FIVE NEW SPECIES OF ATELOPUS FROM COLOMBIA, WITH NOTES ON OTHER FORMS FROM COLOMBIA AND ECUADOR

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THE MAIN purpose of the paper is to publish the description of five new members of the genus *Atelopus*. Incidental to this, however, I encountered a number of problematical descriptions, and a few words are presented regarding these forms. The author frankly admits that the investigation and consultation undergone have not been as extensive and conclusive as might be desired. Actually, the opinions concerning these additional species are included more with the intention of bringing the problems to light. than with the pretense of solving them.

It is impossible to deal with Colombian frogs without also considering those of Ecuador, and to a lesser but not insignificant extent those of Panamá and Venezuela. The Colombian Llanos extend east well into Venezuela and the same can be said of the Amazonian Region, while in the north, the tropical forests of the Pacific coast of Colombia and those of the Cauca-Magdalena valleys extend into Panamá as far north as Rio Tuyra.

In Ecuador, the Andean system is composed of only one range, with one Pacific and one Atlantic slope. But shortly after crossing the Colombian horder the range divides into three branches each one of which is separated from the other by a valley which descends into tropical areas. The Magdalena valley lies between the Eastern and Central Andes and the Cauca valley between the Western and Central Andes. These valleys are usually not less than 20 miles in width but the Cauca narrows near Antioquia to the width of the Cauca River, from whose banks the Central and Western Andes arise, It is only at this point where the central and occidental cordilleras approach each other, and nowhere do the upper life zones (Subtropical, Temperate and Páramo) meet. The central and western ranges terminate in northern Colombia, and forms from the upper regions of these ranges do not find connection with the mountains of Panama. The Eastern Range, however, extends to Venezuela, where a depression at Táchira interrupts the continuity of the Páramo and Temperate Zones and cuts deep into the Subtropical.

There appear to be no passes in the Western Andes below 4,900 ft., and the summit of the range is usually in the Subtropic?] Zone. In the Central Range, however, there are many Páramo «islands», there are apparently no passes below 10,000 ft., and the summit is largely in the Temperate Zone. The same can be said of the Eastern Range,

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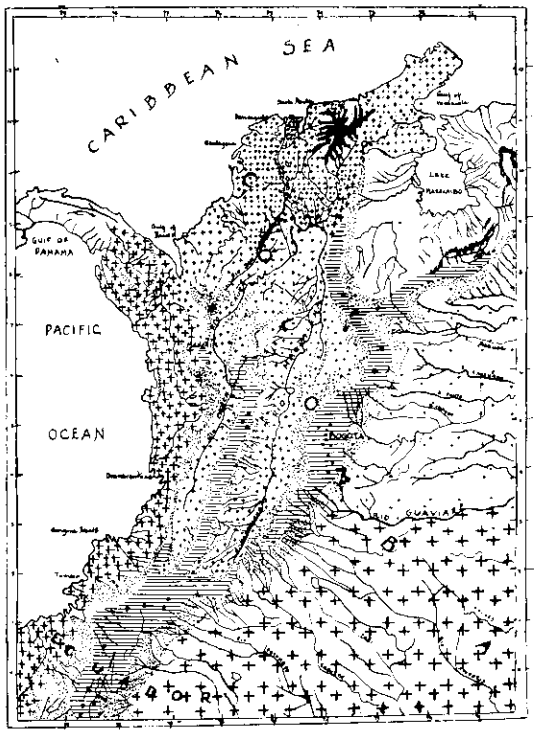


Life Zones and Faunas in Colombia (after Chapman, 1927).

Páramo Zone	black
Temperate Zone	cross hatched
Subtropical Zone	dotted
Tropical Zone	with crosses.
Pacific or Chocoan	med. size, crowded crosses.
Cauca-Magdalena	small, less crowdcd crosses.
Orinocan	minute scattcred crosses.
Amazonian	larger crosses.
Caribbean	dots and crosses.

but here there are passes at Andalucía between the upper Magdalena and the Caquetá region at an elevation of 7,000 ft., and other communications also exist along Paso de las Cruces and on the northernmost part of the range.

Another important range in Colombia is the Baudo-Panamanian mountains of the Pacific Coast, with their upper elevations of about 5,500 ft. (and thus subtropical at their summits) and said once to have been of higher elevation and more extensive, connecting the mountains of Panamá in the north with the Western Andes of Colombia in the south. The Baudo mountains formed the fourth Andean branch, and the subtropical fauna that they contain may have been continuous with the montane faunas of Panamá.

The Santa Marta Mountains have originated independently from the Andes and do not communicate with them at any point: their fauna constitutes an insular one, with characteristics of its own.

Forested, humid, tropical Colombia may be divided into several well isolated and well defined faunal areas: the Amazonian (bounded on the west by the Andes and on the north by the Llannos, but apparently extending north as a narrow strip of forest along the base of the Andes, to Venezuela): the Pacific Coast (bounded on the cast by the Andes, on the west by the sea, and on the south by the deserts of Ecuador, but open on the north): the lower Cauca-Magdalena (bounded on the north by the semi-desertic region south-west of Sta. Marta and on the east by Sierra de Perijá, but communicating on the west with the Pacific coast forests and with Panama); the Maracaibo Basin, the southwestern portion of which is in Colombia. and the Sta. Martan, which is surrounded (except on the north) by desertic or semi-desertic conditions.

The unforested tropical regions of Colombia include the Llanos, which are limited on the west and north by the Andes and on the south by Rio Guaviare: the Caribbean arid and semi-arid area, which in Colombia extends from Rio Sinú to Peninsula Goajira;
the Upper Cauca, which although not arid is mostly deforested and is limited on the north by the forests of the lower Cauca: and the Upper Magdalenian, which is separated from the latter by the Central Andes and from the Llanos by the Eastern Andes.

As established by Chapman (1917) the zonal boundaries or life zones in Colombia can be assigned to the following altitudes:

Tropical : sea level to 4.500-6.000 ft.
Subtropical: 4,500-6,000 to 9,000-9,500 ft
Temperate: 9,000-9,500 to 11,000-13,000 ft
Paramo: 11,000-13,000 to Snowline (15.000 ft.).

The Paramos form isolated islands or ridges on the two eastern branches of the An-

des, while the Temperate Zone may form forested or unforested tracts above the sub. tropics, or may occupy the summit of the mountains where these do not rise to near snow-line elevations. The Subtropical Zone is always heavily forested. It constitutes the cloud forest and is demarcated by the level of condensation.

In Ecuador, the Andean system is simpler than in Colombia forming a broad chain at the summit of which there is a Temperate Zone tableland that is (here and there) traversed by the high, crossed knots or «nudos» which connect the high peaks flanking the valleys. Quito, Cuenca, Riobamba and Latacunga are located in such interandine valleys.

The unforested areas of Ecuador include the Páramos, the arid portion of the Temperate Zone of the Andes, some of the interandine valleys, and the Pacific arid region, which starts on the coast at Bahía de Caraques and extends south into Perú. Bordering this region, however, a forested tract extends along the base of the Andes to the Peruvian border.

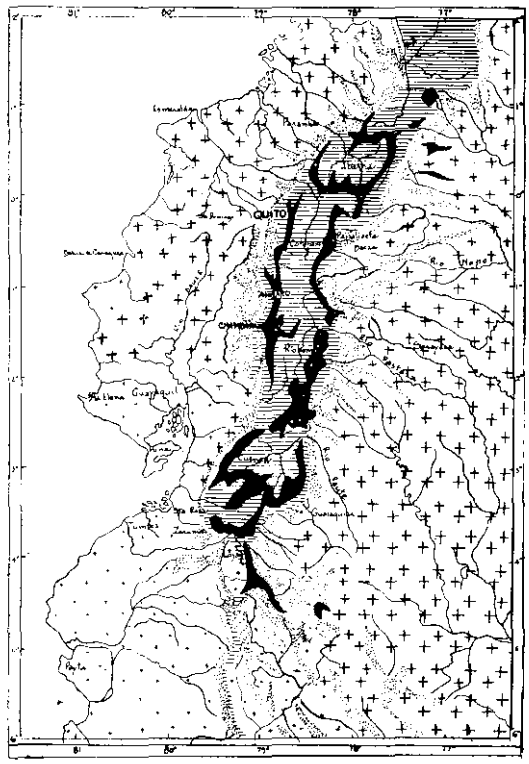
The arid region sends branches into the interior of southwestern Ecuador, at Tumbez. into the valley east of Zaruma and up the Catamayo to the valley between this range west of Loja and east of Punts Santa Aria, and also penetrates the Casanga Valley. These basins are thus arid-tropical instead of arid-temperate, as they are from here northward. The rest of Ecuador seems to be all heavily forested, except for the areas cleared for cultivation or those occupied by marshes or savannas. The life zones are said to be comparable to those of Colombia, but on the western part of the Andes, especially on the southern portion, the Tropical Zone only extends upward to about 2,000 ft.

