

B R E V I O R A

Museum of Comparative Zoology

US ISSN 0006-9698

CAMBRIDGE, MASS.

2 SEPTEMBER 1988

NUMBER 489

NEW OR PROBLEMATIC *ANOLIS* FROM COLOMBIA. V. *ANOLIS DANIELI*, A NEW SPECIES OF THE *LATIFRONS* SPECIES GROUP AND A REASSESSMENT OF *ANOLIS APOLLINARIS* BOULENGER, 1919

ERNEST E. WILLIAMS¹

ABSTRACT. A new giant anole, *Anolis danieli*, is described from northern and western Antioquia, Colombia. Formerly confused with *A. apollinaris* Boulenger, 1919, of Cundinamarca and southeastern Antioquia, the new species differs in the presence of a dewlap of moderate size in the female (absent in *A. apollinaris*) and in minor scale characters. *A. danieli*, *A. apollinaris* and *A. propinquus* Williams, 1984, are demonstrated to be a distinct subgroup within the *latifrons* species group defined by distinctly keeled head scales, relatively short limbs and a green ground color. Previous confusions regarding the taxonomic placement of *A. apollinaris* and *A. propinquus* are corrected.

INTRODUCTION

In 1970 I redescribed *Anolis apollinaris* Boulenger, 1919, primarily on the basis of a series of six specimens from San Pablo, Department of Cundinamarca, Colombia, in the Munich collection (ZSM 427-432) and the type specimen in the British Museum (BMNH 1946.13.22). I referred to the species' three additional specimens from Cundinamarca—two from Antioquia and one from Caldas. I compared the species only with *A. biporcatus* Wiegmann.

Material since made available to me from Cundinamarca and Antioquia now makes it quite clear that my 1970 material was

¹ Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138.

composite, and that only the Cundinamarca specimens were *A. apollinaris*. Fortunately, the illustrations in Williams (1970) are of Munich specimens from Cundinamarca, which are true *A. apollinaris*. The specimens from Antioquia represent a new, although very closely related species. (The specimen from Caldas has not been re-examined.) Further, it can now be established that both *A. apollinaris* and the new species belong to the alpha section of the genus (Etheridge 1960) and must be referred to the *Anolis latifrons* species group (*sensu* Williams 1976); they are not at all close to *A. biporcatus*, which is a member of the beta section.

Confusion as to the placement and affinities of *A. apollinaris* and as to the affinity or lack of affinity of the *biporcatus* and *latifrons* species groups has had a long history. Boulenger (1919) in his description of *A. apollinaris* expressed no opinion about its relationships. Burt and Burt (1931) referred a number of Colombian anoles to the species, but were quite wrong in their identifications as Dunn (1944) demonstrated. Dunn's own judgment was most importantly based on size (SVL of the type specimen of *A. apollinaris* 106 mm) and he compared the species with *A. solifer* and *A. copei* (both synonyms of *A. biporcatus*), which are approximately this size. Unfortunately, Dunn did not compare *apollinaris* with the other group of species, well known in western Colombia, that is comparable in size, in spite of the fact that he had previously reviewed this group—his “mainland giant anoles” (Dunn 1937).

Confusion of the *biporcatus* and *latifrons* species groups first occurred when Günther (1859), describing *Anolis fraseri*, included a specimen of *A. biporcatus* in the type series. Boulenger (1885) corrected the error at the species level, but apparently, as I have commented earlier (Williams 1966), still believed that the two taxa were close relatives. Dunn (1944) committed a parallel error in the reverse direction by associating *A. apollinaris* with the two synonyms of *A. biporcatus*.

In fact, none of the standard external characters used in anole taxonomy permit the placement of the *biporcatus* and *latifrons* species groups as widely separate taxa. Species characters are clear enough, but there is quite obviously marked convergence in ecomorphic features (*sensu* Williams 1972, 1983). The significant internal character of the caudal vertebrae—anteriorly pointing

transverse processes on these vertebrae in the beta section of *Anolis* and the absence of these processes in the alpha section of the genus—was discovered by Etheridge (1960) only with the aid of X-rays.

This character was, of course, known to me in 1970, but by misfortune in 1970 no suitable X-ray equipment was conveniently available to me or to Etheridge (on whom I usually relied for assistance in this particular) nor were any dry skeletons available (there are still none). Therefore, I contented myself at that time with externals. Influenced by minor aspects of color pattern—green with some white spotting, which appeared to eliminate *A. fraseri* as a close relative—and by the short limbs, shared with *A. biporcatus* as well as *A. fraseri*, and quite unlike the long limbs of the *frenatus* subgroup of the *latifrons* assemblage, I accepted Dunn's (1944) allocation.

The recognition of a second species related to *A. apollinaris* and of the alpha affinities of both species began when two large *Anolis* from Antioquia belonging to the collections of the Museo de Historia Natural at the Colegio San José in Medellín (CSJ 111 and 168, now ICN 5997–98) were turned over to me by Stephen Ayala for examination. The female, CSJ 111 from Yarumal, had a very evident large dewlap and bore a paper label in Niceforo Maria's handwriting: "*Anolis purpurescens*." A caudal vertebra teased from its broken tail showed that it belonged to the alpha section of the genus, yet the scale counts routinely taken on *Anolis* specimens were disturbingly similar to those of *A. apollinaris*. The latter, however, was not only believed to be a beta anole, but, in the Munich series I had studied in 1970, five of the six were females, and they had shown at most a vestigial gular fold and not a dewlap.

The absence of transverse processes on the caudal vertebrae of the Yarumal female and in *A. apollinaris* was verified by X-ray. The two specimens from Antioquia attributed to *A. apollinaris* in 1970 were re-examined: MLS 81, recatalogued as MLS 926, a female, and AMNH 38725, a male. Marco Antonio Serna provided three additional specimens from Urrao, Antioquia, all males, from the Colegio San José collection.

For comparison with the specimens from Antioquia, new material of verified *A. apollinaris* has been required. Ten specimens

collected by Juan Manuel Renjifo at Sasaima, Cundinamarca (INDERENA 2853-62) and two collected by José Vicente Rueda at Charalá, Santander (ICN 2865, 6017—a new record) have been available, as well as additional Cundinamarca specimens from the Museum of Comparative Zoology (MCZ) and the Instituto de Ciencias Naturales (ICN) in Bogotá. These comparisons fully established the distinctness of the Antioquian population, which may now be formally described as a new species to be named in honor of Hermano Daniel Gonzalez, now Director of the Museo de Historia Natural at the Instituto de La Salle, Bogotá, in recognition of his 37 years of association with the Colegio San José in Medellín, Antioquia:

Anolis danieli, new species

Holotype. ICN 5997 (formerly CSJ 111), adult male.

