

MILWAUKEE PUBLIC MUSEUM

Contributions

in
BIOLOGY
and
GEOLOGY

Number 59

November 1, 1984

**The Venomous Snakes of Nicaragua:
A Synopsis**

Jaime Villa

INTRODUCTION

The most recent summary of our knowledge of the venomous snakes of Nicaragua appeared over 20 years ago (Villa, 1962). A considerable amount of information (including new locality records, numerous specimens, and re-identification of old ones), has been obtained since then, making the previous summary obsolete. This paper summarizes the state of knowledge of the Nicaraguan species of the families Elapidae (including Hydrophiidae and Micruridae *auctorum*) and Viperidae.

Similar reviews of segments of the entire Nicaraguan herpetofauna are expected to follow, but I prefer to start with the venomous snakes due to the human importance of the species involved. For the *campesino* working the land, the importance of correct species identification is more than academic, if the snake is venomous. A popular version of this work will be made available to the general public, but it is important that such version be based on a recently-published scientific paper.

The format of this paper, as well as that of similar ones to follow, is: (1) a key to the taxa; (2) scientific name of each form (including the author); (3) original description (including publication date, reference and type locality with comments where necessary); (4) local (vernacular) name (with a comment on its meaning, if known); (5) diagnosis (including identifying and other distinguishing characteristics); (6) distribution (a statement of the taxon's geographic range); (7) habitat and habits (the ecologic range), (8) karyotype (when known); (9) remarks (miscellaneous comments about the taxon). A spot-map is also included. Zoogeographic comments are omitted, for now, as the number of species represent too small a segment of the herpetofauna to draw any relevant conclusions.

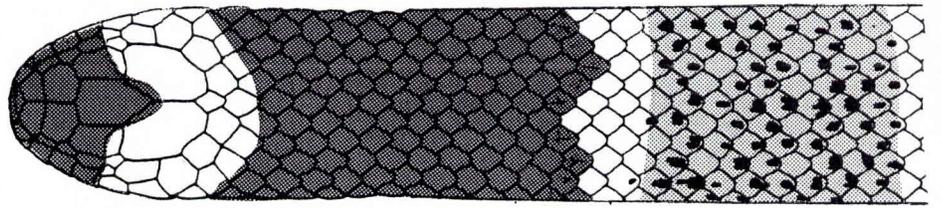
ACKNOWLEDGMENTS

This paper is based on specimens collected by myself and many others — often anonymous graduate students — deposited in many collections and I am indebted to their curators, and their hardworking curatorial assistants, for adopting my specimens and for the privilege of examining theirs. The following deserve special mention: the American Museum of Natural History at New York (AMNH, Richard G. Zweifel, Curator); the British Museum (Natural History) at London (BMNH, Alice Grandison); the California Academy of Sciences (CAS, A. Leviton); The University of Kansas Museum of Natural History at Lawrence (KU, William E. Duellman); the Milwaukee Public Museum (MPM, Robert W. Henderson); the Los Angeles County Museum (LACM, formerly Jay M. Savage); the Museum of Comparative Zoology at Harvard (MCZ, Ernest E. Williams); Museum of Zoology, University of Michigan (Arnold Kluge); Museo Nacional de Nicaragua (MMN, Crisanta Chaves); the Museum of Vertebrate Zoology at the University of California-Berkeley (MVZ, David B. Wake); Museo de Zoología of the Universidad de Costa Rica (UCR, Douglas C. Robinson); and the author's private collection (JV). These collections may not be individually cited in the species' accounts, but their specimens were examined and were used to prepare the distribution maps. Larry David Wilson read the entire manuscript critically; Janis Roze and Jay M. Savage read the *Micrurus* section. Roger Conant, Hobart M. Smith and L. D. Wilson provided many of the etymologies.

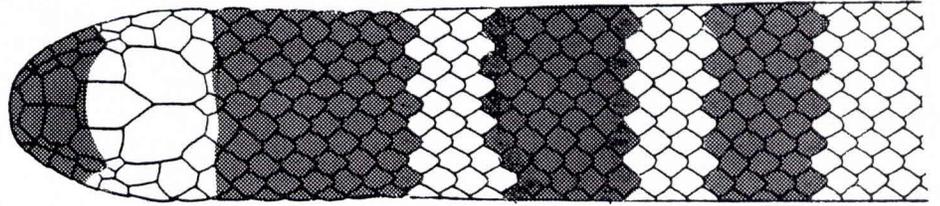
My wife Donna prepared the coral snake illustrations, and our departmental secretaries, Karen Dodig and Harriett Krashin, spent many hours typing and retyping numerous versions of this paper. To all the above, I gratefully dedicate this work.

- 14b. Subcaudals mostly in one row 15
- 15a. Outer border of supraoculars modified as one, two, or three spines or horns
..... *Bothrops schlegelii* 16
- 15b. Supraoculars simple, not so modified 16
- 16a. Scales on top of head smooth, not keeled *Bothrops nigroviridis* 17
- 16b. Scales on top of head mostly keeled 17
- 17a. Ground color green (bluish in preservative) with two pale (yellow in life, pale in
preservative)parallel lines running ventrally *Bothrops lateralis*
- 17b. Ground color gray, cream or brown, never green in life (or bluish in preservative)
without the ventral lines described above 18
- 18a. Dorsal pattern with a thin pale (yellowish or cream in life, whitish in preservative)
vertebral line, and lateral dark markings 19
- 18b. Dorsal pattern not divided by a thin pale vertebral line 20
- 19a. Snout strongly upturned, often with a proboscis-like appendage; ventrals 123-
145 *Bothrops nasuta*
- 19b. Snout rounded or slightly up turned; ventrals 156-173 . *Bothrops ophyromegas*
- 20a. Supraoculars big and wide, much larger than other supracephalic scales; dorsals
in 21 rows at midbody; ventrals 135-146; 5-7 scales between supraoculars ...
..... *Bothrops godmani*
- 20b. Supraoculars long and narrow, or not well-differentiated from other sup-
racephalics; dorsal rows 23-27 at midbody; ventrals 121-134; 7-10 scales be-
tween supraoculars *Bothrops nummifera*

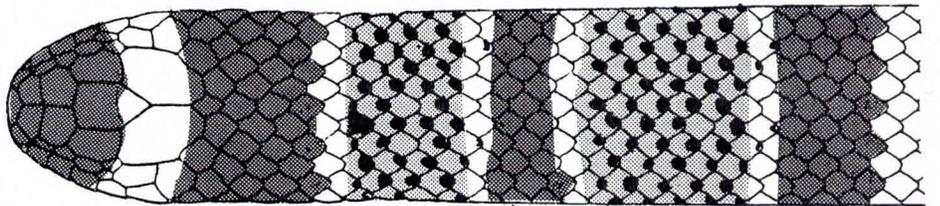
Figure 1. Head and anterior portion of body of the five *Micrurus* found in Nicaragua. (A) *M. alleni alleni* (Based on KU 112975 from Nicaragua; Zelaya: El Recreo, S side of Rio Mico). (B) *M. multifasciatus hertwigi* (JV 7676 = KU 174360. Nicaragua; Matagalpa: near Cerro Musun). (C) *M. n. nigrocinctus* (JV 66407 = KU 174443. Nicaragua; Managua: Casa Colorada). (D) *M. nigrocinctus babaspul*, Type (AMNH 96996. Nicaragua; Zelaya: Little Hill, Great Corn Island). (E) *Micrurus nigrocinctus mosquitensis* (KU 101455. Nicaragua; Zelaya: Bonanza).



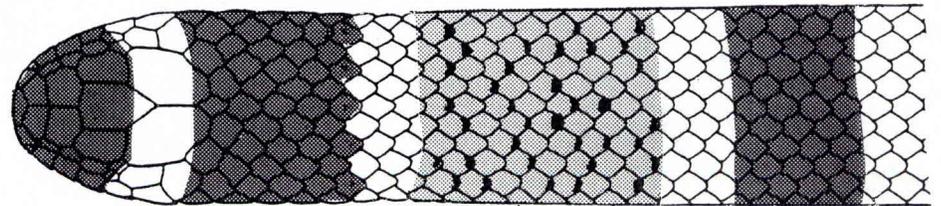
A



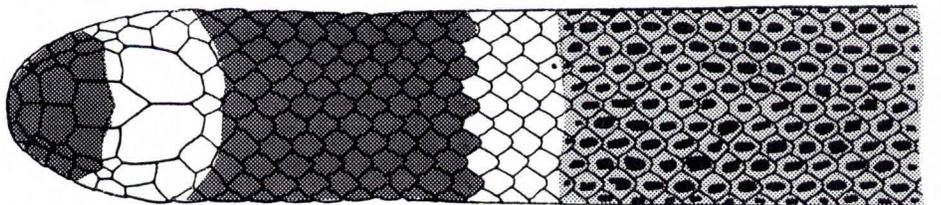
B



C



D



E

ACCOUNTS OF SPECIES
Family Elapidae

Laticauda colubrina (Schneider)
Map, Fig. 2

Original Description: *Hydrus colubinus* Schneider, 1799: 238. Type Locality: unknown.

Nicaraguan records: Villa (1962: 29-30), Nicaragua, Rivas: San Juan del Sur.

Etymology: *lati* = broad, *cauda* = tail; a reference to its laterally-compressed tail; *colubrina*: similar to *coluber*, a common snake.

Local Names: Culebra de Mar Anillada (ringed sea-snake). Coral de Mar (marine coral snake).

Diagnosis: This is the only Central American snake having a compressed, oar-like tail and well differentiated ventral scales. The only other marine snake in the area has dorsals and ventrals of similar size and shape, and

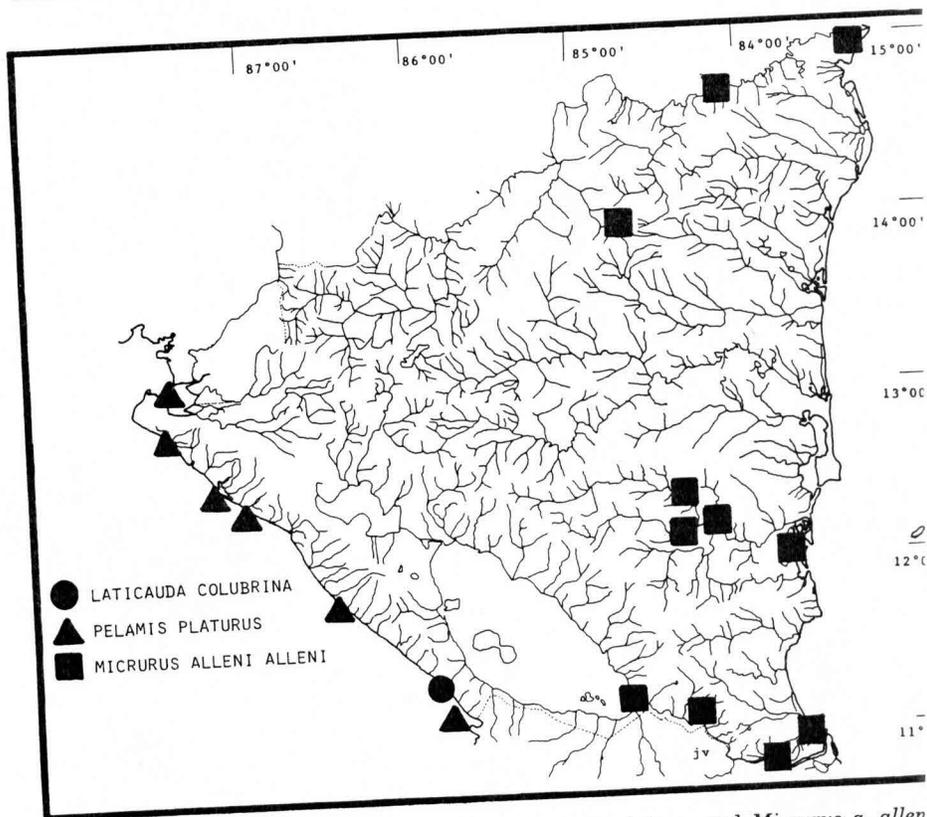


Figure 2. Distribution of *Laticauda colubrina*, *Pelamis platurus* and *Micrurus a. allen* Nicaragua.

has a different color pattern. There are about 29-33 black or dark brown rings on body and tail, alternating with narrower pale or yellow rings. Other distinguishing characteristics (from Pernetta, 1977): dorsal scales at mid-body: males 21-23, females 23-25, ventrals: males 219-226, females 215-227, subcaudals: males 40-45, females 33-37, number of black rings: males 30-33, females 29-32.

Distribution: Bay of Bengal to southern Japan; Australia, New Zealand and Oceania (Peters & Orejas-Miranda, 1970: 140). In America there are sight records for México, El Salvador and Nicaragua (see below).

Habitat and Habits: Amphibious marine; often seen in estuaries and beaches; piscivorous, oviparous, not aggressive.

Karyotype: Diploid number 34, with 7 pairs of macrochromosomes (the six largest are metacentric, the smallest acrocentric) and 20 microchromosomes. The single female studied was not obviously heteromorphic. Based on a specimen from the Philippines (Gorman, 1981).

Remarks: This species was first recorded from the west coast of tropical America by Villa (1962: 29) on the basis of two specimens for San Juan del Sur, Nicaragua. The specimens were lost in the mail and no additional ones have been obtained. Additional individuals were reported from Chiapas, México (Barra de Zacapulco) by Alvarez del Toro (1972: 150, 171). On both occasions the snakes were found in estuaries near the sea but could not be collected. An additional specimen was seen by H. Hidalgo (*pers. comm.*) in the private collection of Sr. Carlos Guillén Chamberlain and was collected at La Libertad: Playas de San Diego, El Salvador. Unfortunately my efforts to examine the specimen have not been successful. Because no specimens are definitely available from the area, the identity of this snake must remain in question. Some of the scale counts provided by Villa (1962: 30) do not agree well with those given by Smith (1926: 6) and Pernetta (1977) for *L. colubrina*. However, the snakes sighted are distinctive enough to consider them, at least, as representatives of the genus *Laticauda*. Hopefully, additional specimens will become available to finally settle the status of the banded sea snake in the Eastern Pacific.

Pelamis platurus (Linnaeus)

Map, Fig. 2

Original Description: *Anguis platura* Linnaeus 1766: 391. Type locality: unknown.

Nicaraguan Records: Villa (1962: 31, pl. 6), Pacific Coast of Nicaragua.

Etymology: *pelamis* = young tuna; *platy* = flat, *oura* = tail, a reference to its flattened tail.

Local Names: Culebra de Mar (Sea-snake). Serpiente de Mar Listada (Striped Sea-serpent).

Diagnosis: Immediately recognizable because of its laterally-flattened tail and dorsally-placed nostrils. The dorsum is dark brown or black, and the venter is cream to bright yellow. There may or may not be diffuse lateral stripes on the sides of the body and/or the ventral surface (occasionally, uniformly yellow specimens are found). On the tail, both colors form a checkered pattern. Other distinguishing characteristics (from Wilson & Meyer, 1982: 122): The lateral portion of the body is compressed forming an inverted triangle or a keel. The ventral scales are not enlarged. Dorsal scales at midbody, 44-61, preoculars 1-2, postoculars 2-3, supralabials 7-11, infra-labials 9-13, ventrals 254-465.

