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**ALBERT SCHWARTZ**, *Miami-Dade Community College*  
**ROBERT W. HENDERSON**, *Milwaukee Public Museum*

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REVIEW COMMITTEE FOR THIS PUBLICATION:  
Max A. Nickerson, Milwaukee Public Museum  
Richard Thomas, University of Puerto Rico  
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## ABSTRACT

A new subspecies of *Anolis cybotes* from Isla Saona, República Dominicana, is described. Comparisons are made between the new taxon and eastern Hispaniolan populations of *A. cybotes*, as well as with *A. c. doris* from Ile de la Gonâve and *A. c. haetianus* from the extreme western tip of the Tiburon Peninsula in Haiti; the status of the latter taxon as a subspecies of *A. cybotes* is questioned.

## INTRODUCTION

Schwartz and Thomas (1975) noted that, of all Hispaniolan anoles, *Anolis cybotes* Cope "more requires detailed analysis" than any other. They recognized four subspecies: *cybotes*, *armouri* Cochran, *doris* Barbour, and *haetianus* Garman. Of these subspecies, *cybotes* has been recorded from virtually the entire mainland of Hispaniola, with *A. c. haetianus* distributed only on the extreme distal portion of the Tiburon Peninsula. *Anolis c. doris* occurs on Ile de la Gonâve. *Anolis c. armouri*, originally described from the high Pic la Selle in the Haitian Massif de la Selle, has been subsequently taken in the western portion of the Sierra de Baoruco in the República Dominicana. Williams (1963) noted intergradation between *A. c. armouri* and *A. c. cybotes* in the vicinity of Furcy on the northern front ranges of the Massif de la Selle; at other localities in the Massif de la Selle and in the Sierra de Baoruco, the two taxa remain separate and distinct, and there is no evidence of intergradation. Williams later (1976) regarded *armouri* and *haetianus* as distinct species. We for the moment agree with him in the former case and assume that *A. armouri* is an upland satellite species of *A. cybotes* in these southern mountain ranges.

There are several other species apparently derived from *A. cybotes*: *A. shrevei* Cochran in the Dominican Cordillera Central, *A. marcanoii* Williams in the lower southern foothills of this range in the Sierra de Ocoa, *A. whitemani* Williams in the xeric Valle de Neiba-Cul de Sac plain and farther north on the Haitian Presqu'île du Nord-Ouest, *A. longitibialis* Noble on the Peninsula de Barahona, and *A. strahmi* Schwartz on the north and south faces of the Sierra de Baoruco. All of these species are generally referred to as the "cybotoid anoles" as a convenient way of distinguishing them as a group from other Hispaniolan and Antillean "groups." In brief,

they agree in having distinct sexual dimorphism and often sexual dichromatism, large dewlaps which vary in color from pale to bright but tending toward the former and involving yellows, white, grays, peach, and deep orange, stocky bodies with large heads in males, and ventral scales usually smooth but keeled in some species or even subspecies (*haetianus*, if it is a subspecies of *cybotes* which usually has smooth ventrals). In general the group is mesophilic with the exceptions of *A. whitemani* and *A. longitibialis*. In mesic-xeric mosaic situations, *A. cybotes* favors the former (as in oases), and it is not unusual to find a second cybotoid occupying the xeric interstices in such a mosaic. This situation surely applies to *A. cybotes-A. whitemani* and seems to apply as well to *A. cybotes-A. longitibialis*. Some member of the group occurs from sea level (*A. cybotes*, *A. whitemani*) to elevations of 8200 feet (*A. shrevei* in the Cordillera Central), and at all intermediate elevations. To summarize the above, cybotoid anoles are widespread both geographically and altitudinally throughout most of Hispaniola, and occur as well on some of the satellite islands.