Type Locality. Urrao, Antioquia, Colombia. Collector and date of collection unknown.

Paratypes. Antioquia, Puerto Antioquia, Baja Rio Cauca: MLS 926, Hno. Ignacio Saza coll., January 1963. Sabanalarga: AMNH 38725, Hno. Niceforo Maria coll., no date. Urrao: MCZ 164894 (formerly CSJ 278), Marco A. Serna coll., 28 May 1972; CSJ 441, M. A. Serna and H. Echeverri coll., 23 March 1983; CSJ 720, M. A. Serna and H. Echeverri coll., 26 July 1985. Yarumal: ICN 5998 (formerly CSJ 168), collector and date of collection unknown.

Referred Specimen. "Western Colombia:" AMNH 4844, collector and date of collection unknown.

Diagnosis. A species very close to *A. apollinaris* but differing in the presence of a moderately large dewlap in the female (rather than a mere longitudinal fold indicating the position of such a structure), and in the possession of a differentiated anterior nasal (rather than a circumnasal separated from the rostral by a post-rostral). Also, by having the keels in the frontal depression with keels oriented anteroposteriorly (rather than keels radiating from the center of the depression); by having a distinct parietal depression usually bounded by ridges (rather than a shallow depression never distinctly set off from the occiput); and by having the scales anterior and anterolateral to the interparietal subequal in size to those posterior to it, *except* for the scale row that abuts on the

semicircles, which is abruptly larger (rather than *all* scales anterior and anterolateral to the interparietal markedly larger than those posterior to it).

Description. Head. Head scales moderate to small, rugose or obtusely to strongly keeled. Eight to 12 scales across the snout between the second canthals. A moderate frontal depression, the scales within it slightly smaller than the surrounding scales and with keels oriented anteroposteriorly (flat in MLS 926). Five to 8 scales border the rostral posteriorly. An anterior nasal scale differentiated (in ICN 5998, on one side, divided into upper and lower portions), in contact with the sulcus between rostral and first supralabial. About 7–8 scales between the supranasals dorsally.

Supraorbital semicircles separated by 3 scales, the middle one smallest, or (in AMNH 38725 and MLS 926) separated by 4 scales equal in size. Supraocular disk ill-defined but the medial scales longer and bluntly keeled, in contact with the supraorbitals or separated by one row of small scales. About 7 scales across the supraocular area between the supraorbitals and superciliaries. One to 3 elongate superciliaries anteriorly, flanked medially by moderately enlarged polygonal scales and continued posteriorly by granules. About 5–6 rather narrow canthal scales, the second largest, decreasing regularly in size forward. Five to 7 loreal rows, subequal or irregular in size.

Temporal scales granular. An indistinct double line of slightly enlarged intertemporal scales. Supratemporals increasing in size laterally toward the margins of the parietal depression. Interparietal round, slightly to much smaller than ear (indistinct or absent in MCZ 164894 and AMNH 4844). Two to 5 scales on each side between interparietal and semicircles. Three to 5 rows of scales behind interparietal larger than nape scales.

Suboculars separated from supralabials by 1 scale row or narrowly in contact. Seven to 9 supralabials to below the center of the eye.

Mental divided or nearly so, each half about as wide as long. Five to 8 scales behind the mental and between the infralabials. Two of these may be differentiated sublabials; if differentiated, as many as six moderately enlarged scales in sequence with the sublabials may be in contact with the infralabials. Central throat

scales small, swollen, smooth or obtusely keeled, becoming gradually larger adjacent to the infralabials.

Dewlap. Large in male, extending onto first third of belly, nearly as large in female, extending past axilla. With crowded scale rows in both sexes, and scales on the skin between the rows; lateral scales irregular and weakly keeled in males, flatter and more regular in females; edge scales larger than ventrals and bluntly keeled in males, smooth and subequal to ventrals in females.

Trunk. Middorsals distinctly keeled, 0 to 4 rows slightly enlarged. Flank scales bluntly conical or pyramidal, separated, with each scale conspicuously surrounded by minute granules. Ventrals larger, squarish, subimbricate, smooth or slightly keeled.

Limbs. Upper arm scales swollen, unicarinate or smooth, surrounded by minute granules like the trunk scales. Lower arm scales more crowded, sometimes larger, imbricate and multicarinate. Thigh scales crowded, swollen, imbricate, unicarinate anteriorly, small, subconical, separated posteriorly. Tibial scales larger anteriorly, distinctly or weakly unicarinate, separated, posteriorly smooth, subimbricate. Supradigitals of hand and foot multicarinate. Twenty-three to 27 lamellae under phalanges ii and iii of fourth toe, pad rather narrow.

Tail. Long, about $3 \times$ snout-vent length, slender, slightly compressed, fragile, but breaks apparently not across vertebrae.

Size. The largest specimen of the type series is the male holotype (SVL 117 mm, tail length 331 mm). AMNH 4844 is a larger specimen (SVL 125 mm) but has not been made a paratype because it has an obscure dorsal pattern of broad transverse bands not seen in the type material and has only the inexact locality "western Colombia." The largest female, from Ur Rao, like the holotype, has an SVL of 104 mm. *A. apollinaris* may be a slightly smaller species. The largest male (INDERENA 2856) has an SVL of 112 mm, the largest female (MCZ 156308) 94 mm.

Color in Life. For most of the few specimens of *A. danieli* there is no data on color in life. The best information (translated) has been provided by Marco Antonio Serna for CSJ 820, a male:

Back completely green with a few elongate spots of even brighter green dorsolaterally. A broad yellowish band extends from behind the eye to the dorsal crest, and a second band

of similar color extends from behind the ear to a more posterior position on the dorsal crest. A yellowish white band above the forelegs. Pale yellow around the eye. Gular region yellowish green. Dewlap yellow with whitish scales. All the belly greenish yellow with a little blue ventrolaterally. Tail green with blackish bars. Palms of fore and hind feet whitish. Fore and hind legs green with barely perceptible bars of slightly darker green. At least twice during its life in captivity the animal changed to brown. When killed, it immediately began to change to rust brown.

This description may be compared with three descriptions of color in life for *A. apollinaris* that I have been able to obtain. W. W. Lamar reports for a female specimen from Sasaima, Cundinamarca:

Top of head yellow green. Eyelids bright saffron yellow. A broad tan stripe continuous from neck to well down on tail where it is replaced by black bars. Side of head behind eye blue green to intense green. A pale greenish white line across upper labials to ear. Dewlap rather small and yellow green. Venter bluish green becoming more so distal to hind limb. A few poorly developed ocelli on sides of body.

