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Three New Grass Anoles from Cuba (Squamata: Iguanidae)

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ABSTRACT. – Three new species of grass anoles of the *alutaceus* group of *Anolis* are described from upland areas of eastern Cuba. They occur in remnant forest of three mountain systems in Guantánamo Province: *A. macilentus* in the Meseta del Guaso, *A. vescus* in the Sierra del Purial, and *A. alfaroi* in the Cuchillas de Moa.

INTRODUCTION

Anolis is the largest amniote genus and is represented in Cuba by 44 described species, the most found on any Caribbean island. The morphological and ecological diversity of this genus especially is evident in Cuba, where one may encounter a wide range of niches (e.g., tree canopies, tree trunks, twigs, grass, rock walls, and streams), each occupied by one or more species of Anolis showing morphological specializations for its particular lifestyle. Of these different morphological and ecological types, the grass ecomorph (Williams, 1983), with 13 species, is the largest in Cuba. Aside from one small, boldly striped species (A. ophiolepis Cope) that belongs to a separate evolutionary lineage (sagrei series), the Cuban grass anoles are grouped in the alutaceus series (Garrido, 1980; Burnell and Hedges, 1990), which contains the following four species groups of small, elongate lizards with very long tails: alutaceus, clivicola, cyanopleurus, and spectrum.

The alutaceus group (A. alutaceus Cope, A. anfiloquioi Garrido, and A. inexpectatus Garrido and Estrada) is comprised of brown lizards with relatively little sexual dimorphism in size or dorsal pattern. The single member of the clivicola group, A. clivicola Barbour and Shreve, is larger (to 49 mm SVL); than other grass anoles (35-45 mm SVL), has keeled head scales and gulars, and is restricted to the high elevations of the Sierra Maestra (>1000 m). Species in the cyanopleurus group (A. cupeyalensis Peters, A. cyanopleurus Cope, A. fugitivus Garrido, A. juangundlachi Garrido, and A. mimus Schwartz and Thomas) are green or greenish (except A. juangundlachi), have yellowish dewlaps, and marked sexual dimorphism in body size and dorsal pattern. The two species of the spectrum group (A. spectrum Peters and A. vanidicus Garrido and Schwartz) are distinguished by enlarged and strongly keeled dorsal scales, and by contact of the supraorbital semicircles.

During June and July of 1990, three new species of Anolis were collected in extreme eastern Cuba (Guantánamo Province) during a joint expedition organized by the Museo Nacional de Historia Natural of Cuba, the University of Havana, and Pennsylvania State University. All three belong to the *alutaceus* group and were found in remnant forest of three different upland areas. Each occurs sympatrically with A. *alutaceus*.

METHODS

For measurements and most scale counts, the mean (range in parentheses) is given for males and females, respectively. For scale counts on the sides of the head, the left and right (L/R) count is given together with the number of individuals in brackets. Mo = mode; N = number; SVL = snoutvent length (reported as maximum); femur is the length taken with a ruler from the bend of the leg to the middle of the vent; femoral ratio is the length of femur divided by SVL; the number of dorsal scales, ventral scales, and gular scales were counted over a distance equal to that between the anterior edge of the orbit and the tip of the snout; the length and width of the interparietal scale was measured. Museum abbreviations follow standardized usage (Copeia 1985:802-832), except for MNH-NCU, which refers to the newly formed collection of the Museo Nacional de Historia Natural, Cuba (La Habana).

DESCRIPTIONS

Anolis macilentus sp. nov. (Fig. 1A, 2A, 3B)

Holotype. — MNHNCU 2721, an adult male from Río Pai, Monte Líbano, south slope of the Meseta del Guaso, 650 m, Guantánamo Province, Cuba, collected by Orlando H. Garrido on 26 June 1990 (original number USNM field series 191159).

Paratypes. —USNM 314190 (original number 191421), male; MNHNCU 2739, male; MNHNCU 2737, male; USNM 314193 (original number 2741), female; USNM 314192 (original number 2740), female; USNM 314191 (original number 2738), female; MNHNCU 2735, female; MNHNCU 2736, female. Same locality, date and collector as the holotype, with the exception of USNM 314193, that was collected by O. H. Garrido and E. Alfaro.

