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A NEW ANOLE (REPTILIA: IGUANIDAE) FROM GREAT CORN ISLAND, CARIBBEAN NICARAGUA

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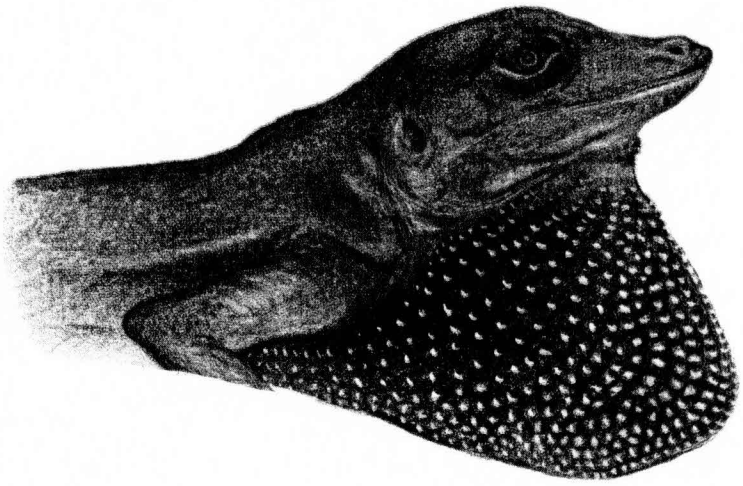
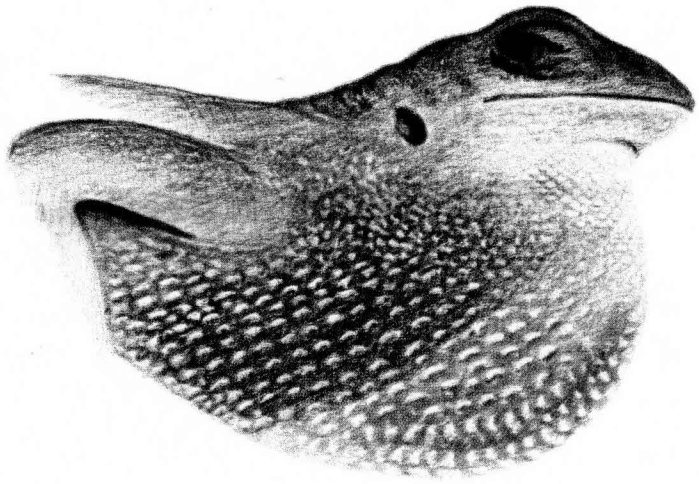
Plate 1



Adult male of *Anolis villai* showing dark, chocolate-colored dewlap, here not fully spread.



Adult male *Anolis cupreus* (from San José, Costa Rica) showing bi-colored dewlap with orange basal portion and rose outer portion (from a photograph by A.A. Echelle).

Abstract. — A new species of *Anolis* closely related to *Anolis cupreus* is described from Great Corn Island, Caribbean Nicaragua.

* * *

On a recent field trip to Great Corn Island (Isla del Maíz Grande), off of the Caribbean coast of Nicaragua at 12°07′ North Latitude, 83°02′ West Longitude, we collected anoles of a species distinct from any currently recognized. This insular population is herewith described as:

Anolis villai new species

Holotype. — Adult male, No. 159646 University of Kansas Natural History Museum (UKNHM), collected 18 February 1976 on Great Corn Island by H.S. Fitch and R.W. Henderson.

Paratopotypes. — UKNHM nos. 159647-159716 and Milwaukee Public Museum (MPM) nos. 12650-12671 all collected on Great Corn Island, 15, 16, 17, 18 and 19 February 1976, by H.S. Fitch, R.W. Henderson and J. Villa.

Diagnosis. — A close relative of *Anolis cupreus* of the Central American mainland, resembling that species in most characters, but differing as follows: dewlap dark, chocolate-colored; dorsal ground color dark brown; ventral surface dusky; iris dark (with narrow, pale, inner rim); ventrals smooth; scales around mid-body average 169 (156-184); frontal concavity prominent; loreal scales usually in 6 horizontal series; 2 series of scales between supraorbital semicircles; widened lamellae beneath 4th hind toe 9 or 10; size large (adult males average 51.5 mm S-V, adult females 46.0).