Stephen Ayala, reporting on animals from the same general locality, gives the following details:

Anolis apollinaris is a green lizard, with a prominent white line or zone under the eye between the snout and the sides of the neck. The green changes to dark brown in less than half a minute. Small white spots or thin diagonal lines may be seen on the sides of the female, and some females have a broad tan vertebral stripe covering the entire back and tail. Light brown, saddle-shaped spots or bands may appear across the back of the male (especially in the dark phase) and small or large blue or reddish spots occur on the shoulders or sides of the neck. The eyelids stand out because of their contrasting color: yellow in female and yellow orange in the male. The dewlap of the male is pale yellow green, with rows of green scales (brown scales in the dark phase).

For the animals from Charalá, Santander, a description by José Vicente Rueda is available (translated):

Dorsally head and body *senf. green* (olive green), edge of supraorbital semicircles and postparietals black. Middorsal body spot chestnut. Irregular symmetrical spots black with a bluish cast above the insertion of the forelegs. Symmetrical and irregular brown spots on the base of the hind legs. Tail with well-spaced transverse black bands. Sides: a white band extending from posterior supralabials to shoulder. Eyelids burnt yellow (rust yellow). Ventrally mental, gular, dewlap, chest and forelegs yellowish green. Belly, tail and hind legs chartreuse (cream yellow).

It is clear from these and other descriptions and slides that both species change color readily and show different elements of the pattern at different times. Both are predominantly green anoles, and it may not be easy to distinguish them on color alone.

Color in Preservation. Most of the few preserved *A. danieli* are dull dark gray-blue, lighter below, with obscure traces of cross bars middorsally and of light lines on the nape. The Yarumal female is a faded brown. Only AMNH 38725, the male from Sabanalarga, shows any distinctive pattern (well-depicted in Fig. 5). This specimen has mottled blue on the flanks, with the nuchal crest black, with faint and narrow yellowish cross streaks. The head is more brownish, mottled, the light patch on the labials whitish and the streak continuing it above the ear suffused with blue. The wider black streak parallel to this contains whitish spots as does the similar black streak in front of the shoulder. Between the two black streaks is an area that is grayish anteriorly, grading into a general darker coloration posteriorly. The posterior body, limbs and tail are essentially patternless, the tail more olive than blue. In general terms, but not in detail, this animal matches rather well the description of the color in life of CSJ 720 above.

A rather similar but distinguishably different head and nape coloration is seen in the most patterned of the preserved *A. apollinaris* that I have examined (ICN 2865, Fig. 6).

A. apollinaris, although the body patterns may often be somewhat obscure, shows even in preservative the patterns mentioned

by Ayala: the saddle markings of males, the broad dorsal stripe, the small white spots ("ocelli" of Lamar) or thin diagonal lines of females. No such patterns have been seen in *A. danieli*. Even AMNH 38725—the most patterned of the small type series—shows no comparable patterns.

A. apollinaris, however, is now relatively well known, both in life and as museum specimens. *A. danieli*, as here described from only eight specimens, is still very inadequately understood. The relative absence of body pattern in *A. danieli* must for the present remain a poorly supported conclusion. AMNH 4844, which I have excluded from the type series and which has very imprecise locality, does show obscure broad banding.

In the Parque de Las Orquideas, the borders of which are only 15 km from Ur Rao, a population that in most respects is closely similar to *A. danieli* but is boldly patterned is known from a series of 5 specimens. It is, however, restricted to shaded forest. The body pattern, uniform in all specimens, of broad dark cross bands enclosing small light spots is quite unlike that of the most patterned known *A. danieli*, and the animals seem to have a slighter slenderer body build. I have provisionally excluded this series from the hypodigm of *A. danieli* as a distinct, though obviously sibling, species.

Ecology. Almost nothing is known of the ecology of *A. danieli*. CSJ 720 is reported from a garden within the city limits of Ur Rao, 1,850 m elevation. AMNH 38725 may be from a somewhat lower elevation (Sabanalarga, 1,250 m), while ICN 5998 from Yarumal is presumably higher (Yarumal, 2,265 m). Only MLS 996 from Puerto Antioquia may not be montane; Caceres near Puerto Antioquia is given as 85 m elevation, but sites above 1,000 m are relatively close by. Lack of precision in the older locality records makes any comment on altitudinal range at best tentative.

If *A. danieli* is like other members of the *latifrons* group, it should occur at low to moderate heights on large trees but not in canopy. *A. danieli*'s sibling, *A. apollinaris*, is known to behave in this fashion (observations by Juan Manuel Renjifo and student). *A. danieli*'s occurrence in gardens indicates that it is not restricted to shaded forest, and *A. apollinaris* similarly occurs in rather open situations (J. M. Renjifo, personal observation). Stephen Ayala also reports that he has seen *A. apollinaris* in guava and several

other trees in rural household "gardens" in areas of low forest in Cundinamarca, usually on the vertical trunks.

Distribution. *A. danieli* occurs in the northern regions of both the Western and Central Cordilleras in Antioquia. So far as is known, it is endemic to the Río Cauca drainage, extending from Puerto Antioquia and Yarumal in the north, to Sabanalarga and Urrao in the south; perhaps over a considerable range of elevations, but rather clearly montane. It is apparently replaced in the Western Cordillera in the Parque Nacional Natural "Las Orquideas" by the unnamed and more boldly patterned sibling mentioned above. To the east and southeast, it is represented by the species with which I previously confused it, *A. apollinaris*.

One juvenile but unmistakable *A. apollinaris* (CSJ 435) is known from El Retiro, 23 km southeast of Medellín in Antioquia. It is a female without a dewlap, with the anterior nasal separated by one scale from the rostral, and with the keels of the scales in the frontal depression radiating from the center. It has a distinctive pattern of diamond-shaped light rhombs on the middle of the back that matches perfectly the dorsal pattern of a juvenile *A. apollinaris* (MCZ 46422) from La Mesa, Cundinamarca.

The El Retiro specimen implies a close approach of these two closely related species, so similar structurally and not separated by any obvious physiographic or ecological barriers. What happens in the potential range of contact or overlap remains an open question.

Comparisons. Most of the characters of the species of the *latifrons* species group as I now understand it are summarized in Tables 1–3. I have added to the species in the group as listed by Savage and Talbot (1978) not only *A. apollinaris* (removed from the *biporcatus* species group of Williams 1970, 1976) but also *A. propinquus* Williams, 1984, described from a hatchling and in the description erroneously referred to the *punctatus* species group.

A. apollinaris, *A. danieli* and the still unnamed *danieli* sibling from the Parque Las Orquideas, along with *A. propinquus*, appear to constitute a distinct subgroup within the *latifrons* species group defined by distinctly keeled head scales, relatively short limbs, and a green ground color.