Definition and Diagnosis. — A species of the alutaceus group, characterized by medium size (males, 34-41 mm SVL; females, 30-36 mm SVL); slender body; a very long tail; dark blue iris; small dewlap (Fig. 2A), grayish brown in color; smooth ventral scales; one or two rows of scales between supraorbital semicircles; 3-4 postmentals; scales surrounding interparietal multicarinated; color in life light brown (straw-like), a white postlabial band that extends past the ear opening and reaches the supraxillary region (bordered above by dark brown or almost black); a conspicuous black spot behind the eye; suffusion of blackish marks on the sides of body, well marked tail verticils.

In A. macilentus, A. anfiloquioi, A. inexpectatus, and the two species described below, the dewlap is small to medium in size and the white postlabial band extends past the ear opening to the supraxillary region. Anolis alutaceus can be distinguished from all of these by its very large yellow dewlap

and poorly developed white postlabial band that does not extend past the ear opening. Anolis anfiloquioi can be distinguished by its black suprahumeral spot and brown iris (not blue). The new species from the Sierra del Purial (described below) has fewer loreals (25–32, $\bar{x} = 29$, versus 33–43, $\bar{x} = 37$), a conspicuous supraxillary spot (lacking in A. macilentus), and its iris is not blue. The new species from the Cuchillas de Moa (described below) has a very small dewlap and keeled ventrals (smooth in A. macilentus). Anolis macilentus shares with A. inexpectatus smooth ventrals, a dark blue iris, and a small dewlap, but differs in the following ways: A. macilentus is larger (41 mm SVL versus 36 mm in A. inexpectatus); it has a black postocular spot; a smaller dewlap which is brown (not yellowish green as in A. inexpectatus); although the iris is blue in both taxa, it is lighter in A. inexpectatus; gulars and loreals are keeled in A. macilentus, smooth or nearly smooth in A. inexpectatus; A. macilentus has more loreals (33-43, $\bar{x} = 37$, versus 19-37, $\bar{x} =$ 30); head scales are keeled in A. macilentus (Fig. 3B), smooth in A. inexpectatus; and there are often (5 out of 9) two rows of scales between the supraorbital semicircles in A. macilentus whereas there is always one row in A. inexpectatus (31 specimens examined by Garrido and Estrada, 1989).

Description (holotype).—SVL, 41 mm; tail length, 111 mm; femur length, 11.9 mm; femoral ratio, 0.29; distance between ear opening and tip of the snout, 11.2 mm; distance between anterior orbit and tip of the snout, 5.60 mm; ventral scales, 22; dorsal scales, 20; gular scales, 25; one row of scales between supraorbital semicircles; loreals, 43; number of scales between nasal openings, seven; postmentals, four; scales bordering rostral, nine; scales between supraorbital semicircles and interparietal, 3/3; number of enlarged supraxillary scales, 6/7; IV toe lamellae, 22; size of interparietal, 1.35 mm \times 0.70 mm; supralabials, seven; infralabials, seven; scales between first canthals, seven; ventral scales, smooth; scales surrounding interparietal, keeled, with one or more carinations; dewlap small and gravish, with light brownish tinge.

Color in Life.—Dorsal ground color light

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FIG. 1. (A) Anolis macilentus (holotype, MNHNCU 2721, male) and (B) A. alfaroi (USNM 314201, male).

brown (straw-like); white postlabial stripe bordered above by narrow blackish brown stripe; iris dark blue; conspicuous postocular black spot; sides of body with inconspicuous blackish flecks between limbs, more pronounced near hind limbs and tail; five or six pairs of small, dark brown lateral body spots; a pair of dark brown dorsal spots just above vent; frontal depression beige, lighter than rest of head; nape dark brown; venter grayish beige with scattered pinkish scales.