Description of holotype. — Length S-V, 55 mm; tail 100 mm, live weight 3.12 gm; length of head (from anterior edge of tympanum) 13.4 mm; width of head 9.2 mm; hind limb extending forward to middle of eye; forelimb extending forward to tip of snout and backward to groin; low dorsal crest extending from nape to sacral region; about 166 scale rows around mid-body; widened lamellae on 4th hind toes of left and right sides 10-10; 45 midventral scales in head length; 140 middorsals from nape to level of groin, 60 midventrals from posterior edge of dewlap to level of groin; supraorbital semicircles separated by 2 scale series and separated from interparietal by 3 series on each side, from supraoculars by a series of small intercalated scales; supraocular series on each side having 2 much enlarged inner scales and a longitudinal row of 6 less enlarged scales, all heavily keeled; scales on top of head behind

eyes flat and smooth; scales on top of head, anteriorly, rugose or keeled; 7 postrostrals, 9 dorsal scales between nasals; supralabials 8-8 (6 anterior to mid-eye); canthals 3-3, heavily keeled; interparietal about twice area of ear opening; loreals in 5 horizontal rows of 9 (two lower rows) or 8 (three upper rows), lowest row extended forward to separate suboculars and supralabials.

Color in life dark olive brown with greenish tinge, with faint darker and lighter flecks; dorsal crest darker olive; pale stripe from above axilla nearly to groin (faint and discontinuous on its posterior half); narrow, pale, oblique streak extending upward and backward from forelimb; hind limbs and tail faintly banded with reddish brown; fingers relatively dark with banding scarcely discernible, lower parts of sides yellowish brown, with small, faint, pale spots in a reticulate pattern; ventral surface of limbs and midventral surface of body pale gray; remainder of ventral surface dark gray, stippled with pale gray dots; dewlap dark chocolate, darkest in central part, paler toward outer edge, scales paler contrasting with darker skin (on basal and outer parts only); eye dark with narrow, pale rim around pupil.

Variation. — Scale counts around the body averaged 168.90 ± 1.05 (156-184, n = 59). The average was slightly lower for the 15 females, 167.1 ± 2.35 (156-184) than for the 44 males, 169.75 ± 1.36. Number of midventral scales in a head length (from front edge of ear opening to tip of snout) averaged 41.8 ± .53 (33-50, n = 50).

Supralabial scales were most often 8. The supralabial series ends posteriorly in relatively minute scales which perhaps should not be included in the count, but there is no well defined dividing line between the large supralabials and these smaller scales. The supralabial suture that was most nearly below the center of the eye was therefore used as a reference point to obtain more clear-cut counts. Usually there were two (sometimes only one) fairly large supralabials behind this suture; anterior to it there were either 6 (68.2%), 7 (29.5%), or 8 (2.3%) in 44 specimens.

Counts of loreal rows were made in 53 *Anolis villai*; 29 had 6 rows, 19 had 7 and 5 had 5. These counts did not include granules at the upper corner of the loreal triangle. Even so, somewhat different counts could be obtained from the same individual as the rows are not consistently uniform or complete.

Of 62 *A. villai* 57 had the supraorbital semicircles separated by two scales at the narrowest point, four had only one scale between, and one had 3. In the same series, the number of scales intervening between the

interparietal and the supraorbital semicircles was 3-3 in 24, 3-2 or 2-3 in 20, 2-2 in 16 and 1-2 in 2. In 51 *A. villai* counts of widened lamellae on the fourth hind toe were made; 33 had 10, 16 had 9 and 2 had 11. Only those lamellae that were definitely wider than the remainder of the toe were included.

In color and pattern the entire series of *A. villai* was notably uniform, except in shade. There were relatively dark and light individuals. Such differences were not readily distinguished from changes in the individual responding to light, temperature, or excitement, but dewlaps especially varied in the amount of dark pigment obscuring underlying colors.

Comparisons and relationships. — *Anolis villai* (Fig. 1) seems to be closely related to *A. cupreus* of the Central American mainland but is sufficiently distinct so that various morphological traits show no overlapping. Existence of these trenchant differences, the isolation of *A. villai* by land and water barriers, and observed ecological differences all indicate that full specific status is appropriate even though the rela-