A. propinquus, on re-examination, seems clearly to belong here. Its size as a hatchling (41 mm SVL) implies a giant adult, and the lamellae number implies the same and fits well with counts found in the *latifrons* group. It lacks an interparietal—and this initially seemed significant—but absence of an interparietal occurs also, as an individual variation, in *A. danieli* (AMNH 4844; the interparietal is indistinct also in MCZ 164894) and in the Parque Las Orquideas sibling. Its dewlap or gular region was described in the field as “blue.” From Lago Calima, Valle, it is geographically distant from other members of this subgroup. The radiating keels of the scales of the frontal depression and the nasal separated by one scale from the rostral suggest a closer relationship to *A. apollinaris* than to *A. danieli*. This unique specimen and the Parque Las Orquideas sibling indicate that there may be still further surprises within the *latifrons* group.

A. frenatus, *A. purpurescens*, *A. latifrons*, *A. princeps*, and *A. squamulatus* form a second subgroup. These species are relatively long-legged and share with *A. apollinaris* and *A. danieli* the character of green background coloration, but always have a dorsal pattern of oblique bands or rows of spots, sometimes also an ocellus in front of the shoulder. Despite considerable morphological variation in some features (most impressively in the swollen superciliaries of typical *A. latifrons*), this is a tight knit subgroup, in which, in fact, the separate species status of some nominal species—*A. purpurescens* and *A. princeps*—is still unconfirmed. (For this reason the latter species—cited by Savage and Talbot, 1978—were not mentioned in Williams 1976.)

A. fraseri is distinctive in head squamation—smooth head scales, the superciliaries squarish and flat, the suboculars always in contact with the supralabials. Its color—dark olive brown and green—is unlike that of any other species. It is short-legged like *A. danieli* and *A. apollinaris*, but it has more characters in common with the two Central American *latifrons* group endemics, *A. insignis* and *A. microtus* (not only short legs, but smooth head scales and suboculars in contact with supralabials and background coloration not green), and it is best grouped with these.

A. insignis and *A. microtus* may be, as Savage and Talbot (1978) suggest, relatives, but they are amply distinct from one another

and, perhaps, end points of a former Central American radiation. *A. microtus* is the one *latifrons* group species, thus far described, that consistently lacks an interparietal scale.

ACKNOWLEDGMENTS

I am indebted to M. A. Serna and H. Echeverri for providing the newer specimens of *A. danieli*, to Dr. Charles Myers and to Dr. George Zug for the privilege of examining the specimens under their care, and to Dr. Pedro Ruiz and to Juan Renjifo for loan of comparative material of *A. apollinaris*. Dr. Stephen Ayala sent me the female from Yarumal that was the stimulus for the present investigation and has given much assistance and many essential comments. He has also generously donated the map that is here published as Figure 7. Laszlo Meszoely drew Figures 1–6.

LITERATURE CITED

- BOULENGER, G. A. 1885. Catalogue of the lizards in the British Museum (Natural History), 2: ix + 497 pp. London British Museum (Natural History).
- . 1919. Descriptions of two new lizards and a new frog from the Andes of Colombia. Proceedings of the Zoological Society of London, 1919: 79–81.
- BURT, C. E., AND M. D. BURT. 1931. South American lizards in the collection of the American Museum of Natural History. Bulletin American Museum of Natural History, 61: 227–395.
- DUNN, E. R. 1937. The giant mainland anoles. Proceedings New England Zoological Club, 16: 5–9.
- . 1944. Herpetology of the Bogotá area. Revista, Academia Colombiana de Ciencias Exactas, Fisicas y Naturales, 6: 68–81.
- ETHERIDGE, R. 1960. The relationships of the anoles (Reptilia: Sauria: Iguanidae), an interpretation based on skeletal morphology. Doctoral Dissertation, University of Michigan. University Microfilms International, Ann Arbor. 236 pp.
- SAVAGE, J. M., AND J. J. TALBOT. 1978. The giant anoline lizards of Costa Rica and western Panama. Copeia, 1978: 480–492.
- WILLIAMS, E. E. 1966. South American anoles: *Anolis biporcatus* and *Anolis fraseri* compared. Breviora Museum of Comparative Zoology, No. 239: 1–14.
- . 1970. South American anoles: *Anolis apollinaris* Boulenger, 1919, a relative of *A. biporcatus* Wiegmann (Sauria, Iguanidae). Breviora Museum of Comparative Zoology, No. 358: 1–11.
- . 1972. The origin of faunas: Evolution of lizard congeners in a complex island fauna—a trial analysis. Evolutionary Biology, 6: 47–89.
- . 1976. South American anoles: The species groups. Papeis Avulsos de Zoologia, São Paulo, 29: 259–268.

- . 1983. Ecomorphs, faunas, island size and diverse end points in island radiations of *Anolis*, pp. 326–370, 481–483. In R. Huey *et al.* (eds.), *Lizard Ecology: Studies of a Model Organism*. Cambridge, Harvard University Press.
- . 1984. New or problematic *Anolis* from Colombia II. *Anolis propinquus*, another new species from the cloud forest of Western Colombia. *Brevoria Museum of Comparative Zoology*, No. 477: 1–7.

Table 1. *Latrifrons* group anoles with short legs and green bodies.

	<i>apollinaris</i>	<i>danieli</i>	<i>propinquus</i>
Head scales	keeled	keeled	keeled
Number between second canthals	8-12	8-12	12
Scales in frontal depression	with keels radiating from the center	with keels oriented anteroposteriorly	with keels radiating from center
Circumnasal/rostral	circumnasal or anterior nasal separated from rostral by one scale	anterior nasal in contact with sulcus between first supralabial and rostral	anterior nasal separated from rostral by one scale
Scales between supraorbital semicircles	2-4	3-4	3
Superciliaries	one very elongate scale followed by one or two shorter and these by subgranular series	one very elongate scale followed by two shorter and these by smaller conical scales	one extremely elongate scale ($\frac{1}{2}$ supraciliary) margin followed by granules
Ear	small	small	small
Loreal rows	5-7	5-7	7
Interparietal	small	small	not differentiated
Scales in parietal depression	large and rugose anterior to interparietal, smaller behind it	convex, weakly keeled or rugose, largest next supraorbitals, slightly smaller behind interparietal	small, subequal, weakly keeled
Scales between interparietal and semicircles	2-4	2-5	no interparietal
Scales between suboculars and supralabials	0-1	0-1	1

Table 1. Continued.

