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A NEW FOSSORIAL SNAKE OF THE GENUS *GEOPHIS* (REPTILIA: SERPENTES: COLUBRIDAE) FROM THE CORDILLERA DE TALAMANCA OF COSTA RICA

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Abstract.—*Geophis talamancae,* a new species of colubrid snake from south-central Costa Rica is described. The new form belongs to the *sieboldi* group, which includes five Mexican species, *G. nasalis* (Guatemala), *G. hoffmanni* (Honduras to western Panama), *G. zeledoni* (central Costa Rica), *G. nigroalbus* (eastern Panama to Colombia), and *G. brachycephalus* (northern Costa Rica, Panama and Colombia). We reallocate *Geophis betaniensis* of Colombia, previously referred to the *championi* group, to the *sieboldi* group; present scale counts of *G. godmani* from populations geographically intermediate to those previously known; comment on distinguishing between *Geophis* and *Atractus* on the basis of chin shields and temporal scales; and present a key to the *Geophis* species of Lower Central America and Colombia.

Resumen.—En este trabajo se describe a *Geophis talamancae,* una nueva especie de serpiente colúbrida del centro-sur de Costa Rica. Esta nueva forma pertenece al grupo *sieboldi,* el cual incluye a 5 especies mexicanas y a *G. nasalis* (Guatemala), *G. hoffmanni* (Honduras a Panamá occidental), *G. zeledoni* (Costa Rica central), *G. nigroalbus* (Panamá oriental hasta Colombia) y *G. brachycephalus* (norte de Costa Rica, Panamá, y Colombia). Se reasigna a *Geophis betaniensis* de Colombia, previamente en el grupo *championi,* al grupo *sieboldi*; se proporcionan números de escamas de *G. godmani* de poblaciones intermedias geográficamente a las conocidas anteriormente y se comenta sobre la distinción entre *Geophis* y *Atractus* con base en las escamas geneiales y temporales. Finalmente se presente una clave para las especies de *Geophis* del sur de Centroamérica y Colombia.

A single example of a rather nondescript snake of the genus *Geophis* was collected during a survey of the herpetofauna of the Zona Protectora Las Tablas of the Reserva de la Biosfera la Amistad of Costa Rica, near the Costa Rica–Panama border by the senior author in 1992. A comparison with other *Geophis* confirms that the unique type appears to represent a population that may be called:

Geophis talamancae, new species
Fig. 1

Holotype.—CRE 5343, an adult female from Costa Rica: Puntarenas Province: Cantón Coto Brus: Zona Protectora Las Tablas, Finca Jaguar, 1800 m elevation; taken 1 Sep 1992 by Karen R. Lips.

Etymology.—The species name is derived from the Cordillera de Talamanca, the mountain range from which the specimen was collected.

Definition.—The features listed below characterize the species and follow the format used by Downs (1967) in his revision of the genus: 1) dorsal scale rows in 15-15-15 rows, strongly keeled on posterior half of body; 2) no anterior temporal; 3) one supraocular and one postocular scale; 4) snout blunt and shovel-shaped, rostral bare-

ly projecting posteriorly between internasals; 5) dorsal surfaces of body and of head uniform iridescent black; 6) venter white with black bands on posterior edges of scutes.

Diagnosis.—The new form is a member of the *sieboldi* group (Downs 1967), previously represented by 12 species ranging from Mexico to Colombia and including four that occur in Costa Rica and Panama. *Geophis talamancae* may be distinguished from *G. brachycephalus* by having the dorsal scales on the anterior half of the body smooth and a uniform dorsal coloration (in *brachycephalus* the dorsal scales are keeled except on the neck and there is often a distinct dorsal pattern of light, usually red, bars, spots and/or stripes). The new form differs from both *Geophis zeledoni* and *G. hoffmanni* in the keeling of the dorsal scales since these two forms have keels only on dorsal scales above the vent. Unlike *G. nigroalbus,* which has the postocular and supraocular separated by an anterior projection of the parietal, the supraocular is in broad contact with the postocular in *G. talamancae.* The new species is distinguished from *G. betaniensis* of west-central Colombia (features for that form in parentheses) by having keeled posterior dorsal scales (smooth dorsal scales) and one (two) postocular. Finally, it differs most obviously from the several species of the *G. championi* group, all of which are endemic to Costa Rica and/or Panama, in the shape of the head and associated features of scutellation. *Geophis talamancae* has an elongate snout that is rounded in dorsal outline, a rostral that barely extends posteriorly between the internasals, and a short postnasal that is higher than wide (Fig. 1). In the four members of the *championi* group (*G. championi, G. downsi, G. godmani,* and *G. ruthveni*), the elongate snout is pointed, the rostral separates the internasals for much of their length and the postnasal is broad, the width being at least 75% of its height.