Variation.—There are four adult males (including holotype) and five adult females; SVL, 34-41 mm, 30-36 mm; femoral ration, 0.29 (0.29-0.30), 0.30 (0.28-0.32);

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FIG. 2. Fully extended dewlaps of (A) Anolis macilentus (holotype, MNHNCU 2721) and (B) A. alfaroi (USNM 314201).

length between ear opening and tip of the snout, 10.03 mm (9.05–11.20 mm), 8.95 mm (7.95–9.40 mm); dorsal scales, 24.0 (20–28), 22.7 (18–30); ventral scales, 21.7 (20–24), 19.6 (17–22); gular scales, 21.2 (19–25), 18.8 (16–20); row of scales between supraorbital semicircles, one row [5] or two rows [4]; scales between semicircles and interparietal, 3/3 [3], 4/4 [1] in males, 2/3 or 3/2 [3], 3/4 [1], 4/4 [1] in females; loreals, 36 (33–43), 38.5 (35–40); scales between nasal semicircles, 6.7 (6–7), 6.8 (6–7), Mo = 7; postmentals, 3.7 (3–4), 3.8 (3–4), Mo = 4; scales that border the rostral, 7.7 (7–9), 7.4

(7-8), Mo = 7; enlarged supraciliary scales, 6/7 [1], 7/8 or 8/7 [3] in males, 6/6 [1], 6/8 [1], 7/7 [1], 7/8 [2] in females; IV toe lamellae, 21.4 (20-22), 23.4 (19-25); size of interparietal scales, 1.22 mm (1.10-1.35 mm) \times 0.80 mm (0.70-0.95 mm), 0.98 mm (0.95-1.20 mm) \times 0.74 mm (0.60-0.80 mm); supralabials, 6.2 (6-7), 6.8 (6-8), Mo = 6; infralabials, 6.2 (6-7), 5.8 (5-6), Mo = 6; scales between first canthals, 7.5 (7-9), 8.6 (7-10), Mo = 7; scales surrounding interparietal, keeled, with one or more carinations (9); ventral scales, smooth (9).

Distribution.—Known only from the type

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FIG. 3. Dorsal surface of the head in two species of Anolis. (A) A. vescus (MNHNCU 2732, female) and (B) A. macilentus (MNHNCU 2740, female).

locality on the Meseta del Guaso, 650 m, Guantánamo Province, Cuba (Fig. 4).

Etymology.—From Latin; in reference to the feeble and slender aspect of the animals.

Natural History.—This population lives in the compact brushy vegetation (ferns, bushes, and scattered trees) that grows several meters above one of the steep slopes of the Río Pai. The area is bordered by an eroded hill, devoid of trees and covered with herbaceous growth and abundant loose rocks. Most of the lizards were found from a half to about two meters above the ground, perched on twigs, and stems of high grass. One male was perched on the bark of a tree. The major time of activity was about midmorning. When the animals were encountered, they became still for a moment and then tried to escape by dashing down among the lower grass and bushes and remained motionless (and cryptic). Two species syntopic with A. macilentus are A. alutaceus and A. angusticeps. Anolis sagrei also is found in the open periphery of the vegetation.

Anolis vescus sp. nov. (Fig. 3A)

Holotype. — MNHNCU 2729, an adult male from Palmarito, 4.7 km N Los Calderos, Municipio Imías, Guantánamo Province, 700 meters, collected by Orlando H. Garrido on July 1, 1990.

Paratypes.—MNHNCU 2731-32, adult females; MNHNCU 2734, female; USNM

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FIG. 4. Localities for A. macilentus (circle), A. vescus (square), and A. alfaroi (triangle). Solid line is 500 m contour; dashed line is boundary between Guantánamo Province (below) and Holguin Province (above).

314194 (original number MNHNCU 2730), female; same locality, date and collector as the holotype.

Definition and Diagnosis.—A species of the alutaceus group, characterized by medium size (41 mm SVL); slender body; a very long tail (108 mm), a dark metallic iris, decidedly not blue; a rather small (but long) light brown dewlap that reaches back to the chest; a conspicuous (almost black) supraxillary spot; white postlabial band that reaches the forelimbs with a very narrow dark edge above; diffusion of dark spots on venter; general color brown; a conspicuous wide black band on the tail; Nuchal crests, snout and orbits dark brown (females with greenish suffusion); ventral scales smooth; rows between the supraorbital semicircles, 1.2 (1-2); postmentals, 4.2 (4-5).

