior half of body there is a regularly slight darker pigmentation in that region, suggesting vestiges of these markings (Fig.1). Tail predominantly dark gray, due to the enlargement and almost confluence of the rounded dorsal blotches; the light gray interspaces, present between the three first caudal blotches, are short (with the first and second blotches confluent mid-dorsally) but distinct, until the middle of the tail; posterior half of tail predominantly dark gray, with scarcely visible vestiges of straight light gray transversal bands to the tip; ventral surface of tail light gray, with anterior subcaudals showing darker posterior edge. Ventral surface of body predominantly light gray to yellowish, powdered with dark gray and with a series of irregular dark spots in the lateral edges of ventrals, occupying nearly one to two shields, extending to the paraventral scale row and being separated by whitish interspaces of nearly one shield. The dark ventral spots occupy exactly the middle of the interspaces between dorsal blotches, being larger than the others placed below or immediately before or after the dorsal blotches. The live specimen had dorsal ground coloration red brown and darker blotches.

Variation – Selected external measurements of the type series are given in table 1. A summary of the variation in scalation and coloration observed in the type series is presented in table 2. Both paratypes fit well to the above description of the holotype, showing little variation, but with noteworthy differences in color pattern for the male and ontogenetic variation.

TABLE 1

Measurements (in mm) of the type series of *Bothrops muriciensis* sp.nov.

	♀ holotype	♀ paratype	♂ paratype
Snout vent length	540	770	225
Tail length	79	114	40
Head length	32.5	48.6	15.9
Head width	20.2	29.1	11.7
Snout width (between nostril)	5.1	6.6	2.7
Eye-snout distance	10.2	14.6	5.0
Eye-pit distance	2.6	2.9	1.3
Eye-nostril distance	6.9	9.5	3.4
Diameter of eye	3.5	3.9	3.0
Internasal length	2.6	2.8	1.1
Internasal width	2.8	3.3	1.6
Canthal length	3.8	4.4	1.7
Canthal width	2.0	2.3	1.3
Supraocular length	6.2	8.3	3.0
Supraocular width	3.5	5.3	2.2

TABLE 2

Summary of the variation in the type series of *Bothrops muriciensis* sp.nov.

	♀ holotype	♀ paratype	♂ paratype
Intercanths	11(2+3+6)	10(3+3+4)	10(3+3+4)
Intersupraocular rows	4	7	7
Interrictal rows	23	25	25
Supralabials	8/8	8/9	8/8
Infralabials	10/10	10/11	10/11
Preventrals	1	3	3
Ventrals	155	151	150
Subcaudals	48	48	55
Dorsal blotches on body	13/13	12/14	14/14
Ventral surface of head	White	White	Black
Ventral pattern	light with dark spots	light with dark spots	dark with white spots
Tail tip	Dark gray	Dark gray	Whitish

The scalation of the paratypes is similar to that described above for the holotype, showing variations in the number of supralabials (8-9), infralabials (10-11), preventrals, intersupraoculars and intercanthals (Tab.2). The variation in number of ventrals is 150 for the male and 151-155 for females (paratype and holotype, respectively), and the number of subcaudals is 48 for both females, to 55 for the male. In the male, the intercanthals are not disposed in regular rows, with outer shields distinctly larger than internal ones. Also, the first infralabial of the left side and the pair of anterior genials are anomalous in division, forming small accessory

plates between mental and genial. The differences observed in scalation of the type series did not exceed those already expected in intraspecific variation and sexual dimorphism in other congeneric taxa.

