

A New Species of *Anolis* (Sauria: Iguanidae) from Eastern Cuba

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ABSTRACT.—*Anolis alayoni* is described from upland localities in eastern Cuba. It is a cryptic species, and the fourth member of the twig ecomorph of Cuban *Anolis*. Morphological data suggest that its closest relative is the partly sympatric species *A. angusticeps*.

The largest amniote genus, *Anolis* (>300 sp.), is represented in Cuba by more than 50 species (Estrada and Garrido, 1991; Garrido and Hedges, 1992; Hass et al., 1993). One of the most unusual groups of this widespread genus on Cuba is the *angusticeps* group, of which there are three species: *Anolis angusticeps*, *A. guazuma*, and *A. paternus* (Williams, 1976; Burnell and Hedges, 1990). All three are members of the twig ecomorph (Williams, 1983), characterized by a cryptic morphology (resembling a twig) and behavior.

Anolis angusticeps has been the focus of attention of several previous studies. Hardy (1966) studied variation in the Cuban and Bahama Islands populations, and described *A. angusticeps paternus* from Isla de la Juventud. Schwartz and Thomas (1968) examined variation in *A. angusticeps* in more detail, including in their analysis specimens from eastern Cuba. Later, Garrido (1975) analyzed variation in western populations and treated *A. paternus* as a distinct species. Finally, Garrido (1983) described *A. guazuma* from Pico Turquino in Santiago de Cuba province. In this paper, we describe a fourth Cuban twig anole from localities in two eastern provinces of Cuba: **Holguín** and **Guantánamo**.

In the account below, the following abbreviations are used: MNHNCU (Museo Nacional de Historia Natural de Cuba), CZACC (Colecciones Zoológicas, Instituto de **Ecología y Sistemática**, Academia de Ciencias de Cuba), USNM (United States

National Museum of Natural History, Smithsonian Institution), and CARE (A. R. Estrada Collection).

Anolis alayoni sp. nov.
(Fig. 1A)

Holotype. —MNHNCU 2746, an adult male from La Fangosa, Yateras, **Guantánamo** Prov., Cuba, collected by Alberto R. Estrada on 22 June 1990.

Paratypes. —(29) CARE 60800, male, same collecting data as holotype; MCZ R178768 (male) and CARE 60721 (female), between Cayo Fortuna and **Riíto**, Yateras, **Guantánamo** Prov., 11 March 1989, collected by A. R. Estrada; MCZ R178769, CARE 60801, female, **Arroyón**, San Antonio del Sur, **Guantánamo** Prov., 22 June 1990, collected by A. R. Estrada; CARE 60872, female, Cayo Fortuna, Yateras, **Guantánamo** Prov., 16 March 1987, collected by Antonio **Pérez-Asso**; CARE 60759, 60819, females, Piedra la Vela, Yateras, **Guantánamo** Prov., 22 March 1989, collected by A. R. Estrada and A. **Pérez-Asso**; CARE 60299, female, Farallones de la Italiana, Levisa, **Mayarí**, **Holguín** Prov., 18 September 1987, collected by A. R. Estrada and Orlando H. Garrido; CARE 60327 female, Cayo Guan, Mea, **Holguín** Prov., 3 October 1987, collected by A. R. Estrada; CARE 60797, 60799 females, **España** Chiquita, Sierra de Canasta, El Salvador, **Guantánamo** Prov., 20 June 1990, collected by A. R. Estrada; CARE 60186, male, Arroyo Culebra de Hacha, Mea, **Holguín** Prov., 21 September 1986, collected