General characteristics.—Head not distinct from neck; snout elongate, rounded in dorsal profile; rostral not extending posteriorly between internasals; its length from above about ⅛ its distance from frontal; internasals large, rounded anteriorly, slightly shorter than suture with prefrontal; prefrontals short, their median suture about ⅔ length of frontal; frontal slightly wider than long, quadrangular, in contact with prefrontals, supraoculars, and parietals, distinctly angulate anteriorly; parietals moderately long, broad, their median suture almost equal to length of frontal; parietal does not contact prefrontal above middle of orbit, but meets the supraocular and postocular scales. There is one postocular and one supraocular scale on each side of the head (Fig. 1).

Nasal divided, postnasal about the same size as prenasal, their combined length about 70% length of loreal; loreal relatively long, slightly more than ½ length of snout, slightly more than 2 times eye diameter; eye small, contained about 4⅓ times in snout length (tip of snout to anterior border of eye), its vertical diameter about equal to distance from supralabials; supralabials 6-6, 3 and 4 in contact with orbit on both sides, 5th in contact with parietal; anterior temporal directly above 6th supralabial, not fused with nuchals along parietal margin.

Mental rounded anteriorly, definitely broader than long, separated from chin shields by first pair of infralabials; infralabials 6-6, first 3 in contact with anterior chin shields; anterior chin shields slightly longer than broad, longer than posterior chin shields; posterior chin shields short, in contact anteriorly, diverging posteriorly; 3 gulars separate chin shields from first ventral.

Dorsal scale rows 15-15-15, keeled on posterior half of body and tail; posterior dorsal scales without discernible apical pits. Ventrals 138; anal entire; subcaudals 33. Ventrals + subcaudals 171. Standard length (snout-to-vent) 185 mm, tail length 33 mm; tail length 16 percent of total length.

Coloration.—Dorsal surfaces of head and body uniform dark charcoal grey to black. Head color extends ventrally to supralabials, infralabials, mental, and chin shields.