	<i>apollinaris</i>	<i>danieli</i>	<i>propinquus</i>
Supralabials to below center of eye	7-8	7-9	7
Trunk scales	swollen, keeled with inter-spersed granules; middorsals slightly enlarged or 2 rows distinctly so	swollen, keeled or pyramidal, <i>sur-rounded</i> by granules; 2-4 mid-dorsal rows enlarged	granular, convex, subequal
Ventrals	smooth or keeled, juxtaposed to imbricate	smooth, subimbricate to imbricate	smooth, juxtaposed or sub-imbricate
Femoral scales	unicarinate, multicarinate near knee	unicarinate, multicarinate at knee	
4th toe lamellae	23-29	23-27	25
Dewlap	in male only	large in male and female; smaller in female	hatchling; no female known
Dewlap scales	densely scaled, scales bluntly keeled	densely scaled, keeled	scales crowded but a series of raised rows each two scales wide
Postanal scales	present in males, sometimes obscure; absent in females		
Scales posterior to vent	smooth or keeled	keeled	keeled
Tail crest	never present in any species		
Tail SVL	ca. 3x	ca. 3x	ca. 2x
Maximum SVL	♂ 112	♂ 117	unique type, a hatchling
	♀ 94	♀ 104	

Table 2. *Latifrons* group anoles with long legs and green bodies.

	<i>frenatus</i>	<i>purpurescens</i>	<i>squamulatus</i>	<i>latifrons</i>	<i>princeps</i>
Head scales	smooth or weakly keeled or rugose 9-15	nearly smooth	keeled	smooth, wrinkled or tuberculate 11-15	keeled 12-17
Number between second canthals		17	11-15		
Scales in frontal depression	rugose, tubercular or keeled, keels without definite orientation	smooth	with keels anteriorly oriented	wrinkled or tuberculate rather than keeled	nearly smooth
Circumnasal/rostral	circumnasal or anterior nasal separated from rostral by one scale	circumnasal separated from rostral by two scales	anterior nasal (sometimes divided) in contact with rostral	anterior nasal separated from rostral by one scale or (rarely) in contact	circumnasal or anterior nasal separated from rostral by one or two scales 2-6
Scales between supraorbital semicircles	2-5	2	3-5	3-5	
Superciliaries	one very elongate scale followed by one shorter and this by subgranular series	one to two elongate scales followed by subgranular series	ca. four relatively short scales followed by subgranular series	swollen, rugose, boundaries indistinct, but anterior most sometimes longer than wide but still short	one very elongate scale followed by subgranular scales

Table 2. Continued.

	<i>frenatus</i>	<i>purpurescens</i>	<i>squamulatus</i>	<i>latifrons</i>	<i>princeps</i>
Ear	large	moderate	large	large	large
Loreal rows	7-10	9	8-12	6-10	7-11
Interparietal	moderate	moderate/small	small	moderate	moderate
Scales in parietal depression	convex or tubercular, rather small all around interparietal	flat, nearly smooth, larger anterior to interparietal than behind it	convex, rugose, largest near surrounding ridges	flat, rugose, rather small all around interparietal	flat, nearly smooth, rather small all around interparietal
Scales between interparietal and semicircles	3-6	4	4-8	4-7	3-7
Scales between suboculars and supralabials	0-1	0	1	0-2	0-2
Supralabials to below center of eye	8-10	9	6-11	8-10	9-12
Trunk scales	keeled, subimbricate or juxtaposed, no enlarged middorsal rows	not swollen nor keeled, two middorsal rows slightly enlarged	swollen, keeled, juxtaposed with frequent interpersed granules	swollen, keeled or tuberculate, juxtaposed, middorsals not or slightly enlarged	swollen, keeled, juxtaposed, middorsals not enlarged

Table 2. Continued.

	<i>frenatus</i>	<i>purpurescens</i>	<i>squamulatus</i>	<i>latifrons</i>	<i>princeps</i>
Ventrals	smooth, juxtaposed to imbricate	smooth, juxtaposed	smooth or very weakly keeled, juxtaposed to imbricate	smooth, juxtaposed or subimbricate	smooth, juxtaposed to imbricate
Femoral scales	unicarinate, multicarinate at knee	—	unicarinate, multicarinate at knee	unicarinate, multicarinate at knee	unicarinate, multicarinate at knee
4th toe lamellae	22-28	22	22-27	21-26	22-25
Dewlap	large in males, poorly developed in females	unique type			large in both sexes
Dewlap scales	weakly scaled in crowded rows one scale wide	scales in rows 3 to 5 scales wide present in males, sometimes obscure, absent in females	in widely spaced rows each 3-4 scales wide keeled	weakly scaled, scales not in distinct rows	weakly scaled, in rows 1-2 scales across
Postanal scales	smooth	smooth		smooth	smooth
Scales posterior to vent	more than 2 ×		more than 2 ×	more than 2 ×	ca. 2 ×
Tail SVL	♂ 137 mm ♀ 121 mm	juvenile	♂ 125 mm	♂ 124 mm ♀ 97 mm	♂ 121 mm ♀ 108 mm
Maximum SVL					

Table 3. *Latifrons* group anoles with short legs and not green.

	<i>fraseri</i>	<i>insignis</i>	<i>microtus</i>
Head scales	smooth	smooth	smooth
Number between second canthals	6-10	7-12	7-9
Scales in frontal depression	smooth	smooth	smooth
Circumnasal/rostral	circumnasal or anterior nasal separated from rostral by one or two scales	circumnasal or anterior nasal separated from rostral by one or two scales	circumnasal separated from rostral by one scale
Scales between supraorbital semicircles	2-4	2-6	2
Superciliaries	no very elongate scale, the anteriormost scale short but longer than wide and followed by a double series of smooth series of smooth <i>squarish</i> scales	3 <i>short scales longer than wide followed by a series of smaller flat scales, irregular in size</i>	one scale longer than wide followed by smaller smooth or subgranular scales
Ear	moderate	moderate	moderate
Loreal rows	5-9	5-8	3-5
Interparietal	moderate	moderate	not differentiated
Scales in parietal depression	flat, smooth, large all around interparietal	flat, smooth all around interparietal	flat, smooth, moderately large all around interparietal
Scales between interparietal and semicircles	2-5	2-5	no interparietal
Scales between suboculars and supralabials	0	0	0
Supralabials to below center of eye	6-9	7-12	7-9

Table 3. Continued.