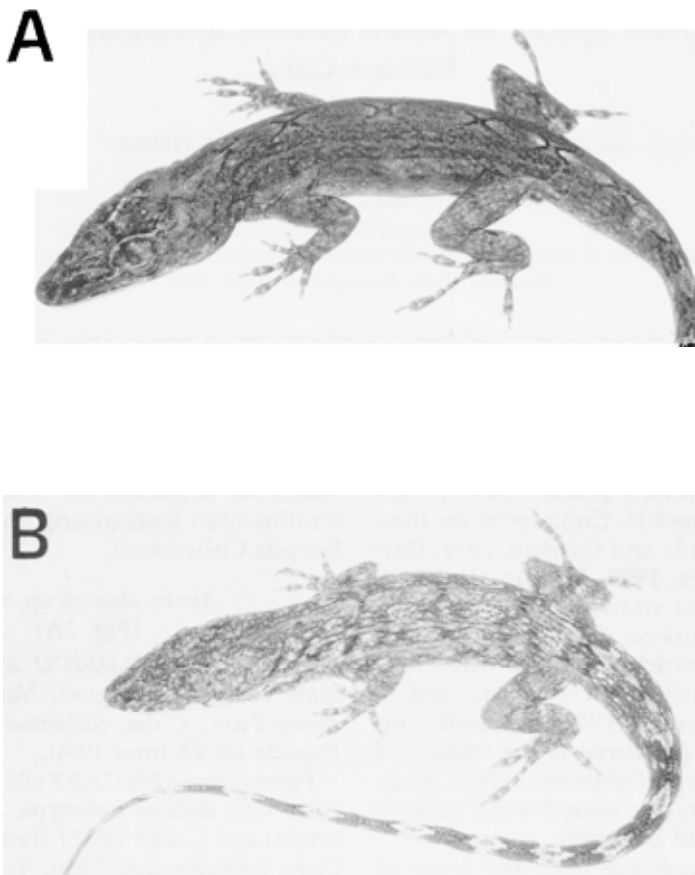


FIG. 1. (A) *Anolis alayoni* (El Molino, **Guantánamo** Prov.), and (B) *A. angusticeps* (9 km W Trinidad, Sancti **Spiritus** Prov.).

by A. R. Estrada; MNHNCU 31, male, 3 km E La Melba, Mea, **Holguín** Prov., 23 September 1987, collected by Carlos **Peña** and Orlando H. Garrido; MNHNCU 2762, female, Sumidero del **Río** Cuzco, El Salvador, **Guantánamo** Prov., 16 June 1990, collected by Alfonso Silva Lee; USNM 335020, El Molino (ca. 7 km W Palenque), Yateras, **Guantánamo** Prov., 21 June 1990, collected by S. Blair Hedges; MNHNCU 51,70, males, La Poa, Sabanilla, Baracoa, **Guantánamo** Prov., between November 1986 and March 1987, collected by O. H. Garrido; MNHNCU 1607, male, **Yumurí, Maisí, Guantánamo** Prov., 27 July 1989, collected by Riberto Arencibia; CZAZZ 7400, (old number IZ 6267), male, **Yumurí, Maisí, Guantánamo**

Prov., 20 September 1980, collected by Noel **González**; CZACC 7302 (old number IZ 4220), male, Arroyo Blanco, Baracoa, **Guantánamo** Prov., 27 May 1974, collected by O. H. Garrido; CZAZZ 9778 (old number IZ5272), male, Sabanilla, Baracoa, **Guantánamo** Prov., May 1978, collected by Anfiloquio **Suárez**; CZACC 7325, female, La Florida, Baracoa, **Guantánamo** Prov., 14 September 1965, collected by O. H. Garrido; CZACC 7326, 7332, female and male, Base de Monte Iberia, Baracoa, **Guantánamo** Prov., 9-10 March 1972, collected by Jorge de la Cruz and **Luis** F. de Armas; CZACC 7377, male, Base de Monte Iberia, Baracoa, **Guantánamo** Prov., 9 March 1972, collected by O. H. Garrido; CZACC 7264

(old number IZ 5941), male, Gran Tierra, **Maisí, Guantánamo** Prov., 10 May 1972, collector unknown; CZACC 7266 (old number IZ 5929), male, **Nibujón**, Baracoa, **Guantánamo** Prov., Lorenzo Zayas; CZACC 7329-30, female and male, 9 km S from **Aserrió**.