With this physiographical knowledge, some expectations on the distribution of frogs may be advanced:

1. Many of the forms occurring in the Páramo «islands» of the Andean range, both in Colombia and Ecuador, will be found to be distinct and endemic to their respective Páramos. This may be the case of *A. ebenoides.*

2. Many of the forms occurring both in the Páramo and Temperate Zones, or only in the latter, will be found to occur continuously at corresponding elevations in both the Eastern and Central Andes, and south to convenient latitudes in Ecuador. The Eastern Andes may not have attained faunistically effective elevation until fairly recently. The passes of las Cruces and Andalucía, at 7,000 ft. or below in Colombia, may prevent some forms from passing over in recent times and a few may be broken into races or perhaps even into representative species None of these forms is likely to occur in CentraI America or in the Sta. Marta massif.

3. Many of the forms from the Temperate and Subtropical Zones may behave as the



Life Zones and Faunas in Ecuador
(after Chapman, 1926)

Páramo Zone	black
Temperate Zone	cross hatched
Subtropical Zone	dotted
Humid Tropical Zone	large crosses
Arid Tropical Zone	minute crosses

above, but they will not be interrupted in their distribution by any of the Andean depressions or passes occurring at elevations higher than about 4,500 ft.

4. Many forms from the Subtropical Zone of the Western Andes of Colombia (the Subtropical Zone occupies the summit of this range) will also occur on the western flank of the Central Andes, but are not likely to occur in the eastern flank of the Central Andes (as they may not be able to cross the temperate barrier), or in the Eastern Andes. In Ecuador, most of them will only occupy the western flank of the Andes.

As there is geologic and faunistic evidence to indicate that the Baudo Range was connected with the Western Andes in the south and the mountains of Panama in the north, some of these forms may be found at the Baudo mountains, either as identical species or as representative species or races. Representative species, or perhaps even races if their low degree of morphological differentiation is taken as the most significant index for their classification, may also be found in the mountains of Panamá and Costa Rica. The Panama «fault» of Chapman (1917: 92) is presumed to have been a fairly recent event. When the mountain connection existed, if it really did. the Baudo Range was perhaps more extensive and the Pacific area may have included Gorgons Island.

5. Many of the subtropical forms of the eastern flank of the Central Andes of Colombia may be expected to occur on the western flank of the Eastern Andes, up to Sierra de Perijá, and also along its eastern flank, some of the species perhaps extending south to the Marañón or further to the south. Low elevations in the Eastern Andes, both in its north and south will permit forms from both sides to move freely from one flank to the other. More forms will probably be found common to the Central and Eastern Andes than to the Central and Western, but many will be found common to all three ranges, and a few may be endemic of each range.

6. Tropical Amazonian species are not likely to occur in the forested Pacific side of Colombia or vice-versa, but some affinity may be expected to occur on the eastern and western slopes of the Andes of southern Ecuador. Strong affinity has been found to occur between the fresh water fish species and between the plants and birds of east and western Ecuador (Campman, 1917: 110). To explain this, a fairly recent transandean connection has been suggested from Santa Rosa, south of Guayaquil, through Zaruma and Loja to Zamora. Here the Río Zamora breaks through the Loja valley at low elevations, suggesting that this region was one of the latest to be closed to the passage of the tropical faunas of each side.

Many of the tropical forms of the uniform, humid forested Pacific region are likely to be the same from north to south, but some differentiation can also be expected in a few species, in spite of the great uniformity of the region.

8. Species from the Cauca-Magdalena forests may also occur in Panama, up to Rio Tuyra, Some may also occur in the Pacific forests, with which these are continuous, while others may have their affinities east of the Andes. These latter forms may be expected to have differentiated somewhat from their representative forms at the east, A few endemics may also be expected here.

9. Forms from the arid and deforested upper Cauca-Magdalena may also be found in the arid Caribbean area, but a Llanos element may also be found here.

10, Most forms from the Caribbean arid area will also be found along the north coast of Venezuela, and a number may extend south into the Llanos.

11. The fauna of the Llanos will have a strong Amazonian and a lesser Caribbean arid element. but an occasional endemic may also be found.

The following Ecuadorian and Colombian members of the genus *Atelopus* are of interest in the present discussion. The list perhaps includes all the species described from Colombia and most of the species from Ecuador:

I. Species from the Temperate Zone or above *.

* Elevations given in feet have been converted into meters by dividing by 3.4. When elevation was not given by the authors of the species mentioned, the number appears in parenthesis.

A. From the summit tablelands of the Ecuadorean Andes (Quito, Latacunga).

1. *A. laevis* (Günther), 1858, Panamá, Quito and Chile (The elevation of Quito is 2,819 m.).
2. *A. ignescens* (Cornalia), 1849. Latacunga (2,771 m.).
3. *A. longirostris* Cone. 1868. Vane de Quito.

B. From high elevations in the Ecuadorean Andes,

1. *A. bufoniformis* Peracca, 1904, Pun (2,850 m.),
2. *A. laevis exigua* Boettger, 1882, Zurucuchi, W. Andes, 3,250 m.

C, From high elevations in the Eastern Andes of Colombia.

1. *A. flaviventris* Werner, 1899, Alto de Sibaté. 2.800 m.: Tierra Negra, Fusagasugá, "2,300-2,800 m.
2. *A. subornatus* Werner, 1899, Alto del Sibaté, 2,800 m.; above Fusagasugá, 2,800 m,

D. From high elevations in the Sta, Marta Massif,

1. *A. carrikeri* Ruthven, 1916, Páramo de Macotama, 2,353. 4,412 m.

IL Species from the Subtropical Zone of the eastern flank of the Andean system either in Colombia or Ecuador,

1. *A. bicolor* Noble, 1921, East of Macas, Cutucú Cordillera, 1,800-2,000 m., Ecuador.
2. *A. planispinus* Jiménez de la Espada, 1878, San José de Moti, foot of Volcán Sumaco, Ecuador (apparently, San José de Sumaco, El Viejo, fide Chapman, 1926: 719 and Peters, 1955: 345. According to Chapman, at the lower border of the Subtropical Zone) (See also V below).

111. Species from the Subtropical Zone of the western flank of the Andean system either in Colombia or Ecuador.

1. *A. pachydermus* (Schmidt), 1858. New Grenada, near Buenaventura, 1,471 m. (See also IV below).

IV, Species from the tropical, forested, western flank of the Andean system or from the Pacific forests.

1. *A. elegans* Boulenger, 1882, Tanti, Ecuador, 588 m.
2. *A. pachydermus* (Schmidt), 1858, New Grenada, nr. Buenaventura*, 1.471 m. (See 111 above).
3. *A. spurrelli* Boulenger, 1914, nr. Peña Lisa, Condoto, Choco, Colombia. (Elev. of Condoto: 44.4 m.)

V. Species from the tropical, forested, eastern flank of the Andean system or from the Amazonian forests.

1. *A. palmatus* Andersson, 1945, Rio Pastaza, Ecuador, 1,000 m.
2. *A. spumarius* Cope, 1871, Pebas, Ecuador (now Peru, in the lowland),
3. *A. planispinus* Jiménez de la Espada, 1875, San Jose de Moti, foot of Volcán Sumaco, Ecuador. (See 11 above.)
4. *A. boulengeri* Peracca, 1904, Gualaquiza (706 m.) and San José, Oriental Ecuador (San José = Sn. José de Cuchibamba, about 5 miles above Gualaquiza, on the Río Blanco at 1,000 m,, fide Peters 1955: 348),
5. *A. festae* Peracca, 1904, Gualaquiza (see above) and Valle de Santiago (lower Zamora, fide Peters, 1955: 348).
6. *A. pulcher* Boulenger, 1882, Chyavetas, E. Pert (reported from Ecuador by Peracca, 1904, etc.).

* There are several Buenaventuras in Colombia, the best known, at lat. 3°53',, long. 77°10', is at 0 elevation, an the surroundings are low and wooded. High altitudes can, however, be obtained at no great a distance.

VI. Forms with no precise type locality.

1. *A. bibronii* (Schmidt), 1858, New Grenada, nr. Panama, 588-882 m.
2. *A. carinatus* Andersson, 1945. E. Ecuador.
3. *A. longirostris marmoratus* Werner. 1901, Ecuador.

Atelopus flaviventris Werner has been considered a synonym of *Atelopus subornatus* Werner by Dunn (1944: 74), and both were put under the synonomy of *A. ignescens* by Nieden, 1926, and according to Peracca, 1904, by Boulenger (this citation was not found in the literature). However, Peracca did not agree with Boulenger and maintained the three as separate species. Being from the same locality, it is possible that *A. flaviventris* only represents a color variation of *A. subornatus,* and following Dunn, I eliminate that name from any further consideration in this paper.

On the basis of what was previously said about Sierra de Santa Marta, I also eliminate from further discussion *A. carrikeri* as this species, from the Páramos of the Sierra, is not likely to be found anywhere else and its ancestors, if living, will probably be found al lower elevations in the same massif.