Distribution: In the eastern Pacific, from México to Ecuador. The species is pelagic in the Pacific Ocean and Indo-Australian seas, from Siberia to Tasmania.

Habitat and Habits: Marine, helpless on dry land. Viviparous, piscivorous. Sometimes beached during heavy storms. Local residents in many areas usually do not realize that this snake is venomous and handle it carelessly. However, there are no records of bites or deaths attributed to this species in Nicaragua. When handled it is calm and gentle and usually does not bite unless persistently provoked. One of the specimens I kept in captivity was often provoked. At first it would take a few minutes to elicit biting; after a few days it would attack anything approaching it. Others, not provoked, remained docile.

The biology of this species is relatively well known. Several papers in Dunson (1975), especially Kropach (1975) deal with various aspects of this pelagic snake.

Karyotype: Diploid number 38; 10 pairs of macrochromosomes, 18 microchromosomes. Females with a slightly heteromorphic second pair (Z W metacentrics, but one is slightly smaller and has a more submedian centromere). Based on 2 males and 2 females from Costa Rica (Gutiérrez & Bolaños, 1980).

***Micrurus alleni alleni* (Schmidt)**

Fig. 1A, Map, Fig. 2

Original Description: *Micrurus nigrocinctus alleni* Schmidt 1936:209, fig. 25. Type Locality: Rio Mico, seven mi. above Rama, Siquia District (Depto. Zelaya), Nicaragua.

Nicaraguan Records: Schmidt (1936: cited above); Gaige, Hartweg & Stuart (1937: 17), Zelaya: 10 mi above Recreo, and 10 mi above Rama on the Río Siquia; Savage & Vial (1974: 327-8); several Nicaraguan localities.

Etymology: *Micro* = small, *oura* = tail. Short tail, as in some of the species in the genus. The species was named after Morrow Allen, who collected numerous Nicaraguan specimens in 1935, including much of the type material of *alleni*.

Local name: Coral. This name is applied to many ringed snakes, venomous or not.

Diagnosis: A tricolor coral snake with a black head cap extending posteriorly to cover interorbital area and reaching onto parietal scales as a linear, oblong, or lanceolated figure; nuchal ring not crossing parietals and extending posteriorly for 5-11 dorsal scales (Fig. 1 A); supra-anal scales strongly keeled in adults; black rings on body 13-26. Other distinguishing characteristics: ventrals, males 214-224, females 229-237, anal divided, subcaudals 48-59, pale supracephalics yellow in life, some outlined in black; several infracephalics (especially mental and some infralabials), dark or black.

Distribution: Nicaragua (Cabo Gracias a Dios), Costa Rica and northwestern Panamá, on the Caribbean versant.

Habitat and Habits: Typically in humid and very humid Caribbean lowlands (to 600 m) including Tropical Moist, Tropical Wet and Subtropical Wet Forests. Most of the 79 Costa Rican specimens reported by R. Taylor *et al.* (1974: 390) were from elevations well below 1000 m, but two were from the Meseta Central (approx. 1200 m). Terrestrial, usually found in leaf litter or under objects. Little is published about the biology of this species. A specimen reported by Gaige *et al.* (1937) had eaten an eel-like fish, *Symbranchus marmoratus*.

Karyotype: Diploid number 34; 10 pairs of macrochromosomes and 14 microchromosomes. A secondary constriction is present in the first pair of macrochromosomes. Based on two males from eastern Costa Rica (Gutiérrez & Bolaños, 1979).

Remarks: A specimen from Granada (Departamento de Granada) reported by Savage & Vial (1974: 322) may not be from Granada. Granada, situated at the northwestern edge of Lake Nicaragua, is a relatively active port for boats coming from various parts of the Caribbean versant, including El Castillo and San Carlos, where *M. alleni* is definitely known to occur. It is possible that this specimen found its way from any of these localities. On the other hand, the Volcán Mombacho (near Granada) is a small biogeographic "island" which contains several species not found in the Pacific versant of Nicaragua (such as *Bolitoglossa striatula* and *Coniophanes b. bipunctuatus*; Noble 1918; Villa, 1971). The *M. alleni* could have come from Mombacho. I have obtained many specimens from the Granada area, none of which were *alleni*. I consider this locality record questionable until it can be substantiated.

Roze (1967, 1970) recognized two subspecies of *M. alleni*: *M. a. alleni* of the Atlantic slopes of Nicaragua, Costa Rica and Panamá, and *M. a. yatesi* of the Pacific slopes of Costa Rica and southwestern Panamá. Both subspecies were characterized on the basis of different ventral, caudal and black body-ring counts. A characteristic not mentioned by Roze (1970) but of useful diagnostic value is the ontogenetic color change the *M. a. yatesi* undergoes "The juveniles and young adults of this population are tricolor red, black and yellow, but the red becomes suffused and gradually obliterated by black pigment with age, so that mature adults are black and yellow above. On the ventral surface, the basic pattern of red-yellow-black yellow-red rings is retained, although the red areas are heavily mottled with black pigment" (Savage & Vial, 1974: 298-299). The adults of *M. a. alleni* retain the typical tricolor dorsal pattern. The Nicaraguan specimens I examined agree with Roze's (1970) characterization of *M. a. alleni* and its geographic distribution. None of the adults were black and yellow dorsally as in *M. a. yatesi*.

Savage & Vial (1974) in their review of Costa Rican *M. alleni* noted that Roze's (1970) counts do not hold up as well on the basis of their Costa Rican material; some overlap was noted in the numbers of ventrals, caudals and black body rings. They recognize the "remarkable differences in adult coloration" and that both populations are geographically isolated ("a case might be made for considering *alleni* and *yatesi* allopatric semispecies"). However, "It seems preferable to us to speak of Atlantic *alleni* and Pacific *alleni* where reference is made to either population, rather than by formal Latin names" (Savage & Vial, 1974: 325). As long as preferences are involved, I prefer to use the appropriate Latin names.

In his review of the above account, Savage (1983, *in litt.*) opined that "probably *yatesi* should be regarded as a full species." Curiously, Roze (1983) now considers it a synonym of *alleni* on the basis of Savage & Vial's (1974) paper, an action with which I do not concur.

***Micrurus multifasciatus hertwigi* (Werner)**

Fig. 1B, Map, Fig. 3

Original Description: *Elaps hertwigi* Werner 1897:354. Type locality: Central America.

Nicaraguan Records: Cope (1885:279, as *M. nigrocinctus multifasciatus*), no definite locality; Cope (1887:87, as *M. multifasciatus*), no definite locality; Günther (1895:184), Chontales; Boulenger (1896:423-426) Chontales; Villa (1972a: 10, as *M. mipartitus hertwigi*), Matagalpa: near Cerro Musún, northernmost species record; Savage & Vial (1974:328, as *M. mipartitus*), several Nicaraguan localities, including Chontales and San Juan del Norte (= Greytown).

Etymology: *multifasciatus* = many-banded. The subspecies was probably named after Wilhelm A. O. Hertwig (1849-1922), notable German naturalist.

Local name: Coral.

Diagnosis: A long, slender bicolor coral snake having 45-65 black body

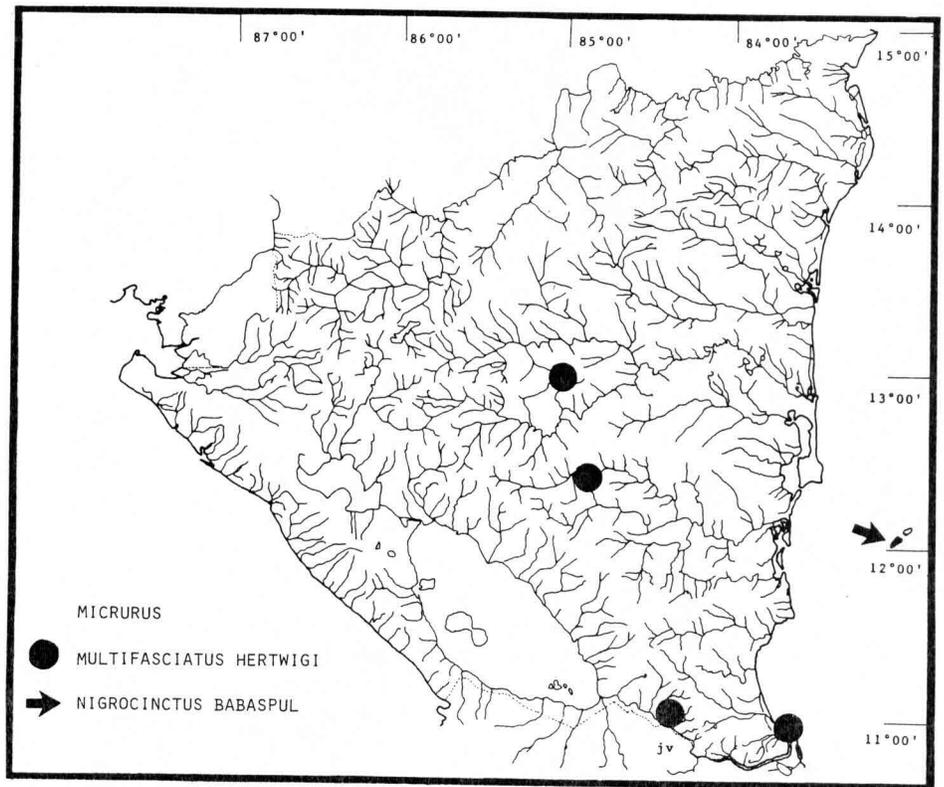


Figure 3. Distribution of *Micrurus multifasciatus hertwigi* and *M. nigrocinctus babaspul* in Nicaragua.

rings*, a black head cap only rarely extending to anterior margin of supra-oculars and frontal, and a first black body ring not reaching the posterior edge of the parietals (Fig. 1 B). Other distinguishing characteristics: ventrals: males 237-244, females 256-269, anal divided, subcaudals: males 31-33, females 23-29; supra-anal scales weakly keeled in adult males. Dark rings black, pale rings red in young specimens, sometimes paler in adults, including pale pink or totally white; most infracephalic scales white, some with dark punctations.

Distribution: Nicaragua (near Cerro Musún, Matagalpa), Costa Rica and Panamá, on the Atlantic versant. Other subspecies (Roze, 1970, 1983) range into Panamá.

Habitat and Habits: Low and moderate elevations in moist environments of the Caribbean versant and slopes of the Central Plateau (to 1200m). Very little has been published about the biology of this relatively common species.

*In their diagnosis of *M. mipartitus* (= *M. multifasciatus* fide Roze 1983) from Costa Rica, Savage and Vial (1974:326) state that specimens have "25-33 black body rings." This statement is incorrect, Picado (1931:31) pictured a specimen having about 47 black body rings, Taylor (1951:158) found 62 in his specimen, Villa's (1972a:12) specimen from Costa Rica had 47; all the Costa Rican specimens I have examined had at least 45 black rings. According to Savage (*in litt.*, 1983) the number was a misprint for "41-65".

Test & Sexton (1966) observed *M. m. semipartitus* in the cloud forests near Rancho Grande, Edo. de Aragua, Venezuela. Several individuals were seen active during the day, on the forest floor, apparently foraging for food. Unlike other coral snakes, they were not disturbed by the observers until touched. The snakes I have collected in Nicaragua were also active in the early and late afternoon. One was found inactive under a log in early morning. All were high-strung and when collected shook vigorously and attempted to bite.

Karyotype: Diploid number 34; 7 pairs of macrochromosomes (with a secondary constriction in the second pair) and 20 microchromosomes. Based on a single male from Limón, Costa Rica (Gutiérrez & Bolaños, 1979).

Remarks: *M. mipartitus* was divided into six subspecies by Roze (1967). Savage & Vial (1974) do not recognize these subspecies on the basis of their material from Nicaragua and Costa Rica. The Nicaraguan specimens I examined agree well with Roze's (1970) characters for *M. m. hertwigi*; thus I prefer to use this trinomial until a revision of the species throughout its range dictates otherwise. In a recent paper Roze (1983) transferred the subspecies *hertwigi* to *M. multifasciatus*.

The *Micrurus nigrocinctus* Complex

Original Description: *Elaps nigrocinctus* Girard, 1854:226. Type locality Taboga Island, Bay of Panamá, Panamá.

Nicaraguan Records (not assigned to any subspecies): Cope (1887:86) no definite locality; Günther (1895:182, as *Elaps fulvius*), no definite locality; Boulenger (1896:423-26), Chontales, Matagalpa; Schmidt (1928:63), Nicaragua; Villa (1962:35-36), Granada: Volcán Mombacho; Carazo: San Marcos.

Local name: Coral.

Diagnosis: A tricolor coral snake having 10-22 black body rings and a black head-cap covering most or all of the supraoculars, and frontals, sometime extending to the anterior margin of the parietals. The first black body (nuchal) ring may or may not include the posterior portion of the parietals, and extends posteriorly onto body for 4-13 scale rows (Fig.1 C-E); supra-anal scales strongly keeled in males. Other distinguishing characteristics: scale on light area on top of head yellow, not outlined by black, 222-268 ventral plus caudals, several infracephalic plates (usually mental and several infralabials) black (Savage and Vial, 1974:326).

Remarks: Following Roze (1970) Nicaraguan *M. nigrocinctus* can be assigned to 3 subspecies: *babaspul*, *melanocephalus* and *mosquitensis*. Wilson and Meyer (1972), and Savage and Vial (1974), have rejected the use of trinomial in this (as well as in other) species, although recognizing morphological differences in the populations. Savage and Vial (1974) recognize two different Nicaraguan mainland populations which they designate "Population I" (northwestern Costa Rica and Nicaragua west of the east margins of the great lakes; Roze's (1970) *M. n. melanocephalus*) and "Population III" (Atlantic lowland Costa Rica and Nicaragua; Roze's *M. n. mosquitensis*). These, and a third population (*M. n. nigrocinctus*) are "clearly separable from or

another." Savage and Vial (1974) analyzed the numerous specimens available to them and found a "complex variation pattern." Rather than using the available subspecific designations, they prefer to call these populations "morphs," a term which by a previous definition implies "the occurrence at the same locality of two or more *discontinuous* forms" (Savage and Emerson, 1970:640, italics mine) although in Savage and Vial's (1974) analysis "samples from Nicaragua and Costa Rica show various sorts of *intermediacy* in characteristics between population II and III . . ." (1974:313, Italics mine); "many individuals within the intermediate populations agree in all features with one or the other of the named forms, with about *a third* of the examples combining features of both" (1974:317, italics mine). Although they feel "tempted to conclude that three species . . . occur in eastern Nicaragua" they prefer to explain the variation in terms of "a relatively few gene loci that are probably linked" with "incomplete or partial dominance" (1974:318); the *mosquitensis* "morph" being homozygous for one allele, the *melanocephalus* "morph" homozygous for the other, and the intermediate "morph" probably heterozygous. Savage and Vial's (1974) analysis is detailed and their explanation is plausible, although they recognize that "this view cannot be proven on the basis of available specimens."