The color pattern of the female paratype is nearly identical to that described for the holotype, but the dorsal ground color in life was olive gray. The color pattern of the male paratype is similar to that described for the holotype, but the ground coloration is very distinct from that of both females especially in the densely and distinctly pigmented ventral surface. The belly is dark gray, with a conspicuous series of irregular white markings occupying the edges of one to three ventrals (and extending to paraventral scales), and less pigmented medially, forming an ill-defined midventral light stripe; anteriormost ventrals, gulars, mentals and labials uniform black, this coloration gradually changing to gray on the temporal region and at the top of head. Its dorsal coloration is much similar to that of the holotype, but darker, causing some obscuring of the dorsal blotches. Dorsal blotches mostly confluent mid-dorsally, in 14 pairs, the last confluent pair forming a broad transverse band over the cloacal region, and with an additional unpaired straight transversal band in the left size, between 11th and 12th blotches. End of tail distinctly whitish dorso-ventrally in its two fifths, a condition also present in other juvenile specimens of congeneric taxa (see CAMPBELL & LAMAR, 1989).

**Etymology** – The specific epithet *muriciensis* refers to the area where the new species is known to occur, named “Mata de Murici” (= Murici Forest), which is an allusion to the common name of one of the most frequent trees in the region.

**Distribution** – *B. muriciensis* n.sp. is known only from the type locality.

#### AREA OF OCCURRENCE AND HABITAT

The Murici forest, about 70km NW from Maceió (9°14'S e 35°48'W), is the largest remain of the Atlantic Forest in the State of Alagoas, and encompass several forest patches that occupy about 10,060ha in the municipals districts of Messias, Flexeiras, Joaquim Gomes, União dos Palmares, and mainly Murici (ASSIS, 1998). It is recognized as the most significant remain of Atlantic Forest of the northeastern and northern Brazil, and is probably the last residue of the so-called Pernambuco subcenter (POR, 1992). In its most conserved areas, the trees reach 40m and form a closed canopy, retaining a moist environment favorable to the growth of numerous Araceae, Orchidaceae, and Marantaceae.

Among the arboreal species present, the murici (*Byrsonima sericea*), the sambacuim (*Didimopanax morototoni*), the visgueiro (*Parkia pendula*), the ipê amarelo (*Tabebuia* sp.), and the munguba (*Pseudobombax* sp.), which are the most abundant species (R.P.Lemos, Instituto do Meio Ambiente de Alagoas, pers. comm.).

The young male and the smaller adult female were found during the day in similar microhabitats, within fallen logs in decomposition on the forest floor. The larger female was exposed on the forest floor at 10:00h. Although we have made intensive collecting effort in the Murici forest, the specimens of *B. muriciensis* sp.nov. were found only within the area of the Fazenda Bananeira.

We express our wish of see this forest transformed in Biological Reserve, assuring

thus the preservation of this and of hundreds of other species, for what we hoped to have contributed with the description of this endemic species.

#### COMPARISONS WITH CONGENERIC SPECIES

The extremely low number of ventrals, in combination with enlarged canthals, absence of postorbital stripe, less than 15 dorsal blotches, smooth intersupraoculars, and less than 26 interriotal rows, are characteristics sufficient to unequivocally diagnose *Bothrops muriciensis* sp.nov. from all other species of *Bothrops*.

By having enlarged canthal plates distinctly wider than internasals, and separated by only a few shields, *Bothrops muriciensis* sp.nov. is similar to *B. brazili*, *B. pirajai*, *B. sanctaerucis*, and *B. jararacussu*. All other species of *Bothrops* with lacunolabial have relatively smaller canthals, which are not much differentiated from internasals, and usually separated by several scales. Besides a strong similarity in external appearance, there are special similarities among *B. muriciensis* sp.nov. and some of these aforementioned four species (see below), suggesting their close relationship. For this reason, we made a more detailed comparison of the new species with these species with enlarged canthals.