In 1964, when Richard Thomas secured the first specimens of *A. cybotes* from Isla Saona off the southeastern shore of Hispaniola, these specimens were sent to Ernest E. Williams who affirmed that they were indeed quite different from his concept of *A. cybotes* elsewhere. Since that time, Schwartz has made an effort to secure material of this species from throughout Hispaniola and from the satellites as well, with the resulting accumulation of a very large number of specimens representing all known taxa. In the process of gathering this quantity of material, it soon became apparent that *A. cybotes*, even under casual examination in the field and laboratory, is not uniform throughout Hispaniola nor on the associated islands. But the quantity of material involved is forbidding; additionally there are large numbers of specimens in museum collections, at least some of which should be examined during a total revision of the species (or species complex).

The junior author recently visited Isla Saona several times (1979, 1980, 1981) and secured a small number of *A. cybotes* there. He in turn contacted the senior author about the status of the Saona population (which was already known to be distinctive but had remained nameless). It seemed an appropriate time to become involved in an evaluation of the entire species. It might be much simpler to begin with the status of an insular population on a small satellite island and work from that vantage point, rather than to attack the entire problem as a unit. Such a technique has its obvious drawbacks, but it does allow one to get his "foot in the door" as far as a revision of the entire species is concerned.

The present paper is thus the first of a series dealing with *A. cybotes*. We have examined, in addition to material from Isla Saona, specimens from the eastern Dominican provinces of La Altagracia, San Pedro de Macoris, El Seibo, and the Distrito Nacional; in addition we have studied specimens from the extreme western tip of the Tiburon Peninsula (*haetianus*) and from Ile de la Gonâve (*doris*), the only two other recognized subspecies of *A. cybotes*. We have not studied specimens of *A. (c.) armouri*, since its current status (and almost certainly the correct one) is that of a species distinct from *A. cybotes*. In our analysis of these eastern Hispaniolan specimens, it became obvious that even within the area involved, there are, on the mainland, two subspecies, one of which occurs in El Seibo Province and the other

from the eastern Distrito Nacional eastward. We have divided the data for these two samples (both of which we for the moment call *A. cybotes* without subspecific designation), since we are aware that the eastern mainland Hispaniolan populations are not uniform.

For the Isla Saona (and Isla Catalinita) populations we propose the name

*Anolis cybotes ravifaux*, new subspecies

HOLOTYPE. MCZ 156221, an adult male, from environs of Mano Juan, Isla Saona, República Dominicana, collected 19 July 1964 by Richard Thomas. Original number ASFS V3055.

PARATYPES (all from Isla Saona). ASFS V3054, ASFS V3056-59, same data as holotype; ASFS V14806, Mano Juan, S.J. Inchaústegui, 14 August 1969; ASFS V16160-62, environs of Mano Juan, native collectors, 28 December 1968; ASFS V34987-88, northwest corner (= Punta Catuano), 19 November 1971, D.C. Fowler, B.R. Sheplan; MPM 18896, Mano Juan, R.A. Sajdak, 28 June 1980; MPM 19008, Mano Juan, R.A. Sajdak, 1 July 1980; MPM 19029, Mano Juan, R.A. Sajdak, 2 July 1980; USNM 220899-903, woods E Punta Catuano, R.W. McDiarmid, F.G. Thompson, H.W. Campbell, R.I. Crombie, 19 February 1975; USNM 220904-05, just WSW Punta Catuano, R.W. McDiarmid and R.I. Crombie, 19 February 1975; USNM 220906, naval camp Catuano, native collector, 27 July 1975; USNM 220907, km 9 on Mano Juan road, J.F. Jacobs and R.I. Crombie, 27 July 1975.

ASSOCIATED SPECIMENS. USNM 220908-12, Isla Catalinita.

DEFINITION. A subspecies of *A. cybotes* characterized by the combination of small size (males to 59 mm, females to 44 mm snout-vent length), low number (4-7;  $\bar{x}$  = 5.5) of snout scales at second canthals, supraorbital semicircles almost always in contact, suboculars usually in contact with supralabials, low number of postrostrals (3-5;  $\bar{x}$  = 3.7); body yellow-tan rather than brown to reddish brown, and without a bold green lateral stripe, dewlap varying from pale yellow to grayish white or a combination of these two colors.

