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A NEW SPECIES OF XENODONTINE COLUBRID SNAKE OF THE GENUS *SYNOPHIS* FROM ECUADOR AND THE PHYLOGENY OF THE GENERA *SYNOPHIS* AND *EMMOCHLIOPHIS*

By

DAVID M. HILLIS¹

Snakes of the genus *Synopsis* are rarely collected, despite the fact that considerable field work has been conducted within the ranges of the three known species. Until a review by Bogert (1964), all three species had been reported only from their holotypes; Bogert referred an additional five specimens to *S. bicolor* and eleven specimens to *S. lasallei*, all from the Andean foothills of Colombia and Ecuador. The third species, *S. miops*, remains known only from the type specimen described in 1898 from the Pacific lowlands of Ecuador. In addition, the closely related *Emmochliophis fugleri* (Fritts and Smith, 1969), also of the Pacific lowlands of Ecuador, is known only from the holotype; its obscurity is emphasized by the fact that *Emmochliophis* has not been listed in several recent checklists of Neotropical colubrids (Dowling and Duellman, 1978; Jenner, 1981).

I have examined nine additional specimens of *Synopsis* that have been procured since Bogert's (1964) review. Two of these specimens from Pacific cloud forest localities in northwestern Ecuador represent a species distinct from the three described species of *Synopsis*, and so I here name this snake

¹Department of Zoology, The University of Texas, Austin, Texas 78712-1064, USA.

SYNOPHIS CALAMITUS, NEW SPECIES

(Fig. 1)

Holotype.—KU 197107, a juvenile female collected 4 km SE Tandayapa, Pichincha Province, Ecuador, elevation 1890 m, on 2 April 1984 by David M. Hillis.

Paratype.—KU 164208, a juvenile collected dead-on-road 9 km SE Tandayapa, Pichincha Province, Ecuador, elevation 2150 m, on 10 April 1975 by William E. Duellman.

Diagnosis.—*Synopsis calamitus* may be distinguished from snakes of all other Neotropical genera by the following combination of characters: dorsal scales arranged in 21 rows anteriorly, decreasing to 19 rows at midbody and to 17 rows at vent; no apical pits; dorsal scales adjacent to ventrals smooth, others weakly keeled; vertebral row of dorsal scales not enlarged. Prefrontal undivided. Anal plate undivided. Pupil round; eye large (greater than $\frac{1}{3}$ depth of head). Postzygapophyses of vertebrae broadly expanded, forming a shelf-like ridge; adjacent vertebrae without interlocking zygapophysial processes; neural spines expanded.

This species differs from all other species of *Synopsis* by the following (see Table 1 for character states in other species): 19 rows of dorsal scales of midbody with 17 rows weakly keeled and rows adjacent to ventrals smooth; internasals separated by the rostral and prefrontal; 9 infralabials; and in color pattern (see description, below). It further differs from *S. lasallei* and *S. bicolor* in having only one (rather than two) postoculars; from *S. miops* in possessing a loreal, undivided nasals, larger eye size, and a concave rostral; and from *S. lasallei* and *S. miops* in having a greater number of ventrals (163–166, as opposed to 138 in the single specimen of *S. miops* and 144–158 in *S. lasallei*).

Description of the holotype.—*Scutellation*: prefrontals fused; loreal present; preoculars 1–1; postoculars 1–1; supraoculars 1–1; temporals 1+2/1+2; supralabials 7–7; infralabials 9–9; internasals separated by rostral and prefrontal; nasals undivided; rostral concave; parietals large; mental separated from anterior chin shields by first infralabials; anterior and posterior chin shields elongate and in contact throughout lengths. Dorsal scale rows 21–19–17; most dorsal scales weakly keeled, first rows smooth. Anal undivided; ventrals 166; subcaudals 110+1.

Vertebrae: Because the holotype of *S. calamitus* is the only specimen of the species in good condition, vertebrae were not removed and examined in detail. However, the skin was peeled back and enough of the axial musculature removed to confirm the vertebral characters described by Bogert (1964) and used in part to define the genus *Synopsis*, including the broadly expanded prezygapophyses and postzygapophyses that form lateral shelf-like ridges.

