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BOSTON SOCIETY OF NATURAL HISTORY

VOLUME 8

pages 1-358

BOSTON

Printed for the Society

1931-1941

..."Sometime it is hoped that Volume 8 may be completed and title page and contents printed...letter July 20, 1944.

FEDERAL BUREAU OF INVESTIGATION
U. S. DEPARTMENT OF JUSTICE
WASHINGTON, D. C. 20535

45-161615-Aug. 27

Occasional Papers
OF THE
Boston Society of Natural History.

TWO NEW MUTILLIDAE FROM THE WEST INDIES.

BY RICHARD DOW.

ONE of the wasps described in this paper was collected by Dr. W. M. Mann in Haiti. The other was collected by the author while studying at the Harvard Biological Laboratory near Cienfuegos, Cuba. Dr. Clarence E. Mickel, to whom I am very grateful for examining these specimens, has assured me that both species are 'unquestionably new.'

***Ephuta tholosa*, sp. nov.**

Description.—Male: head black, very coarsely punctate, entirely covered with white, silky pubescence, mostly appressed. Eyes deeply emarginate within; ocellar margin nearly straight but with a slight emargination. Ocelli nearly round; the posterior ocelli twice as far from the eyes as from each other, separated from each other by one and a half times their shorter diameter, and from the anterior ocellus by less than their shorter diameter. Antennal scrobes carinate above. Antennal scape hairy, the flattened anterior surface enclosed by a loop-shaped carina; the pedicel and first two or three joints of the swollen flagellum with short hair which is reduced to a dense stubble on the remainder of the flagellum. Carinae below the antennae bidentate in outline, diverging to form an equilateral triangle, the enclosed area shining and nearly glabrous. Mandibles tinged with ferruginous, acute at apex, bearing a single tooth within. Posterior margin of the temples with a crenulate carina.

Thorax black, with white, silky pubescence. Dorsal surface of the pronotum concave and glabrous anteriorly, deeply emarginate posteriorly with a smooth margin; the remainder of the dorsal surface and the upper portion of the lateral surface with large reticulate punctures, pubescent. Lateral surface of the pronotum carinate anteriorly with a second carina branching posteriorly and ventrally from the first. Lower portion of the lateral surface with appressed pubescence, including the region anterior to the carina. Mesonotum similar to the dorsal surface of the pronotum; mesopleura covered with dense, appressed pubescence. Median portion of the scutellum swollen, nearly hemispherical, with large punctures and long, erect hairs; lateral portion on a level with the mesonotum anteriorly, posteriorly on a level with the meta-notum and dorsal surface of the propodeum, the pubescence of the lower area appressed. Meta-notum with lateral impressions, the pubescence appressed; middle portion of the metapleura smooth, glabrous. Dorsal and lateral surfaces of the propodeum covered with large reticulations, the dorsal surface with appressed

pubescence; posterior surface with irregular reticulations and punctures, separated from the dorsal surface by a more or less definite crenulate carina with a large perpendicular median tooth. Tegulae large, black with a paler margin, longitudinally folded but not carinate, with large and small punctures, pubescent. Wings subhyaline, darker at the tip; the nervures black. Radial cell blunt; cubital vein receiving the first recurrent nervure twice as far from the first transverse cubitus as the second, the second recurrent nervure twice as far from the second transverse cubitus as the third; outer nervures of the third cubital and second discoidal cells poorly developed, pale in color; transverse median and basal veins interstitial. Legs black with white calcaria, and white, silky pubescence.

Abdomen black, with white, silky pubescence. First tergite quadrate from above, with two lateral projections anteriorly, coarsely punctate with erect hairs, and covered with appressed pubescence except on the anterior median portion. Second tergite with large punctures, the pubescence mostly short but longer laterally and posteriorly, the posterior margin with a band of dense, appressed pubescence narrowed medially. Tergites 3-7 with a median carina; tergites 3-6 basally punctate and pubescent, the middle portion sparsely punctate with long hairs, the margin smooth and glabrous. Seventh tergite without pygidial area, differing from the preceding tergites in the absence of a glabrous margin. First sternite with appressed pubescence, and a median crest with a tooth anteriorly. Second sternite with large, coarse punctures, an inconspicuous, narrow, apical band of appressed pubescence, and an apical fringe of hairs. Sternites 3-6 sparsely punctured, with an apical fringe. Seventh sternite except for the emarginate apical margin, yellowish white, shagreened, punctured, and pubescent.

Length.—8 mm.

Holotype.—Mus. Comp. Zoöl. no. 16424; a male taken at Vilches Potrero, Soledad, Cienfuegos, Cuba, on August 16, 1930, by Richard Dow.

Remarks.—This species is easily distinguished from *Ephuta furcillata* Mickel by the absence of scutellar projections, the paler color of the wing tips, and the bidentate clypeal carinae.

It should be noted carefully that all of the specimens from 'Soledad, Cuba,' mentioned in *The Mutillidae of Cuba* by Dr. C. E. Mickel (*Psyche* 35: 16-28. 1928), are from the Atkins sugar estate near Cienfuegos, in the province of Santa Clara. In citing this locality, it is necessary to mention Cienfuegos, because there are two other sugar estates in Cuba which are known as Soledad, one in Matanzas and one in Oriente, and two towns of the same name, one in Camagüey and the other in Santa Clara!

***Photopsis retifera*, sp. nov.**

Description.—Male: head roughly circular in outline, pale castaneous, with distinct punctures and white hair, long erect hairs and short hairs intermingled.

Eyes hemispherical, steel gray in color, with distinct facets; eyes touching the base of the mandibles, the posterior margin slightly emarginate, the frontal margin with a still smaller emargination. Ocelli ellipsoidal; the posterior ocelli as far from the eyes as from each other, each separated from the anterior ocellus by one half the same distance. Ocellar area elevated and tinged with black; a crescent-shaped, impunctate impression below each ocellus. Front with a longitudinal impression which has a deep puncture near the anterior ocellus, and meets a short carina below the antennae. Antennae 13-jointed; scape, pedicel, base of the first segment of the flagellum, and tip of the last segment, mostly testaceous; flagellum mostly piceous; scape hairy and densely punctate, the pedicel and flagellum with a stubble of white hair. Antennal scrobes with one or two teeth above, smooth, shining, and glabrous, pitted on each side. Clypeus smooth, shining, nearly glabrous, with an anterior median lobe. Mandibles outwardly angulate, with a deep notch below; the flattened exterior surface carinate above and below, punctate, and hairy; apex of the mandibles oblique, with three teeth. Palpi clear light yellow; maxillary palpi 5-jointed, labial palpi 3-jointed. Postero-lateral angles of the head not carinate, since the occipital carina is circular and does not reach the temples. Median portion of the ventral surface smooth and glabrous.

Thorax pale castaneous, with white hair. Pronotum short, without a flat dorsal surface, reticulate and hairy; collar of the pronotum a short, tongue-shaped projection; posterior margin of the pronotum with a free transparent rim. Prosternum sparsely punctate, with few hairs. Mesonotum with parapsidal furrows and well-developed notauli; punctures larger than those on the head; hair fairly long, not erect; median portion of the scutellum a square, convex area with large punctures and erect hair; lateral portions of the scutellum triangular, impressed, ciliate. Mesopleura reticulate except the dorsal and posterior margins which are punctate, and a large concave area above the front coxae, also punctate; entire mesopleura with fairly short hair; sternauli represented by a carina. Mesosternum without projections. Metanotum shorter than the scutellum but more or less similar. Greater part of the metapleura smooth, shining, with a few short hairs. Propodeum rounded, with very large reticulations and long, erect hairs; the enclosed areas punctured laterally, but flat and impunctate on the dorsal surface; base of the propodeum with a smooth oblong area and an adjacent triangular area on each side of the median line, each oblong area about as long as three reticulations. Tegulae of a rounded triangular shape, honey yellow, transparent, and glabrous except for a series of hairs along the basal margin. Wings hyaline and iridescent, the fore wings slightly fuscous beyond the cells. Stigma brown; nervures pale yellow. Stigma about two thirds as long as the radial cell, the radial vein originating at two fifths of its length; first cubital cell nearly as long as the radial, four times as long as broad; first and second transverse cubital nervures sinuate; second cubital cell five-sided, the cubital vein angulate at two fifths of the distance from the first transverse cubital; the first recurrent nervure received at this angulation; median vein receiving the transverse median beyond the basal; third cubital and second discoidal cells imperfectly developed, very indistinct. Venation of the hind wing hyaline, indistinct. Legs mostly

piceous; the coxae, trochanters, and most of the fore femora concolorous with the head and thorax; calcaria brownish yellow.

Abdomen petiolate, mostly piceous; the petiole and most of the second segment concolorous with the head and thorax; hair white. Petiole nearly as long as the second segment, gradually widening toward the apex; width at apex one half of the length; punctures strong and confluent except on the dorsal surface of the apex; hairs shorter and less numerous in the same area; apical margin with a row of plumose hairs. Second tergite pale castaneous except a piceous apical band which extends anteriorly along the felt lines; punctures widely separated; hairs few. Tergites 3-6 with large and small punctures, and long and short hairs. The apical margins of the second and third tergites are conspicuously fringed with plumose hairs, which also occur on the margins of tergites 4-6. Basal portion of the seventh tergite piceous with long hairs, the remainder of the segment lighter in color; median portion glabrous; apex with a brush of hairs. First sternite without a distinct keel, the punctures strong and confluent. Second sternite colored like the tergite, fringed with plumose hairs; the punctures larger than those on the tergite; the felt lines indistinct. Sternites 3-6 similar to the corresponding tergites, the plumose marginal hairs mostly lateral in position. Median portion of the seventh sternite with a few large punctures and fairly short hair.

Length.—11 mm.

Holotype.—Mus. Comp. Zool. no. 16425; a male taken at Port au Prince, Hayti, by W. M. Mann.

Remarks.—This species belongs to the subgenus *Photopsis*, because there are no projections on the mesosternum. According to Dr. Mickel, it is closely related to *Photopsis facilis* (Cameron) from northern Sonora, Mexico. It differs from the latter species in which the second tergite is entirely blackish, by having the second tergite mostly castaneous.

No other species of *Photopsis* has ever been reported from the West Indies. As this species is represented by a single specimen, the label may be wrong. Dr. Mann did not remember collecting this specimen when I showed it to him recently, but he remarked that it was probably found in a desert area near Port au Prince.

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ENTOVALVA (DEVONIA) PERRIERI (MALARD) IN
THE WESTERN ATLANTIC.

BY W. J. CLENCH AND C. G. AGUAYO.

DURING the past summer at Woods Hole, Massachusetts, the junior author had his attention drawn to this remarkable lamelibranch on the holothurian *Leptosynapta inhaerens* (O. Müller). This is the first record of this genus from either side of North America.

Dr. J. A. Dawson first noted three small bivalves associated with this holothurian in material for use in the laboratory. These, with two additional specimens collected, were studied alive at Woods Hole and several of its habits noted.

This bivalve is apparently *Entovalva (Devonia) perrieri* (Malard) of Europe. It agrees in all shell characters with the descriptions and figures of that species as given by Anthony. It differs slightly in that the mantle does not extend at all over the outside of the valves. Its habits and method of progression over the surface of the host are essentially the same as described for the European form.

Recently Ohshima (1930, p. 25) has described a species of *Entovalva* from Japan, the valves of which are entirely enclosed within the mantle.

Devonia was established by Winckworth (1930, p. 14) for *Entovalva perrieri* (Malard) as this species differed anatomically from *E. mirabilis* Voelt., from Zanzibar, by having its valves nearly enclosed by the mantle. In *Devonia*, according to Winckworth (p. 14) the mantle is not extended or only partially extended over the valves. Of the five specimens examined at Woods Hole none were noted as having the mantle extended beyond the edge of the valves. We agree with Ohshima (p. 26) that, because of the complete series of mantle modification in the three species, a non-extension to complete extension over the valves, it seems best to consider them as belonging to one genus,

retaining *Devonia* as a subgenus for *E. perrieri*, in which the least extension has taken place.

The material obtained at Woods Hole was accidentally destroyed before a more extended study could be made of the animal alive. The two specimens of *E. perrieri*, collected by the junior author in North Falmouth in August, 1931, were found on specimens of *Leptosynapta* collected at low tide in 2½ to 3 feet of water on a sandy bottom. Several specimens of these holothurians were obtained but only two were found associated with *Entovalva*.

Owing to the rarity of these mollusks, little or nothing is known relative to their life history. Two other species of *Entovalva*, *mirabilis* and *semperi*, are found in the lower portion of the digestive tract of holothurians and have been termed endoparasites. *E. perrieri* on the other hand, is found on the outer posterior portion of the host and is termed as commensal by Anthony. Nothing as yet apparently justifies the designation of these forms as either commensals or parasites, because nothing is known biologically about their association with their respective hosts. It is, however, important to note that the two species found internally are both protected by their own mantle, *E. semperi* completely and *E. mirabilis* all but a very small part of the disc. *E. perrieri* is externally associated with the host and is without this protection. In all probability the mantle extension protects the shell against solution by acids when within the body of the host.

Anthony (1916, p. 384) states that in some of the specimens of *E. perrieri* the mantle extended somewhat up over the margin of the valves; in others the margins of the valves were free. The specimens obtained at Woods Hole, as noted above, had the valve margins entirely free of the mantle.

SYNOPSIS

***Entovalva mirabilis* Voelt. (Genotype).**

Entovalva mirabilis Voeltzkow 1890, Zool. Jahr. 5, p. 619, pl. 42.

***Entovalva semperi* Ohshima.**

Entovalva semperi Ohshima 1930, Ann. Zool. Japonenses 13, p. 25, pl. 2.

Entovalva (Devonia) perrieri (Malard).

- Synapticola perrieri* Malard 1903 [1904], Bull. Mus. Hist. Nat. Paris **9**, p. 344; non *Synapticola* Voigt. (Crust.).
Entovalva (Synapticola) perrieri Anthony 1916, Arch. Zool. Exp. Gen. **55**, p. 375.
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A NOTE ON A NEW CHYTRIDIACEOUS FUNGUS
PARASITIC IN *ELODEA*.¹

BY F. K. SPARROW, JR.

DURING an examination of material of *Elodea canadensis* Michx., collected at Forest Home, N. Y., a remarkable chytrid, possibly allied to *Hyphochytrium infestans* Zopf, was encountered parasitizing the leaves of the aforementioned flowering plant.

As a detailed study of this organism is likely to be retarded by other work already in progress, it has seemed advisable to give a generic and specific diagnosis of the fungus at this time.

Megachytrium, gen. nov.

Description.—Mycelium extra- and intramatrical; profusely branched and extensive, covering nearly the whole surface of the host with its interlocking, much branched hyphae. The latter variable in diameter but usually of great size, never rhizoidal; occasionally septate. Sporangium irregular in size and shape; either intercalary or terminal; opening by an operculum; proliferating. Zoöspores formed within the sporangium; escaping upon the dehiscence of the operculum. Resting spores intercalary; thick walled; intra- or extramatrical.

Megachytrium Westonii,² sp. nov.

Description.—Mycelium at first entirely extramatrical, later, intramatrical; made up of hyphae 5-7 μ in diameter, with smaller branches about 3 μ in diameter; markedly undulating. Sporangium terminal or intercalary; sometimes spherical or clavate but more often of irregular shape; with a short discharge tube; varying greatly in size; 15-50 μ in length by 10-30 μ in diameter; proliferating. Zoöspores fully formed within the sporangium; variable in number; escaping upon the dehiscence of the operculum which is 3-5 μ in diameter; uniciliate, 5 μ in diameter with a single small oil droplet. Resting spores intercalary; intra- or extramatrical; thick walled; broadly ovate with truncated ends; usually about 20 μ long by 15 μ in diameter.

Parasitic in *Elodea canadensis*, Fall Creek, Forest Home, Ithaca, N. Y.

Department of Plant Pathology,
Cornell University.

¹ This investigation was pursued while the writer was a National Research Fellow.