*Bothrops muriciensis* sp.nov. is easily distinguished from *B. jararacussu*, *B. pirajai*, *B. sanctaerucis*, and from most specimens of *B. brazili* by its lower number of ventrals (150 in males and 151-155 in females; 155-186 in the total of the others), lower number of dorsal blotches (12-14; 17-19 in the others), and smooth intersupraoculars. It is additionally distinguished from *B. jararacussu* and *B. pirajai* by lacking any vestige of postorbital stripe and nearly lacking paravertebral spots in the interspaces of dorsal blotches, and from *B. jararacussu* and *B. sanctaerucis* by the absence of a lighter outer border of dorsal blotches. *Bothrops muriciensis* sp.nov. is further distinguished from *B. brazili* and *B. pirajai* in having a distinctly lower number of interriotal scale rows (23-25, rather than 27-31), and smooth intersupraocular scales. It additionally differs from *B. brazili* by its olive grey (rather than pinkish white) ground coloration, darker tail coloration, and gular-labial region densely pigmented in males (at least when young) but uniformly white in females (rather than white in both sexes). A similar sexual dimorphism in gular-labial pigmentation is found in *B. jararacussu*, but data are missing for *B. pirajai* and *B. sanctaerucis*. In lacking postorbital stripes *B. muriciensis* sp.nov. resembles *B. sanctaerucis* and *B. brazili*, but it approaches *B. pirajai* and *B. brazili* in respect to color pattern and the lower number of dorsal blotches on the body. Although the number of ventrals and dorsal blotches can be used to differentiate *B. muriciensis* sp.nov. from most specimens of *B. brazili*, it is reported a wide variation for the last species, with some specimens from northern of the Amazon Region eventually overlapping the values of the former. The slight overlapping in ventral scale counts showed by *B. muriciensis* sp.nov. with *B. brazili* and *B. pirajai* disappears when the two sexes are compared separately, and it may be possibly increased in the future, with a better knowledge of the variation of these three species. In this respect, it is important to note that populations of *B. brazili* from the State of Pará, south to the Amazonas (including the holotype), although geographically closest to *B. muriciensis* sp.nov., are the most distinct from it. They exhibit the highest values of both ventrals (v) and subcaudals (sc): v=159-180; sc= 47-68, as already reported by CUNHA & NASCIMENTO (1975, 1978, 1982, 1993). The lowest values in

ventral and subcaudal counts reported for *B. brazili* ( $v=151-166$ ;  $sc=44-51$ ) approaching the condition present in *B. muriciensis* sp.nov., are found only in populations from Venezuela, Guyanas, Colombia, and the State of Amapá, north of the Amazonas (DUNN, 1944; HOGE, 1962; CUNHA & NASCIMENTO, 1993). The variation on scalation and color pattern for specimens currently assigned to *B. brazili* suggests the existence of geographic differentiation or even the existence of an undescribed allopatric species. The possibility that the lowest ventral values observed in *B. muriciensis* sp.nov. would represent only a geographical extreme of a clinal variation along the distribution of *B. brazili* is incompatible with the spatial distribution of the variation of ventral scale numbers.

It will also be useful to make a brief comparison of *B. muriciensis* sp.nov. with the geographically closer, although not closely related species. The only other species of *Bothrops* known to occur in forest areas close to the locality of *B. muriciensis* sp.nov. is a representative of the *atrox* group, tentatively assigned as *Bothrops* cf. *leucurus*. The taxonomy of this species and other nominal species within the *atrox* complex is problematical and currently under study (WÜSTER *et al.*, 1996). *Bothrops* cf. *leucurus* show a significant variation in color pattern which is not well understood (but perhaps associated to sexual dimorphism - J.Cavalheiro, pers. comm.). One of the color morphs observed in the same region as the new species bears some resemblance in pattern, and can be confused with *B. muriciensis* sp.nov. Both species can be easily distinguished from each other by the number of supralabials (8-9 in *B. muriciensis* sp.nov.; 7 in *Bothrops* cf. *leucurus*), number of ventrals (150-155; 193-200, respectively), ornamentation of intersupraocular scales, and the condition of canthals (smooth/keeled).

*Bothrops pirajai* is the closest relative which is geographically closer (in the Ilhéus-Itabuna region, Bahia) to *B. muriciensis* sp.nov.; however, the limits of their distribution areas are unknown.

