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A New Snake of the Genus *Tropidophis* (Tropidophiidae) from Central Cuba

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ABSTRACT.—**A new species of *Tropidophis* is described from the province of Sancti Spíritus in central Cuba. This small, spotted, gracile species differs from all others in the genus by a combination of scalation, head shape, and color pattern. It is tentatively placed in the *semicinctus* group of gracile, boldly spotted species, but it does not appear to be closely related to any species in the genus.**

RESUMEN.—**Se describe una nueva especie de *Tropidophis* de la provincia Sancti Spíritus, en la región central de Cuba. Es una especie grácil, pequeña y moteada, diferenciable de las restantes del género por una combinación de caracteres de escamación, forma de la cabeza y patrón de colorido. Ha sido tentativamente incluida en el grupo *semicinctus*, que incluye especies gráciles con manchas muy definidas, pero no muestra relación cercana con ninguna de las especies del género conocidas.**

Neotropical snakes of the genus *Tropidophis* (Tropidophiidae) include 14 recognized West Indian species and three mainland species (Peters and Orejas-Miranda, 1970; Powell et al., 1996; Hedges et al., 1999). Most of these species (11) occur on the island of Cuba, where as many as six may be sympatric (Hedges and Garrido, 1992). They feed primarily on frogs and lizards (Schwartz and Henderson, 1991; Rodríguez-Robles and Greene, 1996), and most species undergo physiological color changes on a 24-h cycle related to activity patterns (Hedges et al., 1989). Except for a few common species, they are rarely encountered and, therefore, the number of specimens in collections is limited.

Several species groups are recognized for the West Indian taxa based on morphology (Schwartz, 1957; Schwartz and Marsh, 1960; Hedges and Garrido, 1992): the *fuscus* group (*T. fuscus*), the *greenwayi* group (*T. greenwayi*), the *maculatus* group (*T. canus, T. haetianus, T. maculatus, T. nigriventris, T. pardalis,* and *T. pilsbryi*), the *melanurus* group (*T. caymanensis* and *T. melanurus*), and the *semicinctus* group (*T. feicki, T. semicinctus,* and *T. wrighti*). Although these informal groups may not reflect evolutionary relationships (Hedges et al., 1992; Hedges, 1996), they facilitate discussion and understanding of morphological variation in the genus.

In February 1993, a small and boldly spotted snake was collected at a locality in central Cuba, in the province of Sancti Spíritus, and became available to the junior author for examination. Its unique combination of head shape, scalation, and color pattern indicated that it represented an undescribed species of *Tropidophis*. Although single specimens may be found to possess anomalies at one character, it is much less likely for a specimen of a known species to possess major differences in multiple characters. Thus, we are confident in describing this species based on a single individual. Also, most species in the genus are rarely encountered by herpetologists and therefore it is unlikely that additional specimens will become available in the near future.

Materials and Methods

Snout–vent length (SVL) and tail length measurements were taken to the nearest mm; other length measurements were made with a digital readout micrometer caliper and recorded to the nearest 0.1 mm. Illustrations of head scalation were made with a camera lucida. Abbreviations are EYE (eye diameter), HW (head width), MNHNCU (Museo Nacional de Historia Natural, Havana, Cuba), SVL (snout–vent length), and USNM (United States National Museum of Natural History). Comparisons of the new species with described species of *Tropidophis* were made by examination of comparative material (see Specimens Examined section), published scale count data (Schwartz, 1957; Schwartz and Marsh, 1960; Schwartz and Garrido, 1975; Hedges and Garrido, 1992), and head shape measurements (Hedges and Garrido, 1992).

Tropidophis spiritus, sp. nov.

Fig. 1

Holotype.—MNHNCU 4085, an adult male from Canal Zaza, Cacerio Chorrera Brava, Sancti Spíritus Province, Cuba, 21°47′07″N,

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FIG. 1. *Tropidophis spiritus* (MNHNCU 4085), adult male, holotype. (A) dorsum, (B) venter.

79°21'38"W, collected in February 1993 by O. Jíminez.