² Named in honor of Prof. W. H. Weston, Jr., of Harvard University.

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HERPETOLOGICAL NOTES FROM TUCSON, ARIZONA.

BY CLINTON V. MACCOY.

THROUGH the kindness of Dr. Thomas Barbour the author had the opportunity to collect herpetological material in Tucson, Arizona, and vicinity, from September 14 to 25, 1931. During the stay in this region an attempt was made to visit as many localities and as many different habitats as time permitted. Localities visited and species collected are listed below. Numerous stomachs were examined. Ninety-four specimens, representing 20 species, were secured and are deposited in the collections of the Museum of Comparative Zoölogy.

All collecting was done in Pima County except for a day's trip in the Santa Rita Mountains, Santa Cruz County. Many stones, logs, and other objects were turned over in a special search for small snakes, but without success. A number of persons, acquainted with the smaller snakes, such as *Sonora*, *Tantilla*, and *Chilomeniscus*, were of the opinion that at this time the nights are too cool, and that these reptiles are more often seen earlier in the season.

Headquarters were established at the Carnegie Desert Laboratory at Tucson. For laboratory facilities placed at the author's disposal, and for other courtesies, I am indebted to Dr. Forrest Shreve, Assistant Director of the Laboratory for Plant Physiology, in charge of the Desert Laboratory.

LIST OF LOCALITIES.

SANTA CATALINA MOUNTAINS.

This range, about 15 miles northeast of Tucson, runs northwest and southeast for some 18 miles, the higher peaks reaching from 7,000 to over 9,000 feet. The lower slopes, ramified by various canyons, are covered with cacti, creosote bush, mesquite, and other plants. Higher up *Populus tremuloides* and several species of large pines are found.

Sabino Canyon. This canyon, on the south side of the range, boasts a permanent stream, and is the largest canyon in the mountains. One day's collecting was done in the lower 3 miles, up to 3,100 feet. The canyon is filled with boulders, large and small, which form steep walls in some sections. The height of the water was such that considerable areas of sand were exposed. Cottonwoods, shrubs, and vines grow on islands in the center of the stream. In certain places near the sand and mud are considerable patches of grass, about 1 to 2 feet in height, in the protection of which *Rana halecina* was found. Above the stream, in the lower reaches of the mountains, grow creosote, mesquite, and several species of cacti. In some spots driftwood and overhanging shrubs form a thick, protective shelter for smaller animals, and in this habitat *Crotalus molossus* was taken.

Pima Canyon. At the western end of the range lies this smaller canyon in the lower 2 miles of which a fruitful morning's collecting was done on September 24. The stream bed is full of boulders, and contained no water at that time. Mesquite, creosote, cacti, and other plants line the banks.

Mount Lemmon. This peak, 9,150 feet high, lies near the center of the range. It is covered with a fairly thick growth of pines from 7,000 feet to the summit. In the higher altitudes *Populus tremuloides* grows in some profusion and to a fairly large size. The trip to the summit was made from Oracle, at the northwest corner of the range, to the old sawmill. The distance from there to the summit was covered on foot (7,900 to 9,150 feet) on September 23. The summit was cloudy, cool, and windy, a thermometer in the shelter of a cabin just below the summit, at 8,950 feet, registering 57° F. Many stones, logs, and debris were turned over on the damp forest-floor, but no amphibians or reptiles were seen in this upper 1,250 feet. Below, in the oak, cactus, and shrub zone on the northeast side of the mountain, a few lizards were collected.

SANTA RITA MOUNTAINS.

The Santa Rita Mountains, 20 miles south of Tucson, run southwest and northeast for about 12 miles. Collecting was done along the trail from Madera Canyon or White House Canyon to

the summit of Mount Wrightson, also known as Old Baldy, 9,432 feet high. The mountain is densely covered with pine and oak, the pine giving way to large rocks at the summit. September 20 was spent collecting here; it was warm and sunny all day.

TUCSON MOUNTAINS.

This low range, reaching about 5,000 feet, lies a good 3 miles west of Tucson and runs nearly north and south for about 8 miles. Its general features of vegetation, mesquite, acacia, giant cactus, and creosote, do not differ greatly from those of the desert. Rocky outcrops of some size occur near the higher points.

DESERT.

Carnegie Desert Laboratory grounds and vicinity. This region, Tumamoc Hill on the Laboratory grounds, Sentinel Peak, both about 3,000 feet high, and the country immediately adjacent, is covered with cacti, mesquite, palo verde, creosote, and other less conspicuous shrubs. Laval rocks of various sizes are strewn almost everywhere over this volcanic region.

One slightly rainy afternoon was spent just northwest of Tucson, north of the Laboratory. The claylike ground is packed hard and collecting was extremely poor. The only lizard found was one *Uta stansburiana stejnegeri* which ran along the gravel fill of the railroad track.

Santa Cruz River. Except for one day during the author's visit, the river was but a few puddles, mud, and sand. The river bed and its banks, here at an elevation of about 2,400 feet, were examined one morning above Tucson and during one rainy afternoon below Tucson, both trips quite fruitless. Some willows and cottonwoods grow along the banks. A special lookout for Gila Monsters was kept, but none were seen.

Tucson north to Oracle. This is typical of the desert region about Tucson, the average elevation being about 2,500 feet. The sandy or gravelly desert-floor is dissected by numerous washes of various sizes. Vegetation, in the main, consists of creosote, palo verde, mesquite, cacti, and smaller plants.

San Xavier Mission to Black Mountain. This is another characteristic stretch of desert country in the Tucson region, with an

elevation about the same as that of Tucson. September 15, a warm and cloudless day, was spent collecting from the Mission, 9 miles south of Tucson, to the base of Black Mountain, or Black Hills, and north toward Tucson. Cacti, mesquite, creosote, and acacia are the dominant larger plants. The soil is sandy or gravelly, with fine sand in the washes and coarser soil elsewhere. This is the typical habitat of *Callisaurus ventralis ventralis*.

South of Tucson Mountains. One afternoon was spent in this locality which closely resembles the area north of Black Mountain just described.

West of Tucson. The desert here is more rolling in topography as it approaches the Tucson Mountains. Otherwise its flora generally resembles that found in the desert of the Santa Cruz Valley.

LIST OF SPECIES.

Bufo cognatus cognatus Say.

GREAT PLAINS TOAD.

One 24-mm. specimen was found late in the afternoon of September 15, 6 miles south of Tucson, hopping about on the cracked mud of an almost dry ditch by the side of the road.

Bufo punctatus Baird and Girard.

RED-SPOTTED TOAD.

An adult of 62 mm. was picked up on a cement sidewalk on Congress Street near an irrigation ditch close to the Santa Cruz River in Tucson at 10 p. m. on September 14.

Hyla arenicolor Cope.

SONORAN TREE TOAD.

Two specimens, 40 and 47 mm. long, respectively, were taken at a cabin at 5,600 feet on the northeast side of Mount Lemmon in the Santa Catalina Mountains on September 22. One was taken at 2 p. m. from under a loose-fitting cover of an earthenware jar. The other, which had no food in its stomach, was collected at 6 p. m. when it jumped from a rock onto a porch railing. Here on the mountain it frequented the same habitat as did *Uta ornata symmetrica*.

Rana halecina Linné.¹

LEOPARD FROG.

The Leopard Frog was found only in Sabino Canyon in the Santa Catalina Mountains where it occurred commonly from the mouth of the canyon to a point 3 miles above, beyond which no collecting was done. Over 84 were counted during the trip up the canyon. They were seen on the muddy and sandy banks, often under cover of grass or shelving rocks, and also on the large, smooth boulders which contained small pools of water in pot holes or crevices. Specimens taken measure 48, 59, 61, and 62 mm., respectively. Many tadpoles about 12 mm. long were found near shore just above the mouth of the canyon on September 17. It might be remarked that *Rana* and *Thamnophis* were found together in Sabino Canyon, the only place where either was seen.

One stomach contained a large caterpillar, another held 2 large caterpillars, and a third stomach contained a small beetle, insect fragments, and a small leaf.

Callisaurus ventralis ventralis (Hallowell).

DESERT GRIDIRON-TAILED LIZARD.

This exceedingly timid lizard was always found associated with sand or occasionally with fine gravel. It was common in dry washes, and when alarmed almost invariably darted across the ground for a few feet, stopped, waved its tail back and forth over its back two or three times, when its black and white bars made the animal very conspicuous, and then if it saw further danger, disappeared with remarkable rapidity, tail over back, under cover at the base of a mesquite, cactus, acacia, or other thick bush. It often scurried down holes excavated by small rodents. When resting on the sand its dorsal coloring makes it very difficult to see. Toward sunset this lizard was often startled from the sand into which it had burrowed, and seemed to dart out from under one's foot. It was not seen on boulders and only occasionally stopped on small rocks. Although almost always seen on the fine sand of the open desert, it appeared in the lower part of

¹ I follow Burt (1931, *Proc. Biol. Soc. Washington* 44, p. 13) in the use of this name.

canyons only if fine sand was present. Two other lizards, *Uta stansburiana stejnegeri* and *Cnemidophorus tessellatus tessellatus*, were found in close proximity to this form, although usually occurring on the coarser soil at the sides of washes whereas *Callisaurus* is more strictly confined to the fine sandy washes themselves.

Of the nine stomachs examined one was empty and another contained two parasitic nematodes only. The others had insect fragments and the following insects, listed in order of their abundance: ants, beetles, flies, spiders, and beetle larvæ. A small orange-colored seed was found in one stomach.

Twelve specimens of the Desert Gridiron-tailed Lizard were collected. It was found at the following localities: 1 mile southwest of San Xavier Mission, just north of Black Hills near Tucson, $\frac{1}{2}$ mile north of Black Hills near Tucson, just west of Tumamoc Hill (Laboratory grounds) near Tucson, Tucson Mountains, west of Tucson Mountains, south of Tucson Mountains, east of Tucson Mountains, and Pima Canyon in the Santa Catalina Mountains, Pima County, and 1 mile west of Oracle, Pinal County.

***Holbrookia elegans* Bocourt.**

MEXICAN EARLESS LIZARD.

A specimen measuring 34 mm. from snout to anus was taken on September 19 in a gravel wash two miles west of Tucson on the Laboratory grounds. It ran from the gravel onto a small rock. Its stomach contained two spiders and insect fragments.

***Holbrookia texana* (Troschel).**

BAND-TAILED EARLESS LIZARD.

This species was found in Sabino (Sept. 17) and Pima (Sept. 24) canyons in the Santa Catalina Mountains. A specimen in Sabino Canyon ran from fine sand and sought shelter under a creosote bush. In Pima Canyon one lizard was found on the sand and another was taken as it was running across small rocks. *Holbrookia texana* was found only in rocky canyons, and *Holbrookia elegans* was taken in a small, canyonlike wash. *Holbrookia texana* was found in places where *Uta ornata symmetrica* and *Cnemidophorus sexlineatus perplexus* occurred. The three specimens collected measure 24, 25, and 34 mm., respectively, from snout to anus.

Uta ornata symmetrica Baird.

ARIZONA TREE UTA.

Thirteen specimens were collected and many more observed in the Tucson region. Almost always found on or near large rocks or boulders, it ran, when alarmed, from grass or coarse soil to the top of a rock and held its head high, seemingly on the lookout for further danger. This species was occasionally found on small branches of bushes where it is very difficult to see, and one was found on the stalk of a dead *Opuntia versicolor*. It generally prefers steeper ground than does *Uta stansburiana stejnegeri*. A male and female were found together in Sabino Canyon on September 17 resting upon a large horizontal branch of a cottonwood up which they ran when disturbed. A male in the same canyon ran to the top of a huge boulder and bobbed up and down by flexing all four legs, at the same time highly arching the body. A young specimen of 22 mm. from snout to anus, observed on the northeast side of Mount Lemmon at 6,000 feet, ran from among grass and pebbly soil and headed for a large rock. An adult was found at 8 p. m. resting on the side of a beam in one of the Laboratory storehouses. It was always taken in close company with *Cnemidophorus sexlineatus perplexus*, its other habitat associates being *Sceloporus clarkii*, *Holbrookia texana*, and *Crotalus molossus*. Specimens collected average about 45 mm. from snout to anus, the largest measuring 50 mm.

The stomach of one adult taken in Pima Canyon on September 24 contained 2 centipedes, 3 beetles, and insect fragments. Another taken in the same place had in its stomach one fly and other indistinguishable insect remains.

This Tree Uta was collected in the following localities: Tuma-moc Hill west of Tucson (Laboratory grounds), Sabino Canyon in the Santa Catalina Mountains, on the northeast side of Mount Lemmon at 6,000 and 6,400 feet, and at Pima Canyon in the Santa Catalina Mountains, all in Pima County.

Uta stansburiana stejnegeri Schmidt.

STEJNEGER'S BROWN-SHOULDERED UTA.

(Not as easily approached as *Uta ornata symmetrica*, this species usually ran for cover of bushes and rocks, and occasionally stopped on top of rocks when frightened. When alarmed and

posing on a rock, its head is usually up and the animal seems very alert. When running it carries its tail close to the ground.

While *Uta ornata symmetrica* was found in close proximity to regions of considerable vegetation, *Uta stansburiana stejnegeri* seemed to be more of a desert form and was almost always seen on the coarse soil of the desert floor or on the fine sand of washes, or occasionally running onto small, comparatively flat rocks, and was never found on trees or bushes. *Uta ornata symmetrica*, on the other hand, climbed trees and bushes readily, and often ran about on top of large rocks, but was not seen in the open desert. *Uta stansburiana stejnegeri* lived in habitats which are the same as, or very similar to, those chosen by *Cnemidophorus tessellatus tessellatus*, with which it was very commonly associated, and by *Callisaurus ventralis ventralis*.

Of the five stomachs examined four contained one beetle each, three contained ants, some as many as 8, one had 6 flies, another a caterpillar, and still another had the legs of a large grasshopper. Four of the stomachs contained additional insect material too much macerated to identify.

Twelve specimens of this lizard were taken, at the following localities: Tumamoc Hill west of Tucson (Laboratory grounds), just south of San Xavier Mission, 1 mile west of Tucson, 1 mile east of Tucson Mountains, and Pima Canyon in the Santa Catalina Mountains, all in Pima County.

The average-sized specimen is about 43 mm. from snout to anus, a large one, dark ventrally and almost black on the throat, measuring 51 mm.

Sceloporus clarkii Baird and Girard.

ARIZONA SCALY LIZARD.

Four, both adults and young, were captured on large rocks or boulders near streams or washes. It was not uncommon in Sabino Canyon where it ran over rocks 15 feet or so in height, and when frightened easily scurried to protection on the opposite side of a boulder or into crevices. One 27-mm. lizard was found on a stalk of dead *Opuntia versicolor*, around which it scurried when alarmed, and on being shaken to the ground, sought refuge in the grass.

Large adults were observed several times just after sundown

on the screens above the doors of the Laboratory, and when frightened climbed over the rock walls of the building and up under the eaves. In the daytime it was seen on the stucco walls of a house in the Tucson Mountains.

Sceloporus clarkii occurred only where large rocks or boulders were present. It was not seen high in the mountains, nor is it an inhabitant of the open desert. It was found in the same general habitat as *Uta ornata symmetrica*, *Cnemidophorus sexlineatus perplexus*, *Holbrookia texana*, and *Crotalus molossus*.

The limbs of all specimens are distinctly banded. The predominant dorsal color is brown or gray. A large, adult female, which has a green spot in the center of each dorsal scale, is decidedly green above. The coloration of young specimens does not differ very noticeably from that of adults.

A young specimen had in its stomach a caterpillar 40 mm. long, a large ant, other insect fragments, and a grain of sand. An adult contained 2 caterpillars representing 2 species, one about 20 mm., and the other of some 40 mm. in length. Another adult female, 91 mm. from snout to anus, had just eaten 2 grasshoppers about 38 mm. in length.

This species was collected at the following localities: Tumamoc Hill west of Tucson (Laboratory grounds), Sabino Canyon, 2 miles west of Tucson, and Tucson Mountains.

