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A NEW SUBSPECIES OF THE PIT VIPER, *AGKISTRODON BILINEATUS* (REPTILIA: VIPERIDAE) FROM CENTRAL AMERICA

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Abstract.—A new subspecies of the cantil, *Agkistrodon bilineatus howardgloydi*, is reported from Costa Rica, Honduras, and Nicaragua. This snake is known locally as the castellana, and is distinguished from other subspecies of *A. bilineatus* by several pattern characteristics of the head and body and by a low number of ventral scales.

During the preparation of a monograph (Gloyd and Conant) on the pit vipers, subfamily Crotalinae, of the genus *Agkistrodon* (sensu lato), I assembled virtually all the known museum specimens of *A. bilineatus* from Central America. By comparison of these with numerous examples of the several subspecies indigenous to Middle America, the following facts emerged: (1) *A. b. russeolus* Gloyd occurs in disjunct subhumid areas of northern Belize, as suggested by Hoevers and Henderson (1974), Henderson and Hoevers (1975), and Henderson (1978); (2) the range of the nominate subspecies, *A. b. bilineatus* Günther, extends southeastward from southern Sonora, Mexico, through the Pacific coastal plain and versants of the adjacent mountains, and terminates in El Salvador; and (3) a distinct form, a specimen of which Cruz, et al. (1979), and Wilson and Meyer (1982) were unable to assign to any of the described taxa, occurs in Costa Rica, Honduras, and Nicaragua. This last form merits taxonomic recognition.

Agkistrodon bilineatus howardgloydi, new subspecies
Spanish name: Castellana
Fig. 1

Holotype.—American Museum of Natural History (AMNH 125525), total length 746 mm, male, collected by Louis W. Porras and John C. Rindfleish, 8 Aug 1982, in tropical dry forest (=tropical deciduous forest) 0.8 km north of Mirador el Cañon del Tigre, Parque Nacional Santa Rosa, Provincia Guanacaste, Costa Rica.

Paratypes.—COSTA RICA, Provincia Guanacaste, Colonia Jobo de la Cruz, Bahía Salinas (AMNH 125526–125527); Hacienda Bejuco, 5 km east of Bahía Naranjo, Golfo de Papagayo, 25 km northwest of Liberia (Universidad de Costa Rica, UCR 3051 and UCR 3336); near the Río Cuajiniquil (near the Río Salada), Parque Nacional Santa Rosa (UCR 8062).

HONDURAS, Departamento Valle, Isla de Zacate Grande (Universidad Autónoma de Honduras, UNAH 5516).

NICARAGUA, Departamento Granada, vicinity of Granada (AMNH 108600–108601); Departamento Masaya, near Masaya (Cornell University, CU 10020).

Diagnosis.—This subspecies may be distinguished from the three others (*bili-*

Fig. 1. *Agkistrodon bilineatus howardgloydi,* Holotype: Right side of head showing distinctive facial markings. (From a color transparency by Louis W. Porras.)

neatus Günther, *russeolus* Gloyd, and *A. b. taylori* Burger and Robertson) by the following combination of characters: lower light facial stripe divided in two parts that approach each other and usually meet at an obtuse angle at the common juncture of the 2nd and 3rd supralabials; lower light stripe subtended by a narrow dark line; lower parts of supralabials pale, unmarked, and same color as infralabials and ground color of chin and throat; upper light facial stripe narrow, often disrupted or even absent posterior to the supraocular in adults; chin and throat pale and sharply set off from dark venter at level of 1st to 6th ventral; medial third or fourth of venter (on posterior ¾ of body) unpatterned or slightly so in comparison with its outer portion; young bright red or reddish. In all other races of *bilineatus* the lower light facial stripe normally is single and continuous, and the young are gray, brown, or reddish-brown; *howardgloydi* shares the narrow upper light facial stripe and the unpatterned belly center with *russeolus,* but differs in having a lower average number of ventrals (see dichotomous key below).