If the type !ocality of *A. laevis* is restricted to Quito (as it should be by somebody having access to the type material), then this form would have come from very near the type locality of *A. ignescens* (« locis humidus circa Latacunga prope Quito»), and the possibility for the two to be nonspecific would be much enhanced. What appears to be good *A. ignescens* have been examined from Machachi and Riobamba * (north and south of Latacunga) so that even if *A. ignescens* is found to be broken up into races (something that would not be easy to determine by anyone not having access to living material), the examples from Quito and Latacunga are not likely to be different, and on that basis, the name *laevis* is also eliminated from this discussion, considering that if the locality is restricted either to Chile or to Panamá, then the species will not be the same as the one occurring in Quito, which, if not a synonym of *ignescens,* will then be of something else, or will require a description. It should be said in parenthesis that *A. leavis* has already been considered a synonym of *A. ignescens* by a number of authors.

After disposing of two names and one species (which stays at Santa Marta), we arc left with four forms in the higher elevations of the Andes. *A. laevis exigua,* if racially distinct, will become *A. ignescens exigua.* We are then left with *A. ignescens, A. longirostris,* and *A. bufoniformis* for more detailed consideration

Before proceeding with this discussion, I may add that I do not believe that any of these forms will be found, as such, below 1,300 to 1,700 m., and the possibility that any of them will be found at Santa Marta is also minimal. (See, however, *A. longirostris* in page 112). Some forms from the Subtropical Zone may, however, be expected at higher elevations so that in considering the frogs from the upper areas we should not discard the possibility of finding among them, *A. bicolor, A. pachydermus* and *A. planispinus.*

There is another factor that deserves consideration, The Páramo Zone is usually arid and devoid of trees and the same is true for the arid Temperate Zone. The Subtropical on the other hand, is the area of higher condensation and as such contains an exuberant and characteristic vegetation full of mosses, bromeliads and orchids. Thus, even if a species is tolerant to temperature variations, the humidity, the different ecological associations, the different vegetational and soil characteristics or the absence of the proper habitats, may prevent it from invading an upper or lower zone, although there are a number of species that exist, without apparent variation, in two or three zones. The experience with birds is, however, that although it is not uncommon for subtropical species to enter into the humid portions of the Temperate Zone, they do very rarely enter into the tropical areas below. Neither can one expect a species from the dense humid subtropical forest, to occur in the unforested arid valley of Quito, or vice-versa.

A. planispinus, A. longirostris and *A. ignescens,* and also *A. carinatus,* of ambiguous

*A young and rather dry specimen, however.

locality, have been described as tubercular or spiny above or on the flanks and/or limbs. *A. subornatus* is said to have rounded and not too distinct warts behind the tympanic area, on the side of the trunk and on the upper side of the hind limbs, and *A. bufonifornis* was described as areolated all over. Of the forms from lower areas only *A. festae* is covered with conical warts or tubercles. but *A. boulengeri* has areolated tubercles on the hind limbs (smooth on the head and dorsum) and on the belly while all others are smooth *.

Spiny or tubercular skin is apparently not a sexual character in *Atelopus,* although in tubercular species, the male is usually more distinctly so than the female. In *A. carrikeri,* some variation has been found to be present, the spines being sometimes limited to the space between tympanum and shoulder while in others they extend along the flanks to the groin or in a young specimen they covered practicality all the body. It appears, however, that although a spiny species may occasionally exhibit individuals that are not so spiny or tubercular the reverse is seldom or never true, that is, a smooth species never seems to contain spiny individuals.

Of the spiny or tubercular species mentioned above, only one pair seem to coincide in enough characters, to make one consider the possibility of making the two nonspecific; these are *A. carinatus* and *A. ignescens.* Specimens of the former fit so perfectly into the description of the latter, that maintaining the name *carinatus* seems completely gratuitous, in spite of the fact that the type of that species has not been examined.

Forms with pointed and overhanging snouts are *A. longirostris* (black with some green spots on the back; yellow below), *A. planispinus* (reticulated with brown on a yel1ow or ochre background: below whitish sometimes with some brown on the throat), *A. subornatus* (brown turning to yellowish of greenish on the sides ; flanks black with white dots. venter whitish with brown spots or anteriorly brown m black with small white spots). and the lower elevation *A. festae* (brownish black above and below).

Forms that have been described as reticulated, variegated or with sinuous markings above, are *A. planispinus* and *A. pachydermus.* In *A. planispinus* the heel of the anteriorly extended hind limb reaches to the center of the eye; in *A. longirostris,* to the anterior corner of the eye, and in *A. subornatus, A. ignescens, A. bicolor, A. bufoniformus* and *A. festae* it does not usually pass anteriorly beyond the level of the shoulder.

It would appear that some of those species, whose characteristics and localities more or less coincide, could be considered synonymous but detailed comparison of the descriptions does not permit such conclusion and until the type material is examined it has been considered more convenient to keep d] those names in the amphibiology of Co!ombia and Ecuador.

With the forms from lower areas, the situation is different. *A. elegans* is a well known species from Gorgons Island (from where it was described as *A. gracilis)* and from W. Ecuador, and if not recorded from W. Colombia it will perhaps be found there eventually. No Colombian continental material has been examined but two specimens from Salidero, Ecuador at M.C.Z. (2615, 7605) seem sufficiently distinct from the Gorgonan material to make the island form deserve the racial name of *A. elegans gracilis.* The two Salidero specimens also show intergradation towards the East of the Andes species *A. pulcher,* and it is not improbable that *A. pulcher* may have been derived from *A. elegans* (or its ancestral stock) through the previously described region of Guayaquil-Zamora.

The continental *A. elegans* is also related to the Chocoan *A. spurrelli,* which again has been connected with the *varius* group. Its relationship to *A. certus* (or *A. varius certus),* from the mountains of Eastern Panamá, is most obvious, but more locality records will be necessary before coming to any con. elusion regarding the line of evolution of these three forms. The implication of the Baudo-Panamanian Range in the speciation and present distribution of these frogs cannot be discarded. In Trinidad, where the Andean range has subsided, *Prostherapis trini-*

* *A. bibroni* is described as having flat granules on the thighs, between flanks and anus.

tatis, a Subtropical and Temperate Zone species in Venezuela, inhabits the tropical regions, into which it has apparently been forced by the disappearance of the proper zone and/or habitats. There is a possibility that a similar situation may have occurred in western Colombia, but nothing definite can be said about this until more data becomes available. Any detailed study of these frogs will require the inclusion of Guianan *A. flavescens,* a form which is also similar to *A. spurrelli* and *A. pulcher.*

A. bibroni, long considered a sy onym of Venezuelan Coastal Range *A. cruciger,* with which it does not appear to have much in common was described from « Grenada, unweit Panama». The description somewhat fits both *A. pulcher* and *A. spurrelli* but since *A. pulcher* has not been recorded from Colombia and if it is, it is not likely to be west of the Andes, or in the Cauca-Magdalena forests, and less so in Panamá, we can discard the possibility that this form may represent *A. bibroni.* Against considering *A. spurrelli* as a synonym of *A. bibroni* we have: (a) the dorsolateral and almost uninterrupted yellow band from snout to thighs of *A. bibroni,* (b) its plain ventral color and, (c) the ventrally fading blue black band in the lower part of which there are bright, yellow spots.

The illustration of *A. bibroni* shows that the yellow band is actually interrupted in the posterior end and that at the anterior end there is a lateral prolongation of one of the central markings that almost becomes confluent with the dark lateral band, thus, almost interrupting the yellow band. This black lateral prolongation may represent one of the points of the X most *A. spurrelli* have at the scapular region and which apparently always join, with its posterior points, the anterior part of the dark lateral band. In *A. spurrelli* a dorsolateral yellow band is not actually defined although I presume an occasional specimen may show something that may appear like the «yellow band» pictured by Schmidt for *A. bibroni.* The bright yellow dots on the black lateral band and the absence of dark dots on the venter make one doubt, however, if *A. bibroni* and *A. spurrelli* are synonymous. Such being the case, the name *A. bibroni* is maintained for a form which has not as yet been recognized.

Atelopus spumarius Cope is another controversial form, It was poorly described and not pictured, a situation which makes the determination of the species a particularly difficult one. The type locality (Pebas, Perú), the spotted anterior venter, the cross-barred limbs and the yellow lateral band that sends prolongations into the dorsum immediately suggest *A. pulcher* Boulenger, a name it antedates by 11 years.

Atelopus palmatus Andersson should also be investigated for possible synonymity with the above. A swelling behind the eye, an indistinct ridge along the dorsolateral line, a fully webbed foot (except for the fourth toe) and plainly colored venter definitely speak against this, but the pattern described is extremely similar to that of *A. pulcher,* as the author himself well recognized.

Atelopus bicolor Noble, from Macas, does not seem to be referable to any other Colombian or Ecuadorean frog, although it is said by the author to be similar to *A. boulengeri* Peracca, described from nearby Gualaquiza, in E. Ecuador.

Atelopus pachydermus (Schmidt), from Buenaventura, Colombia, 5,000 ft. has swollen anterior legs (it was a male!) and very large hind limbs, fully webbed toes and a variegated dorsum it shares with *A. planispinus.* The snout of *A. pachydermus* is not pointed. however, and it lacks the spinulets said to be present in *A. planispinus.*

More detailed notes on some of the species and the description of five new forms follow

Atelopus ignescens (Cornalia)

P1, II, fig. 9, 10

Pluryniscus ignescxens (Cornlia), 1849. Vert syn, Mus. Mediolanense: 316.