***Sceloporus jarrovi* Cope.**

YARROW'S SCALY LIZARD.

Eighteen specimens were taken on September 20 on Mount Wrightson in the Santa Rita Mountains, Santa Cruz County, the only locality where it was found. *Sceloporus jarrovi* was very abundant, running over good-sized rocks which occurred from the summit (9,432 feet) to a point about 1,000 feet lower, where it was the only reptile seen. Below this point it became scarce as the vegetation became more abundant, only two smaller and browner lizards being taken as low as 6,000 feet in the oak belt. It basked in the sun on the summits of large rocks which it climbed with great ease. At the top of the mountain the greatest number of lizards was observed between 1 and 2 o'clock. Late in the afternoon as the eastern side of the mountain became shady, most of the lizards disappeared from this region, but were

seen later on the sunny, western side. They allowed one to approach very near, one large adult permitting the author to stroke its chin, and a young one was easily caught by hand.

The young quite consistently have the back dark bronze-colored, with large dark spots, but adults vary much more in their dorsal color and the spots are very much smaller.

One female contained 2 eggs with well-developed embryos.

The stomachs contained an assortment of insects, mostly ants and beetles. One contained 6 lady beetles and another, one. Directly on the summit of the mountain a patch of grass about a foot square contained over 200 lady beetles. A young snail, *Sonorella* sp., was found in one stomach. Another animal contained a 12-mm. piece of a tail of a *Sceloporus jarrovi*. This may indicate a partly cannibalistic habit which is further indicated by the fact that many of the young observed had lost portions of their tails. The table on page 21 (Table 1) shows the result of 17 stomach examinations.

In many specimens 100 or more mites make an orange-colored spot in each gular fold. Under a hand lens they seemed to be mostly eggs, or at least egglike, and some had apparently hatched and were moving around. All specimens collected were parasitized in this way. One specimen had 8 oxyuroid nematodes about 5 mm. long in its stomach.

One specimen of *Phrynosoma douglassii hernandesi* was taken at 6,900 feet on Mount Wrightson and may possibly be a habitat associate of *Sceloporus jarrovi*. No other reptiles or amphibians were observed on the mountain.

Sceloporus undulatus thayerii Baird and Girard.

STRIPED SWIFT.

On September 22, two specimens were secured on the northeast side of Mount Lemmon, at 5,800 and 5,950 feet, respectively. One, an adult female was distinctly marked, the white dorso-lateral line being very conspicuous. The light brownish-gray harmonized well with the rocks from which it ran. A young specimen of 40 mm. from snout to anus was uniformly colored above, with dorso-lateral lines much fainter than in the adult and with no apparent dorsal crossbarring.

The two specimens were found in a region of oak and grass.

TABLE 1.

Stomach contents of Sceloporus jarrovi from Santa Rita Mountains.

FIELD NUMBER	ANTS	MOths	BETTLBS	INSECT LARVÆ	CATERPILLARS	NEMATODES	HEMIPTEKANS	FLIES	GRASSHOPPERS	SPIDERS	MOLLUSKS	INSECT FRAGMENTS	TAIL OF <i>S. jarrovi</i>	TWIGS
44	2								1					
45	4				3		1	1						
46					1				1					
47			1						1					
49						8			1					
50	2			5	1									
51	12			1			1	1						
52	2													
53	2							1						
54		23		1					1					
55	1		6	1										
56	1		2			1						×		
57			2				1	1					1	
58	12		1	1			2			1				
59			1		1									
60		1	3	2	2		1			1	1	×		
61	4				2			1				×		1
TOTAL	42	24	16	11	10	9	6	5	5	2	1	×	1	1

The adult ran from some large rocks up a sloping tree-trunk for about 6 inches. The young one was on the ground and headed for the cover of thick grass when alarmed, and another escaped in a similar habitat.

The stomach of the adult contained 2 ants, 1 fly, 1 grasshopper, and other insect fragments. A beetle about 10 mm. in length was taken from the stomach of the young specimen.

***Phrynosoma douglassii hernandesi* (Girard).**

ARIZONA SHORT-HORNED HORNEO TOAO.

One specimen, measuring 25 mm. from snout to anus, was found on September 20 running over twigs and leaves in the pine and oak region at 6,900 feet on Mount Wrightson in the Santa Rita Mountains.

Phrynosoma solare Gray.

REGAL HORNED TOAD.

On September 16 one of these horned toads, measuring 94 mm. from snout to anus, was found in the grass under a mesquite near the Laboratory office where it tried to escape by running into thicker grass. Except for several small seeds, its stomach contained a great number of black ants.

Cnemidophorus sexlineatus perplexus Baird and Girard.

SONORAN RACE RUNNER.

Six specimens of *Cnemidophorus sexlineatus perplexus* were collected, all taken on coarse sand or gravel. It was occasionally seen on small rocks, but mostly on the ground, and never on trees or bushes. *Cnemidophorus sexlineatus perplexus* was taken in canyons, most commonly in the region at the lower end of canyons, and on Mount Lemmon. *Cnemidophorus tessellatus tessellatus* was restricted to the desert, *Cnemidophorus sexlineatus perplexus* being found on the desert floor only near the mouths of canyons.

One specimen ran across the road at 6,000 feet on Mount Lemmon and stopped halfway up a bank. It usually was seen walking or skulking slowly about and when alarmed moved a little quicker for a short distance, stopped, moved again, and by repeating this procedure made itself a difficult target. It generally headed for the shelter at the base of bushes, and often disappeared down holes in such places. At Pima Canyon it proved quite common and here, as well as in other suitable localities, preferred the same type of country as *Uta ornata symmetrica*. *Sceloporus clarkii* was found with it, and, to a less noticeable extent, *Crotalus molossus*. The specimens collected average about 45 mm. from snout to anus.

Of four stomachs examined two were empty, one contained 2 hemipterans and 1 caterpillar, and the other, 1 hemipteran, 1 fly, 1 insect larva, and other insect fragments.

This lizard was found at the following localities: Sabino Canyon and Pima Canyon in the Santa Catalina Mountains, Tumamoc Hill west of Tucson (Laboratory grounds), and on the northeast side of Mount Lemmon at 6,000 feet, all in Pima County.

Cnemidophorus tessellatus tessellatus (Say).

DESERT WHIPTAIL.

This lizard was found both on coarse gravel and sand. When alarmed it headed for bushes at a comparatively slow pace, stopping now and then in such a way as to make collecting somewhat difficult. On reaching the shelter of a bush the animal sometimes retreated into a rodent burrow, but more often left the bush on the opposite side and headed for a bush farther away. One specimen collected just north of Black Hills near Tucson on September 15 was molting. One lizard, after having been shot, climbed 2 feet or so up a small tree. *Cnemidophorus tessellatus tessellatus* inhabited the same, or very similar regions, to those chosen by *Uta stansburiana stejnegeri*, *Callisaurus ventralis ventralis*, *Phrynosoma solare*, and *Crotalus molossus*. Specimens collected average about 52 mm. from snout to anus.

One stomach contained 3 caterpillars, 2 grasshoppers, and a hemipteran. Another had a 25-mm. caterpillar, a hemipteran, a small fly, and other insect fragments. A third stomach contained 20 small ants.

Five specimens were taken, from the following localities: just north of Black Hills near Tucson, 1 mile west of Tucson at the Laboratory office, and 1 mile east of Tucson Mountains.

Pituophis sayi affinis (Hallowell).

ARIZONA GOPHER SNAKE.

One specimen, 1038 mm. long, which had been run over, was picked up in the road 9 miles north of Tucson at 6 p. m. on September 23. Its stomach was empty.

Thamnophis eques (Reuss).

WHITE-BELLIED GARTER SNAKE.

Two specimens, 278 and 554 mm. long, respectively, were taken in Sabino Canyon in the Santa Catalina Mountains on September 17. The small one was crawling over rocks in the dry part of the stream bed and when pursued hid quite effectively in a small clump of grass. The larger snake was found among very large boulders near the stream, and had in its stomach a nematode worm about 75 mm. long.

Crotalus molossus Baird and Girard.

BLACK-TAILED RATTLESNAKE.

Two were collected in Sabino Canyon on September 17. One was stretched out in partial shade on driftwood and twigs of bushes about 4 inches above the ground. The other, taken during a light rain in the late afternoon, was found lying on twigs, leaves, and sand by the side of a large rock near heavy cover of bushes. A third rattler, which had been run over, was picked up in the road 2 miles south of Sabino Canyon. A fourth specimen was taken about 7 p. m. 2 miles west of Tucson on the Laboratory grounds. All specimens were observed in the desert near considerable vegetation, and in the semi-desert of canyons, none being seen high in the mountains. It was observed in the same habitat as *Sceloporus clarkii* and *Uta ornata symmetrica*. The total lengths of the 3 specimens taken measure 910, 912, and 1048 mm., respectively.

Kinosternon sonoriense Le Conte.

SONORAN MUD TURTLE.

A *Kinosternon*, possibly of this species, was seen in Sabino Canyon on September 17. It was discovered at about 3,000 feet in a small inlet of the stream about 6 inches deep and some 2 feet wide, and swam with considerable speed into a deep pool.

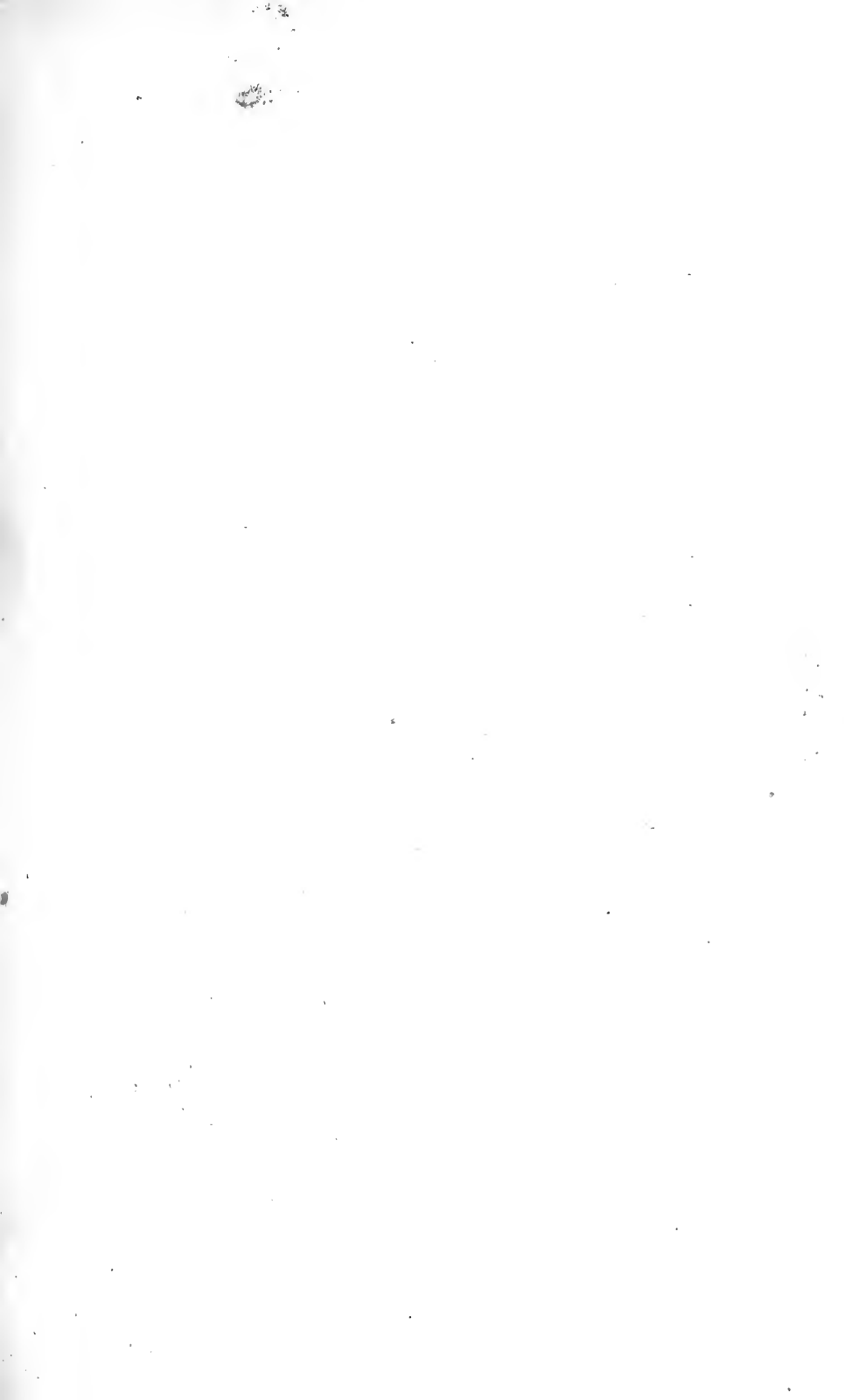
Gopherus agassizii (Cooper).

DESERT TORTOISE.

One specimen was found crossing the road 8 miles north of Tucson at 6 p. m. on September 23.

It has a carapace length of 190 mm., and carapace breadth at midbody of 135 mm. The greatest carapace width is 148 mm. The length of plastron from nuchal to caudal notch measures 173 mm., and width of plastron, 125 mm.

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Occasional Papers
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FIVE NEW SUBSPECIES OF THE FAMILY BOIDAE.
BY OLIVE GRIFFITH STULL.

IN the course of a revision of the family Boidae the examination of large series of specimens has revealed examples of what are apparently five new subspecies representing four genera of that group. It seems advisable to describe these forms before the presentation of the complete revision.

I wish to express my indebtedness for the opportunity of studying this group to the National Research Council, under whose grant as a Fellow in the Biological Sciences the revision has been made, and to give my sincere thanks to Dr. Thomas Barbour, under whose direction the work was done in the Museum of Comparative Zoölogy at Harvard University.

Four of the described forms are represented by types in the Museum of Comparative Zoölogy. The fifth is based on two specimens in the American Museum of Natural History which were collected by Dr. E. R. Dunn during the Burden East Indies Expedition, and is named in his honor, as follows:

Liasis mackloti dunn, subsp. nov.

Plate 1.

Type.—American Museum of Natural History no. 32263, collected by Dr. E. R. Dunn.

Type locality.—Uhak, north coast of Wetar, Dutch East Indies.

Paratype.—American Museum of Natural History no. 32264, Uhak, north coast of Wetar, Dutch East Indies, collected by Dr. E. R. Dunn.

Diagnosis.—This form may be distinguished from the most closely related subspecies, *Liasis mackloti mackloti* (Duméril and Bibron) of Timor and Smao, by the larger number of scale rows (61-63 instead of 49-55) and the unpitted rostral shield.

Description.—Female. Squamation: scale rows 48-63-31; ventrals 304; caudals cannot be counted as the tail is injured; supralabials 12 on the right side, with the sixth and seventh entering the eye, 11 on the left, with the fifth and sixth entering the eye; infralabials 18; preoculars 1; postoculars 2; supra-

labials 1-2 faintly pitted; infralabials 10-14 deeply pitted; rostral unpitted; 2 loreals on each side. Anal spurs present.

Dentition: premaxillary teeth 2; mandibular teeth 22; maxillary 20; palatine 6; pterygoid 13.

Coloration: dorsum brownish gray with irregularly scattered black scales; sides paler but with black scales more frequent and merging into irregular black spots; belly grayish, speckled with black, and with large black spots at the sides.

Variation.—The paratype differs from the type as follows: scale rows 48-61-32; ventrals 301; supralabials on both sides 12, with fifth and sixth entering the eye; infralabials 17, with 9-13 pitted; 1 loreal; maxillary teeth 22; palatine 7; pterygoid 16.

Another new subspecies of the genus *Liasis* is Australian, and is named for the type locality.

Liasis childreni perthensis, subsp. nov.

Plate 2, figure A.

Type.—Museum of Comparative Zoölogy no. 24426, collected by Winthrop Sprague Brooks.

Type locality.—Perth, West Australia.