DESCRIPTION OF HOLOTYPE. An adult male with snout-vent length 58 mm, tail length 83 mm; 5 snout scales at level of second canthals, 7 vertical loreal rows, supraorbital semicircles in contact, 2/2 scales between interparietal and supraorbital semicircles, suboculars in contact with supralabials, 3 postrostrals, 5 postmentals, canthals 3/3, fourth toe subdigital lamellae 18, median dorsals in head length 45, ventrals in head length 44, femur/snout-vent length ratio X 100 34.0. Dorsal ground color in life yellow-tan without prominent green lateral stripe, virtually patternless; venter whitish; dewlap white on anterior two-thirds, pale yellow on posterior one-third; throat with faint lineate longitudinal gray lines.

VARIATION. For scale count variations, see Table 1. Noteworthy are the low mean (5.5) and mode (5) of snout scales at second canthals, low mean number (5.8) and mode (6) of vertical loreal rows, almost regular contact between the supraorbital semicircles, high frequency (61%) of contact between the suboculars and the supralabials, and low mean number (3.7) and mode (4) of postrostrals. The distinctive dorsal coloration, recorded as yellow-tan in the "pale phase" (= male metachrosis) to tan with red lateral marblings, and (in males) with a pair of black nuchal spots and dark saddles in the "dark phase." Metachrosis apparently does not appreciably darken the basic dorsal ground color but rather only intensifies the dark dorsal markings. In no case has a green lateral stripe been observed or reported. Dewlaps have been recorded as "dewlap white on anterior two-thirds, light yellow posteriorly," "dewlap dirty gray," "dewlaps pale yellow to gray-white." As preserved, the specimens are pale tan and without prominent dark markings or any indication of a green flank stripe.

COMPARISONS. In general terms, the coloration and pattern of *Anolis cybotes* can be given (from specimens from the city of Santo Domingo, Distrito Nacional, República Dominicana — ASFS X7708-09) as "dorsal ground color reddish brown, two lateral lines pale greenish buffy, with same color markings on lower sides. Ventral ground color pale creamy buff. Dewlap pale orange centrally, pale yellow peripherally. Dark lines on throat." This general description suffices to indicate the "typical" *A. cybotes* coloration on much (but by no means all) of the Hispaniolan mainland. There is much variation in dewlap coloration; Williams (1963), in differentiating *A. cybotes* from *A. whitemani*, noted that the dewlap in the former was "pale yellow or rarely pale pink with white or grayish streaks or grayish with yellow streaks," and later Williams (1975) noted that *A. cybotes* dewlaps are "yellow or grayish, more rarely orangish pigmentation, but never red except in populations at the extreme end of the Southwest Peninsula of Haiti." The last-named population is presumably *A. c. haetianus*, a population that Schwartz and Thomas (1975) questionably assigned to *A. cybotes*. No recent specimens of *A. c. haetianus* taken by Thomas in this area have red dewlaps; rather, they are pale yellow to pale peach. We have no doubts about the distinctness of *A. c. haetianus* but what is in question is its relationship to the balance of the species. Without going into details here, let it suffice to say that both *haetianus*- and *cybotes*-like anoles occur in the vicinity of Jérémie, Dépt. du Sud, Haiti, the type-locality of *A. cybotes*. Considering the complex geographic inter-relationships (Williams, 1975) between *A. cybotes* and *A. marcanoii* (the latter a sibling of the former, with an apparently limited distribution but quite distinctive in its red dewlap color), it may be premature to consider *haetianus* a subspecies of *A. cybotes*. We do so herein only as a convenience, since we have had little personal experience with it and have examined only limited material.