#### ACKNOWLEDGMENTS

We thank Selma T. Silva and Edelmo M. Gonçalves (Universidade Federal de Alagoas), for their invaluable help in field work and for collect of the holotype and one paratype; Miguel T. Rodrigues (Instituto de Biociências/USP) and Ronaldo Fernandes (MNRJ), for critically reviewing the manuscript; Ulisses Caramaschi (MNRJ), for the facilities during this study; Vera F. Barbosa and Thais S. Freitas (MNRJ), for their help in the bibliography obtaining; Coordenação de Aperfeiçoamento de Pessoal de Ensino Superior (CAPES), for the fellowships to the junior author. We also thank two anonymous reviewers for comments on the manuscript.

#### RESUMO

##### ESPÉCIE NOVA DE *BOTHROPS* DA FLORESTA ATLÂNTICA DO NORDESTE DO BRASIL (SERPENTES, VIPERIDAE, CROTALINAE)

*Bothrops muriciensis* sp.nov. é descrita com base em duas fêmeas adultas e um macho jovem procedentes do Estado de Alagoas, Brasil. A espécie nova é facilmente diagnosticável das outras espécies congêneras pela combinação da presença de



lacunolabial, 8-9 supralabiais, cantais aumentadas, ausência de faixa pós-ocular, escamas intersupraoculares lisas, menos de 26 fileiras de escamas interrietais, menos de 156 ventrais, menos de 15 blocos dorsais no corpo e ausência de manchas escuras dorsais nos inter-espaços dos blocos. Superficialmente, esta espécie assemelha-se a *B. jararacussu*, *B. pirajai*, *B. brazili* e *B. sanctaerucis*, com as quais parece estar intimamente relacionada.

Palavras-chave: Serpentes, Viperidae, *Bothrops muriciensis* sp.nov., Taxonomia.

#### ABSTRACT

*Bothrops muriciensis* sp.nov. is described based on two adult females and a young male from the State of Alagoas, Northeastern Brazil. It is easily distinguished from all other congeneric species by the combination of the presence of a lacunolabial, 8-9 supralabials, enlarged canthals, absence of postorbital stripe, smooth intercanthal and intersupraocular scales, less than 26 interrietal scale rows, less than 156 ventrals, less than 15 dorsal blotches on body, and absence of dorsal dark spots on blotch interspaces. In superficial appearance this species resembles *B. jararacussu*, *B. pirajai*, *B. brazili*, and *B. sanctaerucis*, with which it seems to be closely related.

Key words: Snakes, Viperidae, *Bothrops muriciensis* sp.nov., Taxonomy.

#### LITERATURE CITED

- AMARAL, A., 1926 – Novos gêneros e espécies de ophidios brasileiros (contribuição III para o conhecimento dos ophidios do Brasil). **Arq. Mus. Nac.**, Rio de Janeiro, **26**:101-121.
- AMARAL, A., 1955 [1954] – Contribuição ao conhecimento dos ofídios do Brasil. 15. Situação taxonômica de algumas formas de Crotalidae Lachesinae, recentemente descritas. **Mem. Inst. Butantan**, São Paulo, **26**:215-220.
- ASSIS, J.S., 1998 – **Um projeto de unidades de conservação para o Estado de Alagoas**. Rio Claro. 241p. Tese (Doutorado em Geografia), Instituto de Geografia e Ciências Exatas, Universidade Estadual Paulista.
- BOULENGER, G.A., 1896 – **Catalogue of the Snakes in the British Museum**. London: British Museum (Natural History). v.3, 68p.
- CAMPBELL, J.A. & LAMAR, W.W., 1989 – **The Venomous Reptiles of Latin America**. Ithaca and New York: Cornell University Press. 425p.
- CUNHA, O.R. & NASCIMENTO, F.P., 1975 – Ofídios da Amazônia. VII – As serpentes peçonhentas do gênero *Bothrops* (jararaca) e *Lachesis* (surucucu) da região leste do Pará (Ophidia, Viperidae). **Bol. Mus. Par. Emílio Goeldi**, n.ser. Zool., Belém, **83**:1-42.
- CUNHA, O.R. & NASCIMENTO, F.P., 1978 – Ofídios da Amazônia. X - As cobras da região leste do Pará. **Publ. Avulsas Mus. Par. Emílio Goeldi**, Belém, **31**:1-218.
- CUNHA, O.R. & NASCIMENTO, F.P., 1982 – Ofídios da Amazonia XIV - As espécies de *Micrurus*, *Bothrops*, *Lachesis* e *Crotalus* do Sul do Pará e oeste do Maranhão, incluindo áreas de cerrado deste estado (Ophidia: Elapidae e Viperidae). **Bol. Mus. Par. Emílio Goeldi**, n.ser. Zool., Belém, **112**:1-58.