Diagnosis. —A small species (\bar{x} SVL 42.2 mm males; 36.6 mm females) of *Anolis* with short limbs, long snout, short semiprehsile tail, and enlarged scales on dorsal surface of head. *Anolis alayoni* is a member of the *angusticeps* species group of *Anolis*, which includes *A. angusticeps*, *A. guazuma*, and *A. paternus*.

From *A. guazuma*, it can be distinguished by a tail longer than SVL (shorter in *guazuma*), 1-2 scales between supraorbital semicircles (modally 0 in *guazuma*), keeled head scales (smooth in *guazuma*), well-developed yellow dewlap (small and whitish in *guazuma*), and other scale and pattern features. From *A. paternus*, it can be distinguished by smooth ventral scales (keeled in *paternus*) and larger body size.

From its closest relative, *A. angusticeps*, it can be distinguished by large size of the males (\bar{x} SVL = 42.2 mm in *alayoni*; 39.9 mm in *angusticeps*) and the color of the dewlap: dark yellow in *alayoni*, pale orange or peach in *angusticeps*. Scale characters which can distinguish most *A. alayoni* from most *A. angusticeps* are: modally 11 (8-12) scales around the interparietal in males, 10 (9-13) in females of *alayoni* (modally 13 [11-16] in males, bimodally 13 and 14 [12-15] in females of *angusticeps*); modally two [2-3] scales between naris and rostrum in *alayoni* (modally three [2-3] in *angusticeps*), modally four (3-5) scales between nares in *alayoni* (modally five [3-6] in *angusticeps*), modally 15 (13-16) lamellae under phalanges II and III of fourth toe in *alayoni* (modally 13 [12-20] in *angusticeps*), modally four (2-6) postmarital scales in *alayoni* (modally six [4-7] in males, four [4-6] in females of *angusticeps*), bimodally 20 and 22 (18-28) middorsal scales in *alayoni* (bimodally 35 and 37 [26-37] in *angusticeps*). In combination, these color, measurement and modal scale differences clearly distinguish all specimens of *alayoni* and *angusticeps*.

Description. —Head narrow and elongate; head scales enlarged, hexagonal, more or

less keeled, smallest anteriorly; nostril circular; nasal scale separated from rostral by 2-3 (modally two; two in holotype) irregularly shaped scales; supraorbital semicircles large, convex, rugose laterally, separated by 1-2 (modally one; one in holotype) rows of scales of small size; canthal ridge with five scales well-defined, second canthal longest, diminishing in size anteriorly; supraorbital ridge well-defined in both sexes; frontal ridge well-defined, confluent anteriorly; 10-29 loreal scales (modally 24; 22 in holotype); temporal scales small; interparietal about 1.4 times as long as wide, separated from supraorbital semicircles by one scale or in contact (one in holotype); 8-13 scales around the interparietal (modally 11; 10 in holotype); ear opening small, elliptical or subcircular, behind mouth commissure; 5-9 (modally 7; 7 in holotype) scales between second canthals; 3-5 (modally four; five in holotype) scales between nasal scales; suboculars directly in contact with supralabials, anteriorly grading into loreals; 6-10 (modally eight; eight in holotype) supralabial scales; mental large, divided, in contact with 4-6 small, granular postmarital scales (modally four; five in holotype).

Trunk with dorsal scales small, granular; two middorsal rows larger, 25-35 scales in 0.5 cm on middorsal region (modally 28; 26 in holotype); ventral scales larger than dorsals, smooth, rounded, arranged in transverse rows, 18-28 scales in 0.5 cm on midventral region (bimodally 20 and 22; 22 in holotype); dewlap large (Fig. 2), present in both sexes, but vestigial in females; scales large and arranged in rows, larger than throat scales; limbs short, tibial length shorter than femoral length, quotient of humeral length/tibial length 0.74- 1.0 (0.88 in holotype); 13-16 (15 in holotype) lamellae under phalanges II and III of fourth toe; scales of supracarpal smooth; scales of hind limbs smooth, keeled on supratarsals; tail laterally compressed, broader at the base.