* 3 (C.N.H.M. 54305, 07, 08) Guaitarillo, Patía riverside, 2,000 m. Nariño, Colombia. XII. 45.

* 1 (C.N.H.M. 54306) Barbacoas, Path riverside, 2,000 m. Nariño, Colombia, XII .45.

* 1 (C.N.H.M. 54309) Tuquerres, Patía riverside, 3,000 m. Nariño, Colombia, XII, 45.

* 2 (C.N.H.M.) 61 182.3) probably Bolívar, Catival, Upper Río San Jorge. 45.

* There is apparently a mistake here as these localities are by the margin of Rio Guaitara, a tributary of the Patía, but quite distant from it. Bolívar, in the Upper San Jorge, is 1,777 m. high.

14 (M.C.Z. 242011—15 +9) Guachucal, Colombia, 28.
1 (M.C.Z. 2617) Fixan, Ecuador, 10.
8 (M.C.Z. 24206—10+ 3) Machachi, Ecuador, 28.
1 (M.C.Z. 2259) Ecuador, 1890.
1 (M.C,Z, 13743) Ecuador, 28.
2 (M.C.Z. 300203) Machachi, Ecuador, 13.
2 (M.C.Z. 3004-05) Riobamba, Ecuador, 13.
1 (M.C.Z. 2461) Ecuador, 08.
1 (M.C.Z. 33241) Encano, Nariño, Colombia.
1 (M.C.Z. 33240) Roadside above Pasto, Nariño, Colombia

The specimens from the first three localities arc very similar although they vary in size from 49 (54305) to 29.6 mm, (54308). No. 54307 is a large female in which the dorsal surfaces of the trunk, behind the nape, are covered with large blackened tubercles, while in 54305, also a female from the same locality, the blackened tubercles are restricted to the flanks. Other specimens are either tubercular or smooth above but general among the specimens examined is the presence of tubercles on the temporal region, flanks and proximal segments of the limbs. Apparenty the tubercles never invade the dorsal surfaces of the head, the loreal region, the anterior portion of the thighs or the limbs distal to the knee or elbow. In most examples, the nontubercular portions of the limbs appear smooth under the naked eye but upon enlargement they arc shown to be minutely and closely granular or shagreened, pitted or longitudinaly wrinkled.

In specimen 54305 many small tubercles aggregate in elevated areas or warts along the flanks and it IS the warts, not the individual tubercles, that are black. In many other examples the tubercles do not generally form aggregations but they arc equally darkened, and thus, under a lens, the animals appear to be minutely spotted wherever tubercles are present,

In all examples the venter is shagreened and areolar and the palm and sole, distinctly warty. There is a very large palmar and a much smaller and inconspicuous inner metatarsal tubercle. The first and second fingers can be said to be at least 1/3 w-ebbed (1 and 2 phalanges free of web, respectively) while the last only has a short, basal web. The sole is very broad, reminding one of the figure of *A. pachydermus* (Schmidt), but the toes are not usually more than 2/3 webbed. except for the first and second (in the fourth, about 3 1/2 phalanges are left free) which are almost totally webbed. Some variability is found, however, even among specimens from the same locality.

In all specimens the snout is short and blunt, the eye diameter being greater than the distance between eye and nostri; the edge of the eyelid is thickened; there is a low, not too prominent, parotid ridge and the limbs are short, the fingers of the adpressed forelimb not reaching the posterior margin of the body; the heel of the adpressed bind limb only extending to the axilla or the shoulder and the heels not even meeting when the tibiae are placed perpendicular to the body.

The color of most specimens is gray above, the tubercles being dark brown or black, but in can be very dark brown, almost black, (C.N.H.M. 61182-3) in which case the forelimbs and the anterior and posterior per. lions of the thighs may be lighter. In M.C.Z. 33241 them is some dark, lateral spotting and the posterior segments of the hind limbs are broadly marbled with black. The ventral color seems to have been yellow, and still is in C.N.H.M. 54305 and several other specimens but has faded to grayish white in most of the examples examined.

Provisionally included in this species, pending further investigation, is M.C.Z, 3004, from Riobamba, Ecuador (P1. II, Fig,. 10), In most morphological characters it agrees with the other material here considered, except for the fact that the snout seems to be narrower and longer, and the toes are more webbed (first toe fully webbed, second 3/4 [one free phalanx], third 3/4 and last 3/4, leaving only slightly more than one phalanx free of web).

The most striking difference rest on its dorsal color pattern, which consists of bright yellow, vermiculatcd or sinuous spots on a chocolate brown background. The venter and flanks seem to have been yellow, the latter being spotted with rounded brown spots from where the lateral tubercles arise,

Should this be found to be a color variation of *A. ignescens* (the amount of webbing more or less falls within the range of variation of that species) then *A. pachydermus*

should be further studied for possible synonymity with *A. ignescens*.

Atelopus longirostris Cope
(P1. II, figs. 1, 2, 3)

Artelopus, longirostris Cope, 1868. Proc. Acad. Sci., 116: Valley of Quito.

2 (C.N.H.M. 43850-51) Cisneros, Valle del Cauca, Colombia.

These two, 38 and 45 mm. specimens are provisionally placed under *A. longirostris*, pending further collections from the area. They more or less agree with Cope's description, but they are so dried up that some of the characters cannot be satisfactorily studied. As in the type, the dorsal color is black (in one specimen, dark brown which could have been black before), and the venter is yellow, except for brown areas (diffuse) on the throat and pectoral region.

the upper lip of one of the specimens (43850) has narrow yellow areas and some yellow is also found as a row of spots along the dorsolateral margin, from shoulder to groin. A yellow margin occurs from the tip of the snout to the posterior end of the supratympanic ridge. The limbs are more or less black above, with well defined yellow spots, and yellow below with well defined black spots. A brownish stain occurs longitudinally on the sides of the belly of no, 4.3850. Between this stripe and the dorsolateral row, of yellow spots, the flanks are black. No. 43854 has a large, dark brown X on the anterior part of the back, with the two anterior points of the X starting on the upper eyelids. and the two posterior ones ending on each side, on the middle of the back; two other large, rounded spots or stains occur over the sacral diapophyses. No green can be detected in any of the specimens.

The first fingers considerably webbed and there is a small web between second and third fingers, hut the last is completely free. The toes are half webbed between third and fourth and between fourth and last, but the first is totally webbed and the second almost so.

Cisneros. along the railway from Buenaventura to Cali, does not appear to be more than 200 m. high, while the valley of Quito is beyond 2,800 m. As frogs of the genus *Atelopus* seem to be very sensitive to environmental factors, it is very doubtful if the form represented by these two specimen: would prove to be strictly nonspecific with Ecuadorean species. For the lack of better material there is no alternative now but to call them by the same name.

Also long snouted, and similar morphologically to *A. longirostris* and the above mentioned specimens, are U.S.N.M. 144937-40 from a tributary of the Opón (Quebrada La Lechers) in Santander, Colombia (P1.II Fig 8). These animals are, however, distinctly spotted above and the fingers arc free or almost so. The locality record (The Opón empties into the Magdalena on its eastern margin, south of Barrancabermeja) strongly enforce the morphological and color differences to make one believe that this is a distinct form requiring description.

Atelopus longibrachius sp. n.
[PI. 1, fig. 8)

Type. Chicago Natural History Museum No. 54283, a ♀ from El Tambo, Guisitó, Cauca, 300 m., Pacific side of Colombia, Coll. K. von, Sneidern, Aug. 46.

Diagnosis. A large but slender *Atelopus* with normal, non pointed snout, granular skin, fully webbed toes (except for fourth. where about 2 1/2 phalanges are left free): heel of the adpressed hind limb extending to the eye, fingers of the adpressed fore limb extending beyond the posterior margin of the body and without any apparent subarticular tubercles.

Description. Head flat; snout concave in front, not acute, more or less rounded at the tip; nostrils much closer to the tip of the snout than to the eye; tongue narrow, entire and free: eye diameter shorter than distance between eye and nostril ; interorbital space much broader than an upper eyelid; canthus sharply angular; loreal region vertical, concave: tympanum absent; fore-limbs long and slender; one large, rounded, outer metacarpal tubercle, but no apparent inner; subarticular tubercles absent; palm rugose, areolated; fingers and toes with swollen tips, the first finger fully webbed, the second about

FIG. 1. M.C.Z. 9235, *Atelopus certus,* Mte. Sapo, **Panamá,** 38.4 mm.—FIG. 2, M.C.Z. 9240, *A. certus,* Mte. Sapo, **Panamá,** 30.9mm.—FIG. 3. U.M.M.Z. 113925, *A. cruciger,* Aragua, Venezuela, 32.3 mm.—FIG. 4. M.C.Z. 17927, *A. pulcher,* Canelos, Oriente, Ecuador, 29,2 mm.—FIG. Ventral view of M.C.Z. 17927.—FIG. 6. Ventral view of C.N.H.M. 81871.—FIG 7. C.N.H.M. 81871, *A. spurreli,* Chocó, **Bahía Utría,** Colombia, 12.2 mm.—FIG. 8. C.N.H.M. *A. longibrachius,* type female, El Tambo **Guisitó,** Cauca, Pacific Side of Colombia, 36.6 mm.—FIG. 9. M.C.Z. 7605, *A. elegans,* N.W. Ecuador (Salidero), 28.2 mm.—FIG. 10. U.P.R.M. 1395, *A. elegans,* Gorgona Is., Colombia.