From A. inexpectatus, A. macilentus, and the third new species described below, A. vescus differs in having a metallic grayish iris (definitely not blue), and a supraxillary spot. In addition, A. vescus is larger (41 mm) than A. inexpectatus (36.5) and A. alutaceus (37.5), and it differs from A. macilentus in having the loreals weakly keeled and fewer in number (25-32 versus 33-43), su-

pranasals keeled, dewlap longer (extending back into the chest), and dewlap color light brown/grayish, not dark brown. It differs from the new species described below in having smooth (four of five individuals) instead of keeled ventrals. Anolis vescus is most similar to A. anfiloquioi, with which it shares a similar body size, a similar-sized dewlap, and general dorsal pattern. However, the black spot of A. anfiloquioi is larger, more lentel-like (not a mere spot) and is situated in the scapular region, not immediately above the shoulder (Garrido, 1980). The color of the dewlap is darker brown (with a slight yellowish tinge) in A. anfiloquioi (not light brown or gravish) and the color of the iris is a medium brown (metallic gravish color in A. vescus). In scalation, A. vescus has fewer loreals than A. anfiloquioi (25-32 versus 30-37).

Description (holotype).—SVL, 41 mm; tail length, 108 mm; femur length, 11.20 mm; femoral ratio, 0.28; distance between anterior orbit and tip of snout, 11.20; ventral scales, 21; dorsal scales, 28; gular scales, 19; one row of scales between supraorbital semicircles; loreals, 31; number of scales between nasal openings, seven; postmentals, four; scales bordering the rostral, seven; scales between supraorbital semicircles and the interparietal, 1/2; number of enlarged supraciliary scales, 6/4; toe IV lamellae, 20; interparietal, $1.05 \text{ mm} \times 0.80$ mm; supralabials, six; infralabials five; scales between first canthals, five; ventral scales, smooth; scales surrounding interparietal, smooth or keeled; dewlap long, reaching behind forelegs, but small.

Color in Alcohol.—Brown, darker on head; postlabial stripe white with poorly developed dark brown edge above; supraxillary spot, black; dewlap, light brown; grayish throat and venter.

Color in Life.—General color brown; iris dark metallic gray, but decidedly not blue, green or brown; dewlap light brown/grayish; a dark spot (almost black) above the shoulder; profusion of dark spots on venter; a black band about middle of tail as in *A. alutaceus*; nuchal crest, snout, and orbits dark brown; female lacks dewlap and has a greenish suffusion in the snout and upper head.

Variation.-There is only one male (the holotype) in the series. The four females show the following variation: SVL, 33–37 mm; femoral ratio, 0.29 (0.28-0.30); distance between ear and tip of snout, 9.1 mm (8.65-9.45 mm); distance between anterior orbit and tip of snout, 4.45 mm (4.10-4.75 mm); dorsal scales, 22 (16-26); ventral scales, 19 (17-23); gular scales, 18.5 (17-20); scales between supraorbital semicircles, one [3] or two [1]; scales between supraorbital and interparietal 2/3 [1]; 3/3 [3]; loreals 28.5 (25-32); scales between nasal openings 7.25 (6-8); postventrals 4.25 (4-5); scales that border rostral 6.25 (5-7); enlarged supraciliary scales 5/5 [1], 6/6 [2], 7/6 [1], IV toe lamellae 20.5 (19-22); mean size of interparietal scale 1.11 mm \times 0.75 mm; supralabials 6.5 (6-8); infralabials 5.5 (5–7); scales between first canthals 8.25 (7– 10); scales surrounding interparietal are smooth [2] or keeled [2]; venter smooth [3] or weakly keeled [1].

Distribution.—Known only from the type locality, Palmarito, 700 m, located on the south face of the Sierra del Purial (Fig. 4). No additional specimens were found despite collecting efforts in other areas of lower altitude between this locality and Los Calderos.

Etymology.—From Latin; slim, in allusion to its thin and elongate body.

Natural History.—The general description of habits and habitat given above for *A. macilentus* applies to this species. The type locality is adjacent to an orchard with bananas and crotus trees. Here too, the small brushy area where the lizards were found stands as a relict pocket of forest.