Description of holotype.—Crown with 9 symmetrical plates, paired internasals, prefrontals, supraoculars, and parietals, and a single frontal; parietals slightly truncate posteriorly. Rostral slightly higher than wide, apex not rising above canthus. Nasals 2, the anterior (at its upper edge) about 1½ times width of posterior nasal; nostril chiefly in prenasal. Preoculars 2, the upper separated from the postnasal by a quadrangular loreal, wider at its base; loreal on left split obliquely (in a somewhat vertical direction) into 2 subequal scales; lower preocular forming upper posterior border of facial pit; a small postfoveal enters orbit, another borders

pit inferiorly. Sum of post- and suboculars 3 on left side, 4 on right. Orbit surrounded by 7 scales on left, 8 on right (including postfoveals). Supralabials 8, the upper portion of 2nd forming anterior border of pit. Infralabials 11. Temporals in somewhat irregular rows, 1st one of lower row conspicuously larger than all others; 1st and 2nd rows of temporals without keels. First pair of infralabials extending posteriorly in long, narrow points that are in contact with each other posterior to tip of mental. One enlarged pair of chin shields, each about twice as long as wide. Median gulars in 2 pairs; lateral gulars in 2 to 5 oblique rows.

Dorsal scales with paired apical pits; all with keels except those of lowermost row anteriorly. Scale rows 25-23-21-19; order and places of reduction, in accordance with the Dowling (1951) recount system:

$$25\ \frac{5+6\ (15)}{-6\ (14)}\ 23\ \frac{4+5\ (85)}{4+5\ (78)}\ 21\ \frac{-5\ (111)}{4+5\ (113)}\ 19\ (129)$$

Ventrals 129; anal plate single; hemipenes not everted. Subcaudals 61, the 30th and the distal 28 divided; terminal spine sharp, extending downward but curved at end to point away from tail tip.

Total length (measured when snake was relaxed after euthanization) 746 mm; length of tail 149 mm, 20 percent of total length.

General coloration (in life soon after capture) varying shades of brown, the darker ones purplish in tone. Crown and sides of head dark purplish brown. A broad dark purplish-brown cheek stripe bordered by bold narrow light lines (facial stripes) above and below. Upper light line cream-colored (slightly yellowish anteriorly), beginning at anterior tip of internasal and extending along the canthus on edges of internasal, prefrontal, supraocular, and uppermost postocular, and then diagonally posteriorly on second row of temporals and downward to the neck; upper light line slightly intermittent, distinctly narrower than lower light line, and subtended in part by a thin line of dark brown pigment. Lower light line white, divided into two parts, which narrowly make contact at an obtuse angle at posterior edge of 2nd supralabial. Anterior part of lower light stripe meets the upper light stripe at outer edge of internasal and then extends obliquely downward across the anterior nasal, lower edge of postnasal, upper tip of 1st supralabial, and continues at a slightly different angle across 2nd supralabial. Posterior portion of lower light line begins on 3rd supralabial and continues in a more or less straight line to last (8th) supralabial where it turns sharply downward at a right angle across 10th infralabial, anterior edge of 11th infralabial, and the adjacent gulars; it then continues posteriorly as a series of white spots almost to join the downward extension of the upper light line. The lower light stripe is narrowly subtended by a thin dark brown line. Lower edges of supralabials, all of infralabials, and ground color of throat bright (slightly brownish) orange, which color extends irregularly onto first five ventrals and terminates almost abruptly at level of 6th ventral. A series of small white, mostly dark-bordered, streaks and spots on chin and throat. Rostral and mental each marked medially by a broad vertical white bar narrowly bordered by brown against a ground color that almost matches chin color.

Dorsal ground color, which appears in pale areas between crossbands and down sides of body, is medium brown. The 11–12 purplish-brown crossbands are darker at their edges and incompletely bordered by white spots which are larger and

more conspicuous on lower sides of body. The dark brownish-gray ventro-lateral blotches are broadly connected with the crossbands and merge below with the dark grayish stippling of the venter. Last several crossbands with pairs of faint dark markings near their centers at level of scale rows 2 to 5, some accompanied by flecks of white. Venter dark and marked with numerous bold white spots and curved lines anteriorly and also along the sides posteriorly. Longitudinal central 4th of venter distinctly paler (light pinkish) than outer portions of belly on posterior ¾ of body, thus imparting appearance of a pale midventral stripe. Eight dark crossbands on tail that become pale where distal half of tail is medium pale gray. Anal plate dark gray; orange pigment on parts of first 16 subcaudals; remainder of underside of tail dark gray; terminal spine black except for a narrow vertical pale gray stripe on left side.