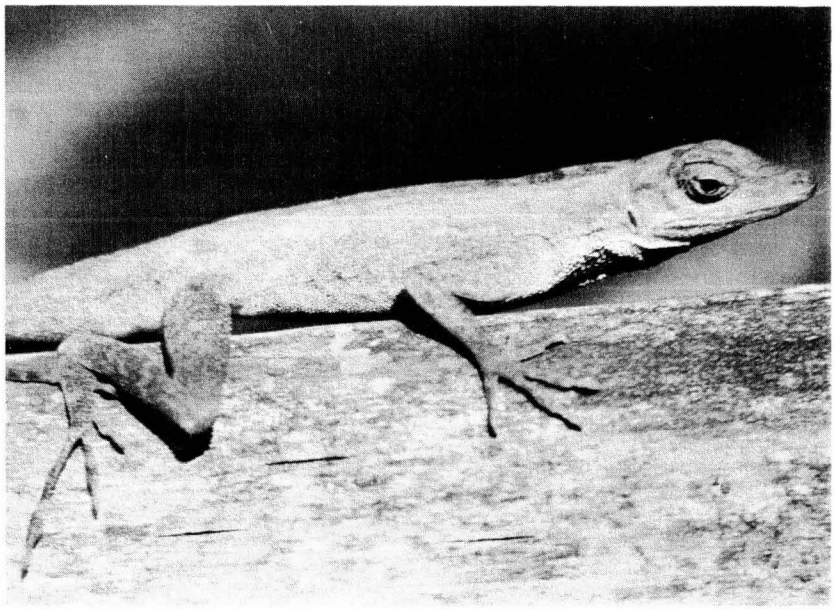


Figure 1. Adult male *Anolis villai* showing frontal concavity, dorsal crest, dark eye, and finely granular lateral scales. Photo by R.W. Henderson.

tionship to *A. cupreus* appears fairly close.

Comparisons between the two are complicated by the fact that *A. cupreus* is highly variable both individually and geographically (Fitch, Echelle and Echelle, 1972), with four recognized subspecies. Differences between the two species are listed below. 1. Dewlap much darker, chocolate-colored in *villai,* relatively pale in *cupreus*, which has a basal darker area of amber orange and a paler pinkish-rose outer area (Plate 1). In *villai* the same relatively dark inner area and light outer area are discernible, and in several males that had unusually pale dewlaps, the resemblance to *cupreus* was especially close. 2. Dorsal ground color predominantly dark olive in *villai*, but much paler, often olive-tan, in *cupreus*. 3. Ventral surface dusky in *villai*, dull white or ivory in *cupreus*. 4. Dorsal surface dark, lacking prominent markings in *villai*, but in *cupreus* often with a definite pattern, which may consist of a series of middorsal black chevrons or a dirty white band in the male, or a pink, orange, or whitish (sometimes black-edged) stripe, or diamonds or chevrons in the female. 5. Iris dark with narrow pale rim in *villai*, partly golden yellow in *cupreus*. 6. Scale rows around midbody average 169 in *villai*, much fewer in *cupreus* (from 136 in *A. c. cupreus* and *A. c. spilomelas* males to 102 in *A. c. hoffmanni* females). 7. Ventral scales smooth or nearly so, relatively small and tending to round or hexagonal shapes in *villai*, mostly weakly keeled, coarser and tending to rhomboidal shape in *cupreus*. 8. Frontal region distinctly concave in *villai*, but with relatively straight profile in *cupreus*. 9. Supraorbital semicircles usually separated by two series of scales in *villai* whereas in *cupreus* there may be one to three (two is the most frequent number). 10. Expanded lamellae beneath the fourth hind toe relatively wide in *villai* and usually number 10 or 9 (mean 9.7 in 51) vs 8 or 7 in *cupreus* (mean 7.65 in 20 counts on 10 specimens). 11. Midventral scales smaller and more numerous (mean 41.8 ± .525 in head length, n = 50, vs 31.4 ± 1.39 in *cupreus*, n = 10). 12. Size large in *villai* , males averaging 51.5 mm (S-V) and females 46.0, whereas in *A. cupreus* males of different populations average from 44.1 to 49.6 and females 40.8 to 42.6.

It is also appropriate to compare *Anolis villai* with *A. concolor* and *A. pinchoti* of San Andrés and Providencia islands, respectively, since, except for minor cays along the coast, these are the Caribbean islands nearest (140 km approximately E) to the Corn Islands. San Andrés and Providencia are between three and four times as far removed from the mainland as the Corn Islands, and unlike the latter both are well beyond the limits of the continental shelf. Hence they perhaps have never been connected with the mainland. Corn and Dalby (1973) compared *A. concolor* and *A. pinchoti*, indicating many minor differences,

although the two are closely related. From the descriptions of these authors it is evident that both anoles differ in many respects from *A. villai*. They may not be closely related to it beyond the fact that all are Betas of the Chrysolepis species series. Both are paler colored, with red *(pinchoti)* or yellow *(concolor)* on the ventral surface. Their dewlaps are red or orange-red. Their head shapes are different from that of *villai*, with more attenuate snout, especially in *pinchoti*. Both have higher supralabial counts (usually 7 or 8 anterior to eye) and fewer loreal rows. *A. concolor* is markedly larger than *A. villai* with more sexual size difference, whereas *A. pinchoti* is slightly smaller than *A. villai*, with less sexual size difference.