Diagnosis.—This form differs from the allied *Liasis childreni childreni* (Gray) of eastern and northern Australia in the smaller number of scale rows (35 instead of 39-45), in the smaller number of ventrals (250 instead of 257-287 (average 270.8)), and the three pairs of prefrontals, as opposed to two in *L. c. childreni*.

Description.—Young female. Squamation: scale rows 31-35-21; ventrals 250; caudals 41 mostly divided; preoculars 2; postoculars 4; supralabials 12, without pits, fifth and sixth entering the eye; infralabials 15 on the right side, with 9-11 pitted, 14 on the left side, with 8-10 pitted; rostral unpitted; loreals 6 on the right side, 5 on the left; 3 azygous plates present between the two posterior pairs of prefrontals. Anal spurs present.

Dentition: mandibular teeth 20; maxillary 22; palatine 8; pterygoid 16.

Coloration: dorsum pale with dark brown spots arranged in four more or less regular longitudinal series, giving the general impression of a series of irregular crossbars; belly uniformly pale.

Total length 297 mm.; tail 30 mm. or 8.0 per cent of the total length.

A subspecies of the genus *Enygrus* is named in honor of Dr. Karl P. Schmidt, collector of four of the paratypes.

Enygrus asper schmidti, subsp. nov.

Type.—Museum of Comparative Zoölogy no. 29778, collected by Mr. Gillerup. (Exchange from the Zoological Museum of Amsterdam.)

Type locality.—Kaiserin-Augusta River, New Guinea.

Paratypes.—University of Michigan Museum of Zoology no. 68815, Wanggar River, Wayland Range, Geelvink Bay, New Guinea, collector unknown; Field Museum of Natural History nos. 13968, 14074, and 14153, Marienburg, New Guinea, collected by Dr. K. P. Schmidt, and no. 13876, Awar Pl., Madong, New Guinea, collected by Dr. K. P. Schmidt.

Diagnosis.—This subspecies differs from the closely related *Enygrus asper asper* (Günther) of Duke of York Island and New Britain in the lower number of ventrals (134–140 instead of 146–150), the lower number of dorsal spots (17–20 instead of 24–25), and the lower average number of scale rows (37.8 in *schmidti*, 40.6 in *asper*).

Description.—Female. Squamation: scale rows 31–37–21, all keeled excepting the three lowest rows of each side; ventrals 136; caudals 21; supralabials 10, separated from the eye by a series of suboculars; infralabials 16 on the right side, 15 on the left. No anal spurs present.

Dentition: mandibular teeth 23; maxillary 24; palatine 7; pterygoid 25.

Coloration: dorsum brownish with a median series of darker spots or cross-bars, each outlined before and behind with a row of black scales, and alternating or partly continuous with a similar row of smaller spots on either side; ground color of sides and belly paler than that of dorsum, belly irregularly mottled with darker spots. (See Peters and Doria 1878, *Ann. Mus. Genova* 13: 323–450, pl. 4.)

Total length 507 mm.; tail length 42 mm. or 8.2 per cent of the total.

Variation.—The scale counts of the five paratypes listed above are as follows: scale rows 29 to 33 at the neck, 35 to 43 in the middle of the body (Boulenger lists one specimen with 33), 19 to 23 anterior to the vent; ventrals 134–137; caudals 17–21; supralabials 11–14; infralabials 14–17; oculars 13–15; anal spurs present in the only male seen (field no. 14153).

In this series the mandibular teeth vary from 22 to 25, the maxillary teeth are constantly 24, the palatines 7, and the pterygoids 21 to 25.

The tail length varies from 6.9 to 8.8 per cent of the total length in these specimens, the largest of the series (field no. 13968) measuring 840 mm.

A new subspecies of the genus *Constrictor* is named in honor of Dr. Afranio do Amaral, the collector of the type and several of the paratypes.

***Constrictor constrictor amarali*, subsp. nov.**

Type.—Museum of Comparative Zoölogy no. 16700, collected by Dr. A. do Amaral.

Type locality.—São Paulo, Brazil.

Paratypes.—University of Michigan Museum of Zoology nos. 63009–63011, São Paulo, Brazil, collected by Dr. A. do Amaral, and no. 68005, Buena Vista,

Dept. Santa Cruz, Bolivia, collected by Dr. José Steinbach; Field Museum of Natural History no. 9197, Aquidauana, Matto Grosso, Brazil, collected by Dr. K. P. Schmidt, and no. 9198, Urucum, Matto Grosso, Brazil, collected by Dr. K. P. Schmidt; American Museum of Natural History no. 14549, Brazil, collector unknown.

Diagnosis.—This form may be distinguished from the related subspecies as follows: from the more northern South American form *Constrictor constrictor constrictor* (Linné) by the lower number of scale rows (71–79 instead of 85–89), the lower average number of ventrals (226–237 (average 232) instead of 234–250 (average 242)), the lower average number of caudals (43–52 (average 48) instead of 49–62 (average 54)), and the grayer coloring and differently shaped dorsal spots; from the Argentinian *C. c. occidentalis* (Philippi) by the smaller number of ventrals (242–251 in the latter) and the coloration; from the Mexican and Central American *C. c. imperator* (Daudin) by the lower number of ventrals (235–253 (average 243.4) in the latter), the lower number of caudals (47–69 (average 59.7) in the latter), and the coloration; from the Saboga Island *C. c. sabogae* (Barbour) by the lower number of ventrals (241–245 in the latter), the lower number of caudals (68 in the latter), and the coloration; and from the Mexican *C. c. mexicanus* (Jan) by the higher number of scale rows (71–79 instead of 55).

Description.—Male. Squamation: scale rows 53–75–37; ventrals 237; caudals 50; supralabials 22, separated from the suboculars by a series of scales; infralabials 23 on the right side, 24 on the left; 17 scales in the right ocular ring, 19 in the left. Anal spurs present.

Dentition: mandibular teeth 18; maxillary 17; palatine 5; pterygoid 10.

Coloration: ground color of both dorsum and belly uniformly heavily gray-speckled; dorsal series of 22 median spots on the body, 5 on the tail, the spots of the midbody region being saddle-shaped but each with a definite tapering process extending anteriorly in the vertebral line and another extending posteriorly; the dorsal spots connected by a dark dorso-lateral streak on either side, and bearing each a pale elongate spot at the lateral edge; a series of alternating dark spots, usually with light centers, on the sides; posteriorly and on the tail the spots are larger and quadrangular in shape.

Total length 495 mm.; tail length 51 mm. or 10.3 per cent of the total.

Variation.—The seven paratypes show the following variation: scale rows 53 to 61 at the neck, 71 to 79 in the middle of the body, 37–43 anterior to the vent; ventrals 226–237; caudals 43–52; supralabials 20–24; infralabials 23–27; oculars 15–20; anal spurs much smaller in females than in males; maxillary teeth 17–18; pterygoids 10–11; tail length from 8.3 to 13.8 per cent of the total length, the largest specimen (field no. 9197) measuring 1570 mm.

Remarks.—Of the eight specimens examined two have the mental shield as broad as long, three have it longer than broad,

and three broader than long. This form is thus intermediate between *C. c. constrictor* and *C. c. occidentalis* in this character as well as geographically, and the latter should therefore be considered a subspecies rather than a full species, as hitherto.

A new subspecies of the genus *Eryx* is named in honor of Mr. Arthur Loveridge, collector of the type and two paratypes, in gratitude for his kindness to me during my stay at the Museum of Comparative Zoölogy.

***Eryx thebaicus loveridgei*, subsp. nov.**

Plate 2, figure B.

Type.—Museum of Comparative Zoölogy no. 18184, collected by Mr. A. Loveridge.

Type locality.—Mbunyi, Kenya Colony.

Paratypes.—Museum of Comparative Zoölogy no. 11486, near Nairobi, Kenya Colony, collected by Mr. A. Loveridge, and no. 7295, Uganda, collector unknown; American Museum of Natural History no. 16879, Kahe, German East Africa, collected by Mr. A. Loveridge.

Diagnosis.—This subspecies differs from the allied *E. t. thebaicus* (Reuss) of North Africa in the higher number of scale rows (53–59 instead of 47–49), the lower average number of ventrals (168–182 (average 173.2) instead of 175–192 (average 184.8)), and the immaculate belly and sides

Description.—Female. Squamation: scale rows 47–59–28; ventrals 169; caudals 23; supralabials 14 on the right side, 13 on the left; infralabials 18 on the right side, 19 on the left; 13 scales in the ocular ring on the right side, 14 on the left. Anal spurs absent.

Dentition: mandibular teeth 13, maxillary 12; palatine 4; pterygoid 8.

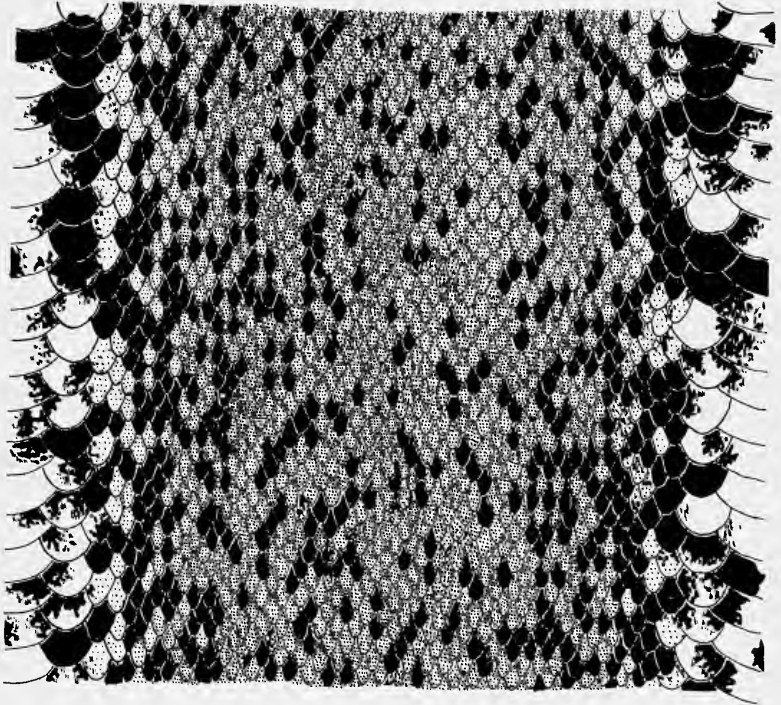
Coloration: dorsum yellowish white with two series of more or less irregular, sometimes confluent, quadrangular black spots; a dorso-lateral series on either side of much smaller black spots, partially confluent with the dorsal spots, and forming a broken, irregular longitudinal band; sides and belly immaculate yellowish-white.

Total length 520 mm.; tail length 45 mm. or 8.6 per cent of the total. The type is the largest specimen examined.

Variation.—The three paratypes vary from the type as follows: scale rows 43–49 at neck, 53–59 in mid-body region, 25–29 anterior to the vent; ventrals 168–178; caudals 22–26; supralabials 12–13; infralabials 19–21; oculars 11–13; mandibular teeth 10–12; palatines 4–5; tail length 8.6 to 11.2 per cent of the total length; anal spurs present in the only male specimen (M. C. Z. no. 11486), but in none of the females.

EXPLANATION OF PLATE 1.

Color pattern of *Liasis mackloti dunnii*, subsp. nov.

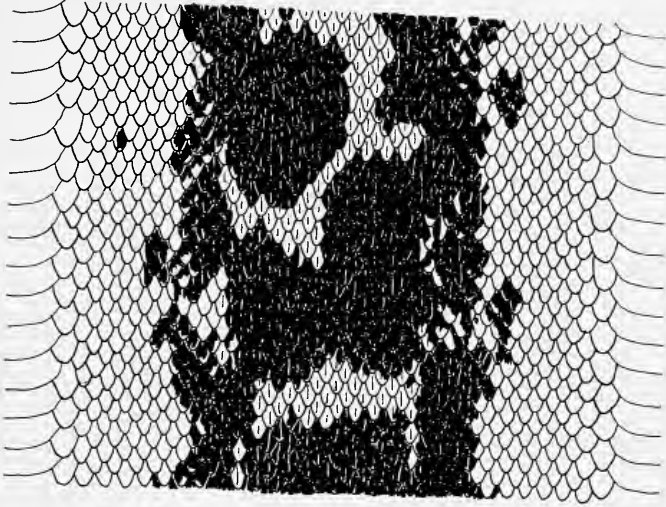


STULL ON NEW BOIDAE.

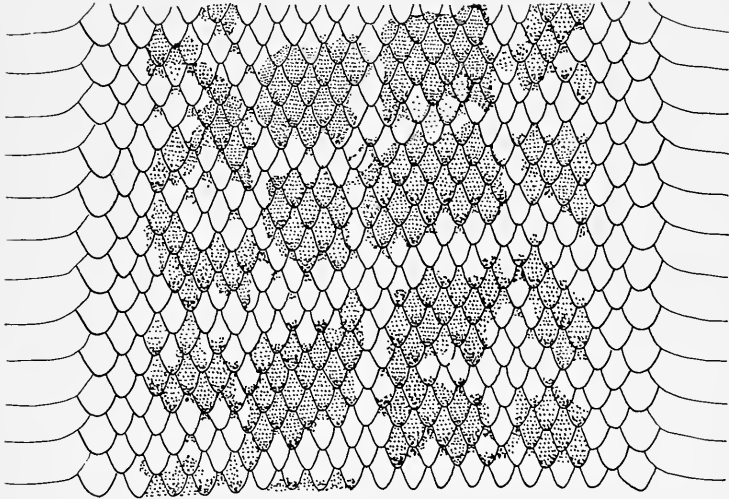
EXPLANATION OF PLATE 2.

FIG. A. Color pattern of *Liasis childreni perthensis*, subsp. nov.

FIG. B. Color pattern of *Eryx thebaicus loveridgei*, subsp. nov.



B



A

STULL ON NEW BOIDAE.

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NOTES AND DESCRIPTIONS OF CUBAN MOLLUSKS.

BY C. G. AGUAYO.

IN this paper, besides the description of four land shells believed new, two Cuban records of well-known Neotropical species are added. Also, there are listed four uncommon species for the knowledge of their geographic distribution. With two exceptions, all the shells here discussed have been collected by the author.

***Eutrochatella* (*Pyrgodomus*) *holguinensis*, sp. nov.**

Plate 3, figures *A* and *B*.

Description.—Shell conic, thin, color brownish red or yellowish. Whorls 5, angulate convex, slightly disjointed. Last whorl carinated, very convex below, subangulated around the umbilical area. Spire very acute. Aperture triangular. Peristome simple, not reflected; basal margin white, evenly passing into the columellar callus, which is small and slightly thick. Umbilical area depressed. Suture deep. Spiral sculpture very fine, formed by numerous, slightly elevated ridges. Axial sculpture microscopic, formed by irregularly spaced growth wrinkles, with numerous fine, intermediate striation (visible only under high-power microscope). Operculum grayish white, very concave, not drawn into the aperture in the adult specimens; the concavity bears numerous long, slender erect papillae; the margin is bordered by radial, stout ridges, which are modifications of the central papillae. The shells vary but slightly in size and proportions. The average length is 3 mm., and the diameter ranges from 3.2 to 3.3 mm.

Holotype.—Museum of Comparative Zoölogy no. 86474, from Cerro Ramon Leyva, Sao Arriba, Holguin, Eastern Cuba, collected by J. Garcia Castaneda. Length 3.1 mm., diam. 3.2 mm., length of the aperture 1.6 mm., width of the aperture 1.1 mm.

Paratypes.—Museum of Comparative Zoölogy no. 86475 from the type lot; and no. 86493 from Las Cuevas, Holguin, collected by C. G. Aguayo. Paratypes also in the collections of Carlos de la Torre and C. G. Aguayo.

Remarks.—This species belongs to the group of *E. rupestris* Pfr., *E. continua* Gundl., and *E. pfeifferiana* Arango. The radula is quite similar to that of *E. rupestris*.