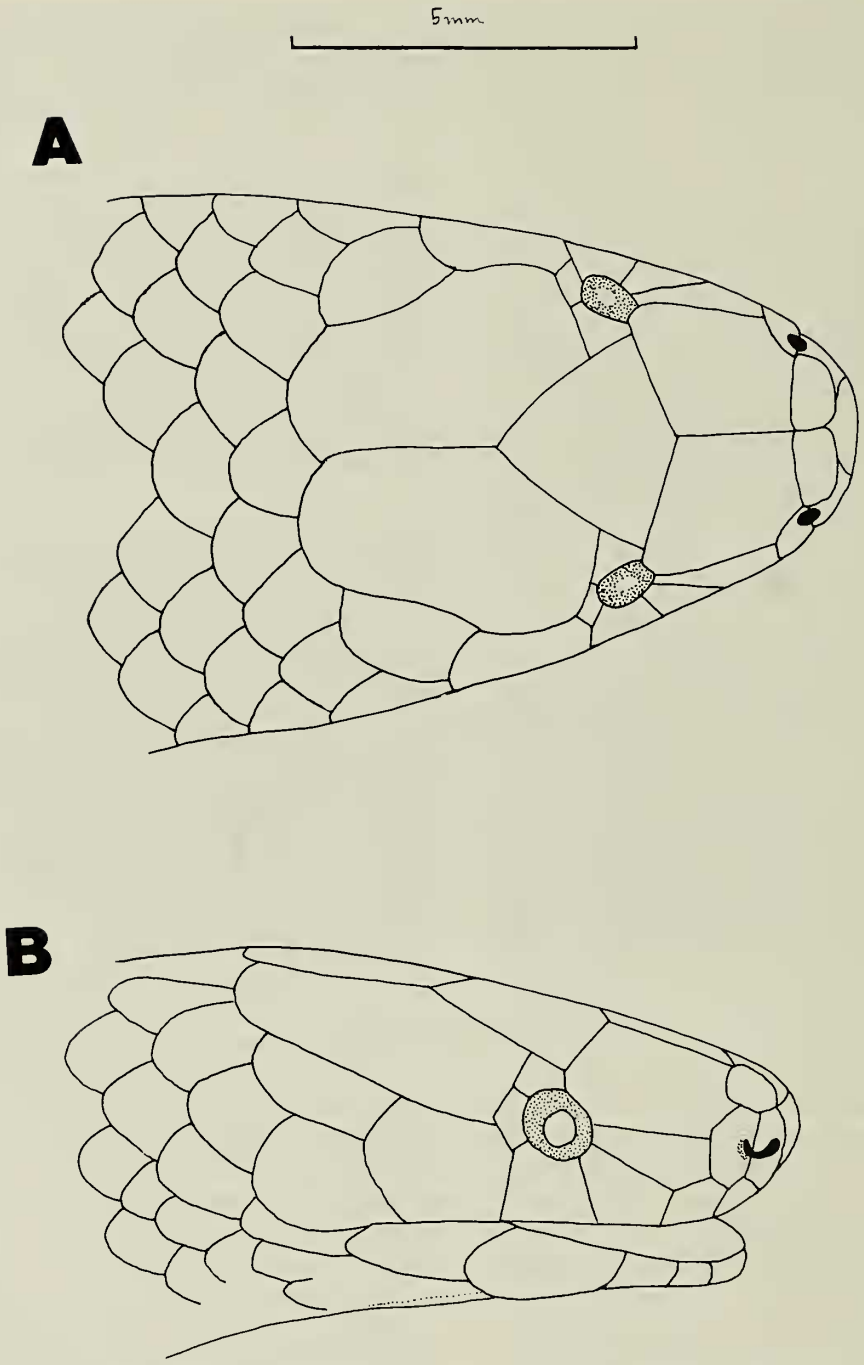

Fig. 1. Semidiagrammatic representation of A) dorsal and B) lateral head scutellation for the holotype (CRE 5343) of *Geophis talamancae*.

Gular area immaculate creamy white, becoming flecked with black on first ventral and becoming progressively more flecked along anterior edge of scutes, until only a very thin white posterior border remains on scutes near vent. Subcaudals completely black, without white markings.

Distribution.—Known only from the type locality in the Lower Montane Rainforest (Holdridge 1967, Tosi 1969) in the Cordillera de Talamanca of Costa Rica near the Panama border at 1800 m elevation.

Remarks.—The type specimen was collected from beneath a series of saplings whose roots were enclosed in plastic bags that had recently (within 4 months) been transported from the region of the central Cordillera de Talamanca along the Carretera Interamericana, about 100 km northwest of the type locality. There is a slight possibility that this snake might have been brought to the Las Tablas area in this shipment. However, a second specimen probably of the same species (white belly with distinct black bands on ventral scutes, uniform black dorsum) was collected from the Las Tablas area earlier in the year but escaped before an accurate identification could be made.

Four specimens of *Geophis godmani* were also collected from the Las Tablas area, representing an intermediate population between the two previously known but disjunct localities: a population from the Cordillera Central and extreme northern edge of the Cordillera de Talamanca in Costa Rica, and a population 250 km ESE of Las Tablas on Volcán Barú in Chiriquí, Panamá. The Panamanian specimens are represented only by heads and necks (Downs 1967) so variation in ventral and subcaudal counts from the southern part of the range was unknown. Because *G. brachycephalus* and *G. hoffmanni* have distinctly lower segmental counts on Volcán Barú than in Costa Rica, Downs (1967) predicted that Panamanian *G. godmani* would vary similarly.

All four specimens have 15-15-15 scale rows; no postocular, no supraocular, and no temporal scales. The number of ventrals for the three males (CRE 5344, 5319, 5072) ranges from 139–141; subcaudals 34–38; ventrals + subcaudals 173–179. The single female specimen (CRE 5337) has 140 ventrals, 27 subcaudals, and 167 ventral + subcaudals. These values do not differ substantially from those of specimens from the north in Costa Rica contra Downs' (1967) prediction. Geographical variation in *G. godmani* exists, however, in the amount of ventral pigmentation between those specimens from the area of the Barva-Poas volcanoes (venter almost uniformly bright yellow in color) and those from Volcán Turrialba south through the Cordillera de Talamanca to Las Tablas (bright yellow color of venter limited to anterior edge of scutes, posterior edge black). It is clear from the differences in ventral color that the escaped snake mentioned above was not *G. godmani.*

Relationships.—The new species is referred to the *Geophis sieboldi* group (Downs 1967) on the following basis: snout long, projecting well beyond lower jaw, rounded in dorsal outline; rostral not produced posteriorly between internasals; internasals short, their greatest length 33–62% of suture between prefrontals; postnasal short, width about 50% of height; prefrontals and loreals elongate; no anterior temporal; rounded mental; maxillary extends forward to suture between second and third supralabials, with 14 subequal teeth, tip of maxillary toothless; posterior end of maxillary tapering to a blunt point.