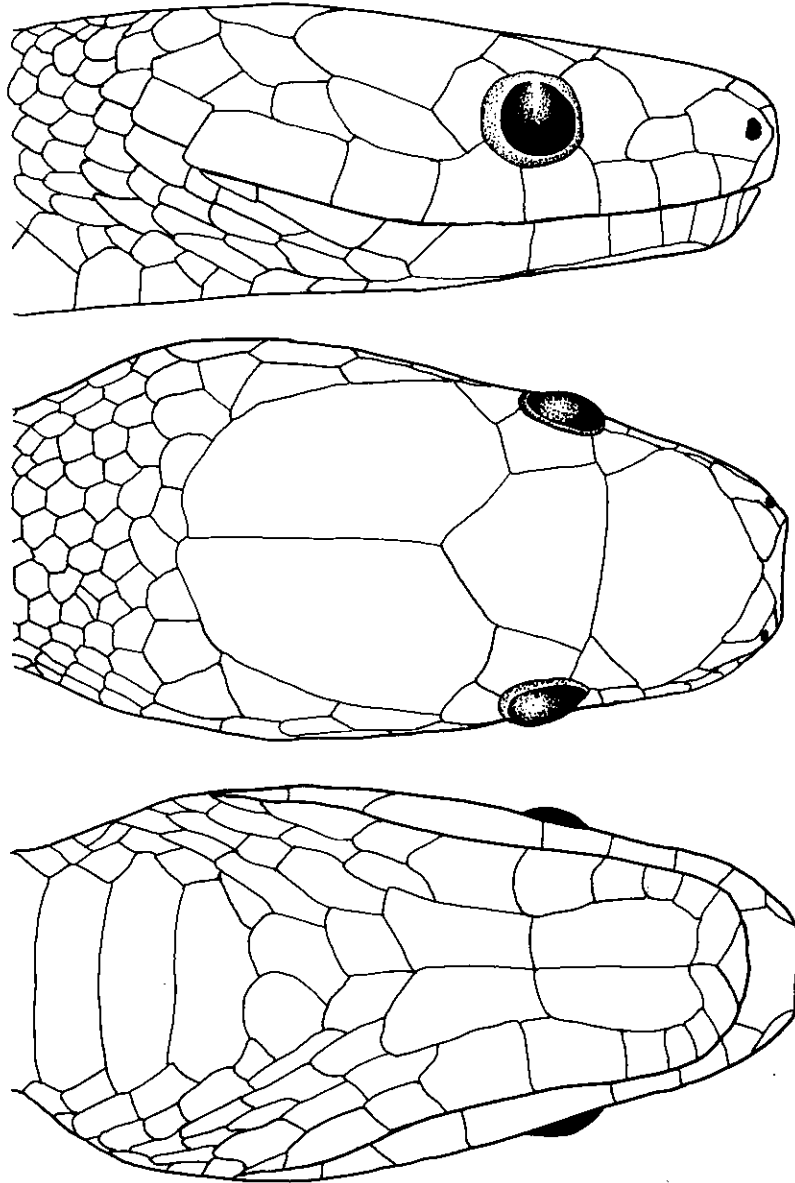


Fig. 1. Lateral (top), dorsal (middle), and ventral (bottom) views of the head of the holotype of *Synopsis calamitus*.

TABLE 1. Differences in scutellation among the species of *Synopsis* and *Emmochliophis*. From Bogert (1964), Boulenger (1898), and specimens examined in this study (Appendix 1).