It differs from all the species of the group by its form, sculpture, position of the operculum and shape of the basal part of the last whorl, and especially, by the structure of the operculum, whose erect papillae are unequalled by any other Cuban Helicinidae. In some forms of the subgenus *Pyrgodomus* there are found granulose opercula, but they are not provided with as long papillae.

E. petrosa has the operculum in a similar position, but it is very different in size, sculpture, proportions, etc.

This new species is apparently restricted to the region of Holguin, being found on limestone cliffs. The specimens are remarkably covered by a thick layer of their excretions.

Ramsdenia garciana, sp. nov.

Plate 3, figure C.

Description.—Shell solid, subperforate, ovate-conic, decollated. Suture very deep. Whorls $3\frac{1}{2}$, convex; last one disjointed. Sculpture formed by axial, hollow, inequal riblets, irregularly disposed, expanding into hollow white bulbs at the suture, both above and below. Spiral sculpture formed by 4 to 6 deep crenulations of the axial riblets. Color ashy white. Aperture subcircular, peristome simple, not expanded. Operculum with a central nucleus and a revolving calcareous lamella, finely, densely and obliquely striated. Young specimens, not decollated have the first two whorls smooth, the third with distant and feebly crenulated axial riblets, which gradually become more numerous and deeply crenulated on the next whorls.

The length of the specimens measured ranges from 7.8 to 10.5 mm.

Holotype.—Museum of Comparative Zoölogy no. 47998, from Sao Arriba, Holguin, Oriente, collected by C. G. Aguayo. Length 9.5 mm., diam. 5.3 mm., length of the aperture 3 mm., width of the aperture 2.6 mm.

Paratypes.—In the collection of C. G. Aguayo, collected by E. Garcia Fera, J. Garcia Castaneda, and C. G. Aguayo.

Remarks.—Although this species does not have a disjointed apical whorl, I do not hesitate to include it in the genus *Ramsdenia*, as the other characters are similar to those of *R. mirifica* and *R. bufo*. The disjointed apical whorl is not necessarily of generic rank, as it occurs as well in a typical *Opistosiphon* (*O. caroli* Aguayo).

R. garciana differs from *R. mirifica* by not possessing disjointed apical whorls, and by the axial riblets not forming into regular groups.

This species has not been compared with specimens of *R. bufo*,

but it seems to differ (according to Pfeiffer's description) by its larger size and disjointed last whorl. *R. bufo* has the last whorl 'antice non soluto.' The locality of *R. garciana* is about 150 km. from 'Cueva de Malano,' the type locality of Pfeiffer's species.

I take pleasure in naming this species for Messrs. Garcia Feria and Garcia Castaneda who accompanied me during many trips through the region of Holguin, and are now much interested in malacology.

Chondropoma ernesti clenchi, subsp. nov.

Plate 3, figure D.

Descriptions.—Differs from the typical *Ch. ernesti* Pfr., by the following characters: shell more conic, *i. e.*, the diameter proportionally larger; whorls less convex; spiral sculpture formed by 6–7 revolving ridges, while cotypes of *Ch. ernesti* examined have 9–10; aperture proportionally larger, ovate, columellar margin less sinuous; color pink or yellowish pink with obsolete brown spots, instead of 'corneo-albida, lineolis interruptis rufis subfaciata.'

The length of the shells measured ranges from 10.9 to 13.5 mm.

Holotype.—Museum of Comparative Zoölogy no. 47999 from Las Cuevas, Holguin, collected by Garcia Castaneda and C. G. Aguayo. Length 11.9 mm., diam. 8.5 mm., length of the aperture 5 mm., width of the aperture 3.5 mm. Whorls 3½.

Paratypes.—Collection of C. G. Aguayo, from the type lot.

Remarks.—*Ch. ernesti*, after Pfeiffer's description, has the following measurements: length 14 mm., diam. 7 mm., length of the aperture 5 mm., width of the aperture 4 mm. A cotype in the Museum of Comparative Zoölogy no. 78169 measures: length 12 mm., diam. 8.5 mm., length of the aperture 5 mm., width of the aperture 3.5 mm.

As I have no larger series of good specimens available for a better description, I prefer to consider this form temporarily as a subspecies of *Ch. ernesti*.

It gives me pleasure to name this subspecies after my friend W. J. Clench, to whom I am very much indebted for many suggestions during my studies in the Museum of Comparative Zoölogy.

Chondrothyra assimilis ('Gundl.' Pfr.) var.

Some specimens of an interesting variety of *Ch. assimilis* were collected on the limestone cliffs of Soroa, Pinar del Rio, by Brother Leon, H. N. Lowe, and myself in April, 1931. They

seem to be intermediate between *Ch. assimilis* and *Ch. ottonis*, but are distinguishable from both. No attempt is made to name this variety as I am not certain whether or not it has received a manuscript name by de la Torre and Bartsch, who are now preparing a monograph of Cuban operculate land snails.

Urocoptis acus bartschi, subsp. nov.

Plate 3, figure *E*.

Description.—Similar to *U. acus* Pfr. in general relative proportions, sculpture and shape of the internal axis.

Differs by the following characters: last 1 to $1\frac{1}{2}$ whorls longer than broad; suture of the last whorl very oblique, descending rapidly; last whorl forming an obtuse angle with the vertical axis of the shell; aperture located very near the middle axis of the shell, instead of being at the right side as occurs in *U. acus* as well as in most of the dextral *Urocoptis*. In *U. acus* the sutures of all the whorls are nearly horizontal and parallel.

The length of the shells measured ranges from 22 to 26 mm.

Holotype.—Museum of Comparative Zoölogy no. 47876, from Loma 'El Soton,' Candelaria, Pinar del Rio, from a lot collected by Dr. Paul Bartsch, P. Bermudez, H. N. Lowe, E. Portuondo, and C. G. Aguayo. Length 22 mm., diam. 3.2 mm., length of the aperture 3 mm., width of the aperture 2.3 mm.

Paratypes.—In the collection of C. G. Aguayo, from the type lot.

Remarks.—This subspecies seems to be restricted to a very small area. It appears to be a topographic variation of *U. acus* which was collected in abundance at El Taburete and at La Tumba, two places separated by the river San Juan from the type locality. None of the specimens collected in these two localities shows the peculiar last whorls of the new subspecies. It was found under stones, a habitat by no means common in the members of the group of *U. torquata* Mörel., to which this subspecies belongs.

It is with pleasure that I name this subspecies for my friend Dr. Paul Bartsch, whom I accompanied during several trips in Cuba in the summer of 1928.

Urocoptis patruelis (Arango).

Plate 3, figures *G* and *H*.

Dr. Carlos de la Torre kindly identified as *U. patruelis* several specimens which I collected on the stone walls of the way up to Soroa, Candelaria, not far from the type locality.

This species was described from material found by Arango on the stones of the coffee plantation 'San Felipe Benicio' in Candelaria, Province of Pinar del Rio. No additional record is known since the collecting of the original lot.

The type is in the collection of Dr. de la Torre.

The specimens figured belong to the lot of Museum of Comparative Zoölogy no. 86491, from Soroa, Candelaria.

Microceramus maculatus ('Wr.' Pfr.).

Plate 3, figure *F*.

The type locality for this species is 'Ingenio Quinones,' Bahia Honda, in the Province of Pinar del Rio. Later were referred to this *Microceramus*, specimens collected by Gundlach at Guajabon, not very far from Wright's locality.

Numerous specimens, collected by Pedro J. Bermudez, Miguel Jaume, and myself on the limestone cliffs of El Mamey, Cayajabos, Pinar del Rio, agree quite well with both the original description (1865, *Malak. Bl.* 12, p. 119) and the figure (*Novit. Conch.* 3, pl. 93, fig. 19-21).

Apparently this is the first record of the species since those from the above-mentioned localities. It seems to be very scantily represented in the collections.

Specimens figured are from lot Museum of Comparative Zoölogy no. 86492.

Microceramus infradenticulatus ('Wr.' Pfr.).

Two specimens, which I temporarily refer to *M. infradenticulatus*, were collected by the author on the hill of Soroa, Candelaria, Pinar del Rio. They seem to have characters of both *M. infradenticulatus* and *M. elegans*, being more closely related to the former, although easily distinguishable from it.

Specimens have been compared with cotypes of *M. infradenticulatus* showing enough characters to be considered as a geographic variety, but it will be convenient to have a larger series before attempting to describe it.

Pupisoma dioscoricola C. B. Adams.

A few specimens of this minute shell, were given to me by Mr. Ignacio Sosa, who found them in Cardenas, Province of Matan-

zas. They seem to agree with the description of *P. dioscoricola* as redefined by Pilsbry in everything except in coloration, which is light corneus instead of cinnamon. By their microscopic spiral striation, they apparently belong to the variety found in Florida.

This species (type locality, Jamaica) is scattered through Florida, Mexico, Central America and the West Indies, but this is the first time recorded from Cuba.

It appears to have been discovered on the yam (*Dioscorea alata*), but it is also known to live on several other plants. I do not know where Mr. Sosa found the specimens.

***Planorbis macnabianus* C. B. Adams.**

This exceedingly depressed Jamaican *Planorbis* is an interesting addition to Cuban fresh-water fauna. A few specimens were collected by Messrs. M. Jaume and M. Barro in the pond 'Coralillo,' Havana Province. The pond is located on the north side of Ariguanabo Lake, being connected with it during the rainy season.

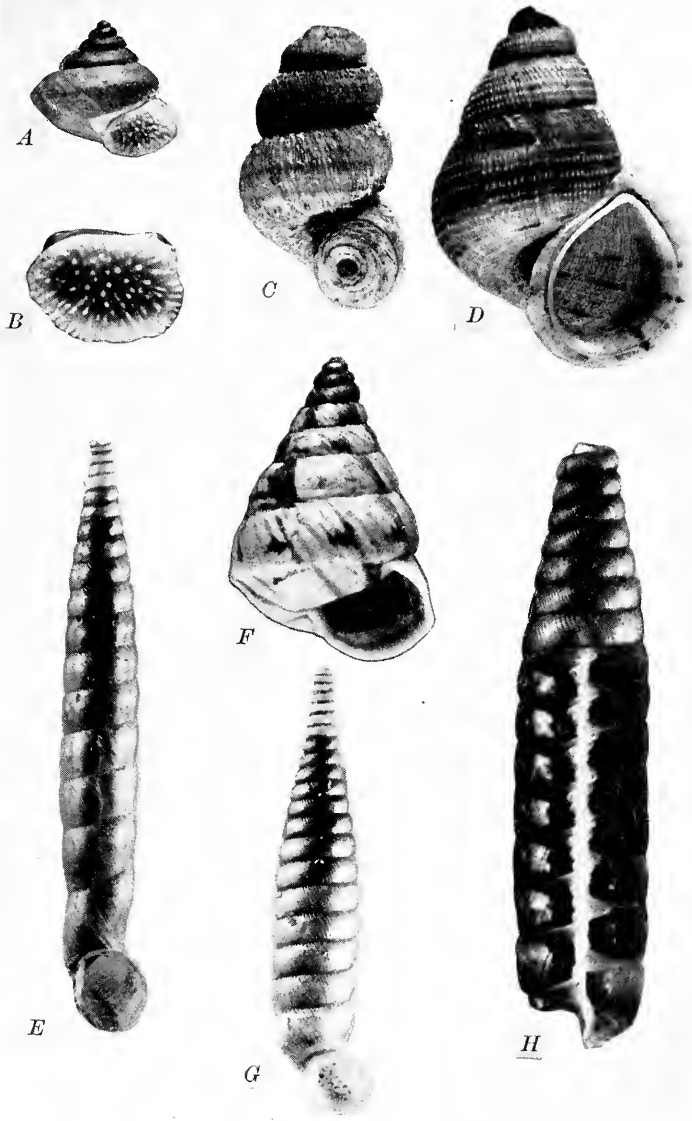
As Ariguanabo has been visited during many years by most of the Cuban naturalists, it is remarkable that they did not find the species. It is quite possible that it has been introduced recently.

Pl. affinis C. B. Adams is another species of the genus which occurs both in Cuba and Jamaica.

EXPLANATION OF PLATE 3.

- FIG. A. *Eutrochatella holguinensis*, sp. nov. (holotype).
FIG. B. *Eutrochatella holguinensis*, sp. nov. (operculum).
FIG. C. *Ramsdenia garciana*, sp. nov. (holotype).
FIG. D. *Chondropoma ernesti clenchi*, subsp. nov. (holotype).
FIG. E. *Urocoptis acus bartschi*, subsp. nov. (paratype).
FIG. F. *Microceramus maculatus* ('Wr.' Prf.).
FIG. G. *Urocoptis patruelis* (Arango).
FIG. H. *Urocoptis patruelis* (Arango).

Photo by F. P. Orchard.



AGUAYO ON CUBAN MOLLUSKS.

Occasional Papers
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SOME NEW LAND MOLLUSKS FROM BORNEO AND
THE PHILIPPINES.

BY W. J. CLENCH AND A. F. ARCHER.

DURING the past year Mr. Pedro de Mesa of Calapan, Mindoro, Philippine Islands, has submitted for naming, a large series of land mollusks. Several are apparently new and certain of these are herein described. In addition to the above, two new land forms from Borneo are included.

Cyclophorus fernandezi occidentalis, subsp. nov.

Plate 4, figure B.

Description.—Shell dextral, narrowly umbilicate, turbinate, solid. Nuclear whorl varying from nearly black to dull white and covered with fine, axial, zigzag flames, this condition continuing for the next two and a half whorls. A series of brown subsutural flecks from the nuclear whorl sometimes well on to the body whorl. The rest of the shell white except where light-brown patches of periostracum remain. Whorls $4\frac{3}{4}$ to 5, rather convex. Spire elevated, almost sharp at the apex. Aperture nearly circular. Peristome reflected especially in the columellar area, and thickened by an inner rim. Parietal callus thick and continuous with peristome. Suture somewhat impressed. Nuclear whorl smooth. Succeeding whorls bearing slightly raised, spiral ribs at slightly irregular distances from each other. On the body whorl these ribs only absent on the base around the umbilicus. A series of closely crowded spiral lines covering the shell from the nuclear whorl onward. A series of axial riblets not closely crowded covering the shell from the nuclear whorl onward.

<i>Length</i>	<i>Width</i>	<i>Ap. Length</i>	<i>Ap. Width</i>	
18	20	8.5	9 mm.	Holotype
18	20	8.5	9	Paratype
18.5	20	9	8.5	“
18.5	19.5	8.2	8.5	“
18	19.5	8.5	8.5	“

Holotype.—Museum of Comparative Zoölogy no. 92,797, from Calaminatao, Mamburao, Mindoro, Philippine Islands.

Paratypes.—Museum of Comparative Zoölogy no. 93,814, Pedro de Mesa, collector. Additional paratype in the Acad. Nat. Sci. Phila., no. 159,750.

Remarks.—This variety may be distinguished from *Cyclo-*

phorus fernandezi Hidalgo by the following points: the spiral ribs are less prominent; in the columellar region, the peristome is more broadly reflected almost in the form of a wing. Furthermore, bluish-spined specimens such as Hidalgo figures as his *C. fernandezi* (Jour. de Conchyl., 1888, pl. 4, fig. 6-6a) are absent. This variety also occurs at Tara Mangyan, Abra de Ilog, Mindoro.

***Pterocyclos kobelti*, sp. nov.**

Plate 4, figure 4.

Description.—Shell dextral, very openly umbilicate, discoid. Nuclear whorl plain brown and beyond that changing gradually to zigzag waves of a dull white ground which are strongly developed above the periphery on the body whorl, the brown waves being absent below the periphery. This characteristic coloring is generally hidden by a dark-brown, rough periostracum. Aperture white. Whorls 4 to 4½, quite convex. Spire raised and prominent while the succeeding whorls expand broadly and do not descend much at all. Aperture diagonal and circular. Peristome double. A sinus running along the whorl from the inner rim to the outer rim of the upper portion of the peristome where it joins the body whorl, and pushing the outer rim upwards. Just outside of that area the outer rim bends down slightly in the form of a lappet. Outer rim projecting beyond inner rim from region of lappet on to the basal portion of peristome where it fuses with inner rim and continues as a single rim in the columellar and parietal region. Suture rather deeply impressed. Sculpture consisting of faint, closely crowded, axial lines from the termination of the nuclear whorl to the termination of the body whorl. Nuclear whorl smooth.