The *sieboldi* group as understood by Downs (1967) in his generic revision included four Mexican species (*Geophis petersi, G. russatus, G. sallei,* and *G. sieboldi*), one Guatemalan form (*G. nasalis*), one Nicaraguan endemic (*G. dunni*) and *G. brachycephalus* (Costa Rica to Colombia), *G. hoffmanni* (Honduras to western Panamá), *G. nigroalbus* (eastern Panamá to Colombia) and *G. zeledoni* (Costa Rica). Downs provided detailed descriptions of most of these

forms but gave belated recognition to *G. nigroalbus* and *G. russatus* only in footnotes (p. 146 and p. 138, respectively). Campbell and Murphy (1977) added another Mexican species (*G. pyburni*) to the group. Within the genus, *G. talamancae* most closely resembles *G. nigroalbus* but differs most obviously in the relation of the parietal to the supraocular and postocular (bordering them posteriorly in *talamancae,* separating them in *nigroalbus*).

Restrepo & Wright (1987) on the occasion of describing *Geophis betaniensis* from Colombia expressed difficulty in accepting Downs' (1967) definitions of species groups and referred their new form to the *championi* group. This decision was reached in part because *G. betaniensis* keyed out to *G. championi* in Downs' key (couplet 29) to the genus. When they used Savage's (1981) key to Costa Rican and Panamanian *Geophis,* they reached a couplet (number 4) that distinguished between *G. hoffmanni* and *G. zeledoni* (*sieboldi* group species) and this seems to be the basis for their puzzlement over species group definitions.

Both keys (Downs 1967, Savage 1981) are artificial ones based upon the most obvious characters of the included species and are designed for field identifications. No attempt was made by either author to design a key in which presumably related form (i.e., members of the same species group) were placed together.

Downs (1967), contrary to Restrepo & Wright (1987), provided unambiguous definitions of the seven species groups that he recognized within *Geophis.* Members of the *championi* group differ from *G. betaniensis* (features for that species in parentheses) in the following characteristics: snout elongate, pointed (rounded); rostral produced posteriorly between internasals (barely projecting between internasals); internasals elongate, greatest length 67–100% of prefrontal suture (50%); postnasal long, width at least 75% of height (postnasal short, width about 50% of height); mental acuminose (rounded). These differences clearly preclude inclusion of *G. betaniensis* in the *championi* group.

Comparison of the features of head shape and scutellation of *Geophis betaniensis* with those of the other species groups of *Geophis* (Downs 1967) show a complete concordance between the Colombian species and members of the *sieboldi* group (see list of characteristics at the beginning of this section). In terms of skeletal and dentitional features the *championi* and *sieboldi* groups are very similar except that in the latter there is no tooth on the tip of the maxillary (present in the former) and the hemipenes of the *championi* group differ in lacking capitation. Unfortunately, features of the hemipenes were not included by Restrepo & Wright (1987) in their original description because the only specimens referred to *G. betaniensis* are both females. Nevertheless we believe that evidence from physiognomy (general shape of the head) and scutellation support the inclusion of *G. betaniensis* in the *sieboldi* group.

Because Colombian species of *Geophis* are sympatric with members of the superficially similar genus *Atractus,* another fossorial group, Restrepo & Wright (1987) discussed features of external morphology that may be utilized to distinguish between them. After some discussion with Frances J. Irish, who is undertaking a systematic revision of *Atractus,* they concluded that the presence (in *Atractus*) and absence (in *Geophis*) of an anterior temporal scale and the number of chin shields (two pairs in *Geophis* and one pair in *Atractus*) are diagnostic for those species found in Central and South America.

Unfortunately, the situation is more complicated than these authors suggest. As pointed out by Savage (1960) and Downs (1967), presence or absence of the anterior temporal exhibits both interspecific and some intraspecific variability in both genera; those *Geophis* characteristically having an anterior temporal are confined to Mex-