Dorsal and dewlap colors and patterns, then, in *A. cybotes* are quite variable; the style and colors cited above from the Santo Domingo material occur to the east as far as El Seibo Province, but on the extreme eastern end of Hispaniola (La Romana, San Pedro de Macorís, and eastern Distrito Nacional) are replaced by a population that is very like *A. c. ravifaux* in dewlap color (grayish to grayish yellow to pale yellow) but differs in slightly larger size (males to 63 mm, females to 52 mm snout-

vent length), higher mean number of snout scales at second canthals (6.9), higher mean number of loreal rows (6.9), suboculars modally (65%) in contact with supralabials, higher mean number (4.6) of postrostrals, slightly smaller median dorsals (mean 47.2 versus 44.9 in *A. c. ravifaux*), and lower mean number of ventrals (32.5 versus 36.5). *Anolis c. ravifaux* and this extreme eastern population resemble each other in the high incidence of individuals with the supraorbital semicircles in contact (96% and 93%), in contrast to specimens slightly more to the west (El Seibo Province), which also have differently colored dorsa and dewlap colors. Although these extreme eastern mainland populations may well ultimately be assigned to *A. c. ravifaux*, we are reluctant to do so now, without further study of material from elsewhere in the República Dominicana.

In many ways, *A. c. ravifaux* most closely resembles *A. c. doris* from Ile de la Gonâve, the large island that is embraced by the two "arms" of Haiti. *Anolis c. doris*, however, reaches a larger size (males to 69, females to 52 mm snout-vent length), modally (41%) has 6 snout scales at the second canthals, has a lower mean of scales around the interparietal (10.3 versus 13.8), modally (81%) has the suboculars separated from the supralabials, has a higher mean (4.6) and mode (4) of postrostrals, lower mean of postmentals (4.1 versus 4.8), larger dorsal scales (mean 40.2 versus 44.9 in *A. c. ravifaux*), and larger ventrals (mean 30.0 versus 36.5 in *A. c. ravifaux*). The dewlaps in *A. c. doris* are whitish to yellowish gray or pale yellow.

The most different named population now associated with *A. cybotes* is *A. c. haetianus*. Its keeled ventrals at once set it apart from all other described populations of *A. cybotes*, although keeling is not uniform in the specimens we have examined. The dewlap has been recorded as pale yellow to pale peach, and Williams (1975) stated that it was "red." *Anolis c. haetianus* reaches a large size (males to 75, females to 60 mm snout-vent length), has a high mean (7.9) and mode (7 and 8) of snout scales at second canthals, high mean (8.1) and mode (8) of vertical loreal rows, modally (64%) has the semicircles in contact, modally (42%) has 3/3 scales between the interparietal and the semicircles (all other samples have 2/2 as the modal condition), usually (92%) has the subocular separated from the supralabials, and ranks high in mean number of postrostrals (4.7) and postmentals (5.0), although in both counts it is equalled (or almost so) by other populations. The median dorsals are large (mean 42.8 versus 40.2 to 48.3 in other samples).

The above comparisons indicate quite clearly that *A. c. ravifaux* most closely resembles that population of *A. cybotes* on the adjacent extreme eastern Hispaniolan mainland — a fact that is not surprising since unquestionably the former was derived from the latter. In scale counts, *A. c. ravifaux* is most different from far-removed *A. c. doris* and *A. c. haetianus*; additionally *A. c. ravifaux* and *A. c. haetianus* differ most radically in size and dewlap color.

We have tentatively considered a short series (USNM 220908-12) of *A. cybotes* from Isla Catalinita as *A. c. ravifaux*. This tiny islet is removed some 4 km from Isla Saona and between that island and the mainland. The series consists of three males (snout-vent lengths 40 to 43 mm) and two females (31 and 43 mm). The scale counts (we have no color notes) fall within the ranges of the larger series from Isla Saona. Most notably, four have the suboculars in contact with the supralabials (only

**Table 1.** Measurements and scale counts (means and extremes) of five populations of *Anolis cybotes*. Modes are either indicated by  $M_0$  or are in italics.