Immediately after euthanization the coloration of the tongue was orange-pink, tips pale yellowish; the pupil of the eye was black, the upper half of the iris matched the coloration of the upper light facial stripe, and the lower half was slightly paler than the dark cheek stripe.

The holotype was held in captivity for six months before I received it alive, and by that time there had been changes in coloration. It had shed its skin, and its general appearance was reddish-brown; the purplish tones had disappeared. Also, probably from rubbing its snout against some object, possibly the cloth sack used in shipping, the upper portion of the anterior surface of the rostral had been abraded. The upper portion of the vertical white bar, which had been slightly forked at its apex, according to a series of excellent color photographs taken soon after the snake was captured, had thus been eliminated. Most veteran reptile keepers have experienced cases in which specimens in their care became paler after ecdysis. Louis W. Porras (pers. comm.), however, noted subtle changes in the snake's coloration from day to day and under varying light conditions (metachrosis?) during the several weeks it was in his possession. The colors of the preserved snake, after three months in alcohol, more closely resembled those seen soon after its capture than they did after shedding.

Variation among paratypes.—In these nine specimens, five males and four females, the diagnostic characters of coloration and pattern are all consistently present with minor exceptions, and most of the latter are attributable to the darkening of large adult males in which some details are obscured.

The two separate components of the lower light facial stripe usually resemble those of the holotype in that they barely touch at the juncture of the 2nd and 3rd supralabials; exceptions occur in AMNH 125526 and UCR 3051, where the two light lines fail to meet but are in close proximity, and in UCR 3336 and UCR 8062, where there is a distinct gap because the anterior component terminates slightly beyond the middle of the 2nd supralabial. Also, on the right side of the head in UCR 8062 the posterior component is intermittent on supralabials 6 and 7. The lower portions of the supralabials are pale, unmarked, and match the coloration of the underside of the head in all specimens except two large males, viz.: in AMNH 108601 considerable dark stippling is present, and in CU 10020, an exceptionally dark snake, the lower edges of the supralabials are almost uniformly black.

In large specimens the upper light facial stripe tends to be narrow and may be only faintly indicated posterior to the eye; this may, in part, be an artifact of

preservation. For example, in AMNH 125526 (female) and AMNH 125527 (male) the upper light stripe terminates at the middle of the supraocular and is virtually non-existent, respectively, in the two preserved specimens; both of these snakes were photographed in life, however, at which time the upper (yellow) light stripe, although quite narrow, was clearly evident from snout to supraocular, but intermittent and only faintly indicated posterior to the eye. In a large male (AMNH 108601), however, the upper light stripe, although intermittent, is well-defined throughout its length and, through a series of light spots at the rear of the head, is connected with the posterior extension of the lower light stripe. In the very dark male (CU 10020) the upper light line is represented, posterior to the eye and on the neck, by an intermittent series of small pale streaks. A more or less continuous connection between the upper and lower light stripes is discernible in two young specimens (UCR 3051 and UCR 3336), but in the other juvenile (AMNH 108600) the upper stripe is almost totally absent, possibly because of fading following preservation.

The pale coloration of the underside of the head terminates rather abruptly and is replaced by the dark coloration of the venter at levels varying from the 1st to 5th ventral scutes. In the two large males there is dark stippling (in AMNH 108601) and a profusion of dark gray (in CU 10020) on the chin and throat. The medial ⅓ or ¼ of the venter (on the posterior ¾ of the body) is unpatterned in all specimens or virtually so; the coloration varies from pale orange, lightly stippled with brown (in life in AMNH 125526), to black (in CU 10020). The medial portion of the venter may or may not be paler than the sides of the belly; the essential fact is that it is not patterned or only slightly so.

The pale ground color between the dark dorsal crossbands normally descends to, or almost to, the ventrals, but dark stippling is usually present on the lowermost 2 to 5 scale rows. In some large specimens the dark stippling blends with the coloration of the adjacent crossbands, and the dorsal portion of the ground color, when viewed from above, appears as a series of more or less diamond-shaped pale areas. This is particularly noticeable in the two large dark males and the female (UNAH 5516) from Honduras.

