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

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ABSTRACT.—**A new species of *Tropidophis* is described from the northern coast of eastern Cuba, in the province of Holguín. It is a small, spotted species previously confused with *Tropidophis haetianus* of Hispaniola. It differs from that species in being smaller, and in scalation and coloration. It is tentatively placed in the *maculatus* species group. *Tropidophis galacelidus* and *Tropidophis hardyi* are recognized as valid species rather than subspecies of *Tropidophis pilsbryi* and *Tropidophis nigriventris*, respectively.**

RESUMEN.—**Se describe una nueva especie de *Tropidophis* del noroeste de la provincia de Holguín. Es una especie pequeña de *Tropidophis* que anteriormente había sido confundida con *Tropidophis haetianus* de La Española. Se diferencia de esta especie en ser de menor tamaño, así como en escamación y colorido.Se le sitúa tentativamente en el grupo de especies *maculatus*. Se reconocen como validás a nivel específico las especies *Tropidophis galacelidus* y *Tropidophis hardyi* en vez de considerarlas subespecies de los táxones *Tropidophis pilsbryi* y *Tropidophis nigriventris*, respectivamente.**

Snakes of the genus *Tropidophis* are Neotropical in distribution, although all but three of the 16 recognized species are West Indian and most are endemic to Cuba (Hedges and Garrido, 1999; Hedges et al., 1999, 2001). The genus was revised by Stull (1928), and later, Schwartz and Marsh (1960) reviewed most of the West Indian species, making further revisions. During the latter study, several specimens from Cuba were discussed that were either difficult to place taxonomically, or had caused confusion. Two from eastern Cuba, MCZ 47896 from Guarda la Vaca in Holguín Province and USNM 27455 from "eastern Cuba," and a third specimen (USNM 137084) from Soledad, Cienfuegos Province, were associated with *Tropidophis haetianus haetianus* of Hispaniola but were recognized as being different in several ways. The Soledad specimen was later described as a subspecies of *Tropidophis pilsbryi* (Schwartz and Garrido, 1975), but the remaining two specimens from eastern Cuba continued to be treated as *T. h. haetianus* (Schwartz, 1975). Another specimen, BMNH 1962.853, was considered by Schwartz (1975) to be a third Cuban *T. h. haetianus*. In this paper, we reinvestigate the status of these problematic Cuban snakes.

The senior author recently examined specimens and data in the Natural History Museum of London (BMNH) and discovered that one of the three specimens of Cuban *T. h. haetianus* in question is almost certainly from Jamaica. BMNH 1962.853 is a recataloged specimen from the mid-1800s. The locality "Cuba?" also reads "probably in error for Jamaica." Also, a note on the jar identifies it as specimen "C" of Boulenger (1893, vol. 1, p. 112), which that author lists as from Jamaica and collected by P. H. Gosse. The scale counts of the specimen agree with those given by Boulenger, and are consistent with *Tropidophis haetianus jamaicensis*. Thus confusion of the locality of this specimen probably originated from a clerical error introduced when it was recataloged.

While investigating the provenance of that specimen, another specimen of possible relevance was located in the BMNH: 58.6.1.16, cataloged in 1858. It is the same as specimen "A" in Boulenger (1893, vol. 1, p. 112). Although Boulenger listed the locality as "Cuba," the BMNH ledger lists the locality as "Cuba?," with the only other notation being "M. Parzonwakes coll." It has several characters that lead us to believe that it is from Hispaniola: it is large (417 mm SVL), the parietal scales are in contact, posterior scale rows reduce to 19, and it has a dark head with bold lateral head stripe. Collectively, these are characters that distinguish Hispaniolan *T. haetianus* from Jamaican populations and associated specimens from Cuba (see below).

Only one specimen of *T. haetianus* from Cuba (MCZ 47896) exists with a specific locality. It is in excellent condition, is an adult female, and its pattern has not faded. In several characters it is clearly a species distinct from *T. haetianus* and therefore requires a name.