1/2 webbed, the last about 1/3 webbed; no apparent tarsal fold; two metatarsal tuber. clcs, the inner the bigger and most prominent: subarticular tubercles of toes absent: toes fully webbed, with the exception of the fourth, where about 2 1/2 phalanges are left free; the web extends, however, to the last phalanx as a lateral fringe on each side: heel of the adpressed hind limb extends to the tympanum; fingers of the adpressed fore limb extend beyond the posterior margin of the body: heels overlap when tibiae arc placed perpendicular to the body, Skin above shagreened, especially on the head, upper eyelids and upper flanks. In the posterior 1/3 of (he body granules are larger and flat; in the temporal region, shoulder and flanks they become small, conical tubercles. Below, rugose and studded with glandular tubercles and areola; glandular tips (or orifices?) are more common on the throat and chest, but a distinct areolated area exists on the buttocks, on the postem-proximal half of the thighs,

Color. Above tan or brownish gray, covered all over with black well defined, distinct, rounded or elongated spots, some of which become confluent with others, forming semi-circles, annuli or sinuous markings; upper lip and warts behind the angle of the jaw, whitish. Below, yellow, with a few black spots on the posterior part of the belly, and one on each side, below the axilla.

Measurements (mm.) ♀ Snout-vent 36.6: head breadth 9.6; femur 17; tibia 18: foot 15.5.

Paratypes. Paratypes are C.Y.H.M. 54276.282, 54284.304, all from the same locality and data as the type. In some of these specimens the dorsal background color is (with the exception of the posterior segments of the bind limbs) in all the specimens (except in 54276, 54283 and 54297 where is one or several black spots) plain yellow. On the flanks, some of the spots may unite to form one or two almost continuous, longitudinal lines from axilla to groin. The dorsal spots may be predominantly rounded, or predominantly irregular or sinuous, but in no case is the pattern too similar to that of *A. certus*.

Apart from these variations, there is considerable uniformity among all the specimens.

Specimen No. 54285 is a male with the following measurements (mm.); snout-vent 31.6; head breadth 8.3; femur 14: tibia 14.1: foot 13.1. In this specimen the second finger is shorter than in the females and it also appears to be considerably more webbed. There is no distinct modification of the fore limb, except for a smooth, brown callosity on the inner side of the first digit. The fingers of the adpressed forelimb do not extend posteriorly beyond the body.

Remarks. Although this species is quite distinct from *A. cruciger* and *A. certus* (or *A. varius certus),* the color description may be confusing to persons not having access to the animals, a reason for emphasizing the differences between the three species.

In the first place, the dorsal pattern of the three species is quite different, as cm be seen from the photograph (P1, I, Figs. 1, 2, 3, 8). the snout of *A. longibrachius* is more blunt than in *A. cruciger,* the fingers of the latter do not pass beyond the posterior margin of the thighs when the fore-limb is adpressed against the body anti there is in that species, a brown lateral band that is margined above by a longitudinal glandular ridge.

In *A. cruciger* the fingers arc only slightly webbed and the toes 1/2 to 2/3 webbed, while in *A. longibrachius* the first two fingers are considerably webbed and the toes (except the fourth) fully webbed. *A. longibrachius* does not have subarticular tubercles while these are present in *A. cruciger*.

In *A. certus* the skin above is smoother (actually minutely shagreened) than in *A. longibrachius,* there are no pointed or conical tubercles anywhere, the fingers only have a rudimentary web, subarticular tubercles are present, the palm and sole are not areolated and warty, and the omnipresent round and small ventral spots are different from the larger, more irrcgulary shaped and seldom present spots in the belly of *A. longibrachius*.

The closest relative of this species appears to be *A. planispinus* Espada. The species here described agrees in a number of important details with that species, but also differs in a few characters and the locality records on the eastern side of the Andes of Ecuador for *A. planisinus,* and on the western side of

the Andes at Colombia for *A. longibrachius*, are indicative of taxonomic distinction of the two forms.

The following characters can be used to distinguish *A. planispinus* from *A. longibrachius.*

1. *A. planispinus* is described with a pointed and projecting snout. This is not the case with *A. longibrachius,* in which the snout is even less pointed than in *A. cruciger.*

2. The fingers of *A. planispinus* are described as with a narrow, basal web. This is not the case, at least in the first two fingers of *A. longibrachius.*

3. The palm of *A. planispinus* is said to be smooth. It is rugose and areolar in *A. longibrachus.*

4. Subarticular tubercles are described between the metatarsal and first phalanges (except in first toe) of *A. planispinus.* These cannot be detected in *A. longibrachius.*

5. A tarsal fold, described in *A. planispinus* has not been found in *A. longibrachius.*

Atelopus nicefori sp. n.
(P]. II, figs. 4, 5, 6. 7)

Type. Chicago Natural History Museum. No, 69748, a ♂ from Caicedo, Antioquia, Colombia, 1,800 m., Cal. P. Hershkovitz, 1951.

Diagnosis. A small *Atelopus* with long, subacuminate snouth; tubercular body, a thick ridge on the margin of the upper eyelid, a rudimentary web in the fingers, a tarsal fold, fully webbed toes (except the fourth, where about 3 phalanges are left free) fingers of the adpressed forelimb not extending beyond the posterior margin of the body, heel of the adpresscd hind limb not passing beyond the posterior corner of the eye, solid brown dorsal and yellow ventral coloration, with brown spots on the region of the throat.

Description. Head flat; snout slightly concave above, subacuminate, the tip forming an obtuse triangle; nostrils a little closer to the tip of the snout than to the eye: tongue narrow, entire and free; eye diameter greater than distance between eye and nostril but shorter than the snout; interorbital space much broader than an upper eyelid; upper eyelid with a thick rige on the outside margin; a heavy supratympanic ridge behind the eye; canthus sharply angular, loreal region concave; tympanum absent; a large palmar tubercle; palm tubercular; subarticular tubercles of fingers not discernible, of toes not distinct: a short basal web between the fingers, particular between the first and second and second and third; a distinct tarsal fold; an indistinct inner and a more distinct outer metatarsal tubercle; sole rugose and granular, toes fully webbed, with the exception of the fourth, where 3 phalanges are left free; the web extends, however, to the tip, as lateral fringes on each side; heel of the adpressed hind limb extends to the posterior corner of the eye; fingers of the adpresscd forelimb not extending beyond the posterior margin of the body; heels only touch when tibiae are placed perpendicular to the body. Skin above, smooth on the head, distinctly warty and tubercular on the rest of the body, but much more distinctly so on both limbs. Flanks tubercular; venter tubercular or granular and areolar, becoming only slightly granular on the anterior part of the throat; no distinct and well defined areolar area on the buttocks, which have more or less the same aspect as the belly.

Color. Above, and on the flanks, solid brown. Below, yellow, with some infuscation and diffuse spotting on the throat and chest. Male with a brown rugosity on the inner side of the curved, inner digit, but with the anterior extremities only slightly enlarged.

Measurements. (mm.) ♂ Snout-vent 19; head breadth 7: femur 10.5; tibia IO; foot 10.

Paratypes. C.N.H.M. 69747 is a female with the same data as the type and showing the following variations: the ridge behind the eye is more protuberant and distinct. almost becoming a crest; the snout is more acute, the subarticular tubercles of hand and toes are more distinct; the heel only reaches to the posterior border of the supratympanic crest and the throat is marked with better defined spots. The measurements of this female are: Snout-vent 32.4; head breadth 8.9; femur 12.8: tibia 12.2; foot 11.5.