Anolis alfaroi sp. nov. (Figs. 1B, 2B)

Holotype. — MNHNCU 2725, an adult male from 2 km N La Munición, Municipio Yateras, Guantánamo Province, Cuba, 730 m, collected by Emilio Alfaro on 23 June 1990.

Paratypes. —MNHNCU 2727a-e (5), USNM 314195, 314201-02, adult males; MNHNCU 2681-82, 2722-24, 2726, 2728; USNM 314196-200, 314203-05, adult females, collected at the same place and same date as the holotype by Emilio Alfaro (specimens at MNHNCU), and by S. Blair Hedges (those at USNM).

Definition and Diagnosis.—A species of the alutaceus group, characterized by small size (36 mm SVL); slender body; light brown color (straw-like); bluish iris; very small dewlap in males (Fig. 2B), absent in females; a white postlabial band that extends past the ear opening and reaches the front limbs; ventrals not smooth, slightly keeled, especially at the sides of abdomen; gulars keeled.

The keeling of the ventral scales and the greatly reduced dewlap (Fig. 2B) separates *A. alfaroi* from the other taxa in the *alutaceus* group. Additionally, *A. vescus* has a metallic gray iris (not blue) and is a larger species (41 mm SVL); *A. anfiloquioi* has a conspicuous black suprahumeral spot and is larger (40-44 mm SVL); *A. macilentus* has multicarinated scales surrounding the interparietal (not smooth) and is larger (41 mm SVL); *A. inexpectatus* is similar in size but has smooth or nearly smooth gulars (keeled in *A. alfaroi*).

Description (holotype).—SVL, 36 mm; tail length, 85 mm; femur length, 10.10 mm; femoral ratio, 0.28; distance between anterior orbit and tip of snout, 5.10 mm; distance between ear and tip of snout, 10.40 mm; ventral scales, 23; dorsal scales, 25; scales of head, multicarinate; gular scales, 21; one row of scales between supraorbital semicircles; loreals, 29; number of scales between nasal openings, seven; postmentals, four; scales bordering rostral, seven; scales between supraorbital semicircles and interparietal, 3/3; number of enlarged supraciliary scales, 5/5; toe IV lamellae, 18; interparietal, 1.2 mm \times 9.5 mm; supralabials, five; infralabials, six; scales between first canthals, 10; ventral scales keeled on sides of abdomen; scales surrounding interparietal, smooth; dewlap very small, absent in females.

Color in Alcohol.—Dorsal ground color brownish-gray; middorsal stripe white; postlabial stripe white, extending (faintly) behind the ear; venter whitish; verticils of tail black.

Color in Life.—Dorsal ground color dark chestnut brown with six or seven evenlyspaced vertical rows of small yellowish spots on each side of body; faint indication of five dark middorsal chevrons; conspicuous dark brown V-shaped interocular band (apex oriented posteriorly); dorsal surface of head and loreal region dark brown; dewlap light gray (under close inspection, dewlap scales are mostly white with some light brown pigment between the scales near center of dewlap).

Variation.—There are nine adult males (including holotype) and 15 adult females; SVL, 32-36 mm, 28-33 mm; femoral ratio, 0.28 (0.27-0.30), 0.29 (0.28-0.31); distance between ear opening and the tip of the snout, 9.52 mm (8.85-10.40 mm), 8.47 mm (7.50-9.10 mm); dorsal scales, 23.4 (18-27), 23.7 (18-31); ventral scales, 22.6 (19-24), 18 (16-20); gular scales, 19.9 (16-22), 17.2 (15-19); scales between supraorbital semicircles, one [8], two [1] in males, one [11], two [4] in females; number of scales between interparietal and supraorbital semicircles, 1/1 [1], 2/2 [6], 3/3 [2] in males; 1/2 or 2/1 [2], 2/2 [4], 3/3 [5], 3/2 [2], 3/4 [2] in females; loreals, 29.7 (22-39), 26.6 (21-35); scales between nasals, 6.2 (6-8), 6.2 (6-7), Mo = 6; postmentals, 3.9 (3-5), 3.6 (2-5); scales that border rostral, 6.5 (6-7), 6.6 (6-9); enlarged supraciliary scales, 5/5[2], 5/6 [2], 6/6 [2], 7/6 [1], 7/7 [1], 10/9 [1] in males, 5/5 [1], 5/6 or 6/5 [4], 5/7 [2], 6/7 or 7/6 [4], 7/8 [1], 8/9 [1], 9/10 or 10/9 [2] in females; toe IV lamellae, 21 (18-25), 21 (18-25); size of interparietal, 1.24 mm (1.10-1.95 mm) × 0.8 mm (0.75 × 1.00 mm), 1.12 mm $(1.00-1.35 \text{ mm}) \times 0.74 \text{ mm} (0.60-0.90)$ mm); supralabials, 5.3 (5-6), 5.6 (5-7); infralabials, 5.5 (4-7), 5.5 (4-6); scales between first canthals, 8.2 (7–10), 7.6 (5–10); scales surrounding interparietal, smooth in all males, a few keeled scales present in females; ventral scales, weakly keeled (piriform), especially at sides of abdomen.