Diagnosis.—This species of *Tropidophis* is distinguished from all others by a combination of scalation, head shape, and color pattern. With its high number of ventral scale rows (200), it is similar to some species in the *maculatus, melanurus,* and *semicinctus* groups (Schwartz and Marsh, 1960; Hedges and Garrido, 1992). Of those, *T. melanurus* and *T. caymanensis* are larger species (SVL to 957 and 515 mm, respectively, versus 307 mm in *T. spiritus*) with a more robust body shape (not gracile), more body spots (47–64 versus 40), and very different color patterns (Schwartz and Marsh, 1960; Thomas, 1963). From *T. celiae* (Hedges et al., 1999), *T. spiritus* differs in having a gracile body shape (not robust), fewer dorsal scale rows at midbody (23 versus 27 in *T. celiae*), no contact between parietal scales, no occipital spots (or band), fewer dorsal body spots (40 versus 60), fewer tails spots (4 versus 12), more rows of body spots (six versus two), and in having ventral spots (absent in *T. celiae*). From *T. maculatus,* it differs in having a gracile body shape (not robust), fewer dorsal scale rows at midbody (23 versus 25), fewer rows of body spots (six versus 8–10), and a different color pattern (Table 1; Schwartz and Marsh, 1960; Tolson and Henderson, 1993: Fig. 65).

With its gracile, laterally-compressed body shape, high number of ventral scales, and color pattern of bold spots, *T. spiritus* most closely resembles the three species in the *semicinctus* group (Table 1). It can be distinguished from all three by its higher number of body spots (40 versus 17–37), higher number of body spot rows (6 versus 2–4), less distinctive head (HW/NW = 1.35 versus 1.70–2.24; Hedges and Garrido, 1992), and relatively smaller and less protrusive

TABLE 1. Comparison of characters of selected Cuban *Tropidophis*. Sample sizes are indicated in parentheses.

Character	*T. spiritus* (1)	*T. wrighti* (18)	*T. feicki* (25)	*T. semicinctus* (26)	*T. maculatus* (25)
Maximum SVL (mm)	307	330	448	408	347
Ventral scales	200	192–222	217–235	201–223	189–208
Midbody scale rows	23	21–23	23–25	21–25	25
Body shape	Gracile	Gracile	Gracile	Gracile	Robust
Ground color	Grayish tan	White or tan	Gray or pink	Yellow to orange	Red or reddish tan
Dorsal pattern	Spots	Spots	Saddles	Spots	Spots
Ventral pattern	Spots	Spots	None	None	Spots
Spot rows	Six	Four	One	Two	8–10
Body spots	40	17–37	17–26	18–29	35–55
Tail spots	5	3–6	2–6	3–9	4–11
Middorsal spot contact	Yes	Yes	Yes	Yes or No	No
Head width/Neck width	1.35	1.77–2.24 (7)	1.76–2.24 (4)	1.70–1.88 (2)	1.44–1.92 (3)
Eye width/Head width	0.243	0.315–0.339 (7)	0.279–0.315 (4)	0.295–0.335 (2)	0.227–0.312 (3)

eyes (EYE/HW = 0.243 versus 0.279–0.339). In addition, *T. feicki* (N = 25) has a higher number of ventrals (217–235 versus 200), an unpatterned venter (versus boldly spotted in *T. spiritus*), and large saddles (versus smaller spots in *T. spiritus*). *Tropidophis semicinctus* (Fig. 2A; N = 26) has a higher number of ventrals (201–223), an unpatterned venter, and an orange or yellow ground color (versus grayish-tan in *T. spiritus*). The third species, *T. wrighti* (Fig. 2B; N = 18), is most similar to *T. spiritus* in having ventral spots and an overlapping number of ventral scales (192–222). However, in addition to the other diagnostic differences noted above (higher number of body spots, higher number of spot rows, lower HW/NW ratio, lower EYE/HW ratio), the two species have very different head shapes and head scale proportions (Fig. 3). For example, the frontal scale is narrower in *T. spiritus* (width of anterior frontal scale/width of supraocular scale = 1.35 versus 2.05–2.50 in *T. wrighti*) and the internasals and prefrontals slope gradually to the supralabials (they slope abruptly in *T. wrighti*).