C.N.H.M. 81875 is a male from Camino Sibaté-Aguadita, collected by Hno. Nicéforo

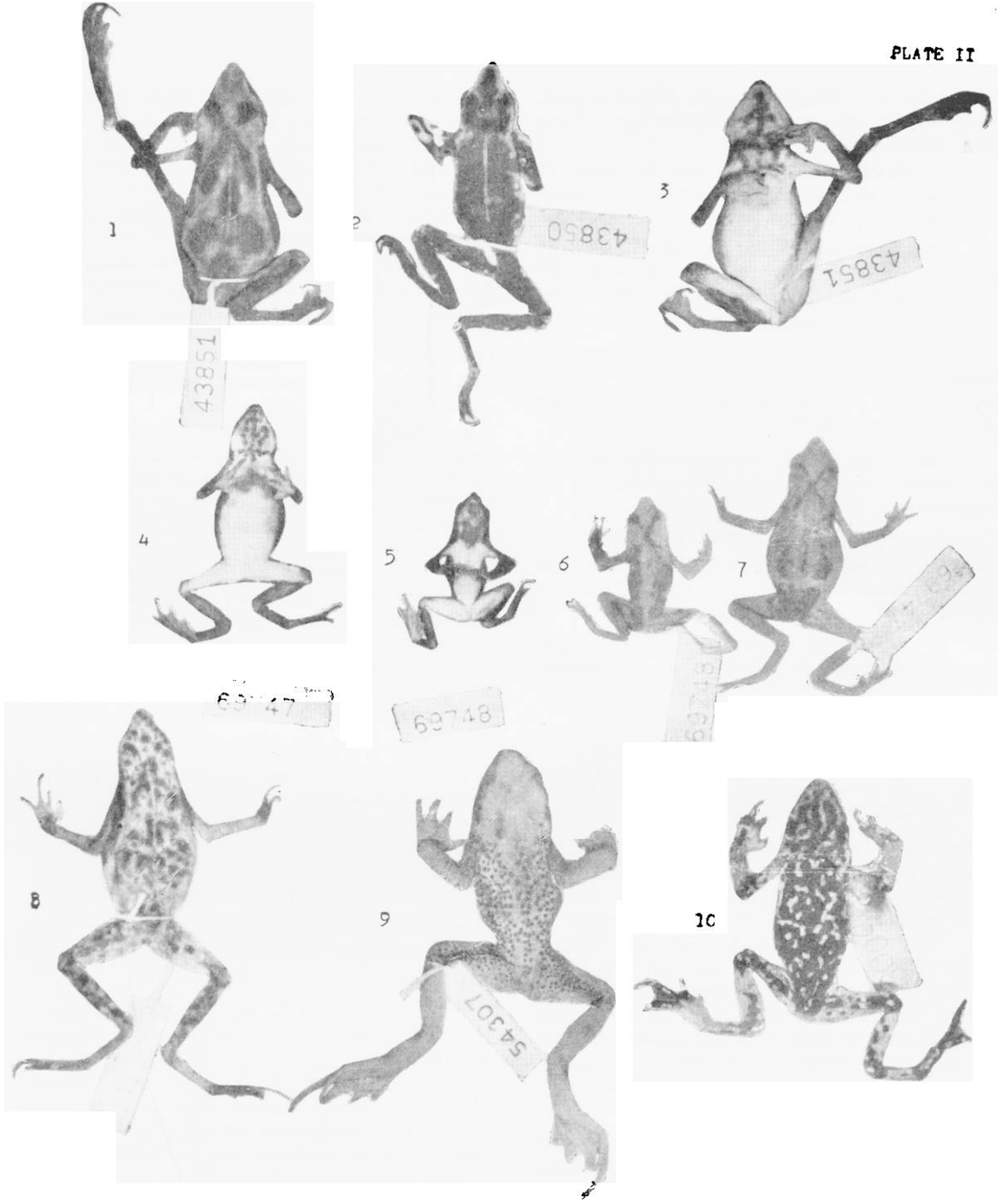


FIG. 1. C.N.H.M. 43851, *Atelopus longirostris,* Cisneros, Valle del Cauca, Colombia, 45 mm.—FIG. 2. C.N.H.M. 43850, *A. longirostris,* same locality, 38 mm.-FIG. 3. C.N.H.M. 43851, ventral view.—FIG. 4. C.N.H.M. 69747, *A. nicefori,* paratype, Caicedo, **Antioquía,** Colombia, 32.4 mm.—FIG. 5. C.N.H.M. 69748, *A. nicefori,* type, Caicedo, **Antioquía,** Colombia, 19 mm.—FIG. 6. Dorsal view of *A. nicefori,* type. Caicedo, **Antioquía,** Colombia, type.—FIG. 7. Dorsal view of *A. nicefori,* paratype.—FIG. 8. U.S.N.M. 144937, *Atelopus* species, Santander, Colombia.—FIG. 9. C.N.H.M. 54307, *A. ignescens,* Guaitarillo, **Patía** Riverside, **Nariño,** Colombia, 44.5 mm.—FIG. 10. M.Z.C. 3004, *A. ignescens,* Riobamba, Ecuador, 44.5 mm.

María. This animal is more warty than the other two, the warts starting on the snout, rather than behind the head; the supratympanic ridge is not as protuberant as in the female; the web of the toes is more indented and the heel does not reach to the eye; the brown lateral color penetrates more on the sides of the belly and thcre is some diffuse infuscation on the throat and chest. More specimens may show this form to be racially distinct from the type and female paratype.

A. necefori seems to he related to *A. festae* Peracca, from which it differs in not being brownish black above and below, in not having an extensive web between the finger. (In this species only the last phalanges of the first, second and fourth digits and the two outer of the third digit are left free), in not having the supratympanic and postorbital crest and in lacking a dorsolateral line of tubercles.

In common with *A. festae* are the projecting and pointing snout, the orbitotympanic crest. the tubercular dorsum and the uniform dorsal coloration.

Gualaquiza (type lot, of *A. festae)* is at 706 m. on the eastern flank of the Andes of Ecuador and quite distant from 1,800 m. Caicedo and 1,929 to 2,596 m. Camino de Sibaté to Aguadita in Colombia. Besides the morphological differences, the locality records are also indicative of possible distinction between some of the forms here considered.

Antelopus walkeri sp. n.

Type. University of Michigan Museum of Zoology No. 48077 a ♂ from Don Diego (Sta.. Marta Region), Colombia.

Diagnosis. A moderately large *Atelopus* with pointed and proyecting snout, a thick edge on the outer margin of the upper eyelid: a heavy, parotid ridge; slightly webbed fingers; 3/4 webbed toes (except for the third where 2-2/3 phalanges are left free): heel extending to between eye and shoulder: fingers no extending beyond the posterior margin of the thighs; a dark dorsolateral line yellowish brown dorsal coloration with darker flanks and limbs: yellowish, usually speckled or marbled venter, and a well defined brown, areolated area on the buttocks.

Description. Head flat ; snout obtusely triangular at the tip, pointing and projecting, concave in front: nostrils closer to the eye than to the tip of the snout; tongue narrow, entire and free behind: eye diameter as large as distance between eye and nostril; interorbital space much broader than and upper eyelid; upper eyelid with a thick edge; a heavy paro tid ridge; canthus sharply angular; loreal region concave; timpanum absent; a large rounded palmar and a less developed oval, inner metacarpal tubercle; palms rugose; only the basal metacarpal tubercles present; fingers swollen at the tips, about 1/3 webbed; a slight fold on the distal half of the tarsus; toes about 3/4 webbed, the web extending as a fringe to the last phalanx on the first. second, third and fifth toe, but being heavily indented between second and third, third and fourth and fourth and last; in the fourth toe about 2-2/3 phalanges are left free; two distinct, oval metatarsal tubercles, sole more or less smooth, its subarticular tubercles indistinct; heel of the adpressed hind limb extends to between eye and shoulder; finger of the adpressed forelimb not extending beyond the posterior margin of the body; heels only meet w-hen tibiae are placed perpendicular to the body. Skin above minutely shagreened. with flat, indistinct warts on the head ; an oblique row of tubercles at the angle of the mouth; a glandular ridge from the parotid swelling to the level of the shoulder continues posteriorly as a row of flat, tubercle covered swellings to the groin: on approaching the groins, the tubercular areas spread somewhat towards the middle of the dorsum; Ioreal region smooth; flanks mostly smooth. with one or two occasional tuber. cles: temporal area and forelimbs distinctly tubercular, most of the tubercles being conical and arising from basal swellings, sometimes several to the swelling; hind limbs not as tubercular as the anterior. Below, smooth except for a well delimited areolar area on the buttocks.

Color. Above yellowish brown, with a brown dorsolateral line from the posterior corner of the eye, along the supratympanic ridge, and under the dorsolateral tubercle aggrupations, to the groin; upper lip yellowish ; a fine, brown vertebral line from tip