The only other available evidence bearing on the problem, however, does not support this interpretation. Gutiérrez and Bolaños (1979, 1981) studied the karyotypes of Costa Rican specimens assignable to *M. nigrocinctus*. Their study showed that the Pacific versant specimens have a diploid number of 26 chromosomes (10 of them being microchromosomes) while Atlantic versant ones have 30 (14 of them being microchromosomes). Some variation in the number of microchromosomes and in the size and shape of the heteromorphic sex chromosomes was noted in a few of their specimens. Their study implies that these populations are not only morphologically but genetically distinct, and that their genetic distinctness is due to more than "a single pair of alleles, or a closely linked series of genes forming a supergene" out, instead, involves several chromosomes. Gutiérrez and Bolaños (1979, 1981) did not dispute Savage and Vial's (1974) interpretation, although they point out the discordance between their results. They did note, however, that "intermediate" specimens did not show an intermediate karyotype; that a chromosome number of either 26 or 30 was typically found. Their study, however, may eventually lead to a different taxonomic arrangement. For example, Pacific versant *M. nigrocinctus*, which would include *M. nigrocinctus nigrocinctus* and *M. n. melanocephalus* would be conspecific (with typically 26 chromosomes); the race inhabiting western Nicaragua and northwestern Costa Rica would be called *M. n. melanocephalus* and the southwestern Costa Rica and northwestern Panamá race being *M. n. nigrocinctus*, whereas the specimens from central and eastern Nicaragua and Costa Rica would be *M. mosquitensis*. We would expect, therefore, to find in Central and eastern Nicaragua four different forms: *M. alleni alleni*, *M. nipartitus*, *M. nigrocinctus melanocephalus* and *M. mosquitensis*, with a few (as much as one third?) hybrids between the last two. Although this conclusion is a tempting alternative to Savage & Vial's (1974), I refrain from

making a formal taxonomic rearrangement for two reasons. First, I would await independent confirmation of Gutiérrez & Bolaños (1979, 1981) findings, hopefully analyzing chromosomal variation of specimens not only from Costa Rica but also from other parts of the geographic range of *M. nigrocinctus*-like specimens. Second, I have examined only a few of the specimens used by Savage and Vial (1974) and none of Gutiérrez and Bolaños' (1979, 1981); their specimens came mostly from Nicaragua and Costa Rica, and I would favor the analysis of specimens (examined for the morphologic and karyotypic characteristics, hopefully including hybridization experiments) from throughout the range of *M. nigrocinctus*-like snakes, before reaching taxonomic decisions. Such a study (worthy of a thesis or a dissertation) remains to be done, and until then I do not consider the problem solved.

For the purpose of this paper I prefer to follow, provisionally, Roze's (1970) arrangement because of (i) its priority over Savage and Vial's (1974), (ii) its more traditional approach, and because (iii) it is based on the study of specimens from the range of the entire genus. I do so recognizing that it does not adequately explain the variation of coral snakes allied to *M. n. nigrocinctus*.

After the above was written, a slightly different arrangement was published by Roze (1983), in which *M. n. melanocephalus* is considered inseparable from *M. n. nigrocinctus*. This conclusion is consistent with the published findings of Savage and Vial (1974) and Gutiérrez and Bolaños (1979, 1981) and is therefore provisionally followed here.

***Micrurus nigrocinctus babaspul* Roze**

Fig. 1 C, Map, Fig. 3

Original Description: *Micrurus nigrocinctus babaspul* Roze, 1967:38, fig. 13
Type Locality: Little Hill, Great Corn Island, about 55 km east-northeast of Bluefields, Nicaragua.

Nicaraguan Records: Barbour and Loveridge (1929:140, as *M. nigrocinctus*)
Corn Island, Nicaragua; Roze (1967:38-39, fig. 13), Nicaragua: Zelaya: Great
Corn Island, Little Hill (description of *M. n. babaspul*); Villa (1972b:16)
Great Corn Island.

Etymology: *babaspul*, the vernacular name of this coral snake on the Great
Corn Island.

Local name: Babaspul; a corruption of "Barber's Pole" referring to the simi-
larity between a barber's pole and the red, yellow and black rings of this
coral snake (Roze, 1967:39).

Diagnosis: A subspecies of *M. nigrocinctus* characterized by having fewer
ventral scales (see key) and in having larger black tips on red dorsal scales
Other distinguishing characteristics (from Roze, 1967: 38-39): body with
18-23 black bands, 5-7 on tail, ventrals 193-209, subcaudals 32-47, black
head cap extending posteriorly to the anterior part of the parietals and the
first black band starts on the posterior portion of the parietals.

Distribution: Known only from Great Corn Island, about 55 km ENE of
Bluefields, Nicaragua, in the Caribbean Sea, where it is the only venomous
snake known.

Habitat and Habits: Moist environments of the island. Local residents claim it frequents piles of coconut husks and trash heaps. There are no first-hand reports on the biology of this snake.

Karyotype: Unknown.

Remarks: Savage and Vial (1974:320) argued against the recognition of this subspecies because it combines characters of Pacific lowland populations (*nigrocinctus*) with segmental counts of Atlantic lowland samples, although "this particular combination is not exactly duplicated elsewhere in Nicaragua." Nevertheless, the Corn Islands possess a somewhat peculiar herpetofauna. The local *Ameiva*, for example, is allied to *undulata*, which occurs on the Pacific lowlands, and not to *festiva*, which is common in the Caribbean lowlands closer to the Corn Islands. A similar situation occurs with another endemic species, *Anolis villai* (Fitch and Henderson, 1976) allied to *cupreus*, typically a Pacific lowland form. I recognize *M. n. babaspul* as a distinct, insular subspecies, as there are several others in these islands, and prefer to use the established trinomial rather than to refer to it as "Corn Island *nigrocinctus*."

This snake appears to be less common than in the past. In 1922 and 1927 F. Booth and J. L. Peters, respectively, visited the island and obtained each one specimen incidental to other collecting. In 1966, J.A. Roze, E.B. Seligman, J. Villa and R.G. Zweifel visited Great Corn Island for 10 days almost exclusively to obtain more specimens. The only one obtained was brought to us by a local resident in response to a bounty offered. I visited the island in 1969 and again in 1976, with H.S. Fitch and R.W. Henderson, without success. If this form is not yet extinct it is nearly so. A similar situation exists in San Andrés Island, Colombia, where Dunn (1945; Dunn and Saxe, 1950) obtained a single *M. nigrocinctus*, later lost in the mail. Several other field trips have failed to produce additional specimens.

***Micrurus nigrocinctus nigrocinctus* (Girard)**

Fig. 1 D, Map, Fig. 4

Original Description: *Elaps nigrocinctus* Girard, 1854:226. Type Locality: Taboga Island, Bay of Panamá.

Nicaraguan Records: Hallowell (1861:485, as *Elaps melanocephalus*), probably from Ometepe Island, Lake Nicaragua; Cope (1887:86) no definite locality; Villa (1962:35, misidentified as *M. corallinus*); Savage and Vial (1974:328-9, as *M. nigrocinctus*) several Nicaraguan localities.

Etymology: *nigros* = black; *cinctus* = band (a reference to its black bands).

Local name: Coral

Diagnosis: A subspecies of *nigrocinctus* having a black head cap covering all of the supraoculars and most of the frontal, extending to cover the anterior portion of the parietals; nuchal black band covering the posterior portion of the parietals and extending posteriorly for 4-7 dorsals (Fig. 1D). Other distinguishing characteristics: ventrals, males 196-206, females 205-209. Black body rings 12-22.

Distribution: Pacific slope of Nicaragua, Costa Rica, and Panamá to adjacent Colombia (Roze, 1983).

Habitat and Habits: Most common in the dry lowlands (typically below 1000 m), including Tropical Dry and Subtropical Dry Forests, but found also in coffee groves and other moist habitats in Subtropical Moist Forests. Terrestrial, crepuscular and nocturnal, often found inactive at daytime under rocks and logs. High-strung but not aggressive, although it attempts to bite when caught.

Karyotype: Diploid number 26; with 8 pairs of macrochromosomes and 10 (sometimes 11-12) microchromosomes. A secondary constriction is present in the first pair of macrochromosomes. Females are heteromorphic for the sixth pair (Z submetacentric, W acrocentric). Based on several specimens from Guanacaste, Costa Rica (Gutiérrez and Bolaños 1981).

Remarks: This is the most common coral snake of the Pacific lowlands of Nicaragua.

***Micrurus nigrocinctus mosquitensis* Schmidt**

Fig. 1 E, Map, Fig. 4

Original Description: *Micrurus nigrocinctus mosquitensis* Schmidt, 1933:33. Type Locality: Limón, Costa Rica.

Nicaraguan Records: Günther (1895:182, as *Elaps fulvius*), no specific locality (part); Boulenger (1896:423-426, *ibid*), Chontales, Matagalpa; Schmidt (1933:33, description of *mosquitensis*), Matagalpa, and 19 km north of Matagalpa, 3000 ft.

Etymology: *mosquitensis*, of the mosquito (Miskito) Coast, as the Caribbean lowlands of Honduras and Nicaragua were known in the nineteenth century.

Local name: Coral.

Diagnosis: A subspecies of *nigrocinctus* having black head cap covering more than half or all of the supraoculars and frontal (except posterior tip), the black nuchal band not covering the parietals, and extending posteriorly for 8-13 scale rows (Fig. 1 E). Other distinguishing characteristics: ventrals 18-21, males 180-192, females 192-211, black body rings 10-16.

Distribution: Nicaragua to northwestern Panamá on the Caribbean versant.

Habitat and Habits: Most common in humid environments of low to middle elevations (to about 1200 m) in the Central Plateau and Caribbean versant. Terrestrial, probably crepuscular or nocturnal. Little has been published on the biology of this snake.

Karyotype: Diploid number 30; 8 pairs of macrochromosomes (with a secondary constriction in the first pair) and 14 microchromosomes. Females with a heteromorphic sixth pair (Z submetacentric, rarely metacentric; W acrocentric). Based on 17 Costa Rican specimens (Gutiérrez and Bolaños, 1979, 1981). On the basis of chromosome numbers, *mosquitensis* is more like *alleni* than *nigrocinctus* (*alleni* has 30, 20, macro- and 14 microchromosomes). It is also like *alleni* in its general color characteristics, i.e. with broad black and yellow rings, and a long black neck band, and in the number of ventrals

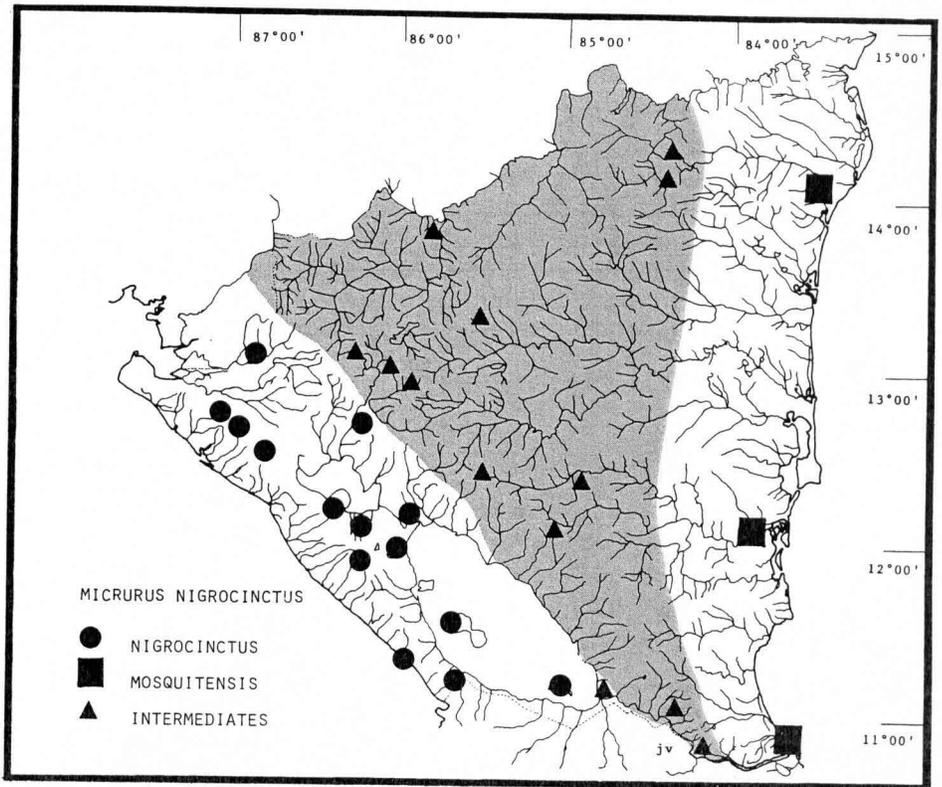


Figure 4. Distribution of *Micrurus nigrocinctus nigrocinctus* and *M. n. mosquitensis* in Nicaragua.

and caudals (in fact Schmidt(1933) included a specimen of *alleni* among the paratypes of *mosquitensis*). *Alleni* differs from *mosquitensis* in the shape of the head cap (see Fig. 1 A and 1 E).

Family Viperidae
***Agkistrodon bilineatus howardgloydi* Conant**
Map, Fig. 5

Original Description: *Agkistrodon bilineatus howardgloydi* Conant 1984:135. Type Locality: 0.8 km North of Mirador Cañón de Tigre, Parque Nacional de Santa Rosa, Prov. Guanacaste, Costa Rica.

Nicaraguan Records: Cope (1887:89), no definite locality (probably collected somewhere between Corinto and León, according to Roger Conant, *pers. comm.*); Villa (1962:42-44, pls. 7-8), southern Nicaragua; Cruz, Wilson and Espinosa (1979:26), Matagalpa (actually Jinotega): 16 km north of Sébaco.

Etymology: *Agkistrodon*, Greek for "hooked tooth"; *bi* = two, *lineatus* = lined; a reference to the two conspicuous light lines on each side of the snake's head. The subspecific name is a patronym for Howard K. Gloyd.

Local Names: Castellana (from Castilla, Spain; the logic for this name, very widely used in Nicaragua, is unknown to me). Castellana de Jáquima. Cantan an indigenous word meaning yellow lips, according to Conant (1982).

Diagnosis: Top of head with nine enlarged, symmetrical scales; snout sharp pointed but not upturned, sides of the head with two well defined bright (yellow or whitish in life) lines: one of them demarcates the canthus rostralis extending over and behind the eye; the other runs from the supralabials to the posterior corner of the mouth. Other distinguishing characters: midbody scales in 23 rows (all keeled except one or two outer rows), ventrals 129-144, anal single, subcaudals (divided) 50-68, supralabials 8, infralabials 11-12, loreal single, 2-3 preoculars, 3-5 postoculars.

Distribution: The species ranges from México to northwestern Costa Rica. The Nicaraguan subspecies, recently described, is found from Honduras (Golfo de Fonseca: Isla Zacate Grande) to extreme northwestern Costa Rica on the Pacific versant.