Two small, spotted taxa that occur in south-central Cuba and that might be confused with *T. spiritus* are *T. nigriventris hardyi* and *T. pilsbryi galacelidus* (Schwartz and Garrido, 1975). However, the more gracile body shape and higher number of ventrals (200 versus 153–172 in *T. n. hardyi*, 177–183 in *T. p. galacelidus*) and caudals (39 versus 27–34 in *T. n. hardyi* and 29–35 in *T. p. galacelidus*) in *T. spiritus* will distinguish it from those two subspecies. In addition, *T. n. hardyi* has an unpatterned venter (spotted in *T. spiritus*) and a medium to dark brown dorsal ground color (grayish-tan in *T. spiritus*); *T. p. galacelidus* has occipital spots (absent in *T. spiritus*), a higher number of dorsal body spots (44–50 versus 40 in *T. spiritus*) and 10 rows of body spots (versus six in *T. spiritus*).

Description of the holotype.—An adult male with spurs; body gracile, laterally compressed, head slightly expanded laterally (slightly distinct from neck; Fig. 3), head width (7.0 mm) ÷ neck width (5.2 mm) = 1.35; eye diameter 1.7 mm, eyes protruding only slightly beyond edge of head when viewed from above, eye diameter ÷ head width = 0.243; SVL = 307 mm, tail length = 43 mm; ventrals, 200; subcaudals, 39 (complete); supralabials, 10/10 (left/right), scales 4–5 in contact with eye; infralabials, 11/11; preoculars, 1/1; postoculars, 3/3; dorsal scales, smooth, in 23-23-17 rows (middorsal row not enlarged, except for a few scales on body and posterior 14 scales on tail); parietal scales not in contact.

In alcohol, ground color grayish-tan dorsally grading to a pale yellowish-tan on venter; small brown flecks scattered sparsely over entire body, including head and chin; body spots dark brown or black with narrow (¼ scale) white border, bold in appearance, in six longitudinal rows (including two on venter); upper dorsal spots round or oblong, 3–4 scales wide and 4–7 scales in length; lower dorsal spots more rounded, 3–4 scales in diameter; ventral spots rounded, medium brown, two ventral scales in length anteriorly grading to dark brown and three ventral scales in length posteriorly, contacting at midventer; 40/40 body spots at dorsal midline; 5/5 dorsal spots on tail; tail tip, orangeish-brown above, pale yellowish-tan below; dorsal surface of head grayish-tan, without bold markings; a pair of indistinct brown blotches posterior to parietals; side of head with dark brown eye stripe, beginning on preocular scale, passing through eye, and extending to immediately posterior of the corner of mouth.

Etymology.—The specific name is the Latin word for "ghost." It is used here in reference to the province in central Cuba, Sancti Spíritus, in which the type specimen was collected.

Distribution.—*Tropidophis spiritus* is known only from the type-locality, which is located in the southern portion of Sancti Spíritus province,