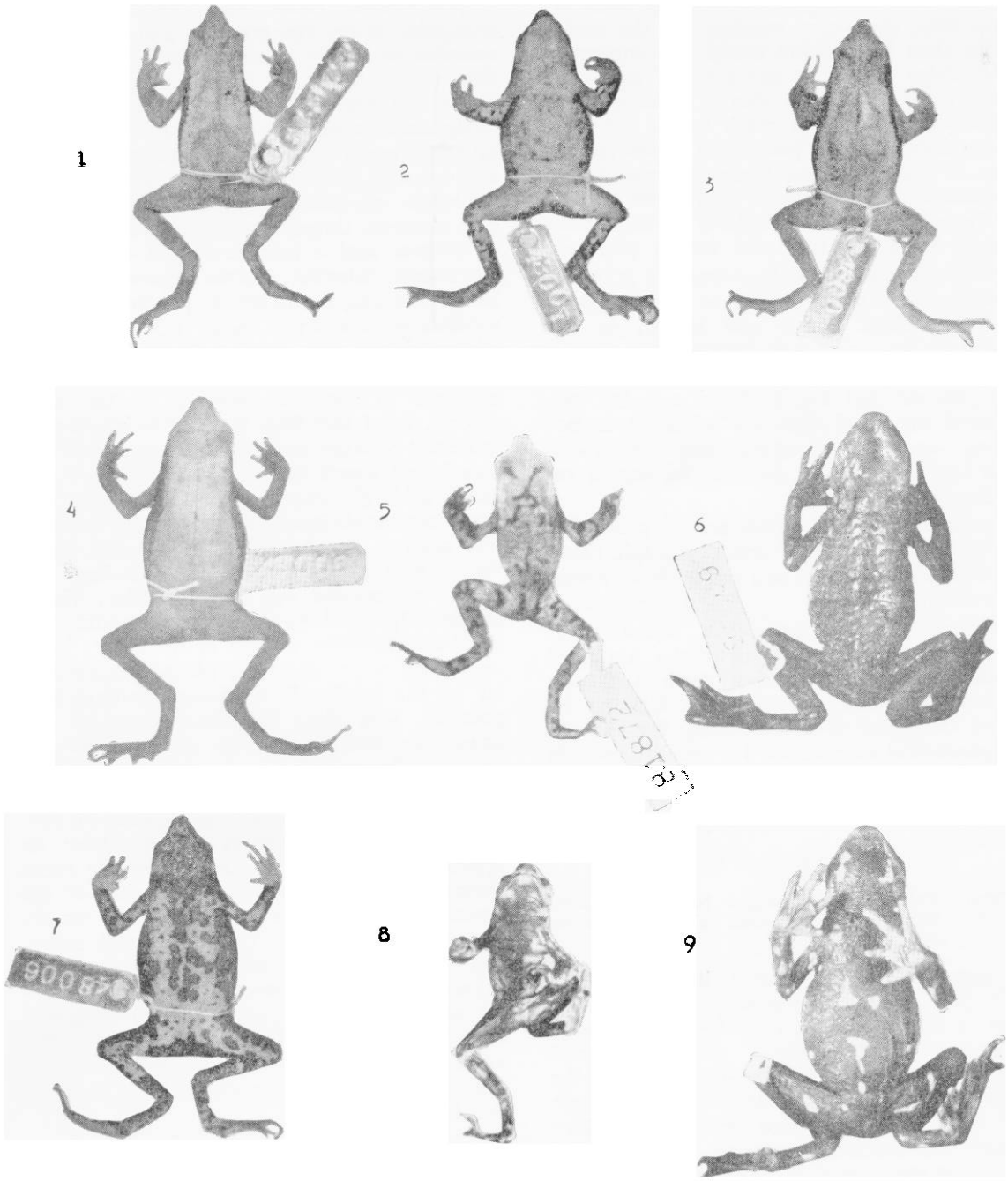


FIG. 1. U.M.M.Z. 54577, *Atelopus walkeri*, male paratype, San Lorenzo, Sta. Marta, Colombia, 38.4 mm, FIG. 2. U.M.M.Z. 48007, *A. walkeri.* type, Don Diego, east of San Miguel, Colombla, ventral view, 37.7 mm.—FIG. 3. Idem, dorsal view.—FIG. 4. U.M.M.Z. 48006, *A. walkeri*, female paratype, Don Diego, 45.5 mm.—FIG. 5. C.N.H.M. 81872, *A. pedimarmoratus*, type, San Isidro, Cundlnamarca, Colombia, 29.8 mm.—FIG. 6. C.N.H.M. 69746 *A. ebenoides*, San Agustín, Huila, Colombia, 48 mm. —FIG. 7. Ventral view of U.M.Z. 48006.—FIG. 8. Ventral view of C.N.H.M. 81872.—FIG. 9. Ventral view of C.N.H.M. 69746.

of snout to anus; dorsum with scattered brown specks, especially at the nape and on the scapular and sacral areas; loreal region, flanks and limbs darker than the dorsum: on the hind limbs the color of the dorsum darkens imperceptibly on the thighs, becoming as dark as the forelimbs on the tibial segment and beyond. Below, speckled with brown on the throat and belly; speckled and marbled on the limbs; areolatcd area of the buttocks distinctly stained with brown.

Male with the forelimbs shorter than in the female, enlarged and with a brown rugosity on the inner side of the first digit.

Measurements. (mm.) ♂ Snout-vent 37.7: head breadth 11: femur 15.5; tibia 15.6: foot 15.

Paratypes. Paratypes are U.M.M.Z. 48006, 48011 and 48012 with the same data as the type, U.M.M.Z. 54577 and 54580 from San Lorenzo, and M.C.Z. 15647 and 15648 from the N. W. Páramo of Sta. Marta. The following variations have been observed in these specimens: In U.M.M.Z. 48011, a male specimen, the flat warts on the head are even less distinct than in the type: the feet are more completely webbed, the web only showing a slight indentation on the outer toe; the vertebral line is very fine and indistinct under the naked eye and there arc two dark, indistinct, oblique bars that commence on the upper eyelid and cross at the nape, the throat and chest are yellow, indicating that this is probably the ventral color of this species. at least on the fore part of the belly and throat.

U.M.M.Z. 48012 is another male individual, very similar to the type and to the anterior, except for the fact that the two brown oblique bars on the upper eyelids are very distinct and end up before crossing at the nape (as in 48011), There are no apparent warts on the head and the ventral specks are fewer and mostly limited to the anterior end. U.M.M.Z. 48006 is a female with the following measurements (mm.): snout-vent 45.5: head breadth 12; femur 17; tibia 17: foot 18.

This animal can be distinguished from the males by the longer and more slender forelimbs and by the marbled coloration of the ventral surfaces. There is a dorsolateral ridge above the brown dorsolateral line, and pointed tubercles form aggrupations along this ridge from the parotid backwards: the dorsum has fewer specks than in the type and the vertebral line commences at the nape: the buttocks are areolated as in the other specimens but the brown color of the ventral aspect of the thighs is not limited to the areolar area; the heel only reaches to the shoulder and the tarsal fold is better defined than in the type.

The specimens from San Lorenzo (U.M.M.Z. 54577 and 54580) differ somewhat from those from Don Diego (east of San Miguel*) and may eventually be found to constitute a race.

The male specimen (54577) is 38.4 mm. in snout-vent length, The skin has above a few small and indistinct warts on the head region and many scattered but distinct ones on the posterior half of the dorsum; there is a tubercle covered glandular ridge from parotid to groin, this ridge being more continuous and prominent and having a greater number of tubercles than in the animals from San Miguel; the flanks and limbs are distinctly tubercular, most of the tubercles being conical and pointed and the color is brownish yellow above with scattered darker specks, and turning to brown on the posterior part of the body and on the extremities.

U.M.M.Z. 54580 is a 49.3 mm. female. In this specimen the heel only reaches to the shoulder (but both femora broken): the heels cross slightly when the tibiae are placed Perpendicular to the body and the flanks are not as tubercular as in the male. The color is paler on the anterior end and seems to have been green or greenish when the animal was alive. A wash of brown that starts behind the nape intensifies and expands laterally behind the sacrum, making the posterior half of the dorsum of a brown color; the flanks and limbs are brown, the venter

* Although the locality of the type material is given as Don Diego, Dr. Charles Walter informs me that he has consulted the collector's (M. A. Carriker) field notes and all the *Atelopus* are said to have come from the «heights cast of San Miguel. 6,000-7,000 ft. n Carriker made his headquarters at Don Diego, which is a lowland station, but apparently many of the forms collected by him came from the mountains to the south.

yellow, with some vermiculations or speckling on the throat, belly and limbs.

These last two specimens differ from the others in being distinctly warty on the dorsum and densely tubercular on the flanks (male), in having denser aggregations of granules along the dorsolateral glandular ridge, which is also more prominent and distinct; in not having the yellowish upper lip as contrasting and in having a longer and higher snout.

The two juvenile specimens (M.C.Z. 15647-8) were collected by P.J. Darlington at the N. W. Páramo of Sta. Marta. They may belong to this species although posessing several characteristics of their own. Both specimens are shagreened above, warty on the dorsum and tubercular on the flanks and limbs; the parotid swelling is already present but a dorsolateral ridge cannot be detected: the snout is very short, the thick ridge of the upper eyelid is absent and the toes are considerably less webbed (about 1/2 webbed) than in the adults, Whether this is a sign of immaturity or not I am not prepared to say. The dorsal color is dark gray in both specimens, and the limbs are brown above and below. There is a black lateral band. and under this the color is blackish, with whitish diffuse spots, or vermiculations on the belly. The throat and the chest are brown. They are about 9 mm. in snout-vent length.

The San Lorenzo material represents the specimens referred to *A. ignescens* by Ruthven, 1922, apparently upon the suggestion of Boulenger (Walker, letter 20.6./58). Dunn mildly suggested (1944: 14) that these specimens and other described forms (inc. A. pachyderms). co u 1 d perhaps be nonspecific with *A. subornutus,* but the truth appears to be that this is a distinct form, whose closest relatives are perhaps *A. oxyrhynchus* in the Mérida Andes of Venezuela and *A. cruciger* in the Venezuelan Coastal Range. *A. oxyrhynchus* and *A. walkeri* have a number of characters in common and it appears possible that both have originated from a common stock in the lowlands, in which case, these characters may have been acquired by convergence as the animals were subjected to similar environmental forces.