- CUNHA, O.R. & NASCIMENTO, F.P., 1993 – Ofídios da Amazônia. As cobras da região leste do Pará. **Boi. Mus. Par. Emilio Goeldi**, n. ser. Zool., Belém, **9**(1):1-217.
- DOWLING, H.G., 1951 – A proposed standard system of counting ventrals in snakes. **British Jour. Herp.**, Missouri, **1**(5):97-98.
- DUNN, E.R., 1944 – Los generos de anfibios y reptiles de Colombia, III. Tercera Parte: Reptiles: Orden de las serpentes. **Caldasia**, Bogota, **3**:155-224.
- HOGUE, A.R., 1953 – A new *Bothrops* from Brazil *Bothrops brazili* sp.nov. **Mem. Inst. Butantan**, São Paulo, **25**:15-22.
- HOGUE, A.R., 1962 [1960-1962] – Serpentes da Fundação “Surinaam Museum”. **Mem. Inst. Butantan**, São Paulo, **30**:51-64.
- HOGUE, A.R., 1966 [1965] – Preliminary account on neotropical Crotalinae (Serpentes: Viperidae). **Mem. Inst. Butantan**, São Paulo, **32**:109-184.
- HOGUE, A.R. & ROMANO, S.A., 1972 – Sinopse das Serpentes peçonhentas do Brasil. **Mem. Inst. Butantan**, São Paulo, **36**:109-208.
- HOGUE, A.R. & ROMANO-HOGUE, S.A.R.W.L., 1979 [1978-1979] – Poisonous snakes of the World. Part I. Check list of the pit vipers (Viperioidea, Viperidae, Crotalinae). **Mem. Inst. Butantan**, São Paulo, **42/43**:179-309.
- POR, F. D., 1992 – **Sooretama: the Atlantic Rain Forest of Brazil**. The Hague: SSP Academic Press. 130p.
- THOMAS, R.A., 1976 – Dorsal scale row formulae in snakes. **Copeia**, Lawrence, **1976**(4):839-841.
- THORPE, R.S., 1975 – Quantitative handling of characters useful in snake systematics with particular reference to intraspecific variation in the ringed snake, *Natrix natrix* (L.). **Biological Journal of the Linnean Society**, London, **7**:27-43.
- WUSTER, W.; THORPE, R.S. & PUORTO, G., 1996 – Systematics of the *Bothrops atrox* complex (Reptilia: Serpentes: Viperidae) in Brazil: a multivariate analysis. **Herpetologica**, Chicago, **52**(2):263-271.

## APENDIX

### SPECIMENS EXAMINED

- Bothrops atrox* – BRAZIL - AMAZONAS: Presidente Figueiredo (UHE-Balbina), IB 52983.
- Bothrops brazili* – BRAZIL - PARÁ: Tomé Assú, rio Acará Mirim, IB 14721 (holotype) e IB 14715 (paratype). Belém, Fazenda Morelândia, IB 46069.
- Bothrops pirajai* – BRAZIL - BAHIA: Ilhéus, IB 3008 (holotype). Itabuna, IB 29284. Vitória da Conquista, IB 54261.
- Bothrops jararacussu* – BRAZIL - SÃO PAULO: Dom Pedro II, IB 29981. Água Vermelha, IB 48235.
- B. sanctaecrucis* – BOLÍVIA - OROMONO: rio Sécuré, IB 24575 (holotype). Zona del rio Ichoa, IB 24576 (paratype).