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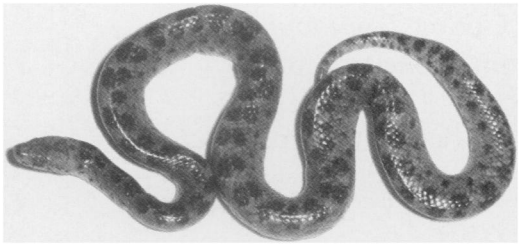

FIG. 1. *Tropidophis hendersoni* (MCZ 47896), adult female, holotype.

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 BMNH (Natural History Museum, London), EYE (eye diameter), HW (head width), MNHNCU (Museo Nacional de Historia Natural, Havana, Cuba), MCZ (Museum of Comparative Zoology), SVL (snout–vent length), and USNM (United States National Museum of Natural History). Comparison of the new species with described species of *Tropidophis* was made by examination of comparative material (see Appendix 1), published scale count data (Schwartz, 1957; Schwartz and Marsh, 1960; Thomas, 1963; Schwartz and Garrido, 1975; Hedges and Garrido, 1992), and head shape measurements (Hedges and Garrido, 1992).

Tropidophis hendersoni, sp. nov.
Figure 1

Holotype.—MCZ 47896, an adult female from Guarda la Vaca, Holguín Province, Cuba, 21° 07′35″N, 77° 49′55″W, probably at sea level, collected by Clench and Alayo on 14 August 1945.

Diagnosis.—This species of *Tropidophis* is distinguished from all others by a combination of scalation and coloration. With its relatively high number of ventral scales (190), midbody scale rows (25), and pattern of dorsal spots, it requires comparison with the following West Indian taxa: *Tropidophis bucculentus*, *Tropidophis caymanensis*, *Tropidophis h. haetianus*, *Tropidophis haetianus stejnegeri*, *Tropidophis maculatus*, *Tropidophis melanurus*, *Tropidophis morenoi*, and *Tropidophis pilsbryi galacelidus*. The species of the *melanurus* group (*T. bucculentus*, *T. caymanensis*, and *T. melanurus*) with those characters can be separated from *T. hendersoni* by their relatively large and robust bodies (maximum SVL 512–957 mm vs 280 mm in adult holotype of *T. hendersoni*), predominantly striped patterns, and two rows of spots (vs 10 in *T. hendersoni*) if spotting is present. From *T. maculatus*, it is distinguished by having a blunt snout (tapered in *T. maculatus*) dorsal spots in contact at middorsum (not in contact in *T. maculatus*), lacking a dark stripe on side of head (present and bold in *T. maculatus*), and almost completely lacking ventral pigmentation (spotted venter in *T. maculatus*). From *Tropidophis pillsbryi galacelidus*, it has a higher number of ventrals (190 vs 177–186 in *T. p galacelidus*) and lower number of anterior scale rows (23 vs 25–27 in *T. p. galacelidus*). From *T. morenoi* (Hedges et al., 2001), *T. hendersoni* has 48–52 body spots in 10 rows (versus 38–39 body bands and six rows in *T. morenoi*), has 25 middorsal scale rows (vs 23), and nearly completely lacks ventral pigmentation (boldly spotted in *T. morenoi*).

None of the above mentioned taxa bear any resemblance to *T. hendersoni*, but they are mentioned and compared for reasons of objectivity. As noted previously (Schwartz and Marsh, 1960; Schwartz, 1975), the species that requires closest comparison is *T. haetianus*. Except for one specimen of *T. h. stejnegeri* with 190 ventrals, the Jamaican subspecies of *T. haetianus* have fewer ventrals (163–189). Also, they rarely (4/46 specimens) have as few as 23 anterior scale rows and usually (32/45 specimens) have fewer than 19 posterior scale rows. The Jamaican subspecies most similar to *T. hendersoni*, *T. h. stejnegeri*, has a pointed snout (blunt in *T. hendersoni*), a dark head (pale in *T. hendersoni*), a reddish-brown middorsal zone (apparently absent in *T. hendersoni*, although some minor fading of specimen may have occurred) and ventral blotches (absent in *T. hendersoni*). The subspecies requiring the closest comparison are those occurring on Hispaniola (problems in the taxonomy of *T. haetianus* are discussed below but do not have a direct affect on this diagnosis).