Habitat and Habits: arid and semi-arid lowlands, including Tropical Dry Forest and Tropical Arid Forests. Sometimes near streams or ponds but, unlike its close congener *A. piscivorus*, *A. bilineatus* is most common in dry, rocky

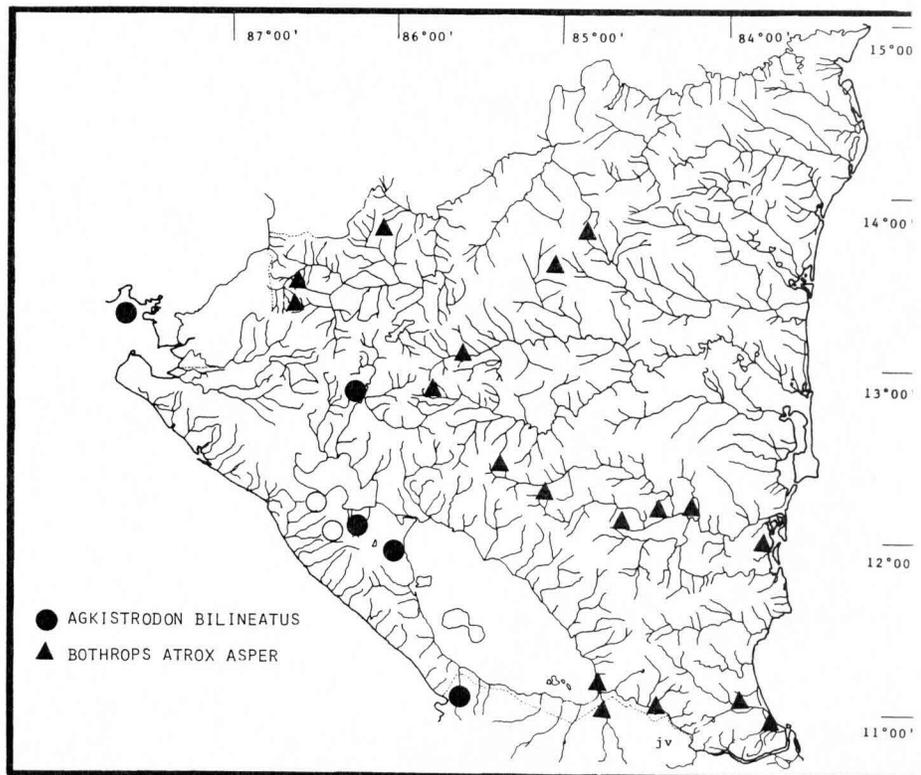


Figure 5. Distribution of *Agkistrodon bilineatus* (open circles represent reliable snakebite records for which specimens are not available) and *Bothrops atrox asper* in Nicaragua.

or scrubby terrain, usually in deciduous forests. In this respect its habits are more like those of *A. contortrix*. Terrestrial, crepuscular to nocturnal, very aggressive. Several cases of snakebite are attributed to this form in Nicaragua (Villa, 1962), none of them fatal. Bolaños and Montero (1970) published preliminary notes on the toxicity of a Costa Rican specimen.

Karyotype: Unknown.

Remarks: This is not a common species in Nicaragua. The young show an ontogenetic color change from the reddish brown of the newborn (with well defined dark markings) to the almost black of the adult (see Fontispiece). The bright sulphur-yellow tail of the young becomes dark in the adult. Adults are seldom over 1.35 m long.

***Bothrops atrox asper* (Garman)**

Map, Fig. 5

Original Description: *Trigonocephalus asper* Garman, 1883:124. Type Locality: Obispo, Darién, Panamá.

Nicaragua records: Cope 1874:67 and 1887:89 (Nicaragua: no definite locality (as *B. atrox*); Günther (1895:188): Chontales; Matagalpa; Boulenger (1896:537-8 as *Lachesis atrox*): Matagalpa; Chontales. Gaige, Hartweg and Stuart (1937:17): Río Siquia, 7 miles above Rama; Brattstrom and Howell, (1954:122, as *Bothrops atrox asper*), Zelaya: El Recreo; Villa (1962:52-54, pl. 13) Atlantic Coast of Nicaragua.

Etymology: *Bothros* = pit, *ops* = eye. A reference to the condition, found in some species, where the lachrymal pit and the eye are connected or closely associated. *Atrox* = atrocious, dangerous. *Asper* = rough (as in rough scales).

Local Names: Terciopelo (Velvet snake, in allusion to the sometimes iridescent skin). Barba amarilla (yellow beard, in allusion to the often yellowish color on its chin, lips and throat).

Diagnosis: A large (2m or more), robust pit-viper having paired subcaudals throughout. The only other viper with paired subcaudals is *Lachesis muta stenophrys*, which differs from *B. atrox* in having 3-5 rows of distal subcaudals and has a strong, well-defined terminal spine. It also has a lanceolate (or quadrangular) head, not strongly triangular as in *B. atrox*. The dorsal ground-color varies individually from pale olive-green to brown (the most common) to pale or dark gray. There are 15-35 pairs of dorsolateral light "V" markings, often meeting mid-dorsally. The ventral surface is pale, yellowish anteriorly, with or without scattered pigment, especially near the border of the ventrals. Other distinguishing characteristics: midbody dorsals in 25-29 rows, all keeled, ventrals 188-215, subcaudals 57-74, anal plate single, supralabials 7 (sometimes 8), infralabials usually 10, loreal single, postoculars 2-4, canthals 2, internasals 2-3, intercanthals 3-5, interoculars 5-10.

Distribution: México (Tamaulipas) to Panamá on the Caribbean versant; from Costa Rica to Colombia and Ecuador on the Pacific.

Habitat and Habits: In moist situations (including Tropical Moist and Sub-

tropical Wet Forests) to 800m. Typically in forested areas but not uncommon near human habitations. In the Tropical Dry Forests, when found, the snakes are in moist environments (near streams, etc.). Henderson, Nickerson and Ketcham (1976:307) noted arboreal habits in Peruvian *B. atrox*. Although similar observations have not been made for *B. atrox asper*, young individuals are sometimes found in trees, especially around bromeliads. A radiotracking study such as theirs may also reveal arboreal habits in the Central American populations. Scott (1983) said of Costa Rican specimens that the young "tend to be arboreal." Crepuscular and nocturnal. Oviparous. Very aggressive and rather common. One of the most dangerous snakes in Central America responsible for most snake bite deaths in the isthmus (Bolaños-Herrera 1971).

Karyotype: Diploid number 36, with 8 pairs of macrochromosomes (pairs 1, 2, 3, 4 and 7 metacentric, 5 and 6 submetacentric). Females with a heteromorphic fourth pair (Z metacentric, W submetacentric and smaller). Based on Costa Rican specimens (Gutiérrez, Taylor & Bolaños, 1979).

Remarks: This snake has been traditionally known as *Bothrops atrox asper* until Hoge (1966) listed it, without comment, as *B. asper*. Other authors (i.e., Peters and Oreas-Miranda, 1970:43; Burger, 1971; Savage, 1975; 1976; Aragón *et al.*, 1974; Henderson and Hoevers, 1975; Gutiérrez *et al.* 1979 and 1980; Wilson and Meyer, 1982) have followed Hoge's dictum, but no convincing arguments in favor of the taxonomic change have been published. I do not believe that this or any other taxonomic change has to be accepted only because it has appeared in print. Therefore I prefer to use the traditional name, *Bothrops atrox asper* (Garman) until an adequate justification for a name change is published.

Some support to Hoge's (1966) contention was provided by Aragón *et al.* (1977) on the basis of quantitative differences in carbohydrate content of the venom, but these differences are by no means conclusive evidence. There are numerous differences between young and adult specimens of this species (Gutiérrez, Chaves and Bolaños, 1980) as well as populational differences in other viperid subspecies (i.e., *L. muta stenophrys*: see Bolaños and Montero, 1970). Until a more comprehensive analysis of the variation in venom composition (involving the entire geographic range of *atrox* and *asper*) is published, I consider the differences reported by Aragón *et al.* (1977) a significant but not yet acceptable justification for granting these subspecies full specific status.

***Bothrops godmani* Günther**
Map, Fig. 6

Original Description: *Bothriechis godmani* Günther, 1863:364, Pl. 6 fig. 5

Type Locality: Dueñas and other parts of the tableland of Guatemala.

Nicaraguan records: Villa, 1962:45; no definite locality (specimens from Matagalpa, Ocotal and Las Manos).

Etymology: named after Frederick D. Godman, who collected the type specimens during extensive explorations in Central America during 1859-1865.

Local Names: Toboa (or Toboba) obscura (toboa is a local name for vipers; obscura refers to its dark color); Toboa de altura (highland viper); toboíta (referring to its small size).

Diagnosis: A small (usually 550 mm or less), thick-bodied snake having a series of dark dorsal blotches (ovoid in shape and not broken by a thin pale vertebral line); some of the blotches join forming a zig-zag pattern. Other distinguishing characteristics: midbody dorsals in 21 rows (all but outer row keeled), ventrals 133-148, anal plate single, subcaudals 28-36, supralabials 7-11 (usually 9), infralabials 9-12 (usually 11), loreal single, 2-3 preoculars, 2-3 canthals, 2-4 internasals, 4-7 interoculars.

Distribution: High elevations (above 1200 m) from México (Chiapas) to Panamá.

Habitat and Habits: Moderate to high, cool forests in Lower Montane, Moist, Sub-tropical, Wet and Lower Montane Wet forests; terrestrial; crepuscular and nocturnal; mildly aggressive; feeds on mice and lizards.

Karyotype: Diploid number 36, with 8 pairs of macrochromosomes (pairs 1, 3, 4, 7, and 8 metacentric, 2 and 5 submetacentric, 6 subtolocentric. Females with a heteromorphic fourth pair (Z metacentric, W submetacentric and smaller). Based on Costa Rican specimens (Gutiérrez, Taylor and Bolaños, 1979).

Remarks: Not very common and not well known in Nicaragua, probably because of the paucity of abundance of its appropriate habitat; better known in countries with more highland habitats, such as México, Guatemala, Honduras, and Costa Rica.

[*Bothrops lateralis* (Peters)]

Original Description: *Bothriechis lateralis* Peters, 1863:674. Type Locality: Veragua and Volcán Barba, Costa Rica.

Nicaraguan records: Villa (1962:47, see "Remarks" below).

Etymology: *lateralis* refers to the lateral yellow lines characteristic of this species.

Local names: Chocoya, Lora (see Comments under *B. nigroviridis*).

Diagnosis: the only Central American prehensile-tailed pit viper having a green body (bluish in preservative) with two light (yellow), well-defined lines running ventrally. The only other snake in the area with similar coloration is *Oxybelis fulgidus*, which is not a pit viper and whose tail is not prehensile. In addition, *O. fulgidus* has a long, attenuate head unlike the short, heart-shaped head of *B. lateralis*. Other distinguishing characteristics: midbody dorsals in 21 rows (all but the outer row keeled), ventrals 155-159, anal divided, subcaudals 54-66, supralabials 9-11 (typically 10), infralabials 10-12 (typically 12); loreals 3-4.

Distribution: Costa Rica and Panamá.

Habitat and Habits: moderate to high (1000-1500m), cool forests; arboreal, prehensile-tailed. Moderately aggressive.

Karyotype: Diploid number 36; with 8 pairs of macrochromosomes (pairs 1, 3, 4 and 7 metacentric, 2, 5 and 8 submetacentric, 6 subtelocentric). Females with a heteromorphic fourth pair (Z metacentric, W subtelocentric and slightly smaller). Based on Costa Rican specimens (Gutiérrez, Taylor and Bolaños, 1979).

Remarks: This species was recorded from Nicaragua (Villa, 1962:47) on the basis of a specimen in the Instituto Pedagógico de Diriamba (Carazo: Diriamba) collection. The specimen was supposedly collected in neighboring coffee groves. Extensive collecting in that area, and in the rest of Nicaragua during the past 20 years, has not produced additional specimens of this species. Possibly the specimen in question was brought by a student from neighboring Costa Rica, (where it is not uncommon) and deposited without locality data in the Instituto's collection. Until specimens of this species are definitely known from Nicaragua, therefore, *Bothrops lateralis* should not be considered a member of the Nicaraguan herpetofauna.

***Bothrops nasuta* Bocourt**

Map, Fig. 6

Original Description: *Bothrops nasutus* Bocourt, 1868:202. Type Locality: Panzos, on the banks of the Río Pocholic, Guatemala.

Nicaraguan records: Cope, 1885:183 and 1887:89 (as *Bothriopsis brachystoma*): Nicaragua, no definite locality; Günther 1895: 190 (as *Bothriechis lansbergi*); Rosa de Jerichó (Matagalpa); Chontales; Boulenger, 1896: 547-8 (as *Lachesis brachystoma*): same localities; Amaral 1929b:22 (part; as *Bothrops brachystoma*): no definite locality; Dunn, 1928:30 (part; as *B. lansbergi*): general species range; Amaral, 1929b:25-26 (as *B. nasuta*): Nicaragua: Greytown (= San Juan del Norte, Río San Juan); Matagalpa; Villa (1962:50-51): no definite locality.

Etymology: *nasutus* = large nosed. A reference to the proboscis-like extension of the rostral and internasal scales.

Local names: Aspid (asp). Chatilla [according to Picado (1931:73) and Alvarez del Toro (1972:157) this name alludes to the upturned snout]. Tamagás.

Diagnosis: a small, stout-bodied viper with typically well-pronounced upturned rostral (proboscis-like in most cases). It resembles *B. ophryomegas*, which has a slightly to moderately upturned rostral (but not proboscis-like) and a higher ventral count (156-173 versus 123-145 in *B. nasuta*). Other distinguishing characteristics: dorsal ground-color varying from pale to dark brown and pale to dark gray, usually with a mid-dorsal pale line (varying from white to orange or tan); on the sides of this line there are 13-23 pairs of dark blotches narrowly bordered by white. Some of the blotches are aligned, some alternate. Ventral surface pale, stippled with brown or gray. Pale postocular stripe (in *ophryomegas* the postocular stripe is dark). Mid-body dorsals keeled, in 21-27 rows, ventrals 123-145, subcaudals 24-41, supralabials 8-11 (usually 9-10), infralabials 12 (9-13), loreal 1, preoculars 3 (sometimes 2-4), postoculars 1-4, intercanthals 3-7, interoculars 3-7, most dorsal cephalics keeled.