## NORMAS PARA APRESENTAÇÃO DOS TRABALHOS

- 1- O MUSEU NACIONAL edita, nas áreas das Ciências Naturais e Antropológicas:  
*Arquivos do Museu Nacional* (ISSN 0365-4508); *Publicações Avulsas do Museu Nacional* (ISSN 0100-6304); *Relatório Anual do Museu Nacional* (ISSN 0557-0689); *Boletim do Museu Nacional, Nova Série – Antropologia* (ISSN 0080-3189), *Botânica* (ISSN 0080-3197), *Geologia* (ISSN 0080-3200) e *Zoologia* (ISSN 0080-312X); *Série Livros* (ISBN 85-7427). Indexadas nas bases de dados: Biological Abstracts, Zoological Record e C.A.B.International.
- 2- Os originais devem ser apresentados em três vias, em papel A4, espaço duplo, em uma só face do papel, bem como em disquete no programa Word for Windows, em fonte Times New Roman (corpo 12), sem qualquer tipo de formatação. Os termos estrangeiros no texto deverão ser grafados em itálico.
- 3- As citações no texto devem ser indicadas pelo sistema autor-data que compreende o sobrenome do(s) autor(es), em caixa alta, seguido do ano de publicação do documento, separado por vírgula e entre parêntese. Ex.: (PEREIRA, 1996).
- 4- As referências bibliográficas (adaptadas das normas da ABNT) deverão ser apresentadas no final do texto, em ordem alfabética única dos autores.  
*Livro:*  
LIMA, D.A., 1982 – Present-day forest refuges in Northeastern Brazil. In: PRANCE, G.T. (Ed.) **Biological diversification in the tropics**. New York: Columbia University Press. p.245-251.  
*Periódico:*  
MORA, O.A., SIMÕES, M.J. & SASSO, W.S., 1987 – Aspectos ultra-estruturais dos fibroblastos durante a regressão da cauda dos girinos. **Revista Brasileira de Biologia**, Rio de Janeiro, **47**(4):615-618, figs.1-2.  
*Trabalhos apresentados em encontros científicos:*  
VENTURA, P.E.C., 1985 – Avifauna de Morro Azul do Tinguá, Miguel Pereira, Rio de Janeiro. In: CONGRESSO BRASILEIRO DE ZOOLOGIA, 12., Campinas. **Resumos**, Campinas: Universidade Estadual de Campinas, p.273.  
*Documentos disponíveis na internet* (não incluídos na ABNT 6023):  
POMERANCE, R., 1999 – **Coral mortality, and global climate change** [online]. Disponível: <http://www.gov/topical/global/envinon/99031002.htm> [capturado em 18 abr. 1999].
- 5- As ilustrações deverão ser identificadas com título ou legenda e designadas, no texto, como figura (Fig.1, Fig.2, etc.).
- 6- No final do texto deverão constar Resumo e Abstract, juntamente com título e palavras-chave em português e inglês.
- 7- Os textos deverão ser precedidos de identificação do autor (nome e instituição de vínculo com endereço completo).
- 8- Serão fornecidos ao(s) autor(es) 100 (cem) exemplares por artigo.
- 9- Os originais não aprovados não serão devolvidos.
- 10- A correspondência editorial e os artigos deverão ser enviados para:  
Comissão de Publicações  
Museu Nacional/UFRJ  
Quinta da Boa Vista, São Cristóvão  
20940-040 – Rio de Janeiro, RJ, Brasil  
Tels.: (0xx21) 567 6316 / 568 8262 ramal 203  
E-mail: <compubli@acd.ufrj.br>