	<i>fraseri</i>	<i>insignis</i>	<i>microtus</i>
Trunk scales	smooth with interspersed granules, none or two middorsal rows enlarged	smooth, juxtaposed one to 3 middorsal rows enlarged	smooth or slightly rugose; flank scales rhomboidal; flat, middorsal scales elongate, rather irregular in shape
Ventrals	smooth or keeled, juxtaposed to imbricate	smooth, juxtaposed to subimbricate	smooth, juxtaposed or imbricate
Femoral scales	unicarinate, multicarinate at knee	smooth	wrinkled, not keeled
4th toe lamellae	18-24	23-27	20-22
Dewlap	large in both sexes	large in both sexes	large in both sexes
Dewlap scales	small, smooth	densely scaled, scales small, very weakly keeled	very weakly and densely scaled
Postanal scales	present in males, sometimes obscure, absent in females		
Scales posterior to vent	keeled	smooth	smooth
Tail crest	never present in any species		
Tail SVL	ca. 2×	ca. 2×	ca. 2×
Maximum SVL	♂ 116	♂ 153	♂ 111
	♀ 102	♀ 135	♀ 104

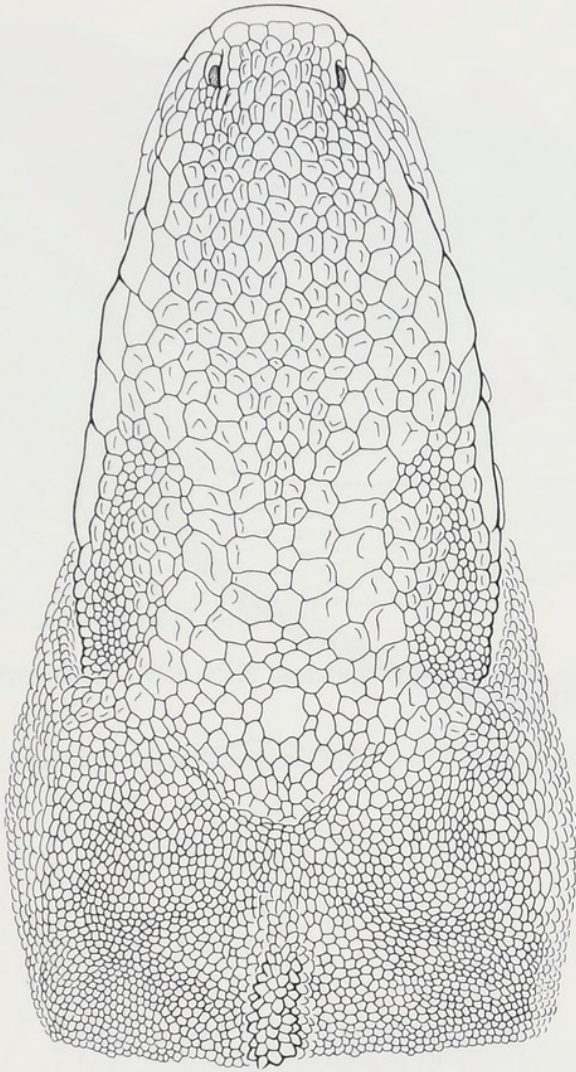


Figure 1. *Anolis danieli*, new species, ICN 5997 (holotype). Dorsal view of head.

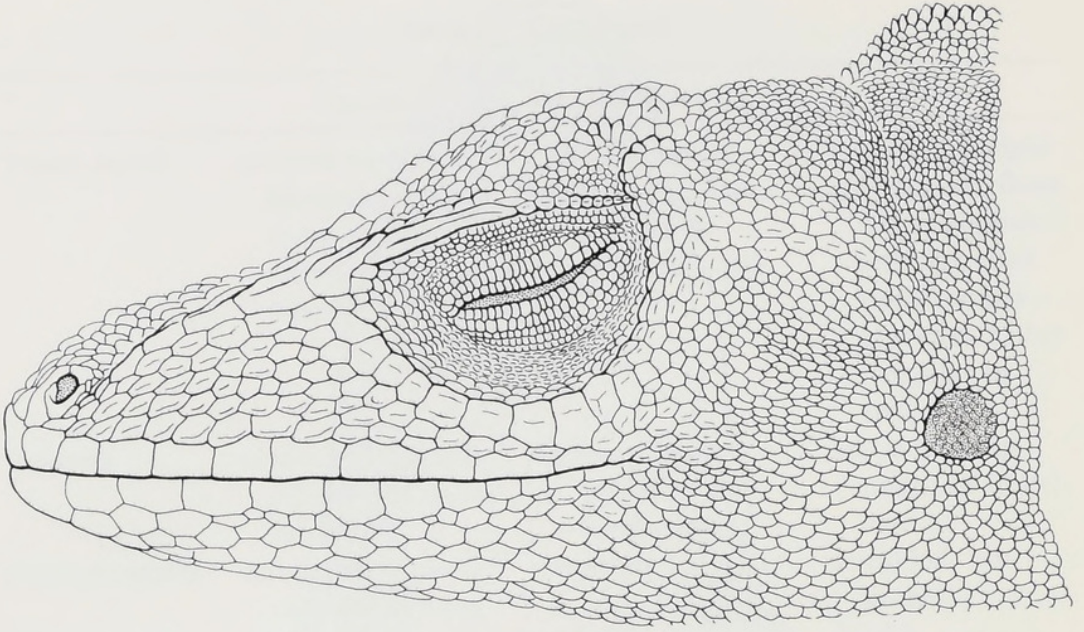


Figure 2. *Anolis danieli*, new species, ICN 5997 (holotype). Lateral view of head.