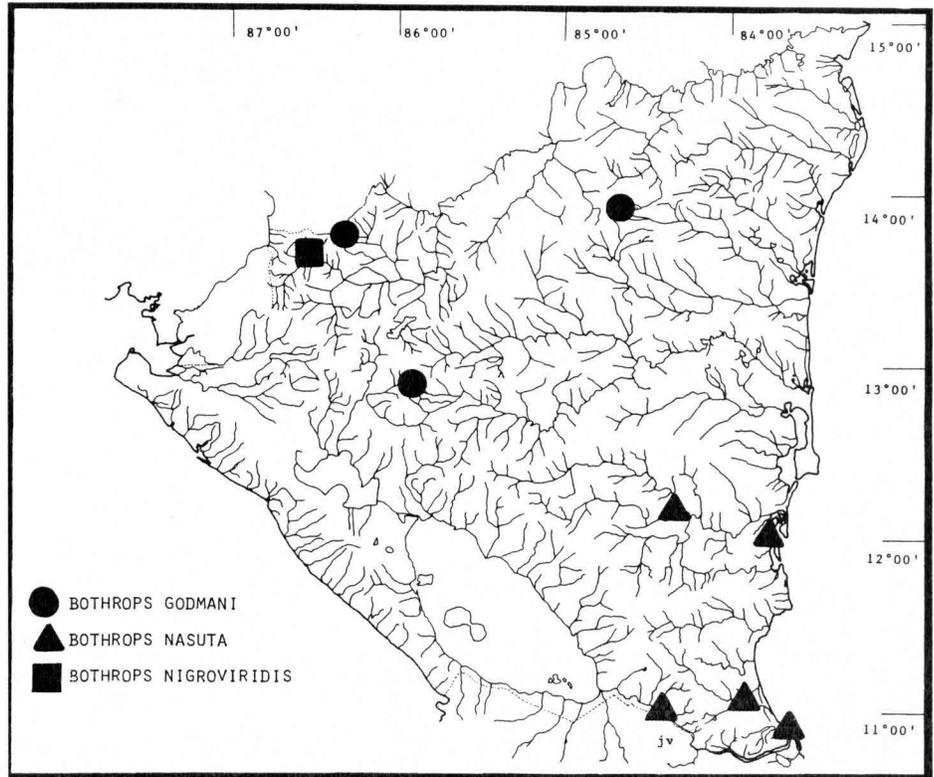


Figure 6. Distribution of *Bothrops godmani*, *B. nasuta* and *B. nigroviridis* in Nicaragua.

Distribution: Atlantic versant of México (northern Chiapas) to northern Panamá; Pacific versant of Costa Rica to Colombia and Ecuador.

Habitat and Habits: typically found in humid lowlands (usually below 600m but found as high as 900m) in habitats including Tropical Moist and Subtropical Wet Forests; also in Tropical Dry Forests in humid environments. Frequently found in leaf litter or dense undergrowths. Terrestrial and sometimes partly arboreal (low bushes and shrubs; Taylor, 1954, Posada-Arango 1889). Crepuscular, nocturnal, viviparous (8-14 young; Picado, 1931, Porrás *et al.* 1981), high strung (often "jumps" to bite) and aggressive. Feeds on earthworms, *Anolis*, *Rana*, and mice; sometimes cannibalistic in captivity (Picado, 1931:73; Porrás *et al.* 1982:91).

Karyotype: Unknown.

Remarks: Burger (1971:132) divided *B. nasuta* into two subspecies, *nasutum* and *sutum* without further clarification. Porrás *et al.* (1982) argued against the use of trinomials in this species although they recognized the existence of three distinct populations.

Amaral (1929b) noted that in males the *canthus rostralis* is better defined and has a horny ridge not present in females. These observations have apparently not been followed up, and the biological significance of this sexual

dimorphism has not been investigated. Porras *et al.* (1981) noted sex dimorphism in the size, body shape, scale counts and coloration of *B. nas* but did not confirm (or deny) Amaral's observations on the *canthus* of male

***Bothrops nigroviridis* Peters**

Map, Fig. 6

Original Description: *Bothriechis nigroviridis* Peters, 1859:276. Type Locality: Volcán Barba, Costa Rica.

Nicaraguan records: Villa (1962:48) no specific locality cited.

Etymology: *nigro* = black, *viridis* = green, alluding to the black pigment on the dorsal green ground-color of some individuals.

Local names: Chocoya, Lora (after the local name for chocoyos, and lora, two types of green parrots). Víbora de las palmas (palm viper).

Diagnosis: a green (bluish in preservative) pit viper without horn-like scales above the eyes or yellowish ventral lines. Other distinguishing characteristics: midbody dorsals in 19 rows (all but outer 2 rows keeled), ventrals 134-171, subcaudals 49-67, anal plate single, supralabials 9-13, infralabials 10-13, loreal single.

Distribution: México (Chiapas) to Panamá.

Habitat and Habits: typically found in high, cool forests including Tropic Moist, Subtropical Wet and Lower Montane Wet Forests; in Honduras Wilscam and Meyer (1982:129) found this species from "near sea level to 1500m". Ovoviviparous. Picado (1930) recorded 4-5 relatively large offspring. Found in trees and other vegetation; arboreal, probably nocturnal or crepuscular. Mildly aggressive; March (1929) noted that "It is by no means excitable but is, nevertheless, of mean disposition".

Karyotype: Diploid number 36, with 8 pairs of macrochromosomes (pairs 1, 2, 3, 4 and 7 metacentric, 5 and 6 submetacentric, 8 and 9 subtelocentric). Females with a heteromorphic fourth pair (Z metacentric, W submetacentric, slightly smaller). Based on Costa Rican specimens (Gutiérrez, Taylor and Bolaños, 1979).

Remarks: This species was recorded from Nicaragua (Villa, 1962:48) on the basis of a specimen, now lost, collected in Nicaragua: Departamento de Nueva Segovia; between Ocotal and Las Manos. Although at the time it was considered a *B. n. marchi* (Barbour and Loveridge), the subspecific designation may have been mistaken. Therefore, I prefer not to use a trinomial until additional specimens of this species are available from Nicaragua. Individuals of this species seem to be rare through their range. Although Costa Rica contains extensive highland areas (above 1550m), of the 2090 specimens of venomous snakes from that country studied by Taylor *et al.* (1974) only 10 were *B. nigroviridis*. Possibly, because of their arboreal habits and homochromic coloration, they are difficult to find. March (1929) noted that "It is extremely difficult to detect it in the foliage because of its coloration and the fact that, unlike most arboreal serpents, it remains motionless even when approached almost within striking distance."

Bothrops nummifera (Ruppel)

Map, Fig. 7

Original Description: *Atropos nummifer* Ruppell, 1845:313. Type Locality: unknown.

Nicaraguan records: Günther, 1895: (as *Bothriechis nummifera*): Nicaragua (Matagalpa): Hda. Rosa de Jerichó; Boulenger, 1896:544-5 (as *Lachesis nummifer*): Matagalpa; Rosa de Jerichó; Villa, 1962:51-52, pl. 13 (as *Bothrops nummifer*) Nicaragua: no definite locality.

Etymology: *nummus* = coin, *fer* = to carry or bear. A reference to its dorsal coinlike design.

Local names: Mano de Piedra (an aboriginal corn-grinding tool, in reference to its short, thick body). Cabeza de Sapo (toad head, a reference to its large and distinct head). Timbo.

Diagnosis: a medium-sized, heavy-set terrestrial pit-viper having strongly keeled scales, a well-defined triangular head; body pale to dark brown or gray in color, with darker rhomboidal blotches on dorsum and flanks and smaller, rounded or oval blotches above the ventrals; no pale vertebral line; venter pale with squarish dark blotches. Other distinguishing characteristics: dorsal scales strongly keeled, some tuberculate, in 23-31 rows at mid-

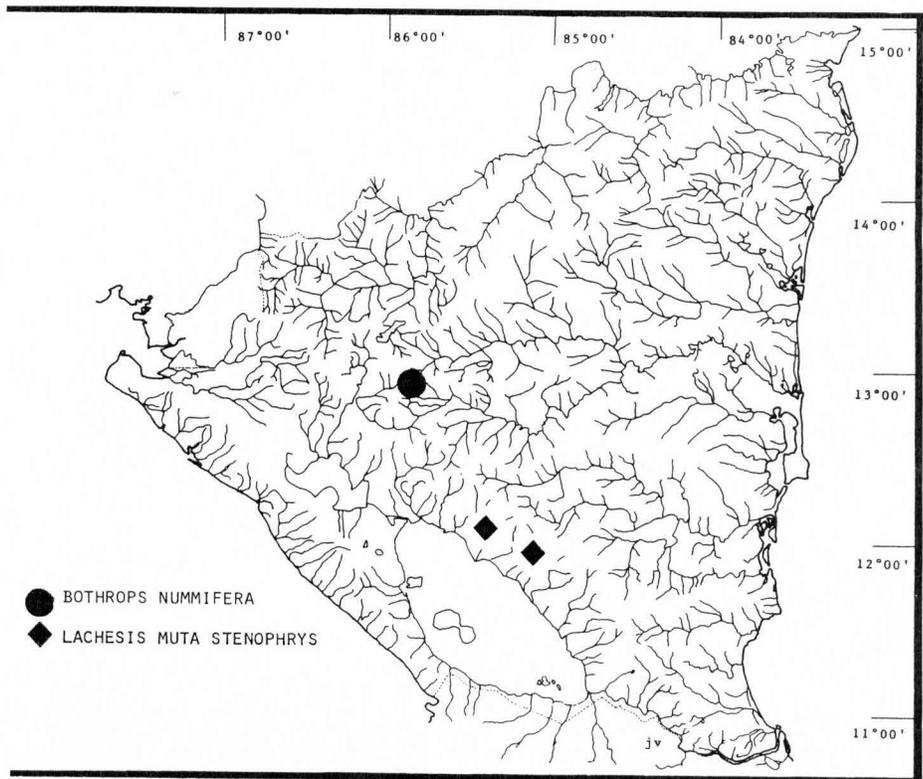


Figure 7. Distribution of *Bothrops nummifera* and *Lachesis muta stenophrys* in Nicaragua.

body, ventrals 114-134, anal single, subcaudals 22-39; supralabials 9, infralabials 10-14, supraoculars long and narrow, not well differentiated from other supracephalics; loreals, preoculars and suboculars 1, postoculars 1-4, canthals 2-5, internasals 2-3, intercanthals 3-6, interoculars 7-9 scales on dorsal and temporal regions of head keeled.

Distribution: México (San Luis Potosí) to Panamá on the Caribbean versant and on the Pacific in Guatemala, El Salvador, and Costa Rica but not Nicaragua.

Habitat and Habits: known from sea level but more frequently found at elevations from 600-1300m. In Nicaragua it seems to be confined to the slopes of the central mountains, where it is rather uncommon. Throughout its range it is found in Tropical Dry (moist situations), Tropical Moist Forests, and Subtropical Wet Forests. Typically terrestrial, although juveniles may be found in tree holes up to 3m above ground (Alvarez del Toro, 1972:1). Activity: Crepuscular and nocturnal; very aggressive, often jumping to bite. When biting, it may do so several times without releasing its prey (Picado, 1931:1). Feeds on small mammals. Captive newborns may eat grasshoppers and crickets.

Karyotype: Diploid number 36; with 8 pairs of macrochromosomes (pairs 1,3,4, and 7 metacentric, 2 and 5 submetacentric, 6 and 8 subtelocentric). Females with a heteromorphic fourth pair (Z metacentric, W submetacentric, smaller). Based on Costa Rican specimens (Gutiérrez, Taylor and Bolaños, 1979).

Remarks: A number of subspecies of *B. nummifera* have been described from various parts of the species range. None, however, appears to be well substantiated. Wilson and Meyer (1982:130-131) pointed out the confusion surrounding the available names, and the paucity of information on the variation of this species. Until such information is available, I prefer not to use a specific name for Nicaraguan *nummifera*.

***Bothrops ophryomegas* Bocourt**

Map, Fig. 8; Fig. 9

Original Description: *Bothrops ophryomegas* Bocourt, 1868:201. Type Locality: Warm regions on southern (western in the original) side of the mountains at Escuintla, Guatemala.

Nicaraguan Records: Günther (1985:190; part, as *Bothriechis lansbergii*): Nicaragua, Chontales; Matagalpa: Hda. Rosa de Jerichó; Boulenger (1896:546-7; part, as *Lachesis lansbergii*): general species range; Dugès (1928:30, as *Bothrops ophryomegas*): general species range; Amson (1929b:23, part): general species range; Villa (1962:46-7, pl. 11; as *B. lansbergii*): Nicaragua: Ciudad Matagalpa; Laguna de Apoyo, Masaya.

Etymology: *ophryos* (Greek for eyebrow); *me-gas* = large. A reference to supraocular scales forming an eyebrow-like shelf.

Local names: Tamagás, Tamagastá, Corníz (Corníz is a contraction of *con-niz*, a quail-like terrestrial bird colored somewhat like this snake).

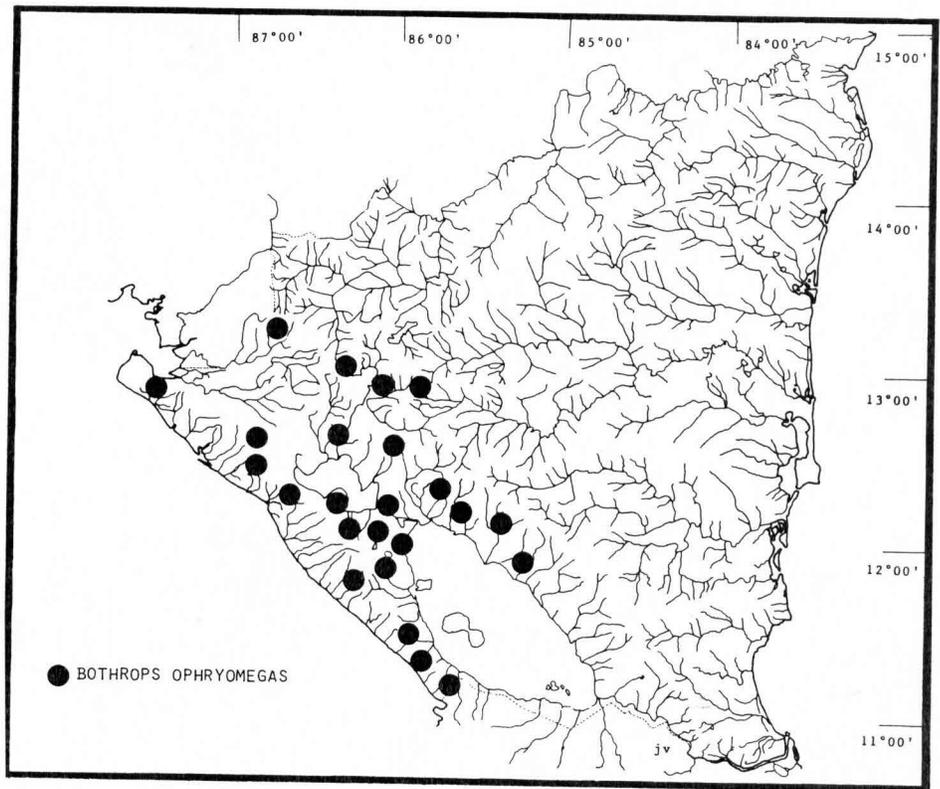


Figure 8. Distribution of *Bothrops ophryomegas* in Nicaragua.