COMISSÃO DE PUBLICAÇÕES  
MUSEU NACIONAL/UFRJ

Editor  
C.N.Ricci

Conselho Editorial - Museu Nacional

V.F.Barbosa, U.Caramaschi, V.G.L.Esteves, V.M.M.Fonseca, A.W.A.Kellner, V.C.Klein, M.A.R.Maia, G.L.F.Mejdalani, M.A.Monné, M.D.B.G.Oliveira, C.N.Ricci, A.M.N.Vilaça, P.S.Young

Conselho Científico

M.B.M.Abaurre (UNICAMP), C.Ades (USP), M.G.M.Ávila (UFPE), M.T.P.Azevedo (SMA-SP), M.E.C.B.O.Babinski (USP), G.Bacocoli (PETROBRÁS), S.G.Baines (UnB), D.C.A.Barberena (UFRGS), M.A.V.Barros (I.Bot.SP), D.C.Bicudo (I.Bot.SP), L.Bisoi (PUCRS), C.R.Brandão (UNICAMP), I.M.Brito (UFRJ), K.S.Brown Jr. (UNICAMP), M.C.O.Bruno (USP), H.F.A.Camargo (USP), M.S.F.S.Capelato (I.Bot.SP), C.J.B.Carvalho (UFPR), L.d'A.F.Carvalho (JBRJ), C.M.G.Corrêa (MPEG), C.G.Costa (JBRJ), N.M.C.Cruz (CPRM), H.Dayan (UFRJ), V.R.D.Eickstedt (I.Bot.SP), C.Fonseca (UFRGS), L.Forneris (USP), C.Galvão (FIOCRUZ), E.F.Guimarães (JBRJ), S.M.P.B.Guimarães (I.Bot.SP), J.Jurberg (FIOCRUZ), M.A.Kato (UNICAMP), J.E.Kraus (USP), A.Langguth (UFPE), M.Lemle (UFRJ), A.A.Lise (PUCRS), M.C.Loureiro (UFV), J.Loyola e Silva (UFPR), S.M.Lucas (I.Bot.SP), L.M.C.Machado (IAB), G.M.A.S.Maior (UFPE), M.C.D.Mansur (FZB), L.A.Marcuschi (UFPE), M.D.Marques (USP), G.Martinelli (JBRJ), H.R.Matthews (UFCE), R.H.Maués (UFPA), J.C.Melatti (UnB), T.S.Melhem (I.Bot.SP), R.P.Mello (FIOCRUZ), J.O.Menegheti (UFRGS), U.T.B.Meneses (USP), N.A.Menezes (USP), N.L.Menezes (USP), O.H.H.Mielke (UFPR), A.E.Migotto (USP), J.L.Morais (USP), E.G.Neves (USP), F.C.Novaes (MPEG), P.E.A.M.Oliveira (UFU), M.G.S.Peirano (UnB), J.F.Pereira (HB), L.M.Pessoa (UFRJ), M.Pinna (USP), S.R.R.Queiroz (UNICAMP), R.E.Reis (PUCRS), C.F.D.Rocha (UERJ), M.A.C.Rodrigues (UERJ), S.A.Rodrigues (USP), M.C.A.P.Rosa (UFRJ), A.B.Rylands (UFMG), F.M.Salzano (UFRGS), J.F.P.Sanchis (UFMG), C.L.SanfAna (I.Bot.SP), H.Sarian (USP), E.Schlenz (USP), P.I.Schmitz (IAP-RS), P.A.C.Senna (U.F.S.Car.) A.LSilva (USP), F.L.Silveira (USP), U.R.M.Souza (USP); J.W.Thomé (PUCRS), D.P.Uchôa (USP), S.A.Vanin (USP), L.Vidal (USP), H.M.Watanabe (I.Bot.SP), O.Yano (I.Bot.SP)

MUSEU NACIONAL  
Universidade Federal do Rio de Janeiro  
Quinta da Boa Vista, São Cristóvão  
20940-040 - Rio de Janeiro, RJ, Brasil

IMPRESSÃO  
Divisão Gráfica - SR-4  
UFRJ