Character	<i>S. calamitus</i> n = 2	<i>S. lasallei</i> n = 16	<i>S. bicolor</i> n = 8	<i>E. miops</i> n = 1	<i>E. fugleri</i> n = 1
Midbody scale rows	19	21-23	19	19	19
Postoculars	1	2	2	1	2
Internasals	separated	in contact	in contact	in contact	in contact
Nasals	undivided	undivided	undivided	divided	divided
Loreal	present	present	present	absent	absent
Supralabials	7-8	7-9	8-9	8	8
Infralabials	9	10-11	10-11	8	8
Dorsal scales (except 1st row)	weakly keeled	strongly keeled	strongly keeled	strongly keeled	strongly keeled
1st row dorsals	smooth	keeled	smooth	keeled	keeled
Ventrals	163-166	144-158	156-166	138	140
Subcaudals	110-125	101-125	103-118	91	97

¹includes only specimens examined by Bogert (1964) or in the present study. The holotype of *S. bicolor* (as described by Peracca, 1896) differed from these specimens in having 9 infraorbitals, 180 ventrals, and 136 subcaudals.

Dimensions: total length 223 mm; snout-vent length 149 mm; head length 10.3 mm; eye diameter 1.4 mm.

Coloration: dark, iridescent black dorsally, cream ventrally; undersurface of tail dark gray. Supralabials white, changing abruptly to black at dorsal border.

Variation in the paratype.—The paratype agrees closely with the holotype in most characters of scutellation and coloration. The head and most of the body of the paratype are crushed, but most scale counts are discernible. The cephalic scutellation is virtually identical to that of the holotype, except that the paratype has 8 supralabials on each side, rather than 7. There are 163 ventrals; although the tail is badly crushed, there seem to be 125 subcaudals. Total length is 215 mm; snout-vent length is 142 mm.

Etymology.—This snake is named for the several calamities that resulted in the collection of the holotype—namely the landslide that forced John Simmons and me to stop and collect, and the second landslide that shortly thereafter crushed our field vehicle.

Relationships.—The characters that differentiate *S. calamitus* from the other species of *Synopsis* and from *Emmochliophis fugleri* are presented in Table 1. In order to determine the relationships among the species, the genus *Diaphorolepis* was used for outgroup comparison to polarize the characters in Table 1. The polarized character-states are presented in Table 2. As argued by Bogert (1964) and Savitzky (1974), *Diaphorolepis* is the probable sister-

TABLE 2. Transformation series of some characters of *Synopsis* and *Emmochliophis*. The hypothesized direction of change (based on outgroup comparison to *Diaphorolepis*) is 0 → 1 → 2.

Character	Character-state		
	0	1	2
A. Postzygopophyses	not expanded	expanded	expanded, interlocking
B. Ventrals	more than 160	141-160	140 or less
C. Infralabials	10 or 11	9	8
D. Eye size	> 1/3 head depth	< 1/3 head depth	—
E. Nasals	divided	undivided	—
F. Loreals	present	absent	—
G. Nuchal collar	absent	present	—
H. Postoculars	2-2	1-1	—
I. Scale row reduction	reduced from midbody to anus	no reduction	—
J. Neural spines	not expanded	expanded	—
K. Rostral	convex	concave	—
L. 1st row dorsals	keeled	smooth	—
M. Dorsal scales (except 1st row)	strongly keeled	weakly keeled	—
N. Posterior supralabials	mostly pigmented	mostly unpigmented	—
O. Intranasals	in contact	separated	—
P. Midbody scale rows	19	21-23	—

taxon of *Synopsis* plus *Emmochliophis*. Synapomorphic character-states used by Savitzky (1974) to support this relationship are the absence of hemipenial calyces, acute prezygapophysial processes in males, narrow infralabial glands, fused prefrontals, and the absence of apical pits. In contrast, Jenner (1981) placed *Diaphorolepis* and *Synopsis* in separate tribes (Diaphorolepidini and Philodryadini) based on hemipenial structure (she omitted *Emmochliophis* from her study). Jenner (1981) considered the hemipenes of *Diaphorolepis* distinct from *Synopsis* in lacking distal calyces; Savitzky (1974) considered calyces to be lacking in both genera (as well as *Emmochliophis*). Bogert (1964), in describing the similarity of hemipenes in the two genera, stated that "... the spines on the hemipenes of *Synopsis* and *Diaphorolepis* are not set apart from calyces largely confined to the lobes;" my own observations agree closely with this statement. Furthermore, as noted by Bogert (1964), in "... features of their scutellation, dentition, mode of scale-row reduction, and hemipenial characters, the snakes of the two genera [*Diaphorolepis* and *Synopsis*] are remarkably similar." Therefore, *Diaphorolepis* appears to be the most appropriate outgroup for this analysis.