Diagnosis: a small, terrestrial hognosed viper having a pale to dark brown, gray or tan ground-color and a thin pale mid-dorsal or vertebral line (white, cream, orange or tan) separating dark middorsal blotches. The postocular stripe, when present, is dark colored. It resembles *B. nasuta*, which has a strongly upturned (proboscis-like) snout (not flat or slightly upturned as in *ophryomegas*), a pale postocular stripe and a lower number of ventrals (see key). Other distinguishing characteristics: midbody dorsal scales in 23-27 rows (all keeled), ventrals 156-173, anal single, subcaudals single, 32-46; supralabials 8-10, infralabials 10-13, loreal single, preoculars 3, postoculars 1-4 (usually 3), internasals 2, intercanthals 5, interoculars 5-6; most scales on dorsal and temporal part of head keeled. The color, aside for the pattern mentioned above, varies widely from very contrasted to very diffuse, and becomes obliterated posteriorly (Fig. 9). The ventrals range from pale to strongly-patterned with gray or brown on the anterior and/or posterior margins.

Distribution: Guatemala to Panamá on the Pacific versant, and Guatemala and Honduras on the Caribbean versant.

Habitat and Habits: In Nicaragua it is most commonly found in the dry lowlands of the Pacific versant and the slopes of the central mountains, in Tropical Dry, Tropical Arid and Subtropical Dry Forest formations; it is less

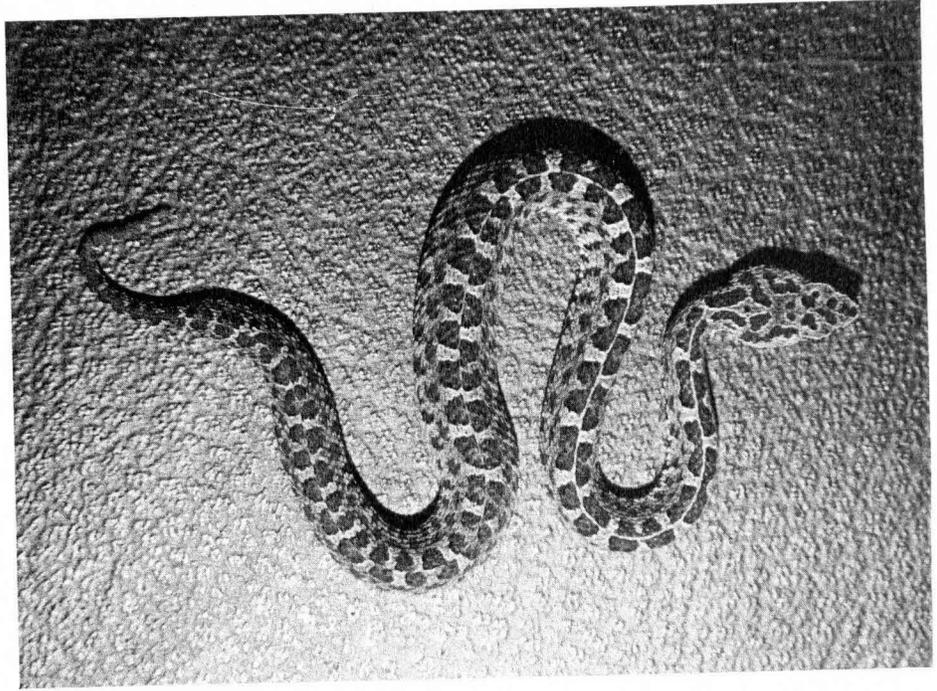
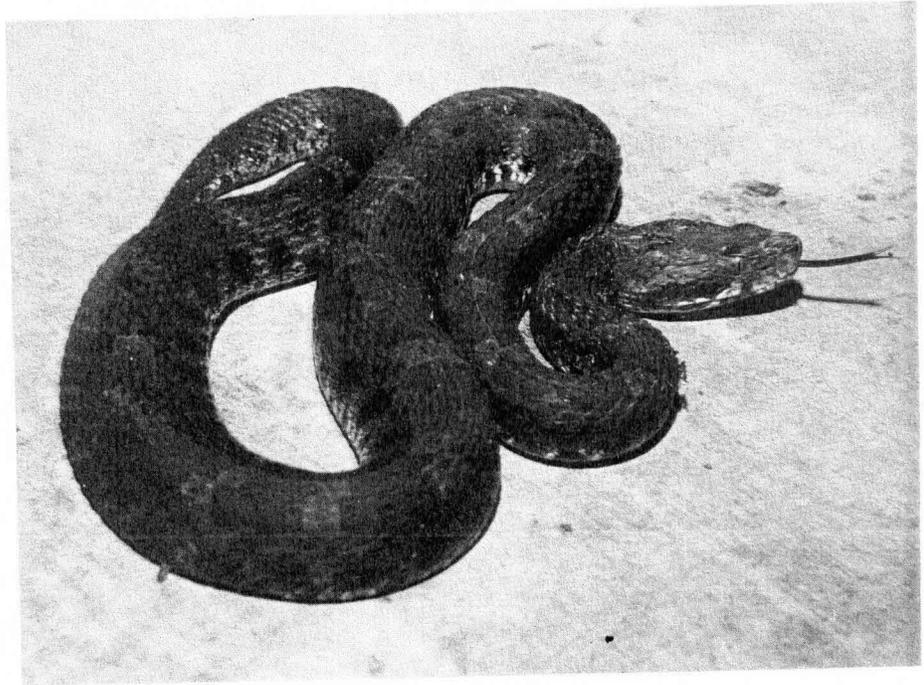


Figure 9. *Bothrops ophryomegas* from Nicaragua: Chontales; near Juigalpa. Above: juvenile (168 mm SVL) showing distinct pale vertebral line dividing well-marked dorsal blotches. Below: adult female (436 mm SVL), showing typical darkening of ground color and progressive obliteration of color pattern.



common in more humid environments but it is found, throughout its range (Wilson and Meyer, 1982), in Tropical Moist, Subtropical Moist and Subtropical Dry Forests, from sea-level to 850m. Terrestrial, commonly found among rocks and in the leaf litter. Very aggressive but not very dangerous to humans. Captive individuals fed on young mice and *Cnemidophorus* (whip-tail lizards). One of Picado's (1931) specimens ate *Anolis*.

Karyotype: Unknown.

Remarks: There has been considerable taxonomic confusion with this and allied species. The two Nicaraguan specimens previously reported (Villa, 1962:46-47) agreed better with Amaral's (1929b) description of *B. lansbergii* and were, therefore, reported under this name. The recent review of Wilson and Meyer (1982:132-5) allows reallocation of those and other Nicaraguan specimens in *B. ophryomegas*, and all fall reasonably well within the limits of variation they provided for this species.

***Bothrops schlegelii* (Berthold)**

Map, Fig. 10

Original Description: *Trigonocephalus schlegelii* Berthold, 1846:13. Type Locality: Popayán Province, Colombia, *fide* Dunn and Stuart 1951:56

Nicaraguan Records: Cope (1874:67 as *Teleuraspis schlegelii*), no definite locality; Günther (1895:189, as *Bothriechis schlegelii*), Chontales Mines and Rosa de Jerichó, 3250 feet (Matagalpa); Boulenger (1896:567-8, as *Lachesis schlegelii*), Rosa de Jerichó; Matagalpa, Chontales; Gaige, Hartweg and Stuart (1937:18), Río Siquia, 7 mi above Rama (now in Departamento de Zelaya); Brattstorm and Howell (1954:121), Zelaya: El Recreo, and Río Mico, 10 mi W of Rama; Villa (1962:49-50), no definite locality.

Etymology: Named after Henry Schlegel, Nineteenth Century German Naturalist.

Local names: Oropel (false gold, referring to the yellow or gold morph). Bocaracá (for the other color morph; according to Picado (1931:76) the name is composed of three indigenous words meaning Devil, Death and Tooth). Culebra de Cachitos (cachito = little horns). Terciopelo de pestaña (eyelash ripper).

Diagnosis: A small snake of slender body and a relatively large triangular head, with supraocular scales modified forming 1-3 hornlike projections above the eyes. There are no other "horned" snakes in Central America. Other distinguishing characteristics (after Wilson and Meyer, 1982:135): midbody dorsals in 23-25 rows (all but the outer row keeled), ventrals 138-66, anal single, sub-caudals 47-62, supralabials 8-10 (usually 8), infralabials 10-13, loreal divided, preocular undivided, 4-5 canthals, 6-8 intercanthals, 5-9 interoculars. Most supracephalic scales are heavily keeled.

Distribution: Southern México to northern South America. Probably the most common and widespread of the Central American tree-vipers.

Habitat and Habits: Common in forests ranging from near sea-level to 500m, including Tropical Moist and Subtropical Wet Forests. It is especially

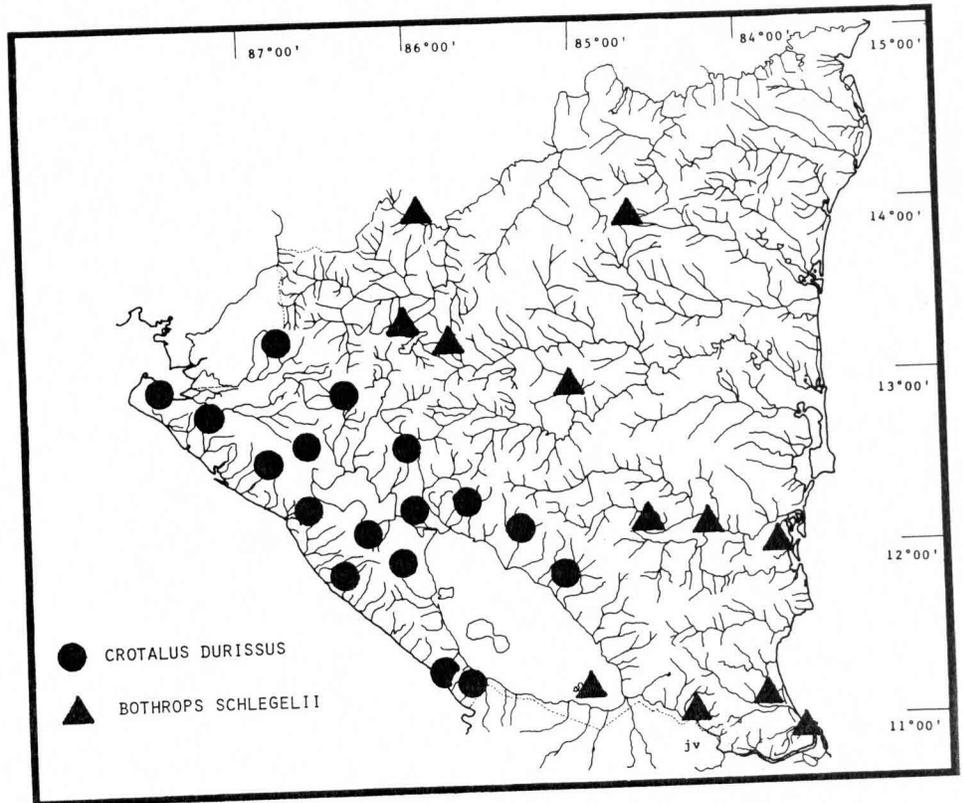


Figure 10. Distribution of *Crotalus durissus* and *Bothrops schlegelii* in Nicaragua.

common in the wet Caribbean lowlands in Nicaragua (including banana plantations), and frequently found in coffee plantations in the Central mountains. Viviparous; females may produce more than one litter per year. Litter size varies with the size of the female, with 6-17 per litter recorded for captive specimens (Blody, 1983). Docile, rarely biting unless provoked persistently.

Karyotype: Diploid number 36, with 8 pairs of macrochromosomes (pairs 1,3,4 and 7 metacentric, 2 and 5 submetacentric, 6 and 8 subtelocentric). Females with a heteromorphic fourth pair (Z metacentric, W submetacentric, smaller). Based on Costa Rican specimens (Gutiérrez, Taylor and Bolaños, 1979).

Remarks: E.H. Taylor (1954) described *Bothrops schlegelii supraciliaris* based on a single specimen from near San Isidro del General, Costa Rica. Although Stuart (1963:131) considered it "for the moment" as a full species (his suggestion was followed by Peters and Orejas-Miranda (1970:55) but not by Savage (1973, 1976, 1980) or by R. Taylor *et al.* (1974)). No other specimens assignable to *supraciliaris* have been reported. Wilson and Meyer (1982:135-136) examined the holotype and considered it a slightly aberrant *B. schlegelii*.

One of the most unusual features of this species is its coloration. Two "color phases", or morphs, have long been recognized. The most common appears to be the "green phase" in which the ground color ranges from pale green through turquoise to dark gray, with a darkly-blotched dorsum. Less common is the "gold" morph, in which the ground-color ranges from pale yellow to gold and orange (or "pink"), with scattered dark flecks (black, green, red). There are apparently no intermediates between the two phases. Picado (1931:79) reported a green-morph female giving birth to 18 similarly-colored offspring. He suggested that both phases may be reproductively isolated. His suggestion has remained untested, although Antonio (1980) reported that the offspring of a cross between "pink" male and "green" female had a 1:1 ratio, suggesting a heterozygous X homozygous recessive cross. It would be interesting to study the genetics of the color in this species. A striped species was recently reported from Costa Rica (Werman, 1984).

Crotalus durissus durissus Linnaeus

Map, Fig. 10

Original Description: *Crotalus Durissus* Linnaeus, 1758:214. Type Locality: America.

Nicaraguan records: Villa 1962:59-65, pls. 1, 14, 15; Nicaragua: no definite locality; Villa and Rivas, 1972:160 (albinistic Nicaraguan specimen); Villa, 1981:81 (fate of albinistic specimen).

Etymology: *Crotalon* = rattle; *durus* = hard; *issus* (*issimus*) = very. A reference to its rough or hardened scales, particularly those in the upper dorsal scale rows.

Local name: Cascabel ("rattle", its most conspicuous feature).

Diagnosis: This is the only Central American snake possessing a rattle, which makes its identification unquestionable. The very young have a distinctive "button", not a tapering tail tip. In addition, they have no enlarged scales on top of the head between the supraoculars; the median dorsals are strongly keeled or even tuberculate, and the subcaudals are in one row throughout. Other distinguishing characteristics: midbody dorsal scales in 25-33 rows (all keeled), ventrals 159-195, anal single, subcaudals single, 19-34, supralabials 11-18, infralabials 12-21, interoculars 1-2, supracephalics mostly keeled. The coloration is also distinctive, consisting of 18-35 dorsal dark blotches (often white-bordered) and a pair of dark lateral paravertebral stripes. The venter is unpatterned, pale. Colors darken posteriorly before the tail, often being dark brown and obliterating the pattern.

Distribution: México (Veracruz and Oaxaca) to northwestern and Central Costa Rica.

Habitats and Habits: Most common in the warm, arid Pacific lowlands in Nicaragua (Tropical Dry Forest and Subtropical Dry Forests); less frequent in more humid formations (Subtropical Moist and Subtropical Wet Forests). A single specimen came from Casa Colorada, 960m, although the species ranges up to 1400 m in Honduras. Terrestrial, mostly crepuscular and nocturnal, very aggressive, ovoviviparous.