Tropidophis hendersoni can be distinguished from Hispaniolan *T. haetianus* by its separation of the parietal scales, which are in contact in nearly all (189/193) Hispaniolan *T. haetianus*, its small body size (280 mm SVL in the adult female *T. hendersoni* versus 552 maximum SVL in females of *T. haetianus*), its larger eyes (EYE/HW 0.279 vs 0.217–0.270 in Hispaniolan *T. haetianus*; $N = 14$, including individuals smaller and larger than *T. hendersoni* holotype), its pale head (dark in Hispaniolan *T. haetianus*), and the absence of a lateral head stripe (present in Hispaniolan *T. haetianus*). The dorsal scale row count of *T. hendersoni*, 23-25-19, also stands in contrast with most Hispaniolan *T. haetianus*, which have 25 anterior rows and 27 midbody scale rows.

Description of the Holotype.—An adult female with enlarged follicles; body robust, head slightly expanded laterally, slightly distinct from neck, HW 7.86 mm ÷ neck width 5.43 mm =

1.45; EYE 2.19 mm, eyes protruding beyond edge of head when viewed from above, EYE/HW = 0.279; SVL = 280 mm, tail length, regenerated = 33 mm; ventrals, 190; subcaudals, 33; supralabials, 10/10 (left/right), scales 4–5 in contact with eye; infralabials, 11/11; preoculars, 1/1; postoculars, 3/3; dorsal scales, smooth (weakly keeled in middorsal region anterior to vent), in 23-25-19 rows; middorsal row not enlarged, except for a few scales at posterior end of body and on tail; parietal scales not in contact, separated by one scale.

Coloration of the holotype (in alcohol): dorsal ground color tan contrasting with the dark brown dorsal spots; body spots in ten irregular longitudinal rows at midbody, although in eight rows for rest of body; the two middorsal rows largest and fused in many places, approximately three scales in width and three scales in length; lateral spots much smaller, approximately 1–2 scales in diameter; venter essentially immaculate, with lateral spotting intruding on 15–20 ventral scales anterior to the vent and rarely elsewhere on venter; underside of tail also unpigmented; 48/52 body spots at dorsal midline; 7/8 dorsal spots on tail; tail tip, black; dorsal surface of head paler than elsewhere on dorsum, with medium brown spots and other markings; side of head and lips conspicuously spotted; top of head with a large central triangular marking, apex oriented forward, separated from dark dorsal markings by three small spots across back of head; small, dark, irregular line, roughly forming an "M" at tip of snout on internasal scales; the region at back of head somewhat paler than top of head and rest of body, giving impression of a pale neck band.

Etymology.—The specific name is in honor of Robert W. Henderson, Curator of Amphibians and Reptiles, Milwaukee Public Museum, for his many valued contributions to West Indian herpetology.

Distribution.—*Tropidophis hendersoni* is known only from the type-locality in Holguín Province, located on the northern coast of eastern Cuba, to the northwest of Banes.

Natural History.—No ecological data are known. This region (Grupo de Maniabón) is characterized by relatively low-elevation karst topography. Guarda la Vaca itself is located on the coast and is referred to as "Playa Guarda la Vaca" on detailed maps (Instituto Cubano de Geodesia y Cartografía, 1978).

Comments.—The parietal scales of the holotype are not in contact. However, the separation involves only a small scale and this may have led Schwartz and Marsh (1960) to consider it as parietal contact. The typical state of parietal contact in Hispaniolan *T. haetianus* involves broad contact of the parietal scales.

The darker head and lateral head stripe in Hispaniolan *T. haetianus* is a relatively constant character and clearly distinguishes that species from *T. hendersoni*. The lateral stripe is formed by a dark region above (top of head) and pale below (lips), and the border forms a sharp line extending from the angle of jaw, through center of eye, across middle of the preocular scale, to the lower portion of postnasal. It then angles abruptly up over the narial opening and across to the other narial opening. Thus, the entire rostral scale is usually pale in Hispaniolan *T. haetianus*. In *T. h. hemerus* of the eastern Dominican Republic, the top of the head is not as dark as in the other two subspecies. However, the lateral head stripe is nonetheless evident. In *T. hendersoni*, the markings are well preserved, but no evidence exists of this lateral head stripe or dark head. Instead, occasional spots occur along the labial scales.