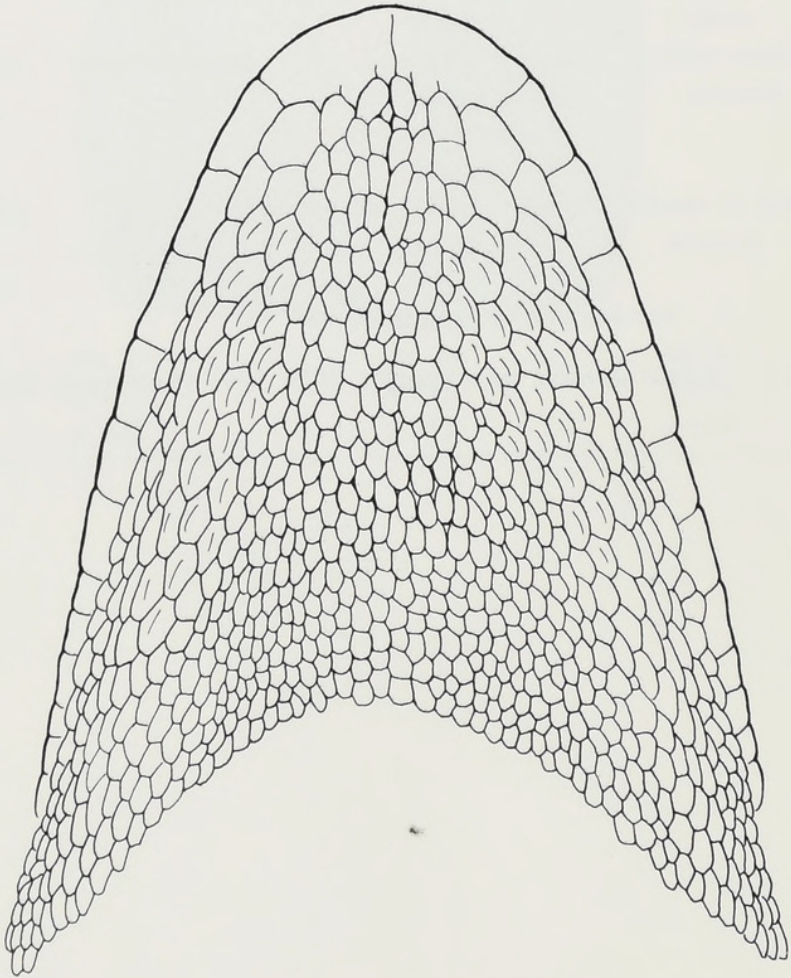


Figure 3. *Anolis danieli*, new species, ICN 5997 (holotype). Ventral view of head.

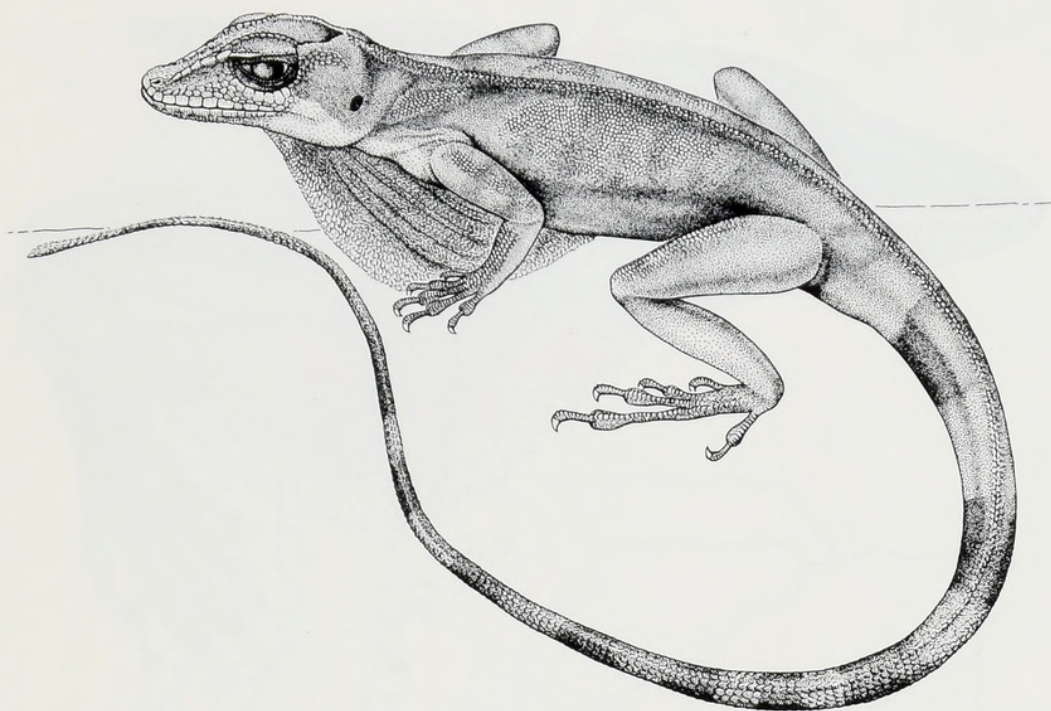


Figure 4. *Anolis danieli*, new species, ICN 5997 (holotype). Lateral view of whole animal.

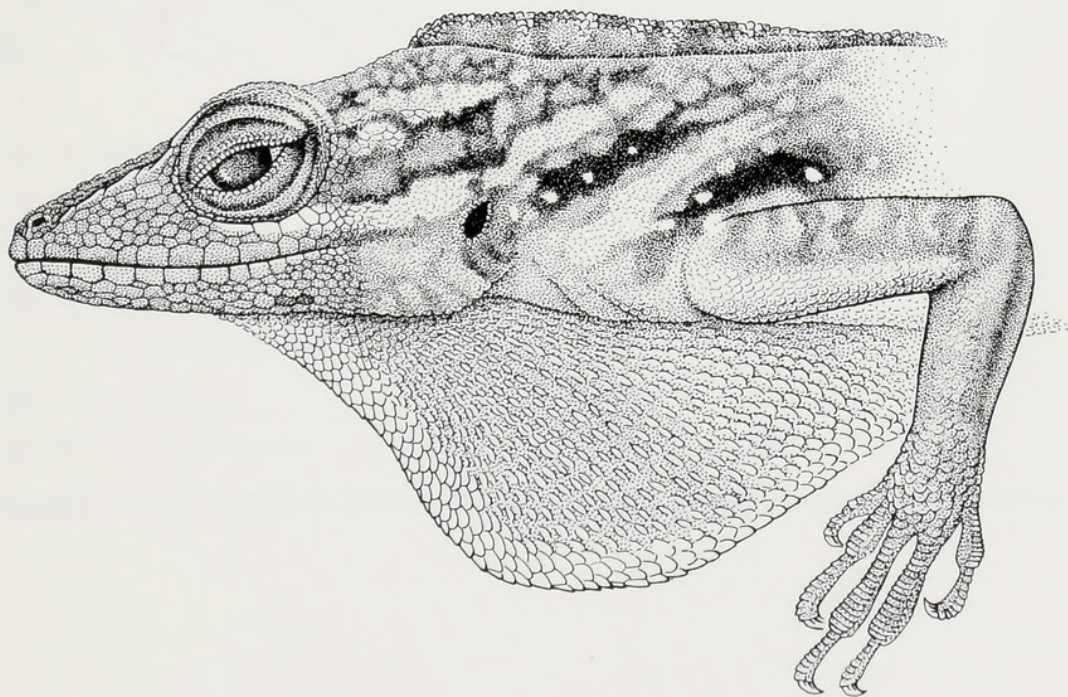


Figure 5. *Anolis danieli*, new species, AMNH 38725. The most distinct pattern seen in the type series.