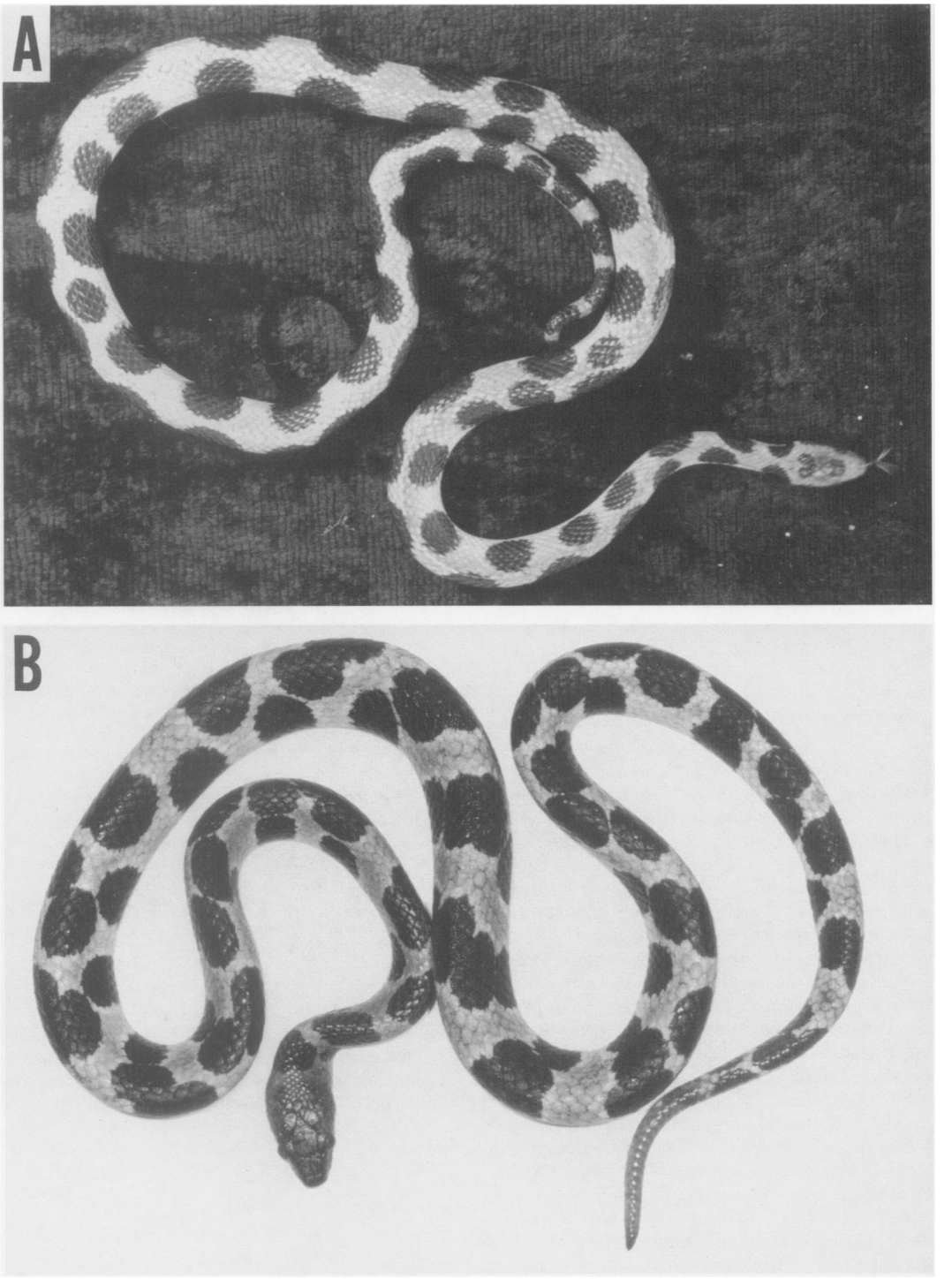

FIG. 2. Two species of Cuban *Tropidophis*. (A) *T. semicinctus* (Loma Canasi, La Habana Province), and (B) *T. wrighti* (2 km N La Munición, Guantánamo Province).

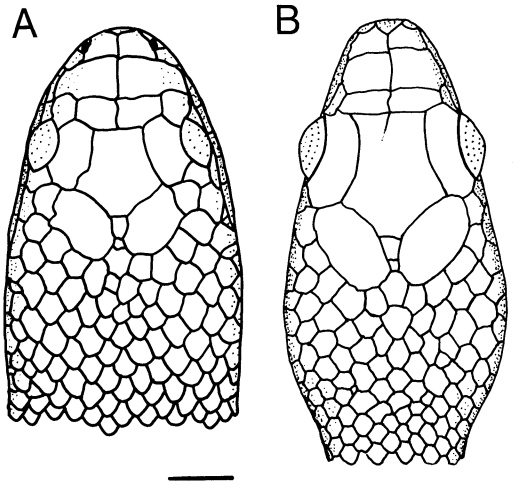

FIG. 3. Head scalation in (A) *Tropidophis spiritus* (holotype) and (B) *T. wrighti* (MNHNCU 3435). Bar = 2 mm.

about 18 km SE (airline) Sancti Spíritus and one km downstream from the large dam (for Presa Zaza) on the Río Zaza (Instituto Cubano de Geodesia y Cartografía, 1978). This is the same locality where Miocene sloth fossils were discovered (identified as "Zaza Dome" in MacPhee and Iturralde-Vinent, 1994).