<i>Length</i>	<i>Height</i>	<i>Ap. Length</i>	<i>Ap. Width</i>	
24	11	8.5	9 mm.	Holotype
21.5	9.5	7.5	7	Paratype
21	10.5	7.2	7	“
23	10	7.5	7	“
23	10.5	8	7	“

Holotype.—Museum of Comparative Zoölogy no. 47,890, from Mt. Kina Balu, North Borneo, received from B. Preston Clark.

Paratypes.—Museum of Comparative Zoölogy no. 31,650.

Remarks.—This species may best be compared with *Pterocyclos tenuilabiatu*s (Metcalf). It is smaller and less robust. The spire is higher and the umbilicus is narrower. The sinus at the point where the upper portion of the peristome joins the

body whorl is narrower while the lappet is smaller and less flexed downward. The outer rim of the peristome is simple and expanding instead of having a curved-over margin. The basal and columellar portions of the peristome are single instead of double. The operculum is unobserved so no comparisons may be made. In other respects the two species are much alike.

Obba listeri mayabigensis, subsp. nov.

Plate 4, figure C.

Description.—Shell dextral, widely umbilicate, solid, very depressed, lens shaped, very sharply carinated. Color consisting of a wide (2 mm.), subsutural, spiral, brown band irregularly marbled with white, this band beginning just beyond the termination of the nuclear whorl and continuing to the peristome. The above mentioned, white marbling continued in the supersutural area alternating with light brown. The under side of the shell possessing just behind the keel a rather wide (4 mm.) band of light brown freely marbled or spotted with white; just beyond this towards the umbilicus a narrow, brown band interrupted occasionally by white spots; finally, the wide area around the umbilicus of a dull, light-yellow color. Peristome white. Interior of the aperture showing more or less distinctly the characteristic colors of the body whorl. Whorls 4, nuclear whorl very depressed, succeeding whorls slightly convex. Aperture nearly horizontal and ellipsoid. The peristome becoming increasingly reflected from the parietal wall to the area of the keel, this character again gradually decreasing from the keel to the columella. The basal lip of the peristome possesses about midway a more or less prominent tubercle. The columella small and curved. Parietal wall armed with a slight semi-transparent ridge forming a connection with the columella and outer lip of the peristome. Suture very slightly impressed. Sculpture on the top of the shell consisting of rather closely crowded, axial lines interrupted here and there by transverse wrinkles or malleations in the region above the keel. The base of the shell characterized by these same axial lines interrupted below the keel by more transverse wrinkles and malleations which give place to regular spiral lines in the region around the umbilicus.

<i>Alt.</i>	<i>Maj. Diam.</i>	<i>Les. Diam.</i>	<i>Ap. Length</i>	
12.8	32	26.5	14.6 mm.	Holotype
11.9	32	27.8	14.9	Paratype
12.9	34.6	28.6	15.5	“
12.5	33	28.4	15.3	“
11.3	29.4	25	13.5	“

Holotype.—Museum of Comparative Zoölogy no. 92,798, from Mayabig, Baco, Mindoro, Philippine Islands, Pedro de Mesa, collector.

Paratypes.—Museum of Comparative Zoölogy no. 93,922 and Acad.

Nat. Sci. Phila. no. 159,749, from Mayabig. In addition there is a series (Museum of Comparative Zoölogy) from Buliran, Naujan, Mindoro, that is a little less depressed but otherwise they agree with the specimens obtained at the type locality.

Remarks.—This variety differs from *O. listeri* (Gray) in being smaller, with a sharper more prominent tubercle on the inner basal margin of the peristome. The malleations are deeper and more numerous. The color is darker brown and more extensive while the light-colored spots are less numerous. This variety may in addition be compared with *O. listeri batanica* Bartsch in being larger, more depressed, with the more prominent basal tubercle already mentioned, while the color is darker. It contrasts with both above mentioned forms in having a sharper, more prominent keel.

Obba planulata mamburaoensis, subsp. nov.

Plate 4, figure D.

Description.—Shell dextral, umbilicus partly closed, low, conoidal above, flattened below, solid. Nuclear whorl dull white, succeeded on the next whorl by a very pale, fleshy brown, which from thereon, consists of axial, interrupted flames, though on the body whorl these are either in the form of axial streaks or are totally absent. The aperture, a fleshy brownish out to the edge of the peristome. Whorls 4. Spire rather elevated, succeeding whorls slightly convex. Body whorl angulated at the periphery, convex above and below. Aperture nearly horizontal and ovate. Peristome continuous and free except at the parietal region where it is adnate but not merging into it. Peristome rounded, increasingly reflected from the upper margin to outer margin and continuing thus at the basal area. Inner basal margin armed with a blunt, broad tubercle. Columellar and parietal areas of the peristome simply in the form of a rounded, continuous ridge. Suture very slightly impressed on the whorls preceding the body whorl, but on the body whorl rather impressed. Nuclear whorl smooth, succeeding whorls covered with axial riblets often fairly widely spaced. The third whorl from the body whorl up to the fourth whorl covered by malleations. From the nuclear whorl onward a faint, closely crowded series of spiral lines.

<i>Alt.</i>	<i>Moj. Diam.</i>	<i>Les. Diam.</i>	<i>Ap. Length</i>	
18.5	30.3	25	14.2 mm.	Holotype
20.3	30.8	25.7	14.4	Paratype
19.6	30	24.5	15	"
15.5	32.2	26	14.3	"
14.5	25.3	21.9	11.9	"

Holotype.—Museum of Comparative Zoölogy no. 92,799, from Calomintao, Mamburao, Mindoro, Philippine Islands, Pedro de Mesa, collector.

Paratypes.—Museum of Comparative Zoölogy no. 93,813 and 92,800, from Calomintao and Tayamaan Bay, Mamburao, and Acad. Nat. Sci. Phila. no. 159,748, from Calomintao.

Remarks.—This variety may be best compared with *O. planulata sarcochroa* Pilsbry. It is more depressed with less convex whorls. It has a darker color. The peristome is thinner and the indented sinus is just beyond where its upper margin reaches the parietal wall. The basal tubercle is smaller and less solid. In sculpture the two forms are quite similar and both are inclined to have a chalky shell. *O. planulata mamburaoensis* is lighter spired than *O. planulata* Lamarek while its basal tubercle is larger and in color it is much lighter. An additional locality where it occurs is Palúan, Mindoro, Philippine Islands.

Amphidromus coeruleus, sp. nov.

Plate 4, figures *E* and *F*.

Description.—Shell sinistral, fairly solid, conic, rather shiny, rimately imperforate. The color of the first one and one-half whorls pale brown, following three and one-half whorls flamed axially with dark bluish-gray, the remaining two and one-half whorls of a nearly solid blue-gray with scattered comet markings. These small markings are initiated by a black dot a little less than one-half mm. in diameter with a small, yellowish, triangular mark, one to one and one-half mm. long attached to each dot. Each mark is similar to a miniature comet with the black dot as the comet and the triangular yellowish portion as the tail. The tip end of the tail is always directed toward the aperture. Whorls 7, rather convex and slightly angular. Spire sharply tapering and acute, produced at 39°. Suture impressed but not indented. Aperture subcircular, peristome reflected and white in color, cast at an angle of 66° with the horizontal. Area within the lip colored a dark gray. Parietal wall thinly calloused. Columella nearly straight, slightly flattened and continued evenly with the basal area of the lip. Umbilical rimation somewhat variable, its size, though small, is relative to the amount of folding of the columellar callous. Sculpture of very fine, axial, growth lines.

<i>Length</i>	<i>Width</i>	<i>Ap. Length</i>	<i>Ap. Width</i>	
44.5	24	17	10.8 mm.	Holotype
39.5	20.5	15	9.5	Paratype
40	22.6	16.6	10.6	“
40	20.5	13.5	9.5	“

Holotype.—Museum of Comparative Zoölogy no. 44,991, from about one-half mile above the Fort at Long Loba, Tinja River, Sarawak, Borneo, Harrison Smith, collector, December, 1920.

Paratypes.—Museum of Comparative Zoölogy no. 47,891 and collection of A. F. Archer, all from the same locality.

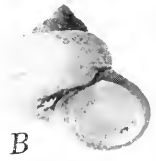
Remarks.—This species is not readily compared with any other. In shape it somewhat resembles *A. furcillatus* (Mousson) from Java. It can be placed after this species in the group of *A. adamsi* (Reeve) as outlined by Pilsbry (Man. Conch. 2, p. 216, 1900).

Museum of Comparative Zoölogy.
Cambridge, Mass.

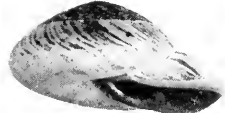
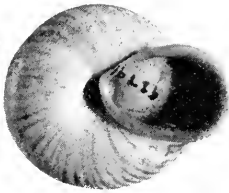
EXPLANATION OF PLATE 4.

- FIG. A. *Pterocylos kobelti*, sp. nov. (holotype, M. C. Z. no. 47,890.)
FIG. B. *Cyclophorus fernandezi occidentalis*, subsp. nov. (holotype, M. C. Z. no. 92,797.)
FIG. C. *Obba listeri mayabigensis*, subsp. nov. (holotype, M. C. Z. no. 92,798.)
FIG. D. *Obba planulata mamburaoensis*, subsp. nov. (holotype, M. C. Z. no. 92,799.)
FIG. E. *Amphidromus coeruleus*, sp. nov. (holotype, M. C. Z. no. 44,991.)
FIG. F. *Amphidromus coeruleus*, sp. nov. (holotype, M. C. Z. no. 44,991.)
Surface of body whorl magnified about 5 X.

Photo by F. P. Orchard.



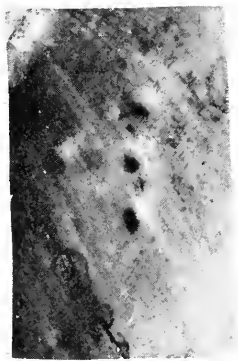
C



D



E



F

Occasional Papers
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EIGHT NEW TOADS OF THE GENUS *BUFO* FROM EAST
AND CENTRAL AFRICA.

BY ARTHUR LOVERIDGE.

IN 1930 I collected a series of small toads in the southern and southwestern highlands of Tanganyika Territory. I was about to follow Nieden in referring them to *Bufo taitanus* Peters but was disturbed by the discontinuous distribution, for *taitanus* has never been found in east-central Tanganyika where so much collecting has been done. In endeavoring to borrow topotypical material of *taitanus* from various museums I discovered that a great many related forms have been confused under this name. A study of the group involves me in the necessity of naming six new forms in which the tympana are hidden and one in which they are present.

The opportunity has been taken to publish the description of a race of *Bufo regularis* from southwestern Uganda, a description which I have had in manuscript for nearly a year.

Of the fifteen species appearing in the accompanying key, the types of thirteen have been examined and utilized, also a topotype of *anotis* Boulenger. The only species of which neither a type nor a topotype was available was the oldest named form, *taitanus*, and of this species an example from Kibwezi, near Taita, was lent by the Paris Museum.

In this connection I would wish to thank my good friend Monsieur F. Angel for the loan as well as for cotypes of his *Bufo mocquardi*, Dr. Einar Lönnberg for cotypes of *B. lönnbergi*, Mr. H. W. Parker for lending all the members of this group in the British Museum, Mr. K. P. Schmidt for the material in the Field Museum, Chicago, and Mrs. H. T. Gage for a

specimen from the Museum of Zoölogy, University of Michigan.

Owing to the necessity of reducing printing costs at this time, the descriptions have been intentionally curtailed to supply only the essential characters of each race or species.

Bufo taitanus uzunguensis, subsp. nov.

Bufo taitanus (part) Nieden (not of Peters) 1915, Mitt. Zool. Mus. Berlin 7, p. 384.

Type.—Museum of Comparative Zoölogy no. 16,383; an adult female from Kigogo, Uzungwe Mountains, southern Tanganyika Territory, collected by Arthur Loveridge, January 23, 1930.

Paratypes.—Museum of Comparative Zoölogy no. 16,382; an adult male with the same history as the type. Nos. 16,380-16,381 from Dabaga, Uzungwe Mountains. No. 16,384 from Ngombe, Ubena Mountains. No. 16,385 from Lukungu, Ubena Mountains. No. 16,386 from Nyamwanga, Poroto Mountains. All in Tanganyika Territory.

Diagnosis.—Differs from the typical form in its possibly smaller size, longer fingers and toes, and other characters which may be contrasted as follows:

Two enlarged metacarpal tubercles of unequal size; palms and soles with larger, simple, smooth, often sharply conical, tubercles; toes without a rudiment of web; third finger (measured from the proximal side of the basal subarticular tubercle) included 6.3 to 9.6 times in the length from snout to anus; fourth toe 4 to 6.2 times; canthus rostralis well rounded. Gravid female measures 28 mm. *B. t. uzunguensis*

A single large metacarpal tubercle; palms and soles with small, sharply spinose tubercles encircled by even smaller tubercles set upon a swelling; toes with a distinct rudiment of web; third finger included 9.6 to 10.6 times in the length from snout to anus; fourth toes 6.4 to 7.1 times; canthus rostralis very sharp. Adult female measures 32 mm. . . . *B. t. taitanus*

Coloration in alcohol.—Type female. Above, reddish brown with symmetrical nut-brown markings reminiscent of those displayed by *B. r. regularis*; a hairlike, light line from the snout to the anus; limbs crossbarred with nut brown. Below, white, a patch of reddish brown on the middle of the chest is flanked by a streak of the same hue in front of each forearm; an incomplete and very indistinct network of lines on the belly.

Measurements.

	Type ♀	Paratype ♂
Head and body	28	29 mm.
Length of foot from metatarsal tubercles	9	10.5
Length of hind limb from the anus	28	33
Length of fourth toe from basal tubercles	4	5.5

Bufo taitanus beiranus, subsp. nov.

Bufo taitanus Boulenger (not of Peters) 1907, Proc. Zool. Soc. London, p. 480.

Type.—British Museum no. 1907.4.29.124; a gravid female from Beira, Mozambique, collected by Mr. Claude Grant, circa 1906.

Diagnosis.—Differs from the typical form from Kenya and the race *uzunguensis* from Tanganyika in its much smaller size. The forms of *taitanus* showing a gradual diminution in size as one proceeds southward from the equator. In proportions it agrees with *uzunguensis* and differs from the typical *taitanus*. It differs from *uzunguensis* in the abbreviated, vertebral stripe which character, however, may not prove constant. With only a single specimen I hesitate to designate other differences which may prove to be individual rather than subspecific.

Coloration.—Above, olive brown with a very conspicuous cream-colored, vertebral stripe from the anus forward to the nape where it terminates in a black spot; a somewhat V-shaped black marking with a light center occurs on the interorbital region, its arms extending upon the upper eyelids; various other, but smaller, black or reddish-brown spots are scattered over the back and flanks. Below, cream colored, throat, breast, and sides of belly flecked with darker while a dusky, longitudinal streak occurs between the forearms on the center of the chest.

Measurements.

	Type ♀
Head and body	22 mm.
Length of foot from metatarsal tubercles	8
Length of hind limb from the anus	22.5
Length of fourth toe from the basal tubercles	4

Bufo ushoranus, sp. nov.

Bufo anotis Loveridge (not of Boulenger) 1925, Proc. Zool. Soc. London, p. 770.

Type.—Museum of Comparative Zoölogy no. 10,330; an adult female from Ulugu, Ushora, Tanganyika Territory, collected by Arthur Loveridge, November 7, 1921.

Paratype.—University of Michigan, Museum of Zoölogy, no. 61,393; an adult male from Nyambita, Mwanza, Tanganyika Territory, collected by Arthur Loveridge, November 10, 1922.