	<i>A. c. ravifaux</i>	<i>A. cybotes</i> (extreme eastern Hispaniola)	<i>A. cybotes</i> (eastern Hispaniola)	<i>A. c. doris</i>	<i>A. c. haetianus</i>
	N = 24	N = 44	N = 56	N = 34	N = 14
Largest male	59	63	70	69	75
mm female	44	52	55	52	60
Snout scales,	5.5	6.9	7.3	5.9	7.9
2nd canthals	(4-7)	(5-9)	(5-10)	(4-7)	(7-9)
	$M_0 = 5$	$M_0 = 6$	$M_0 = 7$	$M_0 = 6$	$M_0 = 7 \text{ \& } 8$
Loreal rows	5.8	6.9	7.7	6.3	8.1
	(5-7)	(5-10)	(6-11)	(4-8)	(7-10)
	$M_0 = 6$	$M_0 = 7$	$M_0 = 7$	$M_0 = 6$	$M_0 = 8$
Semicircle	+ = 23	+ = 40	+ = 23	+ = 25	+ = 9
contact	- = 1	- = 3	- = 31	- = 9	- = 5
Scales bet.	1/1 = 6	1/1 = 2	1/1 = 2	1/2 = 3	1/2 = 1
semicircles	1/2 = 4	1/2 = 5	1/2 = 2	2/2 = 12	2/2 = 3
and interpar-	2/2 = 13	2/2 = 26	2/2 = 24	2/3 = 5	2/3 = 3
ietal	3/3 = 1	2/3 = 3	2/3 = 6	3/3 = 10	3/3 = 5
		3/3 = 3	3/3 = 16	3/4 = 2	
			3/4 = 1	4/4 = 2	
			4/4 = 2		
			5/5 = 1		
Scales around	13.8	13.4	13.4	10.3	12.2
interparietal	(10-18)	(10-16)	(9-17)	(7-13)	(10-15)
Scales between	0/0 = 14	0/0 = 10	0/0 = 4	0/0 = 6	0/1 = 1
suboculars and	0/1 = 1	0/1 = 3	0/1 = 3	1/1 = 25	1/1 = 11
supralabials	1/1 = 8	1/1 = 24	1/1 = 41		
Postrostrals	3.7	4.6	4.6	4.6	4.7
	(3-5)	(3-6)	(4-7)	(3-5)	(3-6)
	$M_0 = 4$	$M_0 = 5$	$M_0 = 4 \text{ \& } 5$	$M_0 = 4$	$M_0 = 5$
Postmentals	4.8	5.0	4.6	4.1	5.0
	(4-8)	(2-8)	(2-7)	(2-6)	(4-6)
	$M_0 = 4$	$M_0 = 4$	$M_0 = 4$	$M_0 = 4$	$M_0 = 5$
4th toe	17.5	17.8	18.8	18.1	20.0
lamellae	(12-20)	(16-20)	(15-21)	(15-21)	(18-23)
Median dorsals	44.9	47.2	48.3	40.2	42.8
in head L	(35-54)	(37-59)	(37-63)	(35-47)	(32-54)
Ventrals in	36.5	32.5	32.6	30.0	34.1
head L	(27-51)	(25-41)	(21-42)	(16-46)	(27-46)
Femur/SVL	31.2	30.3	30.0	29.8	31.2
	(28.3-34.0)	(26.7-35.6)	(27.0-33.1)	(25.6-34.7)	(28.3-32.8)

unilaterally in USNM 220908), and, like *A. c. ravifaux*, four have the semicircles in contact (exception USNM 220912). It is possible that with a longer series, these lizards might be shown to be distinct from the Isla Saona population, but at least for the moment we consider them of the same taxon.