The other remaining Cuban specimen previously associated with *T. haetianus* is USNM 27455. It is an adult male with spurs; body robust, head slightly expanded laterally, slightly distinct from neck, HW 9.43 mm ÷ neck width 5.34 mm = 1.77; EYE 2.04 mm, eyes protruding beyond edge of head when viewed from above, EYE/HW = 0.216; SVL = 302 mm, tail length, incomplete, 39 mm; ventrals, 178; subcaudals, 31; supralabials, 10/10 (left/right), scales 4–5 in contact with eye; infralabials, 11/11; preoculars, 1/1; postoculars, 3/3; dorsal scales, smooth (weakly keeled in middorsal region anterior to vent), in 25-27-17 rows; middorsal row not enlarged, except for a few scales at posterior end of body and on tail; parietal scales not in contact, separated by one scale. Its coloration (in alcohol) is faded and difficult to discern. There are 51/51 body spots in 10 rows, and 5/5 tail spots; middorsal spots are similar to the holotype of *T. hendersoni* in being larger than lateral spots and 2–3 scales in diameter; however, venter distinctly different in being heavily spotted from neck to tip of tail, with two rows of spots, 1–2 ventrals in length, nearly touching at midventer; top of head apparently uniform dark, with distinct lateral head stripe present (similar to that in *T. haetianus*), extending along neck for approximately 20 mm.

This specimen was presumably collected by Charles Wright in eastern Cuba and later forwarded to Edward Drinker Cope for examination. However, with the transfer of a portion of Cope's collection from the Academy of Natural Sciences in Philadelphia to the USNM around 1900, much information apparently was lost (R. Crombie, pers. comm.). Therefore, the collector and specific locality of USNM 27455 is unlikely to ever be known with certainty. Much of Wright's herpetological material came from the

upland region north of Guantánamo, especially Monteverde (Underwood, 1905), although a specific locality in eastern Cuba should not be assumed for this specimen. The specimen itself is faded, and damaged in the head region, thus further reducing its taxonomic value. It appears to be related to *T. hendersoni*, but it differs in several ways such that we believe it is most likely a second undescribed species. However, because of the poor quality of the specimen, and because its specific locality within eastern Cuba is not established, we are reluctant at this time to recognize it taxonomically.

During the course of this investigation, we have reexamined specimens of *T. p. galacelidus* and *Tropidophis nigriventris hardyi*, two additional taxa from Cuba (Schwartz and Garrido, 1975). We have compared them with their nominate subspecies and with other taxa in the genus, including material collected since the original descriptions. We find no evidence of intergradation between these two subspecies and their nominate forms, and we view the original diagnostic differences of these taxa to be at the species level. For example, *T. p. galacelidus* is distinguished from *T. p. pilsbryi* by larger body size (to 405 mm SVL vs 310 mm SVL in *T. p. pilsbryi*), no overlap in ventral scale counts (177–186 vs 160–169 in *T. p. pilsbryi*), and spot rows (10 vs 8 in T. p. pilsbryi). In the case of *T. n. hardyi*, it is distinguished from *T. n. nigriventris* by larger body size (to 334 mm SVL vs 237 mm SVL in *T. n. nigriventris*), no overlap in ventral scale counts (153–172 vs 144–150 in *T. n. nigriventris*), or in caudal counts (27–34 vs 25–26 in *T. n. nigriventris*). Such differences are of the same degree as sympatric species of *Tropidophis* and therefore we recognize these taxa as valid species, *Tropidophis galacelidus* (new status) and *Tropidophis hardyi* (new status).

Discussion

Only a few years ago, 13 species of *Tropidophis* were recognized from the West Indies (Powell et al., 1996). Now, that number has reached 20, with the addition of *T. bucculentus*, *T. celiae*, *T. galacelidus*, *T. hardyi*, *T. hendersoni*, *T. morenoi*, and *T. spiritus* (Powell, 1999; Hedges and Garrido, 1999; Hedges et al., 1999, 2001). Some additional taxa currently recognized as subspecies warrant species level recognition in the future (SBH, unpubl. data), but other subspecies are weakly distinguished and should not be recognized. An example of compelling evidence for the species-level recognition of subspecific taxa concerns *T. haetianus*, in which the three Jamaican subspecies show a closer relationship to Cuban species of the genus than to the Hispaniolan subspecies of *T. haetianus* (Hass et al., 2001).