The cladogram that depicts the relationships of the species of *Synopsis* and *Emmochliophis* is shown in Fig. 2. The analysis strongly supports the close

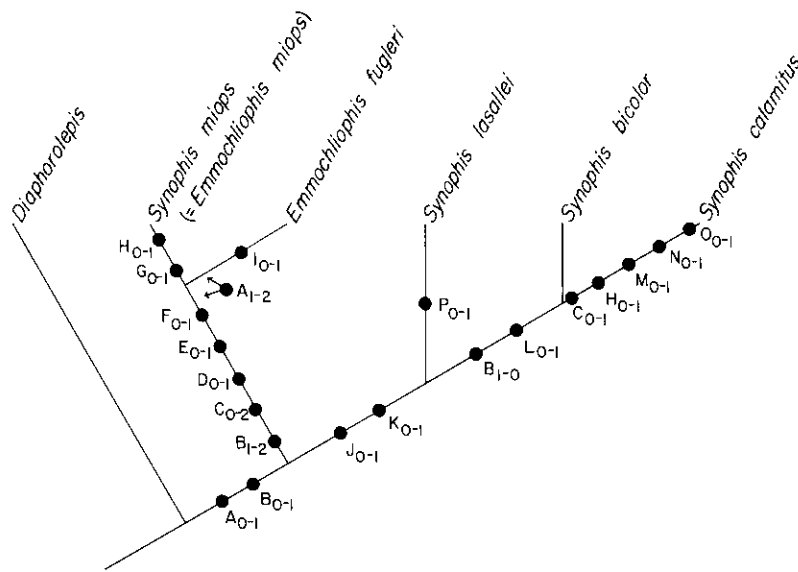


Fig. 2. Phylogeny of the species of *Synophis* and *Emmochliophis*. Synapomorphy codes are listed in Table 2. Each letter is subscripted with two numbers; these numbers indicate a change from the state on the left to the state on the right.

relationship of *E. fugleri* and *S. miops*. The genus *Emmochliophis* was erected by Fritts and Smith (1969) because of the purportedly unique interlocking vertebrae of *E. fugleri*, a condition unknown for the specimens of *Synophis* (*S. bicolor* and *S. lasallei*) examined by Bogert (1964). However, the holotype of *S. miops*, described and figured by Boulenger (1898), is the only specimen of the species and its vertebrae were not examined by Bogert (1964). Whether these interlocking vertebrae are a synapomorphy that unites *E. fugleri* and *S. miops* or are an autapomorphy of *E. fugleri* is unknown as depicted in Fig. 2. However, regardless of which of these two possibilities is correct, there are several other synapomorphies that unite *E. fugleri* and *S. miops* (Fig. 2.). Therefore, if the genus *Emmochliophis* is restricted to just *E. fugleri*, then the species of *Synophis* do not form a monophyletic group. Two solutions are possible: (1) *Synophis miops* could be transferred to the genus *Emmochliophis*, resulting in two monophyletic sister genera; or (2) *Emmochliophis fugleri* could be placed in the genus *Synophis*, resulting in one monophyletic genus. I prefer the former solution as it is more informative. Therefore, *Synophis miops* Boulenger 1898 becomes *Emmochliophis miops* (Boulenger 1898). The genus *Synophis* is restricted to *S. bicolor* Peracca 1896 (type species), *S. lasallei* (Niceforo-Maria 1950), and *S. calamitus* Hillis 1990.

Within the restricted genus *Synopsis*, *S. calamitus* appears to be the sister species of *S. bicolor* (Fig. 2). I follow Bogert (1964) in his treatment of *S. bicolor*, although it should be noted that the description of the holotype of this species by Peracca (1896) differs in several respects from all other reported specimens (greater number of ventrals, greater number of subcaudals, and fewer infralabials; see Table 1). It is possible that the specimens referred to *S. bicolor* by Bogert (1964) and in this paper represent an additional undescribed species of *Synopsis*.