Distribution.—Known only from the typelocality (Fig. 4), but probably widespread in the pine barrens, located from 2 km N of La Munición (730 m) north for several additional km to the region of Cupeyal. This area, which is a pine-laden (*Pinus cubensis*) plateau, lies at the western end of the Cuchillas de Moa, near the headwaters of the Río Toa.

Etymology.—Named for our colleague and member of the expedition, Emilio Alfaro.

Natural History .- The lizards were collected mainly at night while sleeping on the stems of ferns, local grasses, and bushes. During the daytime, some specimens were collected about a meter high on bushes and grass beneath the pines. Anolis alfaroi is sympatric with A. alutaceus, A. cupeyalensis, A. homolechis, A. sagrei, and A. smallwoodi. When A. alfaroi and A. cupeyalensis are found together, the latter is always closer to the ground. The escape behavior of A. alfaroi is similar to the other grass anoles, i.e., jumping into cover when encountered, or moving (squirelling) around the stems to hide. Anolis alfaroi probably is also sympatric with A. inexpectatus, a species which occurs only several km to the north in the pine forests near Cupeyal (Garrido and Estrada, 1989).

DISCUSSION

With the description of these three new species there are now six members of the *alutaceus* group of *Anolis* (key below). All are middle-altitude (upland) forms, al-

though one (A. alutaceus) has been found as low as sea level and is widespread and abundant throughout Cuba. Aside from A. alutaceus, the remaining five species appear to be a complex of vicariants associated with different mountain systems in eastern Cuba, but occupying similar habitats. This also applies to A. anfiloquioi, which is represented by two distant populations that differ somewhat from each other. It is possible that these two populations differ at the species level, but additional material is needed to resolve that question.

KEY TO ANOLIS OF THE ALUTACEUS GROUP

(large = >45 mm SVL, medium = 40-44 mm SVL, small = <39 mm SVL)

- 2a Size medium; dewlap medium, brownish-orange or ochre; iris brown; smooth ventrals ... 3
- 2b Size small to medium; dewlap small, grayish, yellowish, greenish or brownish; iris blue (or at least not brown); smooth or keeled ventrals
- 3a Larger (43.5); dewlap brownish-orange or ochre; conspicuous black suprahumeral spot anfiloquioi (Lebisa)
- 3b Smaller (40); dewlap much browner or ferruginuous; black suprahumeral spot faint
- 4a Ventrals not smooth; rather keeled at sides of abdomen; dewlap very small; gulars keeled; iris bluish; small (36 mm) *.alfaroi* (La Munición)
- 4b Ventrals smooth 5
- 5a Conspicuous supraxillary spot; iris not blue; larger (41); ventrals smooth; gulars keeled; loreals (25-32) weakly keeled; supranasals keeled;

one or two rows of scales between supraorbitals semicircles; dewlap small (but long) and grayish; iris a gray metallic hue, definitely not blue vescus (Palmarito-Los Calderos)

- 6b Smaller (36.5). Gulars smooth or weakly keeled; loreals (19-37) and head scales smooth or nearly smooth; one row of scales between supraorbital semicircles; dewlap yellowish or greenish inexpectatus

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