In the context of the morphological species groups of *Tropidophis* (Schwartz and Marsh, 1960; Hedges and Garrido, 1992), *T. hendersoni* should be placed in the *maculatus* group based on its number of ventrals (low to intermediate), small body size, high number of small dorsal spots, and dorsal spots in 6–12 rows. However, the senior author and colleagues have recently completed a DNA sequence study of *Tropidophis* phylogeny, and the results show concordance with geography but great discordance with the morphologically-defined species groups (unpubl. data). Unfortunately, the only specimen of *T. hendersoni* apparently was preserved in formalin in 1945, and attempts to obtain DNA sequence have failed. At present, we tentatively place *T. hendersoni* in the *maculatus* group until the results of the molecular study are presented.

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APPENDIX 1

Specimens Examined

Tropidophis bucculentus: Navassa Island, USNM 12377 A and B. *Tropidophis caymanensis*: Cayman Islands, MCZ 44864. *Tropidophis galacelidus*: Cuba, USNM 137084. *Tropidophis haetianus*: Hispaniola, MCZ 37602, 127400–401, 132349–350, 132352–353, USNM 195836, 195839–840, 329447–450; Jamaica, MCZ 55745, 59202–205, USNM 42878–880, 73275. *Tropidophis hardyi*: Cuba, AMNH 77784, USNM 137085, 138510 (holotype), 138511–12. *Tropidophis maculatus*: Cuba, USNM 309775, MNHNCU 3422. *Tropidophis melanurus*: Cuba, MNHNCU 3423–3426, 3428–30. *Tropidophis nigriventris*: Cuba, AMNH 81183. *Tropidophis pilsbryi*: Cuba, MNHNCU 3432–3433. *Tropidophis semicinctus*: Cuba, USNM 56347, 139418. *Tropidophis spiritus*: Cuba, MNHNCU 4085 (holotype). *Tropidophis wrighti*: Cuba, MNHNCU 3434–37, USNM 138513.

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Activity Patterns of the Angulate Tortoise (*Chersina angulata*) on Dassen Island, South Africa

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ABSTRACT.—**We examined the activity patterns of angulate tortoises, *Chersina angulata*, on Dassen Island, South Africa, during spring, summer and winter. During typical spring and summer days, *C. angulata* exhibited a bimodal pattern of activity, with activity being suspended around midday. However, during winter, and on cool and wet summer days, activity was unimodal, peaking around midday. Temporal patterns of activity appeared strongly influenced by environmental factors, particularly temperature. *Chersina angulata* were never observed to be active at air temperatures below 14.0°C or above 28.7°C. Activity levels were lowest during summer, when animals were active only 1.75% of the time. Brief appearances of available water (usually from condensing fog) during summer, however, resulted in a dramatic increase in activity levels. Males were significantly more active than females during summer and spring, but no significant difference was found between the sexes in winter. Results of this study are principally contrasted with those from a study conducted near the easternmost range of *C. angulata*, an area that experiences a markedly different climate.**

Southern Africa hosts the richest diversity of terrestrial chelonians in the world; of the 42 currently recognized species, 14 are found in southern Africa, 11 of which are endemic to the region (Branch et al., 1995). Despite this wealth of diversity, many aspects of southern African tortoise biology remain relatively unstudied. The published literature that does exist on the subject is largely concerned with taxonomy, morphology and distribution (Hewitt, 1934a,b; Greig and Burdett, 1976; Branch and Braack, 1987; Boycott and Jacobsen, 1988; Haagner, 1992; Baard, 1993; Van Heezik et al., 1994; Branch et al., 1995), although there has also been some work on other aspects such as thermoregulation (Craig, 1973; Perrin and Campbell, 1981; Els et al., 1988; Hailey and Loveridge, 1997, 1998) and diet (Milton, 1992; Rall and Fairall, 1993; Mason et al, 1999).

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