Distribution.—Although Peters and Orejas-Miranda (1970) and Savitzky (1974) stated that both *S. lasallei* and *S. bicolor* are restricted to Amazonian slopes of the northern Andes, there are actually several records of *S. bicolor* from the Pacific slopes of Ecuador. These include two specimens reported by Bogert (1964) (SU 23612 and BMNH 1940-2-30-31) as well as two additional specimens reported here (USNM 233060 and MCZ 164530; see Appendix I). Also, the holotype of *S. lasallei* is from the Rio Magdalena drainage of Colombia. Most of the specimens of *Synopsis* are from cloud forest; the two specimens of *S. calamitus* are from Pacific cloud forest at 1890 m and 2150 m, and the various specimens of *S. bicolor* and *S. lasallei* have been collected between 460 m and 2200 m. In contrast, the only known specimens of *E. fugleri* and *E. miops* were collected in the Pacific lowlands of Ecuador. Boulenger (1898) reported an estimated elevation for the type locality of *E. miops* of 3500 ft (= 1067 m), but Brown (1941) reported the elevation of the type locality to be 777 m. The type specimen of *E. fugleri* was taken at ca. 600 m (Fritts and Smith, 1969).

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SUMMARY

A new species of xenodontine colubrid snake of the genus *Synopsis* is described from Pacific-slope cloud forest of Ecuador. A phylogenetic analysis of the genera *Synopsis* and *Emmochliophis* (using *Diaphorolepis* as the outgroup) reveals that the genus *Synopsis*, as currently recognized, is not monophyletic. Transfer of *Synopsis miops* to *Emmochliophis* rectifies the situation. As rearranged herein, the genus *Synopsis* contains *S. bicolor*, *S. lasallei*, and the new species *S. calamitus*; and *Emmochliophis* contains *E. fugleri* and *E. miops*.

RESUMEN

Se describe una nueva especie de serpiente colúbrida xenodontina del bosque de neblina de la vertiente pacífica de Ecuador. El análisis filogenético de los géneros *Synopsis* y *Emmochliophis* (usando a *Diaphorolepis* como grupo externo) revela que el género *Synopsis*, tal como es reconocido actualmente, no es monofilético. El cambio de *Synopsis miops* a *Emmochliophis* rectifica esta situación. En el arreglo aquí propuesto, el género *Synopsis* incluye a *S. bicolor*, *S. lasallei* y a la nueva especie *S. calamitus*; y *Emmochliophis* incluye a *E. fugleri* y *E. miops*.

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APPENDIX I: SPECIMENS EXAMINED

- Diaphorolepis laevis*: KU 75682: Panama: Darien: Cerro Mali, Serrania del Darien, 1410 m.
- Emmochliophis fugleri*: UIMNH 78795: Ecuador: Pichincha Province: 4 km E Rio Baba bridge, 24 km S Santo Domingo de los Colorados, ca. 600 m (holotype).
- Synopsis bicolor*: KU 121341: Ecuador: Pastaza Province: Mera, 1140 m; MCZ 164530: Ecuador: Pichincha Province: Tandapi; USNM 233060: Ecuador: "northwest Ecuador."
- Synopsis calamitus*: KU 164208: Ecuador: Pichincha Province: 9 km SE Tandayapa, 2150 m (paratype); KU 197107: Ecuador: Pichincha Province: 4 km SE Tandayapa, 1890 m (holotype).
- Synopsis lasallei*: KU 164221: Ecuador: Napo Province: 2 km SSW Rio Reventador, 1490 m; MCZ 156873: Ecuador: Napo Province: INECEL Station, Cascada San Rafael, Rio Quijos, 1320–1350 m; WWL 977–978 (field tags of W. W. Lamar; not yet deposited in permanent collection); Colombia: Meta Province: Villavicencio.

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