Another possibility is that the Mérida Andes and the Sta. Marta massif were once connected (See Schuchert. 1935: 680 and Todd and Carriker 1922: 87) and that an *Atelopus* which then occupied the whole attitudinal range evolved independently into *A. walkeri* and *A. oxyrhynchus* when the ranges became separated.

A. cruciger may have a common ancestor with *A. oxyrhynchus* and *A. walkeri* as is discussed in another paper in this same number of the Journal of Caribbean Science.

As mentioned before, *A. oxyrhynchus,* from the Venezuelan Andes, is similar to this species, so that it may be of value to point out the differences between these forms, and others that could be confused with them. *A. oxyrhynchus* does not always have a pointed snout; it is covered, especially on the flanks, with large glandular warts, and the toes are much less webbed than in *A. walkeri.*

The descriptions of *A. boulengeri* Peracca and *A. subornatus* Werner are also applicable, to a certain extent, to *A. walkeri. A. boulengeri* came from the eastern flank of the Ecuadorean Andes while *A. subornatus* was from 2,800 m. near Bogotá, so that the possibility of finding any of the two at Sta. Marta seem remote enough.

In *A. subornatus,* the forelimb was said to be longer than the trunk, the metacarpal tubercules were not notable. the metatarsals were indistinct (definitely not the case in *A. walkeri)* and the color of the flanks was black with white dots, while white dots were also present on the venter.

In *A. boulengeri* there was a thick margin on the canthus rostralis, the dorsal color was rosy brown or grayish brown and the sides of the head, flanks and venter were yellowish white, the two colors coming in contact along a line that extended from snout to groin.

Atelopus ebenoides sp. n.
(P1. III, figs. 6, 9)

Type. Chicago Natural History Museum No. 69746, a ♀ fromP~ramo de las Papas, 3,600 m., San Agustín, Huila, Colombia. Coll. P. Hershkovitz, Oct. 1951.

Diagnosis. A large *Atelopus* with short, truncated snout, the eye diameter being larger than the distance between eye and nostril

but shorter than the snout; fingers with a short, basal web; toes almost fully webbed: fingers not extending posteriorly to the rear margin of the thighs; heel of the adpressed hind limb extending to the shoulder; heels not even touching when the tibiae are placed perpendicular to the body; skin warty on the back, flanks and part of the ventral aspect and limbs; color black, all over, with a row of round yellow spots on each flank and irregular yellow markings on the ventral surfaces.

Description. Head with a low and broad marginal rim which starts on the snout and, covering the eyelid, extends posteriorly and continuously to the supratympanic ridge ; snout truncate, short; nostrils much closer to the tip of the snout than to the eye: tongue very long, narrow, entire and free; eye diameter slightly greater than distance between eye and nostril but shorter than the snout; interorbital space broader than an upper eyelid; upper eyelids flat, thick at the margins; canthus angular; lineal region vertical, concave; a thick supratympanic ridge; two large and distinct, rounded metacarpal tubercles; palm and fingers areolate; subarticular tubercles not evident, except for one on the third finger; all fingers well developed, with a short basal web; the first relatively long and distinct but much shorter than the second; no apparent tarsal fold; a rounded outer and an elongated, more distinct inner metatarsal tubercle; sole distinctly wrinkled; subarticulm tubercles of toes. when present, not easily discernible, toes fully webbed between first and second, second and third (where the web is slightly indented) and fourth and fifth, but somewhat indented between third and fourth and with about 3 free phalanges on the fourth; the web extends as a thick fringe to the tip in all toes where the web does not reach the last phalanx; heel of the adpressed hind limb extends to the shoulder: fingers of the adpressed forelimb not extending posteriorly beyond the rear margin of the thighs; heels not even touching when tibiae are placed perpendicular to the body, Skin above covered with more or less equidistant warts, which are, however, more concentrated and distinct on the posterior half; head without warts, smooth in the center, but wrinkled on the elevated marginal rim and on the eyelids and nape; two longitudinal crescent. shaped ridges behind the nape; thighs and humeral segment warty and wrinkled, the rest of the limbs distinctly wrinkled but only with an occasional wart. Below, warty on the throat and chest, wrinkled and aerolate on the belly and limbs.

Color. Above and below black, with a row of 4 (right) to 6 (left) small, round, yellow and equidistant spots, of approximately equal size, along the flanks; each spot crowning a wart; two round, yellow spots between angle of the mouth and shoulder. Throat, belly and undersurfaces of limbs with larger, scattered and irregularly shaped yellow spots; palm yellowish ; sole with yellowish areas; vent with one small, round, yellow spot on each side, another one a few millimeters distally, and a third one further towards the knee.

Measurements. (mm.) ♀ Snout-vent 48: head breadth 12.6; femur 18; tibia 16.7; foot 18.

Remarks. The closest relative of *Atelopus ebenoides* appears to be *A. bufoniformis* Peracca, From this species it differs in having a truncate snout (subacute in *bufoniformis),* in having the nostril much closer to the tip of the snout than to the eye (not equidistant as in *bufoniformis)* and in being considerably less webbed between the fingers.

Atelopus pedimarmoratus sp. n.
(Pl. III, figs. 5, 8)

Type. Chicago Natural History Museum No. 81872, a ♂ from San Isidro, Cundinamarca, Colombia, Hno. Nicéforo María.

Diagnosis. Apparently a small *Atelopus* with moderately pointed snout, the eye diameter much greater than distance between eye and nostril but shorter than the snout; nostrils only slightly closer to the tip of the snout than to the eye; fingers free or almost so; toes about 1/2 webbed; sole smooth; heel extending to the shoulder; heels touching when tibiae are placed perpendicular to the body; skin above, smooth on the head, minutely pitted on the rest of the body: ventral surfaces minutely pitted; color above light brown, with broad dark brown marbling;

below, black with a few diffusely margined, yellow spots.

Description. Snout slightly concave in front, subacuminate, the tip forming a blunt triangle; tongue narrow, entire and free behind; eye diameter much greater than distance between eye and nostril; nostrils almost equidistant between eye and tip of the snout; only slightly closer to the tip of the snout: interorbital space broader than an upper eyelid; upper eyelids thickened at the edge; canthus angular; loreal region almost vertical, concave behind the nostrils; a heavy supratympanic ridge; a large outer palmar and a larger, elongated subdigital tubercle under the thumb; palm more or less smooth, with a tubercle at the base of each of the three outer fingers; other subarticular tubercles absent or indistinct; fingers free or almost so, the second relatively more slender than the others; no evident tarsal fold ; a rounded, flat outer and an elongate inner metatarsal tubercle; sole smooth; subarticular tubercles of toes indistinct; toes fully webbed between first and second, 3/4 webbed bet. ween second and third and about 1/2 webbed between third and fourth and fourth and fifth; the web extends as a lateral fringe to the tip of each toe; heel of the adpressed hind limb extends to the shoulder; fingers of the adpressed forelimb do not extend beyond the posterior border of the thighs: heels touch when tibiae are placed perpendicular to the body. Skin above, smooth on the head, minutely but contrastingly pitted on the rest of the dorsal surfaces, and on the flanks, venter and limbs; a few flat warts on the temporal region and shoulder; ventral surfaces wrinkled but without warts or granulations anywhere, not even on the buttocks; the small, shallow pits or depressions look like pin points under the naked eye but upon enlargement they appear like minute craters, closely and evenly distributed over all surfaces, with the exception of the head, loreal and suborbital regions; male with an enlar. ged forearm and a thickened inner finger whose tip is bended inwards.

Color. Above, light brown with broad, dark brown (black?) marbling consisting of a vermiculated swastika on the anterior half, behind the eyes, and some scribblings on the posterior half; thighs, and less distinctly so, the rest of the hind limbs and the forearms. of a light rosy or yellowish brown color, with darker marbling. (In the living animal the color of the thighs may have consisted of yellow, rose or salmon spots or bands, edged by a thin, darker brown or black margin); rest of the hind limbs and forearms yellowish brown, marbled or cross-marked with dark brown (black?); flanks and venter, black, this color meeting the dorsal along a longitudinal line under the canthus and supratympanic ridge and dorsolaterally back to the groins; a few rather difuse yellow spots on the lower part of the flanks, four large ones along the lower lip and a few others on the belly. Apart from these yellow spots, the ventral surfaces are distinctly black.

Measurements. (mm.) ♂ Snout-vent 29.8: head breadth 9; femur 9.1 ; tibia 10.1 ; foot 11.3.

Remarks. Although no specimens of *Ate. lopus subornatus* have been examined, *A. pedimarmoratus,* from the same general region. seems to follow the description of that species in having black flanks and a black ventral coloration (only some specimens of *A. subornatus* are said to be black below, how-ever, and this color is sprinkled with white dots).

It differs from *A. subornatus* in being considerably less webbed between the toes (In *A. subornatus* only the last phalanx, and in the fourth toe the last two phalanges, are left free), in having distinct metatarsal tuberclcs, in lacking warts on the flanks and hind limbs and in not having the forelimbs longer than the trunk (only a male of *A. pedimarmoratus* was available; however, females may be longer legged).

The marbled thighs, the cross-marked (or marbled?) fore and hind limbs, and the pitted character of the skin of *A. pedimarmoratus* are not mentioned for *A. subornatus*.

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