Total lengths and sexes among the paratypes are as follows: Males (CU 10020 = 960 mm), (AMNH 108601 = 945 mm), (UCR 8062 = 830 mm), (AMNH 125527 = 730 mm), and (UCR 3336 = 319 mm); females (AMNH 125526 = 820+ mm), (UNAH 5516 = 715+ mm), (UCR 3051 = 495 mm), and (AMNH 108600 = 335 mm). Tail ratios (tail length/total length) among specimens with complete tails are 17–21 percent in males and 18–20 percent in females; mean 19 percent in both sexes.

Remarks.—Proof that the young of *howardgloydi* may be bright red was provided by photographs taken in the field in the Parque Nacional Santa Rosa by Daniel H. Janzen. Two of the smaller specimens (UCR 3051 and UCR 3336), although faded since their preservation, were obviously strongly reddish in life. Jaime Villa (1962 and personal communication) reported that juveniles from Nicaragua are reddish or brick red.

The lower light facial stripe is divided into two components as an occasional anomaly in *russeolus* (5 occurrences among the 42 possiblities in the 21 available specimens), and such a separation is present in the (male) holotype of that taxon (University of Kansas, KU 70905). The holotype is unlike *howardgloydi*, however,

in the following key characteristics: the lower light facial stripe is subtended by uniformly dark pigment that extends to the commissure; the chin and throat are uniformly dark (except for several narrow white streaks and spots) and the dark coloration blends imperceptibly with the dark pigmentation of the venter; the upper light facial stripe, although narrow, is distinct and continuous (in most specimens of *howardgloydi* of comparable length the upper light stripe is intermittent, vague, or even absent posterior to the supraocular); ventrals 137 (129–135 in male *howardgloydi*).

These comments on the holotype of *russeolus*, in conjunction with other data accumulated during studies I have made for the monograph (Gloyd and Conant), indicate that *howardgloydi* is much more closely related to the geographically distant *russeolus* (of northern Yucatan and northern Belize) than it is to the nominate subspecies, *bilineatus*, which is known to occur at least as far southeastward as central El Salvador.

Key to the Subspecies of *Agkistrodon bilineatus*

1. Lower light facial stripe extending downward to the commissure; subcaudal counts low (45 to 56 in males; 40 to 47 in females); marked sexual dimorphism in adults ..... *taylori*
   (Northeastern Mexico—Nuevo León, San Luis Potosí, and Tamaulipas)
- Lower light facial stripe bordered inferiorly by dark pigment; subcaudal counts high (56 to 71 in males; 46 to 67 in females); little or no sexual dimorphism 2
2. Adults almost plain black or dark brown, juveniles with brown or reddish-brown crossbands; facial stripes relatively wide, prominent, and continuous; venter dark but sprinkled with whitish markings throughout its width ..... *bilineatus*
   (Southern Sonora in northwestern Mexico to El Salvador, Central America)
- Adults patterned with crossbands that are often reddish; upper facial stripe narrow, often interrupted or greatly reduced posterior to the supraocular; medial ⅓ or ¼ of venter virtually unpatterned on posterior three-fourths or more of body, sometimes appearing as a pale midventral stripe, especially in young specimens 3
3. Lower facial stripe normally continuous and subtended by dark pigment extending to the commissure (except in very young specimens); ground color of chin and throat brown or blackish and blending with dark venter; ventrals in males 131–141 (mean 136.0), females 132–139 (mean 136.2) ..... *russeolus*
   (Northern Yucatan, Mexico, and subhumid areas of northern Belize)
- Lower facial stripe divided in two parts that narrowly meet at an obtuse angle at or near suture between 2nd and 3rd supralabials; lower light stripe subtended by a narrow dark line; lower parts of supralabials pale and matching ground color of pale chin and throat; pale coloration of under side of head terminating abruptly, being replaced by dark coloration of venter; ventrals in males 129–135 (mean 131.5), females 128–134 (mean 130.5) ..... *howardgloydi*, new subspecies
   (Dry Pacific lowland areas of Honduras, Nicaragua, and Costa Rica)

Etymology.—This subspecies is named for the late Howard K. Gloyd, my close friend, colleague, and expert on pit vipers, especially the rattlesnakes. Gloyd worked for decades on the genus *Agkistrodon* (sensu lato), and he had predicted that a new race of *A. bilineatus* would eventually be described from lower Central America.

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