Coloration in life pale grayish-brown (in light phase), with black and brown lichenate markings; 4-5 brown or black crossbands or blotches with "X" form on middorsal line; 5-7 more distinct brown bands on tail, alternating with gray bands;

TABLE 1. Measurements of *Anolis alayoni* and *A. angusticeps*. Snout-vent length (SVL); head length (HL); head width (HW); jaw length (JL); interorbital distance (IO); naris-snout distance (NS); snout-orbit distance (SO); internarial distance (IN); interparietal scale length (IPL); interparietal scale width (IPE); ear opening vertical diameter (EVD); ear opening horizontal diameter (EHD); humeral length (HUL); tibial length (TL); femoral length (FL); tail length (TAL); axilla-groin distance (AG); mean (\bar{x}); standard deviation (SD); minimum-maximum (m-M); sample size (n).

Character	<i>A. alayoni</i>				<i>A. angusticeps</i>			
	Males		Females		Males		Females	
	\bar{x} SD	n m - M	\bar{x} SD	n m - M	\bar{x} SD	n m - M	\bar{x} SD	n m - M
SVL	42.2 2.89	16 35.8 -46.8	36.6 1.74	13 33.3 -38.9	39.9 2.7	10 34.3 -44.8	38.7 2.22	6 36.6 -42.2
HL	12.6 0.79	16 10.9-13.8	10.2 0.47	13 8.9-10.7	11.6 0.99	10 10-13.1	10.1 0.44	6 9.5-10.8
HW	7.5 0.66	16 6.2-8.8	6.0 0.59	13 5.2-7.4	6.5 0.52	10 5.6-7.2	5.8 0.52	6 5.4-6.7
JL	10.9 0.77	16 9.2-12.2	8.8 0.41	13 7.8-9.3	9.9 0.93	10 8.2-11.5	8.8 0.56	6 8.2-9.4
IO	4.3 0.38	16 3.7-5.0	3.6 0.28	13 3.1-4.0	3.9 0.42	10 3.2-4.5	3.5 0.28	6 3.1-3.8
NS	1.3 0.10	16 1.1-1.5	1.1 0.09	13 1.0-1.3	1.2 0.19	10 1.0-1.6	1.1 0.18	6 0.7-1.2
SO	5.7 0.40	16 5-6.5	4.5 0.33	13 3.8-5.1	5.3 0.72	10 4.5-6.8	4.8 0.35	6 4.4-5.2
IN	1.6 0.16	15 1.2-1.8	1.3 0.10	13 1.2-1.5	1.4 0.17	9 1.1-1.6	1.5 0.17	6 1.3-1.6
IPL	1.8 0.26	16 1.1-2.2	1.49 0.21	12 1.2-1.9	1.7 0.33	10 1.4-2.0	1.4 0.34	6 1.0-1.8
IPW	1.2 0.26	16 0.9-2	1.0 0.15	12 0.9-1.4	1.4 0.25	10 1.0-1.8	1.1 0.19	6 0.8-1.3
EVD	0.8 0.1	16 0.5-1.0	0.6 0.1	12 0.4-0.9	0.6 0.09	10 0.6-0.9	0.5 0.08	6 0.4-0.6
EHD	0.7 0.1	16 0.5-1.0	0.6 0.1	12 0.4-0.9	0.5 0.1	10 0.3-0.7	0.5 0.1	6 0.4-0.7
HUL	6.6 0.5	16 5.6-7.6	5.7 0.3	13 5.1-6.2	6.1 0.7	10 4.3-7.2	5.4 0.2	5 5.1-5.6