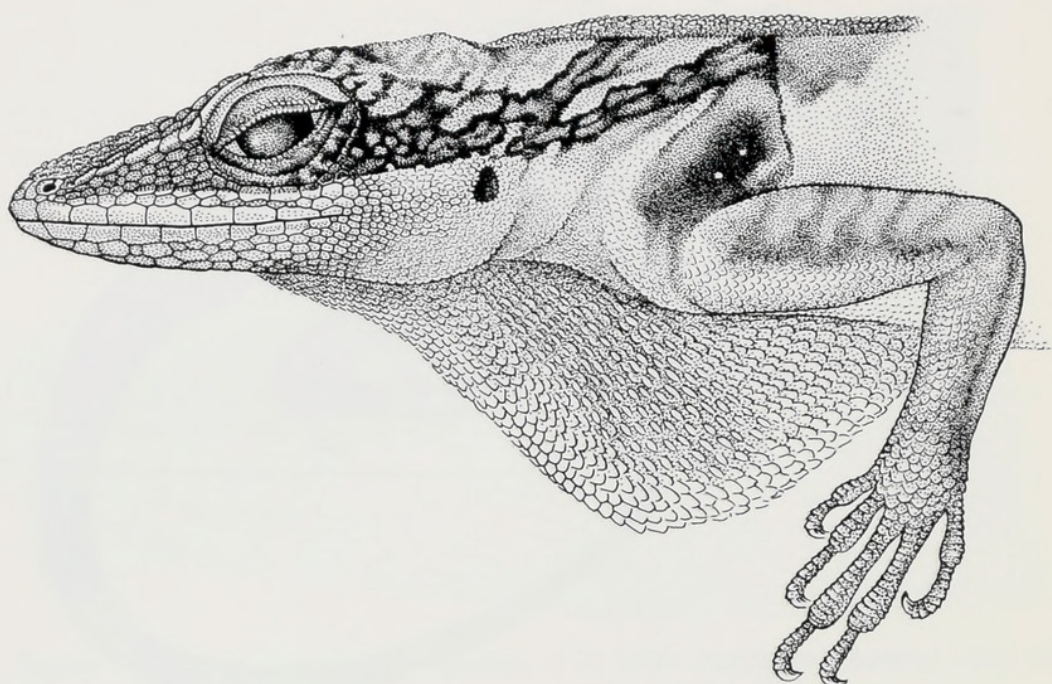


Figure 6. *Anolis apollinaris*, ICN 2865. The most distinct pattern seen in the specimens of this species examined.

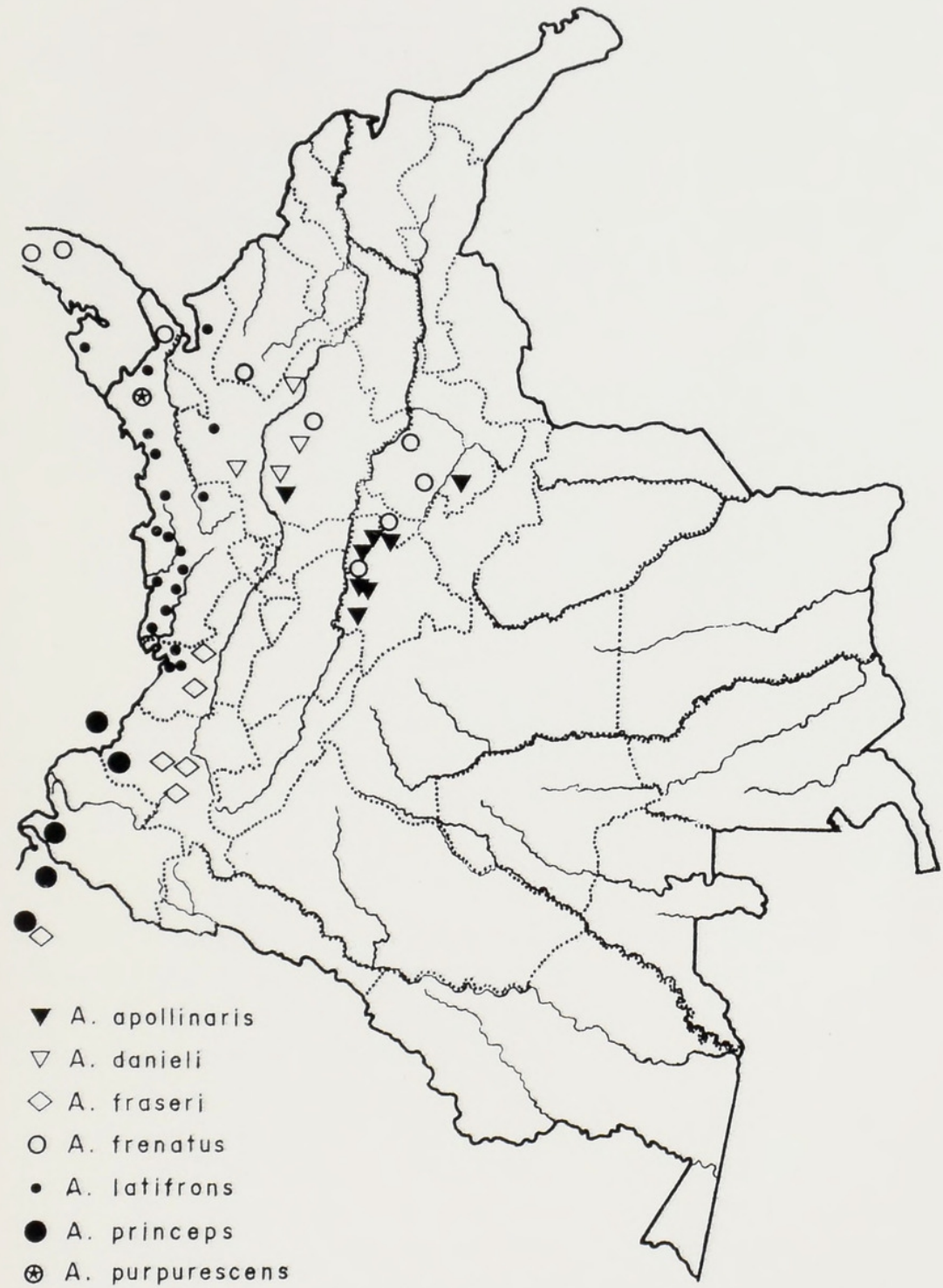


Figure 7. Map of distribution of the *Anolis latifrons* species group in Colombia.



Williams, Ernest E. 1988. "New or problematic *Anolis* from Colombia. V. *Anolis danieli*, a new species of the *Latifrons* species group and a reassessment of *Anolis apollinaris* Boulenger, 1919." *Breviora* 489, 1–25.

View This Item Online: <https://www.biodiversitylibrary.org/item/202453>

Permalink: <https://www.biodiversitylibrary.org/partpdf/6014>

Holding Institution

Harvard University, Museum of Comparative Zoology, Ernst Mayr Library

Sponsored by

Harvard University, Museum of Comparative Zoology, Ernst Mayr Library

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/4.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.