Karyotype: Diploid number 36, with 8 pairs of macrochromosomes (pairs 1,3,4 and 7 metacentric, 2 and 5 submetacentric, 6 and 8 subtelocentric). Females with a heteromorphic fourth pair (Z metacentric, W submetacentric, smaller). Based on Costa Rican specimens (Gutiérrez, Taylor and Bolaños, 1979).

Remarks: This is the most common, and best known, pit viper of the Nicaraguan Pacific versant. Its numbers, however, appear to have been considerably reduced because of the habitat destruction and the poisoning of small mammals resulting from intense, and continued, agricultural activity in the area. In addition, local farmers frequently reward killing of cascabeles. Thus specimens now tend to be rare even in small parcels of non-utilized land.

Ditmars (1905) described *Crotalus pulvis* based on a specimen supposedly collected "20 miles inland from Managua, Nicaragua". Amaral (1927:56, 1929a:4) opined that the *pulvis* specimen was an albino *C. terrificus*. Gloyd (1936) however, considered it conspecific with *C. unicolor* (a species otherwise restricted to Aruba) and noted the supposedly disjunct geographic distribution. Klauber (1956) accepted *pulvis* as a synonym of *unicolor* but questioned the provenance of the Nicaraguan specimen, an opinion with which Hoge (1966) concurred.

Nicaraguan *Crotalus* obtained in the past 25 years have all been typical *C. d. durissus*. The only albinistic specimen known (Villa and Rivas, 1972), now lost (Villa, 1981), agreed in all other respects with normal *durissus*. This supports the opinions that *C. unicolor* is endemic to Aruba, and that Ditmars' (1905) specimen was erroneously labeled.

***Lachesis muta stenophrys* Cope**
Map, Fig. 7

Original Description: *Lachesis stenophrys* Cope, 1876:152. Type Locality: Sipurio, Costa Rica.

Nicaraguan Records: Villa (1962:65-68, pl. 16, as *Lachesis muta*); Vial and Jiménez-Porras (1967:183), Chontales: Between Acoyapa and Santo Tomás; Villa (1971:47), Zelaya: near Muhán.

Etymology: *Lachesis*, a Greek mythological figure; one of the three parcas, or fates, in charge of assigning each person's destiny. *Mutus* = mute; a reference to its rattlesnake-like appearance but lack of a sound-producing rattle. The subspecific name is composed of *stenos* (=narrow) and *ophrys* (eyebrow), a reference to its narrow supraocular scales.

Local Names: Matabuey (ox-killer). Mazacuata (Indigenous word for viper). Cascabel Mudo (mute rattler).

Diagnosis: A large, slender snake, having the proximal subcaudals in 2 rows, the distal ones in 4-5 rows, and a well-developed terminal spine. The dorsal pattern consists of 20-29 brown dorsal rhombs on body, shortening to blotches on tail, about 5-7. Midbody dorsal rows 30-38 (all keeled, except sometimes the outer row), ventrals 200-206, caudals in two rows, 30-38 plus 13-18 in four or five rows; supralabials 8-9, infralabials 13-14; most supracephalics keeled, small and irregular; 10-12 interoculars.

Distribution: Nicaragua (near Acoyapa, Chontales) to Costa Rica and Panamá; in Nicaragua it is restricted to the Caribbean versant. A Pacific population from Southwestern Costa Rica (Bolaños, Muñoz and Cerdas, 1978) shows differences in color pattern and venom biochemistry, and may represent a different subspecies. Two other subspecies, *L. m. muta* and *L. m. noctivaga* are found in South America.

Habitat and Habits: Low elevations (below 300 m in Nicaragua) in moist forests, including Tropical Moist, Tropical Wet and Subtropical Moist Forests. The "bushmaster" is well known for its aggressiveness, although Bolaños *et al.* (1978:295) note that in Costa Rica Pacific-versant individuals are aggressive but those from the Atlantic versant are docile. Crepuscular and nocturnal, oviparous; feeds on mammals.

Karyotype: Diploid number 34, with 8 pairs of macrochromosomes (pairs 1,3,4,7 metacentric, 2 and 5 submetacentric, 6 and 8 subtelocentric). Females with a heteromorphic fourth pair (Z metacentric, W subtelocentric and slightly smaller). Based on Costa Rican specimens (Gutiérrez, Taylor and Bolaños, 1979).

Remarks: This is the largest and one of the most dangerous of Central American snakes. In Nicaragua it does not appear to be common. Because of its large size (4m) and superficial resemblance it is sometimes mistaken for the common boa. Thus campesinos claiming to have killed a Mata Buey usually mean a *Boa constrictor imperator*.

RESUMEN

En el presente trabajo se resume el conocimiento de las serpientes venenosas de Nicaragua, donde existen 17 especies y subespecies pertenecientes a las familias Elapidae y Viperidae. Dos especies de la primera familia son marinas, y se encuentran en el Océano Pacífico pero no en el Caribe. *Pelamis platurus* es una serpiente pelágica común en el Pacífico tropical. *Laticauda colubrina* es de hábitos estuarinos anfibios, y su presencia en Nicaragua y el resto del Pacífico tropical americano requiere documentación. Los elápidos restantes son las corales, pequeñas serpientes multicolores del género *Micrurus*. *M. alleni alleni* y *M. multifasciatus hertwigi* se encuentran principalmente en las elevaciones bajas y moderadas de la región central y oriental de Nicaragua, en ambientes húmedos. *M. nigrocinctus* consta de tres subespecies en Nicaragua. *M. n. babspul* es autóctona de las Islas del Maíz (Corn Islands) en el Caribe, y si no está extinta va en vías de extinción. *M. n. nigrocinctus* es común en las llanuras bajas y cálidas del Pacífico, mientras que *mosquitensis* se encuentra en ambientes húmedos bajos del Caribe. Entre ellas existe una amplia zona de intergradación.

En Nicaragua se encuentran también 10 especies y subespecies de víboras (Viperidae). *Agkistrodon bilineatus howardgloydi*, recientemente nombrada, es la "castellana" una víbora terrestre y posiblemente algo acuática, no muy común en las llanuras cálidas occidentales. El género *Bothrops* tiene 7 representantes en Nicaragua. Uno de ellos es la "terciopelo", serpiente terrestre grande, común y de amplia distribución. Cuatro son serpientes terrestres de tamaño entre pequeño y mediano. *B. godmani* y *B. nummifera* son poco comunes, y se encuentran en ambientes húmedos en regiones mas o menos altas mientras que *B. nasuta* es común en regiones bajas y húmedas del oriente del País. Su contraparte del Pacífico seco es *B. ophryomegas*, una serpiente también común. Otras dos son pequeñas y arborícolas. *B. nigroviridis* parece ser muy rara, confinada a regiones altas y húmedas. *B. lateralis* probablemente no se encuentra en Nicaragua, aunque sí en regiones altas y húmedas al sur. Las dos últimas víboras son terrestres, grandes y muy peligrosas, ambas de regiones bajas. *Crotalus durissus durissus* es el "Cascabel", común en regiones occidentales áridas, y *Lachesis muta stenophrys*, la "Mata Buey", de las regiones húmedas orientales.

Para cada una de las especies y subespecies de serpientes venenosas de Nicaragua se dan una diagnosis (caracteres distintivos), mapas de distribución, citas bibliográficas pertinentes, nombres vernáculos, cariotiupos y comentarios misceláneos.

A continuación se presenta una clave dicotómica para identificar las especies y subespecies de serpientes venenosas de Nicaragua.

Clave Para las Serpientes Venenosas de Nicaragua

- 1a. Parte central y posterior de la cola aplanada, comprimida verticalmente como un remo 2
- 1b. Partes central y posterior de la cola cilíndrica u ovoide, pero no fuertemente comprimida, como un remo 3
- 2a. Color del cuerpo con anillos alternos contrastados; narinas (aberturas nasales) situadas lateralmente *Laticauda colubrina*
- 2b. Color del cuerpo dorsalmente oscuro (o negro), claro (amarillo) ventralmente, con bandas longitudinales oscuras difusas laterales o ventrales; narinas situadas dorsalmente *Pelamis platurus*
- 3a. Con un chischil (cascabel) o un "botón" en la punta de la cola; escamas subcaudales simples *Crotalus d. durissus*
- 3b. Cola sin chischil (cascabel) ni "botón", sino que atenuada distalmente (con espina terminal o sin ella); escamas subcaudales simples o pareadas 4
- 4a. Cuerpo con anillos o bandas alternas de colores contrastados 5
- 4b. Cuerpo con manchas variadas grises a cafés, sin anillos o bandas alternas de colores contrastados 11
- 5a. Anillos completos rodeando el cuerpo, pudiendo ser irregulares en la superficie ventral 6
- 5b. Anillos incompletos, sin rodear el cuerpo completamente en la superficie ventral Especies no venenosas
- 6a. Loreal presente Especies no venenosas
- 6b. Loreal ausente 7
- 7a. Anillos dorsales de sólo dos colores: blancos y negros, negros y amarillos o negros y rojos; con 45-65 anillos negros en el cuerpo (sin contar la cabeza o la cola); machos con 27-38 escamas subcaudales, hembras 23-30 *Micrurus multifasciatus hertwigi*
- 7b. Anillos tricolores dorsalmente: negros, amarillos (blanquecinos en ejemplares preservados) y rojos (grises en ejemplares preservados) 8
- 8a. Caperuza cefálica negra extendiéndose posteriormente, cubriendo la región interorbital, y alcanzando las escamas parietales en forma linear o lanceolada (Fig. 1, A) *Micrurus alleni alleni*
- 8b. Caperuza cefálica negra sin llegar (o apenas llegando) al borde anterior de los parietales, sin extenderse a lo largo de la sutura interparietal (*Micrurus nigrocinctus*) (Fig. 1, C-E) 9
- 9a. Primera banda negra de la nuca no cubre las escamas parietales (Fig. 1, E); ventrales: 180-192 en los machos, 192-211 en las hembras *Micrurus nigrocinctus mosquitensis*
- 9b. Primera banda negra de la nuca cubriendo al menos las puntas de las escamas parietales (Fig. 1, C-D) 10
- 10a. Ventrales: 193 o menos en los machos, 205-209 en las hembras; Islas del Maíz *Micrurus nigrocinctus babaspul*
- 10b. Ventrales: 196-206 en los machos, 205-209 en las hembras; llanuras bajas del Pacífico de Nicaragua y Costa Rica (Fig. 1, D) *Micrurus nigrocinctus nigrocinctus*
- 11a. Con una fosa profunda y bien definida a cada lado de la cabeza, entre el ojo y la narina; pupila verticalmente elíptica 12
- 11b. Sin la foseta mencionada; pupila redonda o elíptica Especies no-venenosas

- 12a. Superficie dorsal de la cabeza con 9 escamas grandes, bien diferenciadas de las demás; Labios con rayas finas de color blanquecino, amarillo o azufre, recorriendo su longitud *Agkistrodon bilineatus howardgloyi*
- 12b. Superficie dorsal de la cabeza con escamas pequeñas entre las supraoculares; labios sin rayas de color claro 1
- 13a. Escamas dorsales en 35 filas (o más) a medio cuerpo; escamas ventrales 200 más; subcaudales terminales en 4 filas o más *Lachesis muta stenophry*
- 13b. Escamas dorsales en 19-25 filas a medio cuerpo; menos de 200 ventrales; subcaudales en 1-2 filas 1
- 14a. Escamas subcaudales pareadas en su mayoría *Bothrops atrox aspe*
- 14b. Escamas subcaudales principalmente en una sola fila 1
- 15a. Bordes exteriores de las escamas supraoculares modificados como 1-3 espina o cachitos *Bothrops schlegel*
- 15b. Bordes exteriores de las escamas supraoculares rectos o redondeados, no modificados como cachitos 1
- 16a. Cabeza con escamas lisas (no aquilladas) dorsalmente. *Bothrops nigroviridi*
- 16b. Cabeza con escamas dorsales principalmente aquilladas 1
- 17a. Color de fondo verde en ejemplares vivos (azulado en ejemplares preservados) con dos rayas paralelas claras (amarillas en vida) en los bordes de las escamas ventrales *Bothrops laterali*
- 17b. Color de fondo grisáceo, crema o café, nunca verde en ejemplares vivos (o azulado en los preservados), y sin las rayas paralelas ventrales mencionadas 1
- 18a. Patrón dorsal con una línea delgada vertebral clara (crema, amarillenta o rojiza en vida, clara en los preservados), a los lados de la cual se ven manchas rectangulares oscuras 1
- 18b. Patrón dorsal no dividido por una línea vertebral clara 2
- 19a. Hocico fuertemente pronunciado, o volteado hacia arriba, frecuentemente en forma de proboscis; ventrales 133-148 *Bothrops nasut*
- 19b. Hocico redondeado o algo levantado; ventrales 156-173 *Bothrops ophryomega*
- 20a. Supraoculares grandes y anchas, mucho mayores que las demás escamas supracefálicas; dorsales a medio cuerpo en 21 filas; ventrales 135-146; con 5-escamas entre las supraoculares *Bothrops godmani*
- 20b. Supraoculares largas y estrechas, no muy bien diferenciadas de las demás supracefálicas; dorsales a medio cuerpo en 23-27 filas; ventrales 113-134; con 7-10 escamas entre las supraoculares *Bothrops nummifer*

LITERATURE CITED

- Alvarez del Toro, M. 1972. *Los Reptiles de Chiapas*, 2nd. Ed. -Tuxtla Gutiérrez, Chiapas, México, 178 p.
- Amaral, A. do. 1927. Da ocorrência de albinismo em cascavel, *Crotalus terrificus* (Laur.). - Rev Mus. Paulista, 15:55-57, Figs. 1-4.
- _____, 1929a. Key to the rattlesnakes of the genus *Crotalus*. -Bull. Antiven. Inst. Amer. 3:4-6.
- _____, 1929b. Studies on neotropical Ophidia. XII. On the *Bothrops lansbergii* group. -Bull. Antivenin Inst. Amer., 3(1): 19-27.
- Antonio, F.B. 1980. Mating behavior and reproduction of the eyelash viper (*Bothrops schlegelii*) in captivity. -Herpetologica 36:231-233.
- Aragón, F., R. Bolaños and O. Vargas 1977. Carbohidratos del veneno de *Bothrops asper* de Costa Rica. Estudio cuantitativo. -Rev. Biol. Trop. 25: 171-178.
- Barbour, T. and A. Loveridge 1929. Reptiles and Amphibians [of the Corn Islands]. -Bull. Mus. Comp. Zool. 69: 138-146.
- Berthold, A.A. 1846. Veber verschiedene neue oder seltene Reptilien aus New Granada und Crustacien aus China.-Abb. Ges. Wiss. Göttingen. 3:3-32.
- Blody, D.A. 1983. Notes on the reproductive biology of the eyelash viper, *Brothrops schlegelii*, in captivity.-Herp. Rev. 14:45-46.
- Bocourt, M.F. 1868. Descriptions de quelques crotaliens nouveaux appartenant au genre *Bothrops*, recueillis dans le Guatemala. Ann. Sci. Nat. paris, Zool. Ser. (5) 10: 201-202.
- Bolaños-Herrera, R. 1971. Nuevos recursos contra el ofidismo en Centroamérica. -Costa Rica: Inst. C. Picado, 29 pp.
- Bolaños, R. and J. R. Montero 1970. *Agkistrodon bilineatus* Günther from Costa Rica. -Rev. Biol. Trop., 16 (2): 277-279.
- Bolaños, R., G. Muñoz and L. Cerdas 1978. Toxicidad, neutralización e inmunoelectroforésis de los venenos de *Lachesis muta* de Costa Rica y Colombia. -Toxicon, 16:295-300.
- Boulenger, G.A. 1896. *Catalogue of the Snakes in the British Museum*, Vol. 3. London, xii + 727 pp.
- Brattstrom, B.H. and T.R. Howell 1954. Notes on some collections of reptiles and amphibians from Nicaragua. -Herpetologica 10 (2): 114-123.
- Burger, W.L. 1971. Genera of pitvipers (Serpents: Crotalidae). -Ph.D. Thesis, Univ. of Kansas, 186 pp.
- Burger, W.L. and W.B. Robertson 1951. A new subspecies of the Mexican moccasin, *Agkistrodon bilineatus*. -Univ. Kansas Sci. Bull. 34:213-218.
- Campbell, J.A. 1977. The distribution, variation, and natural history of the Middle American highland pitvipers, *Bothrops barbouri* and *Bothrops godmani*. -M.A. Thesis, The Univ. of Texas at Arlington. 152 pp.
- Conant, R. 1982. The origin of the name "cantil" for *Agkistrodon bilineatus*. -Herp. Review 13:118.
- _____, 1984. A new subspecies of the pit viper *Agkistrodon bilineatus* (Reptilia; Viperidae) from Central America. Proc. Biol. Soc. Washington, 97(1):135-141.