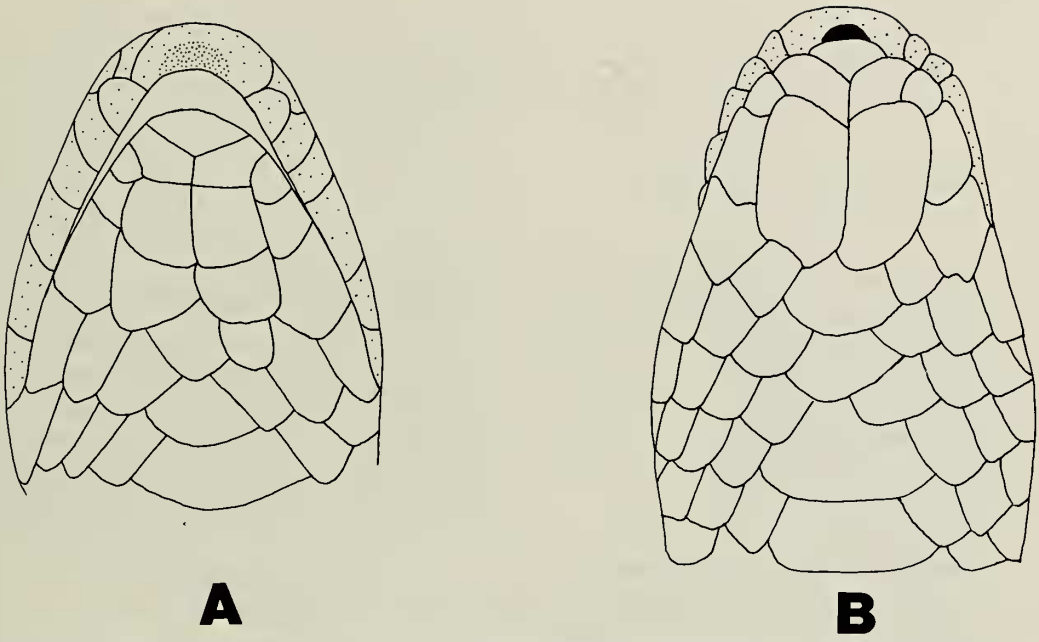

Fig. 2. Diagrammatic differences in chin shields between A) *Geophis* and B) *Atractus.*

ico, and most examples of *Atractus* consistently have one.

Savage (1960) had previously noted that *Geophis* and *Atractus* from the area of geographic overlap in Panamá and Colombia could be distinguished on the basis of the chin shield feature. Downs (1967) however, questioned the utility of this character since it is difficult in some cases to distinguish the posterior chin shield from the adjacent gular scales in *Geophis,* which approaches the condition found in *Atractus.* Nevertheless, although the posterior pair of chin shields are often small and usually separated by a median gular scale, there is no ambiguity in using this feature to separate lower Central and South American *Geophis* from *Atractus* (Fig. 2).

Key to Species of *Geophis* from Lower Central America and Colombia

1a. Supraocular shields present 2
1b. No supraocular scales 10
2a. Two postoculars .... *G. betaniensis* (Colombia)
2b. One postocular 3
3a. Uppermost dorsal scales keeled at least on posterior half of body and tail 4
3b. Dorsal and caudal scales smooth or smooth except for some faintly keeled scales above vent 8
4a. Dorsal scales on body (exclusive of neck) and tail distinctly keeled 5
4b. Dorsal scales on anterior half of body smooth 6
5a. Dorsal scales in 15 rows; dorsum dark, often with light lateral blotches, crossbands, or stripes . . . . *G. brachycephalus* (Costa Rica to Panamá)
5b. Dorsal scales in 17 rows; dorsum light with dark blotches or saddles ..... *G. dunni* (Nicaragua)
6a. Postocular and supraocular in contact, excluding parietal from margin or orbit 7

6b. Postocular and supraocular separated by extension of parietal that meets orbit .... *G. nigroalbus* (Colombia)

7a. Snout pointed; rostral markedly produced posteriorly between internasals; mental pointed .... *G. ruthveni* (Costa Rica)

7b. Snout rounded; rostral barely produced posteriorly between internasals; mental rounded .... *G. talamancae* (Costa Rica)

8a. Five or fewer supralabials ..... . *G. hoffmani* (Honduras to Panamá)

8b. Six or more supralabials 9

9a. Snout pointed; rostral markedly produced posteriorly between internasals; mental pointed anteriorly; ventrals plus subcaudals 156–158 .. *G. championi* (Panamá)

9b. Snout rounded; rostral barely produced posteriorly between internasals; mental rounded; ventrals plus subcaudals 180–191 . ..... *G. zeledoni* (Costa Rica)

10a. Uppermost dorsal scales keeled at least on posterior third of body and on tail; ventrals 122–133; subcaudals 41–46 .... *G. downsi* (Costa Rica)

10b. Dorsal scales smooth; ventrals 132–145; subcaudals 26–36 *G. godmani* (Costa Rica to Panama)

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