Barbour and Loveridge (1929) reporting on a collection of amphibians and reptiles made on the Corn Islands in 1927 by James L. Peters and Edward Bangs, recorded *Anolis rodriguezi* (MCZ 2693) and *A. sallaei* (= *sericeus*). We have not seen the supposed *rodriguezi* but suspect that it may be *A. villai*. The two species are superficially similar in some respects, but also there are many differences. *A. villai* averages much larger and darker and has pronounced sexual size differences, with the

Figure 2. Habitat of *Anolis villai* on the Great Corn Island, February 1976, coconut grove with luxuriant undergrowth. Photo by R.W. Henderson.

male markedly larger (females are a little larger than males in *rodriguezi*); also it has a chocolate-colored rather than orange-yellow dewlap.

Ecology. — We searched all parts of the island during our stay but failed to find *Anolis villai* in most areas, and where it did occur it was usually present in sparse populations. It was abundant only in a few small areas. These varied in dominant vegetation, slope and degree of disturbance by humans, but all were characterized by deep shade and a closed canopy of arborescent vegetation (Fig. 2). Most of the anoles were on stems of banana plants or on trunks of coconut palms (average height 1.17 m and average stem diameter 20.8 cm, n=51). Typically the lizards were found on exposed parts of the stem or trunk, clinging head downward. Average height (1.20 m) for 38 adult males was not significantly different from that for 13 females (1.08 m); the relatively large representation of males in the sample is probably due to their tendency to perch in conspicuous places, and may not indicate an actual difference in numbers between the sexes.

Body temperatures averaged 28.0°C (24.4-31.0) (n=50), and well over half were in the one-degree range 27.4-28.4°C. Most often, body temperature was within one degree of the adjacent air temperature, which averaged 0.7 below body temperature. None of the lizards were seen in sunshine; in their shaded habitat there seems to be little or no tendency to bask. Daytime air temperatures fluctuated within a fairly narrow range and were usually favorable for the lizards, hence there is little incentive for behavioral thermoregulation.

At the time of our observations in February, the population consisted almost entirely of adults. Females were not gravid, indicating that breeding had stopped or proceeded at a low level for several months in fall and winter. On the mainland in western Nicaragua at the same time, females of *A. cupreus* also were not gravid. The population there, however, included a high proportion of partly grown young, indicating that the breeding season had ended considerably later than in *A. villai* on Corn Island.

Remarks. — Great Corn Island is in the Caribbean 65 km from the mainland of southeastern Nicaragua. Unlike most Caribbean Islands it is on the continental shelf, and must have been connected with the mainland during glacial stages of lowered sea level in the Pleistocene, perhaps as recently as 10,000 years ago at the end of the Wisconsin Period. Therefore, it is not necessary to postulate overseas transport of *A. villai* or any other animal or plant species of the island which has near relatives on the mainland. *Anolis villai* is much more like *A. cupreus*

than any other known species, hence the two are probably derived from a common ancestral stock. However, *A. cupreus* is characteristic of the seasonally dry west coast of Central America, and is generally absent from the more humid Caribbean versant. The nearest authenticated occurrences are believed to be on Ometepe Island in Lake Nicaragua and, in Costa Rica, Tenorio in northeastern Guanacaste Province, and San José, San José Province. All three localities are about 275 km from Corn Island and separated from it by extensive areas of lowlands rain forest as well as by the ocean barrier. During the last glacial stage of lowered sea level, however, the Nicaraguan climate was doubtless somewhat different than at present and perhaps much drier. Animals now confined to the xeric west coast may have been more widely distributed then. The presence of *Ctenosaura similis*, even more xeric adapted than *Anolis cupreus*, on Great Corn Island, supports this supposition.

The only known sympatric congener of *A. villai* is *A. sericeus*. On Corn Island the latter occurs in much sparser populations and is generally found in more open situations rather than being confined to deep shade like *A. villai*. On the mainland *A. sericeus* occurs sympatrically throughout most of the range of *A. cupreus*, but also occurs extensively farther north on the Yucatán Peninsula, the Isthmus of Tehuantepec and the Gulf coast of eastern México. In sympatric occurrences it is usually less abundant, smaller and more scansorial than competing *A. cupreus*.

Etymology. — The new anole is named for Jaime Villa in recognition of his important contributions to Nicaraguan biology.

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