DISCUSSION

Within the context of the current species groups, *T. spiritus* can be placed tentatively in the *semicinctus* group based on its gracile body shape, smooth dorsal scales, high number of ventrals, and bold, spotted pattern. Within that group, it most closely resembles *T. wrighti* in having ventral body spots and a number of ventral scales falling within the latter species' range. However, the very different head shape of *T. spiritus* (Fig. 3), and other differences noted in the diagnosis, suggests that those similarities are superficial and that the two species are not closely related.

Seven species of *Tropidophis* now are known to occur in central Cuba. Five of those occur in the region of Trinidad and the Trinidad mountains (Alturas de Trinidad): *T. melanurus, T. nigriventris hardyi, T. pardalis, T. pilsbryi galacelidus,* and *T. semicinctus.* The type locality of *T. spiritus* lies approximately 40–50 km to the east of Trinidad, and *T. wrighti* is known from a locality in the northern portion of Sancti Spíritus Province (Schwartz and Henderson, 1991). As many as six species of *Tropidophis* are sympatric in eastern Cuba (Hedges and Garrido, 1992) and western Cuba (Hedges et al., 1999). This large number of co-occurring species is remarkable for a single genus of West Indian snakes and invites ecological study to better understand how their niches are partitioned.

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APPENDIX I

SPECIMENS EXAMINED

Tropidophis maculatus.—Cuba: Ciudad de La Habana; La Habana (USNM 309775). Pinar del Río Prov., Soroa (MNHNCU 3422).

T. melanurus.—Cuba: Guantánamo Prov.; 9.4 km ENE Acueducto (MNHNCU 3423), Bernardo (MNHNCU 3424), 3.5 km E Tortuguilla (MNHNCU 3425), 2 km N La Munición (MNHNCU 3426). Pinar del Río Prov.; Cueva del Indio (MNHNCU 3428), Cueva de San Miguel (MNHNCU 3429–30).

T. semicinctus.—Cuba: Cienfuegos Prov.; Cienfuegos (USNM 56347). Sancti Spíritus Prov.; 7 mi. W Trinidad (USNM 139418).

T. wrighti.—Cuba: Guantánamo Prov.; 2 km N La Municíon (MNHNCU 3434–37). Santiago de Cuba Prov.; Ocujal (USNM 138513).

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Intraspecific Variation in Antipredator Responses of Three Species of Lizards (*Liolaemus*): Possible Effects of Human Presence

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ABSTRACT.—**Although humans are commonly used as a surrogate predator to assess the antipredator behavior of lizards, little is known about the effects that life associated with humans may have on the escape behavior of lizards. Here we examine the effects that coexistence with humans may have on the antipredator mechanisms in three species of *Liolaemus* (Tropiduridae). For each species we compared two populations exposed to different human densities, to test the null hypothesis that there is no interpopulational variation in the response to an approaching human in the field. Also it was determined whether coexistence with humans would affect the behavioral and physiological antipredator responses to a model of a natural predator in the laboratory. Lizard populations that were exposed to a high human density allowed a closer proximity of humans in the field, and decreased their rate of movement and breathing intensity in response to the presentation of a predator model in laboratory experiments. We discuss the effects humans may have upon the lizards antipredator behavior toward humans and natural predators.**

For many species of vertebrates predation is an important source of mortality (Begon et al., 1990), and thus promotes the evolution of antipredator mechanisms in prey (Endler, 1986; Greene, 1988). However, the response of an individual towards a predator varies with different factors. The approach distance (AD) in lizards (the distance at which an animal first moves to escape from an approaching human), has been widely used as a measurement of the degree of risk of predation perceived by the prey, and, as such, is considered a measurement

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