REMARKS. *Anolis cybotes* appears to be uncommon on Isla Saona, in contrast to its customary abundance elsewhere. *Anolis cybotes* is a mesophile, but the dry forests of Isla Saona appear to be suitable for it. Yet despite a total of seven trips to the island and more than one collector in each case, only a very limited number of specimens has been taken. The species is common on the adjacent mainland in even drier forests than those on Isla Saona. Of our material, two specimens (ASFS V34987-88) were taken on a palm trunk and in a rock pile around the houses of the *cuartel* on Punta Catuano. Two specimens (MPM 19008 and 19029) were taken on low bushes by day and another (MPM 18896) was taken from beneath a rock in pasture-like habitat by day near Mano Juan. A photograph of *A. c. ravifaux* habitat near Mano Juan appears in Henderson et al. (1981:Fig. 1); *A. distichus sejunctus* occurred at the site, also.

ACKNOWLEDGMENTS. We wish to thank M.H. Binder, D.C. Fowler, S.J. Inchaústegui, R. Thomas, R.A. Sajdak and B.R. Sheplan for field assistance on Isla Saona. One trip to Isla Saona was greatly facilitated by the help of Lic. Inchaústegui. Henderson's field work in the República Dominicana has been supported by Friends of the Milwaukee Public Museum, the Museo Nacional de Historia Natural in Santo Domingo, and the Fundación Gulf + Western Dominicana (Campos S. de Moya, Director). S.J. Inchaústegui and J.A. Ottenwalder provided courtesies above and beyond the call of duty. The loan of specimens from the National Museum of Natural History (USNM) was facilitated by George R. Zug and W. Ronald Heyer; most specimens examined are in the Albert Schwartz Field Series (ASFS) and the Milwaukee Public Museum (MPM). The holotype has been placed in the Museum of Comparative Zoology (MCZ). We thank the Dirección Nacional de Parques (Merilio G. Morell, Director), for permission to work on Isla Saona.

SPECIMENS EXAMINED (other than *A. c. ravifaux*). *A. cybotes* (extreme eastern Hispaniola): República Dominicana, La Altagracia Prov., 37 km SE Las Lisas (ASFS V17433); 23.8 km SE El Macao (ASFS V885); Playa El Coco, 46 km N Higüey (V17482-98); 18 km N Higüey (ASFS V13814); Higüey (ASFS V13905); Juanillo (ASFS V17371-78, ASFS V21759-61); 0.8 km NW Boca de Yuma (ASFS V951-53); 2.5 km NW Boca de Yuma (ASFS V1131-34); San Pedro de Macorís Prov., Villas del Mar (ASFS V17266-67); Distrito Nacional, 3.6 km N Guerra (ASFS V14475); 2.1 km NE Guerra (ASFS V597).

*A. cybotes* (eastern Hispaniola): República Dominicana, Distrito Nacional, Santo Domingo (ASFS X7708-09); 15.4 km E Santo Domingo (ASFS X7740-42); 11.2 km E Boca Chica (ASFS X7762-63); El Seibo Prov., Sabana de la Mar (ASFS V3099-116); 5.6 km S Sabana de la Mar (ASFS X7845-460, ASFS X7924-29); 3.4 km NE El Valle (ASFS X7868-69); 10.6 km NW Hato Mayor (ASFS X7870). 5.3 km SW Miches (ASFS X7895-99).

*Anolis c. doris*: Haiti, Ile de la Gonâve, Anse à Galets (ASFS V47370-94, ASFS

V22423-25); Etroits (ASFS X2424-26, ASFS X2513); Source Picmi, above Picmi (ASFS V26616-17).

*Anolis c. haetianus*: Haiti, Dépt. du Sud, Place Nègre, near Jérémie (ASFS V7123-27); Jérémie (ASFS V9035-37, ASFS V9094, ASFS V9117); 2 km NW Jérémie (ASFS V9280); ca. 9 km WSW Jérémie, La Forêt (ASFS V9390); 8 km (airline) S Marché Léon, 915 m (ASFS V9358); Rampe des Léons, 1037 m (ASFS V9364).

ETYMOLOGY. The name *ravifaux* is from the Latin meaning gray (*ravus*) and throat (*faux*), in allusion to the dull dewlap color in the Isla Saona population.

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