Diagnosis.—Nearly related to *Bufo anotis* Boulenger of the Chirinda Forest, Mashonaland, Southern Rhodesia, from which it differs in its much smaller size, breeding females of *ushoranus* being but little more than half the size of *anotis* males. The coloration also differs.

From Boulenger's description of *anotis*, the new species differs in the

parotoid glands being thrice as long as broad (instead of a little longer); the interorbital space is equal to (instead of a little broader than) an upper eyelid; the first finger is shorter than (instead of equal to) the second; the tibio-tarsal articulation reaches only to the axilla. However, in none of these points does it differ from a topotype of *anotis* received from the British Museum. It would appear probable that Boulenger made a slip when stating that the tibio-tarsal articulation of *anotis* reached the posterior border of the eye for it is the tarso-metatarsal articulation which does so in the topotype as is the case with *ushoranus*.

B. ushoranus differs from *anotis* and all other members of the group of earless toads, except *micranotis*, in having the end of the snout covered with minute, acuminate warts. From *micranotis* it may be immediately distinguished by the possession of webbing, for the toes of *ushoranus* are half webbed.

Skin of body and limbs above closely covered with juxtaposed, spinose, and sharply conical tubercles, on the limbs it will be seen that each large tubercle surmounts a swelling on which it is surrounded by a ring of smaller tubercles. This arrangement differs from that of several species where no rings of smaller tubercles are found.

Coloration.—Type female. Above, uniformly yellowish-brown devoid of markings. Below, throat creamy white with a very few scattered specks of black; chest with a central patch of black followed posteriorly by black marblings on the belly; limbs mottled with dusky.

Measurements.

	Type ♀	Paratype ♂
Head and body	25	22 mm.
Length of foot from metatarsal tubercles	7.5	7
Length of hind limb from anus	26	23
Length of fourth toe from the basal tubercles	3	2.75

***Bufo katanganus*, sp. nov.**

Bufo taitanus de Witte (not of Peters) 1930, *Revue Zool. Afr. Brussels* 19, p. 252.

Type.—British Museum no. 1920.5.13.2; an adult female from Lofoi, Katanga, Belgian Congo, collected by Captain Charles Lemaire, *circa* 1898-1900.

Paratype.—British Museum no. 1920.5.13.3; an adult male with the same history as the type.

A third toad (British Museum no. 1896.5.14.31) from Lake Tanganyika, collected by Mr. W. H. Nutt, I refrain from designating a paratype as, though probably referable to the same species, differs in possessing a longer toe and paler coloring. This female is only half a millimeter shorter than the type female yet its toe is one millimeter longer.

Diagnosis.—Closely related to *ushoranus* with which it agrees in the even more extensively webbed toes, the first, second, third and fifth being webbed up to the shiny tip which alone is free. It differs in the smooth end of its snout on which there are no acuminate warts, its smoother back and slightly larger size. The more extensive webbing and its smaller size preclude the possibility of its confusion with *taitanus* Peters.

In proportions agreeing with *B. t. taitanus*, thus the third finger is included 2.5 to 2.75 times in the length from snout to anus; fourth finger 6.6 to 7.8 times; tibia 2.9 to 3.2 times. The hind limb, however, appears to be a trifle longer, the metatarsal tubercles of the adpressed hind limb just reaching to the posterior border of the orbit.

Skin of body and limbs above covered with smooth, flattened warts; parotoid distinct, two and a half times (three and a half in the male) as long as broad. Below, the whole undersurface, including the throat, granular; soles of feet with numerous, small, very prominent, sharply conical tubercles; subarticular tubercles paired.

Coloration.—Type female. Above almost uniformly reddish brown, a few paired darker markings being scarcely distinguishable. Below somewhat paler, a longitudinal streak of irregular outline on the chest and extending backwards to the belly.

Measurements.

	Type ♀	Paratype ♂
Head and body	27.5	26.5 mm.
Length of foot from metatarsal tubercles	7	8
Length of hind limb from anus	27.5	29
Length of fourth toe from the basal tubercles	3.5	4

Bufo osgoodi, sp. nov.

Type.—Field Museum of Natural History no. 12,529; an adult female distended with ova, collected by Dr. W. H. Osgood in Ethiopia in 1926-1927. Regarding its provenance, Dr. Osgood writes me as follows: 'If it is a mountain form, it probably came from the Gedeb Mountains of Bali, just south of the western branch of the Webi Shebéli River. In this locality we were camped in deep forest and worked from eight to ten thousand feet. I seem to have a faint recollection of having picked up one or two toads, especially in the Gedebs, but I am unable to give any positive information.'

Diagnosis.—A very distinct species most closely related to *B. l. lönnbergi* Andersson from Mt. Kenya, Kenya Colony, with which it agrees in the diameter of the orbit being equal to the distance from its anterior border to the nostril (this is the condition in a cotype of *lönnbergi* though apparently not so in the specimen described by Andersson). It also agrees in the tympanum being hidden, parotoid glands absent or indistinct and no tarsal fold.

It differs in that the first finger is considerably shorter than the second; the metacarpal tubercle is large and flat, outer metacarpal tubercle absent or inconspicuous; metatarsal tubercle of the adpressed hind limb marks the end of the snout (in females of *lönnerbergi* it fails to, or just reaches, the eye).

Description.—Crown without bony ridges; snout rounded with well-developed, though rounded, canthus rostralis; the distance between the nostril and the front edge of the lip is shorter than the distance between the nostril and the anterior border of the orbit; interorbital space broader than an upper eyelid, flat; tympanum hidden. Fingers long, first considerably shorter than the second; a large, flat, metacarpal tubercle; toes long, without web, with simple subarticular tubercles, a flat, circular inner metatarsal tubercle; no outer, or only the suggestion of an outer metatarsal tubercle; no tarsal fold; the inner metatarsal tubercle of the adpressed hind limb marks the end of the snout; the tibio-tarsal articulation of the adpressed hind limb fails to reach the orbit.

Skin above covered with flattened warts which are absent on the snout; parotoid glands absent or only faintly indicated. Below granular; soles of the feet with a few, scattered, smooth tubercles.

Coloration.—Above, uniformly purplish brown; a dark brown stripe commences on the snout, passes over the nostril and orbit, broadens on the temporal region and then continues over the forearm to the flank where it breaks up into dusky patches; the upper edge of this line is sharply distinct from the coloring of the upper surface. Below, uniformly white.

Measurements.

	Type ♀
Head and body	40 mm.
Length of foot from metatarsal tubercles	20
Length of hind limb from anus	59
Length of fourth toe from the basal tubercles	11

I am indebted to Mr. A. C. Weed of the Field Museum for supplying me with the measurement of the hind limb.

Bufo lönnerbergi nairobiensis, subsp. nov.

Type.—Museum of Comparative Zoölogy no. 3,237; an adult male from Nairobi, Kenya Colony, collected by the late Sir F. J. Jackson circa 1910.

Paratypes.—Museum of Comparative Zoölogy no. 3,238 and British Museum nos. 1910.10.31.19-25 being in all six males and three females with the same history as the type. It may be noted that a pair in the British Museum series are still in axillary embrace.

Diagnosis.—Distinguished from the typical form by the shorter fingers, toes and tibia as shown in the key which follows. In obtaining these results, and it will be noted that there is scarcely any overlapping, five

cotypes of typical *lönnerbergi* and ten of the Nairobi race were used. In Nairobi toads the third finger (measured from the proximal side of the basal subarticular tubercles) is included 7.2 to 9.1 times in the length from snout to anus; the fourth toe 4.8 to 6.1 times; the tibia 2.6 to 3 times. The three females lack the spotting on the ventral surface present in two cotype females of *B. l. lönnerbergi*.

Coloration.—Type male. Above, very pale olive, almost colorless; a light line from the snout to the anus; a few brown flecks on the snout and lips; some dusky blotches on the limbs. In two paratypes may be seen a somewhat triangular, brown, interorbital mark which is followed by a pair of irregular blotches lying on either side of the constant vertebral line upon the nape. Below, uniformly cream colored.

Paratypes, three females. Above, brown, each with a light vertebral streak. Markings, which are absent or indistinct in the males, are well defined and of a rich sepia tint in the females; additional markings of sepia, often light edged and of irregular shape, occur on the lower back, flanks, and limbs. Below, uniformly cream colored.

The dimorphism, found in the typical form, has been well illustrated by Andersson and is repeated in the Nairobi race. Not only do the females differ in coloration but in the greater development of warts on all dorsal surfaces.

Measurements.

	Type ♂	Paratype ♀
Head and body	29	34 mm.
Length of foot from metatarsal tubercles	12	13
Length of hind limb from anus	35	40
Length of fourth toe from the basal tubercles	6	5.5

Bufo lughensis, sp. nov.

Bufo taitanus (part) Boulenger (not of Peters) 1897, Ann. Mus. Civ. Stor. Nat. Genova (2) 17, p. 22.

Type.—British Museum no. 1895.9.24.38; an adult female? (being eviscerated this must remain in doubt being based on the absence of the male secondary sexual character of the first digit) from between Matagoi and Lugh, Italian Somaliland, collected by the late Captain V. Bottego, circa 1894-1895.

Diagnosis.—Distinguished from all the foregoing bufonids by the presence of a tympanum; from *vittatus* of Uganda by its double subarticular tubercles and shorter foot; from *parkeri* and *urunguensis* of Tanganyika Territory by the strong webbing of its toes and prominently enlarged tubercles of the forearm and foot; from *steindachneri* of the same region, but with which I am unacquainted, apparently separated by the same characters.

In 1897, Boulenger (*loc. cit.*) refers certain toads taken between Matagoi and Lugh to *taitanus* but finding striking differences between individuals in his series, extends the original description of *taitanus* to embrace these variations. After an examination of two of the toads in question I fail to agree with this treatment. In coloration there is strong similarity between the two types but this may be regarded as a convergence resulting from a similar, somewhat desert environment. While agreeing that the specimens with a hidden tympanum are referable to *taitanus* (or possibly to an undescribed race with longer toes) the toad with a conspicuous tympanum I propose naming *lughensis* for it differs from its fellow, as well as from a Kibwezi toad which I regard as typical *taitanus*, in the following points:

Tympanum distinct: toes except the fourth, two-thirds webbed (instead of a third or at most, half webbed): tip of the fourth toe of the adpressed hind limb marks the anterior border of the eye (end of snout in Kibwezi toad, nostril in Matagoi-Lugh specimen): two large, smooth, flat metatarsal tubercles (instead of two small and rounded ones): an inner and an outer metacarpal tubercle (instead of a single large one). It agrees with the Matagoi-Lugh *taitanus* in having the belly speckled (though somewhat differently) with black, but in Peter's type as well as the Kibwezi specimen this region is heavily marbled with black.

Coloration.—Above, very pale yellowish-gray flecked with black specks, each of the latter having a lighter center, the whole resulting in a pepper-and-salt effect. Below, cream colored, the throat and forward part of the chest immaculate, the middle of the belly specked with black.

Measurements.

	Type ♀
Head and body	32.5 mm.
Length of foot from metatarsal tubercles	11
Length of hind limb from anus	33
Length of fourth toe from the basal tubercles	4.5
Length of third finger from the basal tubercles	3.5
Length of tibia	11

Key to the smaller toads of East Africa.

1. Tympanum hidden2.
Tympanum distinguishable12.¹
2. Palmar surface of hands and feet with numerous, prominent, small, spinose or sharply conical tubercles (*mocquardi* in group 9 is somewhat intermediate)3.
Palmar surface of hands and feet with a few (more numerous in *mocquardi*) rather large, smooth tubercles9.

¹*Bufo steindachneri* Pfeffer from Kihengo, Tanganyika Territory is omitted as it is only known to me from the incomplete description of the type.

3. Third and fifth toes without, or with only a trace of web4.
 Third and fifth toes webbed almost to the tips or at least half webbed 7.
4. No light vertebral streak5.
 A light vertebral streak6.
5. Size very small (δ 22 mm., ♀ 23 mm.); toes without web; fifth toe minute, about one-fifth the length of the fourth (Eastern Tanganyika Territory)*micranotus*.
 Size larger (♀ 32 mm.); toes slightly webbed at the base; fifth toe about one-third or half the length of the fourth (Somaliland to Southern Kenya Colony)*taitanus*.
6. Size small (δ 29 mm., ♀ 28 mm.); a light vertebral streak from snout to anus (Southern Tanganyika Territory)....*t. uzunguensis*.
 Size very small (gravid ♀ 22 mm.); vertebral streak absent from snout and head (Mozambique)*t. beiranus*.
7. End of snout densely covered with minute, acuminate warts. Male 22 mm., female 25 mm. (Western Tanganyika Territory) *ushoranus*.
 End of snout smooth with at most only a few scattered warts8.
8. Size small (δ 27 mm., ♀ 28 mm.); length of tibia included three times in the length from snout to anus (Southeastern Belgian Congo)*katanganus*.
 Size larger (δ 41 mm.); length of tibia included 2.5 times in the length from snout to anus (Southern Rhodesia)*anotis*.
9. First finger considerably shorter than the second, metacarpal tubercle flat, large; outer metacarpal tubercle absent or inconspicuous; in females the metatarsal tubercle of the adpressed hind limb marks the end of the snout; back smooth, warts, when present, flattened and inconspicuous. Female 41 mm. (Ethiopia).*osgoodi*.
 First finger equal to, or slightly longer than second, if shorter, only very slightly so; inner and outer metacarpal tubercles prominent, rounded, of moderate size; in females the metatarsal tubercle of the adpressed hind limb marks, or fails to mark, the eye10.
10. Skin of back closely studded with warts; soles of feet with numerous tubercles. Male 28 mm., female 38 mm. (Mt. Kinangop and Mt. Kenya, Kenya Colony)*mocquardi*¹
 Skin of back rather smooth (particularly in males) warts flattened; soles of feet smooth with but few tubercles11.
11. Fingers, toes and tibia longer; third finger² included 5.8 to 7.7 times in the length from snout to anus; fourth toe 3.6 to 4.4 times; tibia 2.2 to 2.5 times. Male 30 mm. Female 35 mm. (Mt. Kenya, Kenya Colony)*l. lönnbergi*.

¹ I have omitted Angel's distinction between *mocquardi* and *l. lönnbergi*, viz., paired subarticular tubercles in the former and single in the latter for an examination of five cotypes of *lönnbergi* shows that this, though usually the case, is by no means a constant character.

² Fingers and toes are measured from the proximal side of the basal

subarticular tubercles, a foot for the purpose of this key from the proximal side of the metatarsal tubercles.

- Fingers, toes and tibia shorter; third finger included 7.2 to 9.1 times in the length from snout to anus; fourth toe 4.8 to 6.1 times; tibia 2.6 to 3 times. Male 32 mm. Female 34 mm. (Nairobi, Kenya Colony) *l. nairobiensis*.
12. Subarticular tubercles single; length of foot² included 2.25 times in the length from snout to anus. Female 37 mm. (Entebbe, Uganda) *vittatus*.
- Subarticular tubercles double; length of foot included 2.76 to 4 times in the length from snout to anus 13.
13. Tympanum vertically elongate; interorbital space concave; tibio-tarsal articulation of the adpressed hind limb reaches to the middle of the flank or just beyond. Male 30 mm. Female 32 mm. (Central Tanganyika Territory) *parkeri*.
- Tympanum almost round; interorbital space flat; tibio-tarsal articulation of the adpressed hind limb reaches to the axilla. 14.
14. Toes without web; tubercles on tarsus and forearm very small. Female 29 mm. (Southwestern Tanganyika Territory) *urunguensis*.
- Toes with a very distinct rudiment of web; tubercles on tarsus and forearm very large. Female 33 mm. (Italian Somaliland to Southern Kenya Colony) *lughensis*.

***Bufo regularis kisoensis*, subsp. nov.**

Type.—Field Museum of Natural History no. 12,005; an adult male from Kisolo, Kigezi district, southwestern Uganda, collected by Edmund Heller, 1926.