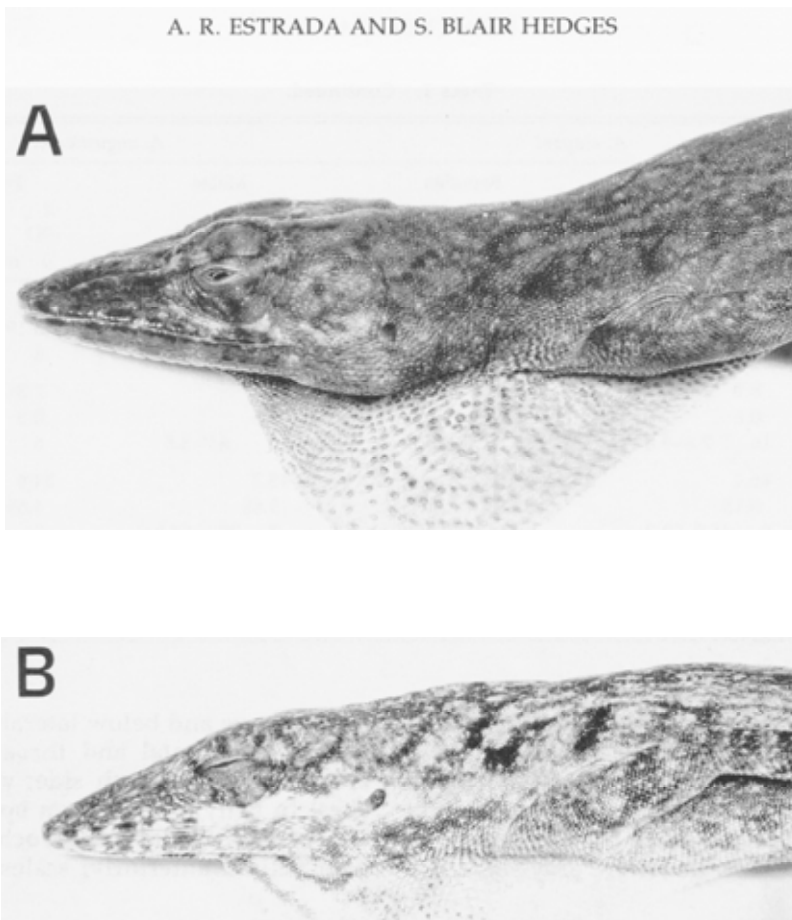


FIG. 2. Extended dewlaps of (A) *Anolis alayoni* (El Molino, **Guantánamo** Prov.), and (B) *A. angusticeps* (9 km W Trinidad, Sacti Spiritus Prov.).

yellow, light brown inside. Animals with dark phase have the same patterns, but with some differences general coloration dark reddish-brown; dark brown orbits; dorsal surface of head and lores dark brown; mid-dorsal brown stripe with a light fine line in the middle; brown belly with dark spots (CARE 60800). Some animals have black or dark brown blotches on sides below the mid-dorsal stripe and above the lateral light stripe (MCZ R178769, CARE 60798).

Measurements of Holotype.—SVL 46.8, 13.8, 7.1, tibial length 8.0, femoral length 9.4, and tail length 53.3. Complete measurements for *A. alayoni* and comparison

with *A. angusticeps* are given in Tables 1 and 2.

Distribution (Fig. 3).—Known only from upland areas of **Holguín** and **Guantánamo** provinces in eastern Cuba. Altitudinal range 200-900 m.

Etymology.—The new species is dedicated to our friend, and distinguished Cuban arachnologist, Giraldo **Alayón**.

Natural History.—*Anolis alayoni* occurs in various kinds of forest. In the Sierra de la Canasta (**España** Chiquita), it was observed on tree trunks and twigs at two or three meters above the ground, in very dry woods. Animals from Cayo Fortuna, Piedra