- Cope, E.D. 1865. Third contribution to the herpetology of tropical America. -Proc. Acad. Nat. Sci., Philadelphia, 17:185-189.
- _____, 1874. Description of some species of reptiles obtained by Dr. John F. Bransford, assistant surgeon, United States Navy, while attached to the Nicaraguan surveying expedition in 1873. -Proc. Amer. Philos. Soc., 25:64-72.
- _____, 1876. On the Batrachia and Reptilia of Costa Rica. -J. Acad. Nat. Sci., Philadelphia, (2) 8 (4):93-154, pls. 23-28 (1875)
- _____, 1885. Twelvth contribution to the herpetology of Tropical America. -Proc. Amer. Philos. Soc. 1884, 22:167-194.
- _____, 1887. Catalogue of batrachians and reptiles of Central America and México. -Bull. U.S. Nat. Mus., 32:1-98,
- Cruz, G.A., L.D. Wilson, and J. Espinosa 1979. Two additions to the reptile fauna of Honduras, *Eumeces managuae* Dunn and *Agkistrodon bilineatus* (Günther), with comments on *Pelamis platurus* (Linnaeus). -Herp. Review 10 (1) :26-27.
- Ditmars, R.L. 1905. A new species of rattlesnake. -Ninth Ann. Rep., N.Y. Zol. Soc. 1904:197-200, 4 Figs.
- Dunn, E.R. 1928. Notes on *Bothrops lansbergii* and *Bothrops ophryomegas*. -Bull. Antivenin Inst. Amer. 2:28-30.
- _____, 1945. The amphibians and reptiles of the Colombian Caribbean islands San Andrés and Providencia. -Caldasia 3:363-365.
- _____, and L.H. Saxe, 1950. Results of Catherwood-Chaplin West Indies Expedition, 1948. Part V. Amphibians and Reptiles of San Andrés and Providencia. -Proc. Acad. Nat. Sci., Philadelphia, 102:141-165.
- _____, and L.C. Stuart 1951. Comments on some recent restrictions of type localities of certain South and Central American amphibians and reptiles. -Copeia 1951:55-61.
- Dunson, W.A. (Ed.) 1975. *The Biology of Sea Snakes*. -University Park Press, Baltimore Md. xi + 530 pp.
- Fitch, H.S. and R.W. Henderson 1976. A new anole (Reptilia :Iguanidae) from Great Corn Island, Caribbean Nicaragua. -Milwaukee Publ. Mus. Contrib. Biol. Geol., 9:1-8.
- Garman, S. 1883. The reptiles and batrachians of North America. -Mem. Mus. Comp. Zool. 83(3):xxi + 185pp.
- Gaige, H.T., N. Hartweg and L.C. Stuart 1937. Notes on a collection of amphibians and reptiles from Eastern Nicaragua. -Occ. Pap. Mus. Zool. Univ. Michigan, (357): 1-18.
- Girard, C. 1854. Abstract of a report to Liut. James M. Gilliss, USN, upon the reptiles collected during the USN astronomical expedition to Chili. Proc. Acad. Nat. Sci. Philadelphia 7:226-227.
- Gloyd, H.K. 1936. The status of *Crotalus unicolor* Van Lith de Jeude and *Crotalus pulvis* Ditmars. -Herpetologica, 1:65-68.
- _____, 1972. A subspecies of *Agkistrodon bilineatus* (Serpentes: Crotalidae) on the Yucatan Peninsula, México. -Proc. Biol. Soc. Wash. 84 (40):327-334.
- Gloyd, H.K. and R. Conant 1943. A synopsis of the American forms of *Agkistrodon* (copperheads and moccasins). -Bull. Chicago Acad. Sci. 7 (2):147-170.

- Gorman, G.C. 1981. The chromosomes of *Laticauda* and a review of karyotypic evolution in the Elapidae. -J. Herpetol. 15:225-233.
- Günther, A.C.L.G. 1863. Third account of the snakes in the collection of the British Museum. -Ann. Mag. Nat. Hist., (3) 12:348-365 pls. 5-7.
- _____, 1885-1902. *Reptilia and Batrachia*. In Godman, F.D., and O. Salvin., *Biologia Centrali-Americana*. -London, Taylor and Francis, 326 pp., 76 pls.
- Gutiérrez, J.M., R. Bolaños 1979. Cariotipos de las principales serpientes coral (Elapidae: *Micrurus*) de Costa Rica. -Rev. Biol. Trop., 27 (1) :57-73.
- _____, 1980. Karyotype of the yellow-bellied sea snake, *Pelamis platurus*. -J. Herpetol. 14:161-165.
- _____, 1981. Polimorfismo cromosómico intraespecífico en la serpiente de coral *Micrurus nigrocinctus* (Ophidia: Elapidae). -Rev. Biol. Trop. 29:115-122.
- Gutiérrez, J.M., F. Chaves and R. Bolaños 1980. Estudio comparativo de venenos de ejemplares recién nacidos y adultos de *Bothrops asper*. -Rev. Biol. Trop. 28:341-351.
- Guiérrez, J.M., R.T. Taylor and R. Bolaños 1979. Cariotipos de diez especies costarricenses de la familia Viperidae. Rev. Biol. Trop. -27:309-319.
- Hallowell, E. 1861. Report of the reptilia of the North Pacific exploring expedition, under command of Capt. John Rogers, U.S.N. -Proc. Acad. Nat. Sci., Philadelphia, 12:480-510.
- Henderson, R.W., and L.G. Hoevers 1975. A checklist and key to amphibians and reptiles of Belize, Central America. -Milwaukee Public Mus., Contr. Biol. Geol. 5:1-63.
- Henderson, R.W., M.A. Nickerson and S. Ketcham 1976. Short term movements of the snakes *Chironius carinatus*, *Helicops angulatus* and *Bothrops atrox* in Amazonian Peru. -Herpetologica 32:304-310.
- Hoge, A.R. 1966. Preliminary account on Neotropical Crotalinae (Serpentes: Viperidae). -Mem. Inst. Butantan 32:109-184, Maps 1-10, Pls 1-20. (1965).
- Klauber, L.M. 1956. Rattlesnakes: their habits, life histories and influence on mankind. Univ. Calif. Press, 2 vols.
- Kropach, C. 1975. The yellow bellied sea snake, *Pelamis*, in the Eastern Pacific. -pp. 185-213 in Dunson, W.A. (Ed.), *The Biology of Sea-Snakes* Univ. Park Press, Baltimore, Md.
- Linnaeus, C. 1758. *Systema Naturae*. Ed. 10a Laurenti Salvius, Stockholm, Vol. 1, ii + 824pp.
- _____, 1766. *Systema Naturae*. Ed. 12a; Laurenti; Salvius, Stockholm, 532 pp.
- March, D.D.H. 1929. Notes on *Bothrops nigroviridis*. Bull. Antivenin. Instit. Amer. 3:58.
- Noble, G.K. 1918. The amphibians and reptiles collected by the American Museum expedition to Nicaragua in 1916. -Amer. Mus. Nat. Hist. Bull. 38:311-347.
- Pernetta, J.C. 1977. Observations on the habits and morphology of the sea snake *Laticauda colubrina* (Schneider) in Fiji. -Can. J. Zool. 55: 1612-1619.
- Peters, J.A. and B.R. Orejas-Miranda 1970. *Catalogue of the Neotropical Squamata*. Part I. Snakes. -Bull. U.S. Nat. Mus. 297: 1-347.

- Peters, W. 1863. Einen Vortrag über die raniologischen Verschiedenheiten der Grubenottern (*Trigonocephalus*) und über eine neue Art der Gattung *Bothriechis*. Monat. K. Akad. Wiss. Berlin, 1862: 670-674.
- Picado, C. 1930. Venom of Costa Rican arboreal vipers. Bull. Antivenin. Inst. Amer. 4: 1-3.
- _____, 1931. *Serpientes Venenosas de Costa Rica*. -Imprenta Alsina, San José, 219 pp.
- Posada-Arango, A. 1889. Apuntamientos para la ofiología colombiana. -Ann. Acad. Med. Medellin 2: 45-49.
- Porrás, L., J.R. McCranie and L.D. Wilson 1981. The systematics and distribution of the hognose viper *Bothrops nasuta* Bocourt (Serpentes :Viperidae). Tulane Stud. Zool. Bot. 22: 85-107.
- Roze J.A. 1967. A checklist of the New World venomous coral snakes (Elapidae): with descriptions of new forms. -Amer. Mus. Novitates, No., 2287:1-60.
- _____, 1970. *Micrurus*. In J. A. Peters and B. Orejas-Miranda, Catalogue of the Neotropical Squamata. Part I Snakes. -Bull. U.S. Nat. Mus. 297:1-347.
- _____, 1983. New World coral snakes (Elapidae): a taxonomic and biological summary. Mem. Inst. Butantan 46:305-338 (dated 1982).
- Ruppel, E. 1845. Verzeichniss der in dem Museum der senckenbergischen Gesselshaft aufgestellten Sammlug. Verh. Mus. Senck. 3: 293-316.
- Savage, J.M. 1973. A preliminary handlist of the herpetofauna of Costa Rica. -Univ. of Southern California, Los Angeles, California, 17 pp.
- _____, 1976. *Ibid.*, second edition. -Univ. Costa Rica, 19 pp.
- _____, 1980. A Handlist with preliminary keys to the herpetofauna of Costa Rica. Allan Hancock Found., Los Angeles, 111 pp.
- _____, and S.B. Emerson 1970. Central American frogs allied to *Eleutherodactylus bransfordii* (Cope): a problem of polymorphism. Copeia 1970: 623-644.
- _____, and J.L. Vial 1974. The venomous coral snakes (genus *Micrurus*) of Costa Rica. -Rev. Biol. LTrop., 21 (2) :295-349.
- Schmidt. K.P. 1928. Reptiles collected in Salvador for the California Institute of Technology. -Field Mus. Nat. Hist., Zool. Ser. 12(16): 193-201.
- _____, 1933. Preliminary account of the coral snakes of Central America and México. Field Mus. Nat. Hist., Zool. Ser. 20: 29-40.
- _____, 1936. Notes on Central American and Mexican coral snakes. Field Mus. Nat. Hist., Zool. Ser., 20: 205-216.
- Schneider, J.G. 1799. *Historia Amphibiorum Naturalis et Literariae*. Jena: Frommann, 264 pp. 2 pls.
- Scott, N.S. 1983. *Bothrops asper* (Terciopelo, Fer-deLance). Pp. 383-384 in Janzen, D.H., (Ed.), *Costa Rican Natural History*; Univ. Chicago Press: xi + 816 pp.
- Smith, M.A. 1926. *Monograph of the Sea Snakes (Hydrophiidae)*. -London, Taylor and Francis xvii, 130 p., 35 figs., 2 pls.
- Stuart, L.C. 1963. A checklist of the herpetofauna of Guatemala. -Misc. Publ. Mus. Zool. Univ. Michigan, No. 122, 150 pp., 1 map.
- Taylor, E.H. 1951. A brief review of the snakes of Costa Rica. -Univ. Kansas Sci. Bull. 34: 3-188.

- _____, 1954. Further studies on the serpents of Costa Rica. -Univ. Kansas Sci. Bull. 36 (11): 673-801.
- Taylor, R.T., A. Flores, G. Flores and R. Bolaños 1974. Geographical distribution of Viperidae, Elapidae and Hydrophidae in Costa Rica. -Rev. Biol. Trop., 21 (2): 383-397.
- Test, F.H. and O.J. Sexton 1966. Reptiles of Rancho Grande and vicinity, Estado Aragua, Venezuela. -Misc. Publ. Mus. Zool. Univ. Michigan, No. 128, 63 pp.
- Vial, J.L. and J.M. Jiménez-Porras 1967. The ecogeography of the bushmaster, *Lachesis muta*, in Central America. -Amer. Midl. Nat., 78:182-187.
- Villa, J. 1962. *Las Serpientes Venenosas de Nicaragua*. -Editorial Novedades, Managua, pp. 94., 19 pls.
- _____, 1971. Notes on some Nicaraguan reptiles. -J. Herpetol. 5: 45-48.
- _____, 1972a. Un coral (*Micrurus*) blanco y negro de Costa Rica. -Brenesia 1: 10-13.
- _____, 1972b. Snakes of the Corn Islands, Caribbean Nicaragua. -Brenesia, 1: 14-18.
- _____, 1981. Three albino snakes from Nicaragua: an update. -Herp. Rev., 12:81.
- Villa, J. and A. Rivas 1971. Tres serpientes albinas de Nicaragua. -Rev. Biol. Trop., 19 (1,2) :159-163.
- Werman, S.D. 1984. *Bothrops schlegelii*. Herp. Rev. 15: 17-18.
- Werner, F. 1897. Über einige neue oder seltene Reptilien und Frosche der Zoologischen Sammlung des Staates in Munchen. Sitz. Akad. Wiss. Munchen 27: 203-220.
- Wilson, L.D. and J.R. Meyer 1972. The coral snake *Micrurus nigrocinctus* in Honduras. Bull. So. Calif. Acad. Sci. 71:139-145.
- _____ and _____ 1982. *The Snakes of Honduras*. -Milwaukee Public Mus. Publ. Biol. Geol. No. 8, iv + 159 pp.