FIG. 3. Distribution of two species of *Anolis* in eastern Cuba. Localities for *A. alayoni* (circles) are (from west to east): Farallones de la Italiana (Sierra del Cristal), Sumidero del **Ric** Cuzco (western Meseta del Guaso), **España** Chiquita (Sierra de Canasta), Culebra de Hacha (Cuchillas de Mea), Piedra la Vela (Cuchillas de Tea), Cayo Fortuna (Cuchillas de Toa), **Riita** (Cuchillas de Toa), Cayo Cuan (Alturas de Baracoa), 3 km E de la Melba (Cuchillas de Toa), **Arroyón** (Sierra del Purial), Base de Monte Iberia (Alturas de Baracoa), **Aserría** Nuevo Mundo (Alturas de Baracoa), **Nibujón** (Alturas de Baracoa), **Nibujón** and La Florida (Alturas de Baracoa), Sabanilla (Cuchillas de Baracoa), Boca del **Yumuri** y Gran Tierra (Meseta de **Maisí**). The localities of *A. angusticeps* (triangles) are: San Ramon, Bajada del Pesquero de la **Alegría** (Meseta de Cabo Cruz), Finca La Bahía, Pico Turquino, La Mula, 4 km W del Uvero, Santiago de Cuba, Playa Siboney, Playa Jaragua, Sardineró, Cuchillas de Guajimero, 9 km SE Mea, Ovando Arriba.

la Vela a Culebra de Hacha, and Cayo Guan, were collected in very dry vegetation associated with *Pinus cubensis*, termed "Char-rascal." These animals were perched on twigs and tree trunks at about the same height. The specimens from **Arroyón** were collected on twigs very close to the river in secondary rainforest. The same situation was observed for specimens from La Melba, Rio Cuzco, and Farallones de la Italiana. Animals collected at El Molino were sleeping on twigs at night several meters above ground next to a small stream.

Remarks. -Ruibal (1964:488) reported a peach dewlap color for Cuban examples of *A. angusticeps*, and in our experience this is the typical color throughout the range of that species. However, there is some variation, and Schwartz and Thomas (1968: 55-56) reported a male from Pinar del **Ric**

with a yellow dewlap. The dewlap color of *alayoni* is always yellow, and females have a yellow throat.

Although *A. alayoni* has not been taken syntopically with *A. angusticeps*, the distributions of these two species overlap broadly (Fig. 3). Three localities for *A. angusticeps* lie within the range of *A. alayoni* and are only a few kilometers from localities of *A. alayoni* (Fig. 3), therefore these two species should be considered sympatric.

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of Comparative Zoology, and the National Museum of Natural History (Smithsonian Institution) kindly allowed the senior author to examine specimens in their collections. This research was supported in part by grants from the U.S. National Science Foundation (BSR 8906325 and DEB 9123556) to S.B.H.

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APPENDIX

Specimens Examined

Anolis angusticeps (25).—CUBA: Bosque de La Habana, Ciudad de La Habana, CARE 60814-17; **Ciénaga** de Zapata, Matanzas, CZACC 7420-21 (IZ 273-74); San Miguel de los **Baños**, Jovellanos, Matanzas, MNHNCU 1259, 1261-62; Cayo Cantiles, **Archipiélago** de los Canarreos, CZACC 7335 (IZ864), Cayo Juan Garcia, **Cayería** de San Felipe, CZACC 7336 (IZ865), **Río** Calabazas, Placetas, Villa Clara, MNHNCU 3238; Bajada al Pesquero de la **Alegría**, Niquero, Granma, CARE 60536; La Mula, 4 km W de Uvero, **Guamá**, Santiago de Cuba, CZACC 6120, Santiago de Cuba, CZACC 7263; Playa Siboney, Santiago de Cuba, CZACC 7445; Sardinero, Santiago de Cuba, CZACC 7428; San Ramon, Campechuela, Granma, MCZ 59248-50 (skeleton); Finca La Bahía, 32 km SW de Victoria de las Tunas, La Tunas, MCZ 59251-52; 9 km SE of Mea, **Holguín**, MCZ 59253; **Río** Ovando Arriba, **Maisí**, **Guantánamo**, MCZ 42469, 42526; Cuchillas de Guajimero, 23.37N, 75.04W, near Guayabal de Yateras, **Guantánamo**, MCZ 42558; Pico Turquino, **Guamá**, Santiago de Cuba, MCZ 50154; Playa **Jaraguá**, Santiago de Cuba, AMNH 96500.