Paratypes.—Field Museum of Natural History nos. 9885, 9889, and 12,005 being 42 adult toads representing both sexes collected at the same time as the type.

Diagnosis.—Distinguished from the typical form and all known races by the extensive webbing of the toes, these, with the exception of the fourth toe, being webbed to the tips in the type and many paratypes, in others webbed almost to the tips. Also distinguished from the typical form by its more pointed snout, slenderer and more tapering fingers. It might be noted that a more pointed snout is also a sexual characteristic of the males in this group, such variation has been taken into consideration.

Twenty males and five females give the following results: end of snout, when viewed laterally, rounded in males, steeper in females; transverse diameter of tympanum 2/3 to 3/4 times the orbital diameter; width of parotoid 2 to 3 times in its length; fingers slender, tapering; the tibio-tarsal articulation of the adpressed hind limb reaches the axilla (in 7) or shoulder (in 18); tibia 2.2 to 2.5 times in the length from snout to anus. Skin in males unusually smooth with flattened warts, in females normal, *i. e.*, warty and tubercular.

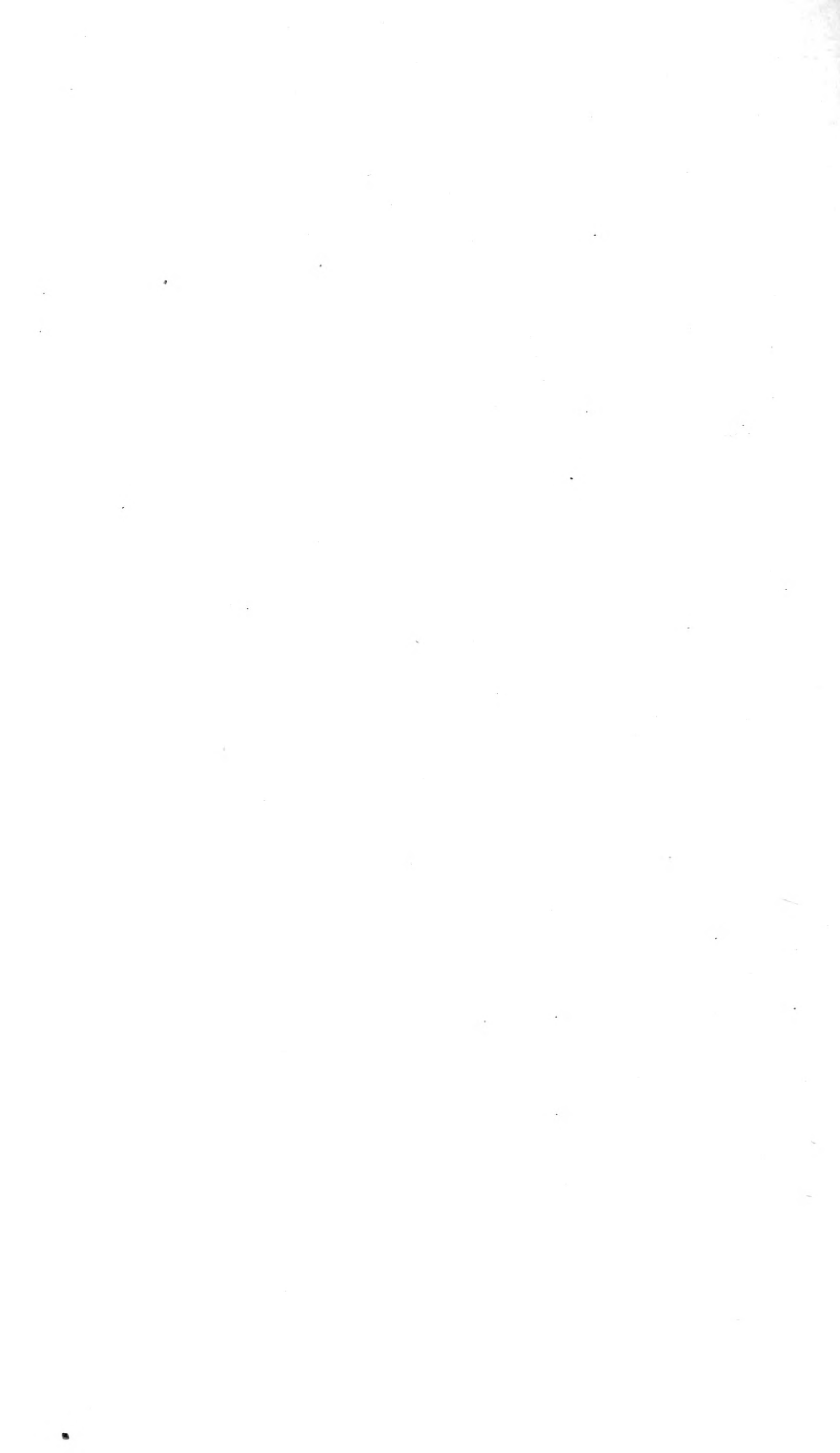
Compared with topotypes of *B. r. regularis* Reuss from Egypt, *B. r. maculatus* Hallowell from Liberia and paratypes of *B. r. gutturalis* Power from Lobatsi, Bechuanaland (believed to be a synonym of *B. tuberculosus* Bocage from Linokana, Bechuanaland).

Coloration.—Type male. Above, olive, uniform except for the warts which are darker and some indications of the typical markings upon the snout and labial border. Below, uniformly dirty white.

Paratype female. Above, very dark brown, a fine, light, vertebral line; the markings of the typical race indicated, chiefly on the head and limbs. Below, uniformly dirty white.

Measurements.

	Type ♂	Paratype ♀
Head and body	62	84 mm.
Length of foot from metatarsal tubercles	29	38
Length of hind limb from anus	80	110
Length of fourth toe from basal tubercles	19	24



Occasional Papers
OF THE
Boston Society of Natural History.

FOUR NEW CRININE FROGS FROM AUSTRALIA.

BY ARTHUR LOVERIDGE.

THE recent arrival of a third shipment of material collected by the Harvard Australian Expedition of 1931-1932 brings the total number of amphibian specimens collected by the party to 545, representing 41 species of which several, being new, are described below.

Paratypes of both the new West Australian species will be deposited in the West Australian Museum; of both the Queensland forms in the Queensland Museum; in addition paratypes of three of the four species will be presented to the Australian Museum. In this connection I have taken the liberty of associating Mr. L. Glauert's name with a new *Crinia* from the vicinity of Perth and seize this opportunity of expressing the Harvard party's appreciation of the generous coöperation accorded them by the respective directors of the aforementioned museums.

A careful revisionary study of all the Australian amphibia in the Museum of Comparative Zoölogy reveals that all the genera and seventy-one of the eighty-five recognizable species or races are represented in the collections of the Museum of Comparative Zoölogy, so that the material available enables one to describe the new forms with some assurance of validity with the possible exception of the first.

***Mixophyes fasciolatus schevilli*, subsp. nov.**

Type.—Museum of Comparative Zoölogy no. 18,150; an adult gravid female from Millaa Millaa, Atherton Tableland, Queensland, collected by Dr. P. J. Darlington, April 1-9, 1932.

Paratypes.—Museum of Comparative Zoölogy no. 18,480 from Lake Bar-

rine, Atherton Tableland, Queensland: no. 18,481 from Tick Camp, circa 4,000 feet. Bellenden Ker Range, Queensland, both collected in April, 1932, by Mr. W. E. Schevill, after whom the race is named. Also two others (M. C. Z. nos. 18,151-18,152) with the same data as the type, donated to the Queensland Museum and the Australian Museum, Sydney.

Diagnosis.—Differs from the typical form from New South Wales in the more extensive webbing of the feet involving all the toes, but best expressed specifically by the following key:

Three joints of the fourth toe free of web (exclusive of a possible narrow fringe); at least the terminal joint of the fifth toe free of web (New South Wales and southern Queensland) *M. f. fasciolatus*

Two joints of the fourth toe free of web (exclusive of a possible narrow fringe); not even the terminal joint of the fifth toe free of web (Northern Queensland) *M. f. schevilli*

Coloration.—Essentially similar to that of the typical form; apparently a tendency for the narrow transverse lines on the thighs to coalesce and form broad, hence fewer, bands.

Measurements.—Female. Snout to anus 83 mm., fore limb from axilla 51 mm., hind limb from anus 153 mm. Male. Snout to anus 61 mm., fore limb from axilla 42 mm., hind limb from anus 118 mm.

Discussion.—Fletcher (1892, Proc. Linn. Soc. N. S. W. 7, p. 18) and Andersson (1916, Svenska Vetensk.-Akad. Handl. Stockholm 52, no. 9, p. 18) have already invited attention to the extensive variation in webbing and limb length displayed by this frog. Attention has been focused largely on the disparity in limb length which, however, appears inconstant in the south; it will probably be found that the tibio-tarsal articulation of the adpressed hind limb of the northern race invariably extends far beyond the tip of the snout.

An area of intermediates occurs from the Richmond River in northern New South Wales, northwards to the Bunya Mountains of Southern Queensland, possibly further. If it is desired to apply a name to these one is available in (*Hyla*) *fenestrata* De Vis from the Tweed River on the New South Wales-Queensland border. As these intermediates essentially agree with the typical form as defined in the above key, with only a very slight tendency to vary in the direction of the northern race, I consider *fenestrata* a synonym of *M. fasciolatus fasciolatus* Günther.

***Crinia glauerti*, sp. nov.**

Type.—Museum of Comparative Zoölogy no. 18,420; an adult, gravid female from Mundaring Weir, about thirty miles northeast of Perth, West Australia, collected by Dr. P. J. Darlington, November 22, 1931.

Paratypes.—Museum of Comparative Zoölogy nos. 18,421-18,422 and two others donated to the West Australian and the Australian Museum; all with the same history as the type.

Diagnosis.—Closely related to *C. georgiana* (Duméril and Bibron) of which it might be said to be a miniature replica. It differs from *georgiana* in its smaller size, *viz.*, a breeding male with swollen arms and black throat measures 15.5 mm. and a gravid female 20.5 mm. as against male 32 mm., female 35 mm. in our series of *georgiana*. Vomerine teeth absent; skin on belly of males strongly granular, on females only slightly so; females marbled beneath.

Description.—Habit fairly stout. Head as broad as long; snout pointed; the distance from the nostril to the tip of the snout is equal to that from the nostril to the anterior border of the eye and about two-thirds the orbital diameter; canthus rostralis feebly marked, loreal region concave; interorbital region as broad as an upper eyelid; pupil distinctly horizontal; tongue pyriform, entire and free behind; vomerine teeth absent. Fingers moderate, increasing in length in the following order: first, second, fourth, fifth; subarticular tubercles strongly developed; a pair of metacarpal tubercles; toes slender, fringed, without web, increasing in length in the following order: first, second, fifth, third, fourth, the latter being twice as long as the fifth; both an inner and outer, strongly conical, metatarsal tubercle present; the tibio-tarsal articulation of the adpressed hind limb reaches the temple or hind corner of the eye in both sexes; the tarso-metatarsal articulation to the end of the snout.

Skin above (formalin to alcohol) moderately smooth but with numerous little warts and a pair of somewhat lyre-shaped glandular folds (inconspicuous in the type) on the anterior part of the back. Below areolate in the females, strongly granular in the males.

Coloration.—Above, uniformly black in both sexes though some specimens show a faint trace of an interorbital mark. Below, white heavily marbled with black in the females; throat black in the breeding male; immature specimens white below, sparsely spotted with black.

Measurements.—Female. Snout to anus 20.5 mm., fore limb from axilla 11.5 mm., hind limb from anus 30 mm. Male. Snout to anus 15.5 mm., fore limb from axilla 8.5 mm., hind limb from anus 24 mm.

***Crinia darlingtoni*, sp. nov.**

Type.—Museum of Comparative Zoölogy no. 18,390; an adult, gravid female, from between 3,000 and 4,000 feet in the Queensland National

Park, MacPherson Range, Queensland, collected by Dr. P. J. Darlington, March 10-16, 1932.

Paratypes.—Museum of Comparative Zoölogy nos. 18,391-18,392 and a third specimen donated to the Queensland Museum; all with the same history as the type.

Diagnosis.—Differs from all other members of the genus in the rudimentary nature of the first finger and the very minute first toe. In coloration some specimens agree closely with *C. acutirostris* Andersson. Usually a single (inner) metatarsal tubercle, in some specimens an almost invisible outer one may be distinguished.

Description.—Habit stout. Head as broad as long; snout obtusely rounded; the distance from the nostril to the tip of the snout is equal to that from the nostril to the anterior border of the eye and about three-quarters that of the orbital diameter; canthus rostralis and loreal region rounded; interorbital space flat, once and a half times as broad as the width of an upper eyelid; pupil horizontal; tympanum hidden; tongue elliptic, entire and free behind; mandible toothed; vomerine teeth absent. Fingers stout, their tips undilated, first very small, a third the length of the second which is shorter than the fourth; toes, except the first, well developed, free, without web, their tips slightly dilated, first toe extremely rudimentary, third very slightly longer than the fifth; subarticular tubercles not prominent; a small inner metatarsal tubercle and an almost invisible outer one; the tibio-tarsal articulation of the adpressed hind limb reaches to the shoulder in adults, nearly to the temple in a young toad; the tarso-metatarsal articulation reaches to the eye or just beyond.

Skin perfectly smooth above and below.

Coloration (in alcohol after formalin).—Very variable, no two specimens alike. The type is: above, pinkish brown, a broad black vertebral band of irregular outline, narrowing in the region of the axillæ, covers the snout, interorbital region, occupies more than half the width of the back, extending to the lumbar region where it forks and terminates; temples black; an obsolete black, lateral line is broken up into large blotches; fore arm black, upper arm paler; hind limb pinkish brown, more or less barred or blotched with dark brown. Below, white, the edges of the throat and a large area on the chest are heavily mottled with sepia brown; belly and underside of the thighs almost white, of tibia almost black; soles of feet parti-colored.

Other specimens have a well-defined, black, lateral line, a more or less triangular, interocular marking, an arrow-headed mark on the center of the back. Below, uniformly dusky.

Measurements.—Female. Snout to anus 19 mm., fore limb from axilla 10 mm., hind limb from anus 24.5 mm. The largest paratype (no. 18,391) measures 20 mm. from snout to anus.

Pseudophryne brooksi, sp. nov.

Type.—Museum of Comparative Zoölogy no. 13,025 from Manjimup, near Pemberton, West Australia, collected by Mr. Winthrop S. Brooks, February 7, 1927.

Paratypes.—Museum of Comparative Zoölogy nos. 13,027-13,031 and four others donated to the Australian Museum, Sydney, the West Australian Museum, Perth, and the British Museum, London; all with the same history as the type.

Diagnosis.—Differs from *P. australis* of West Australia, *P. bibroni*, *P. dendyi*, *P. nichollsi*, and *P. guentheri* in that the tip of the fourth toe of the adpressed hind limb reaches to the end of the snout or more usually well beyond it. In this respect it agrees with *P. albifrons*, *P. coriacea*, and *P. semimarmorata*. Of these the first two are from New South Wales or Queensland and so markedly different in coloring that there is no possibility of confusion.

P. brooksi is obviously intermediate between *semimarmorata* of New South Wales and Victoria and *guentheri* of West Australia. Its leg is a trifle shorter than that of the former, much longer than that of the latter. It may be immediately distinguished from our 121 examples of *semimarmorata* by the absence of pigmentation on the lower sides of the thighs and limbs which are uniformly white in *brooksi*, always marbled with darker in *semimarmorata*.

Description.—Habit moderate. Head as broad as long; snout rounded; the distance from the nostril to the tip of the snout is equal to that from the nostril to the anterior border of the eye and about two-thirds the orbital diameter (if a juvenile character perhaps equal to it in the adult); canthus rostralis feebly marked, loreal region slightly concave; interorbital space flat, broader than an upper eyelid; pupil distinctly horizontal; tongue elongate, entire and free behind; vomerine teeth absent. Fingers cylindrical, first very much shorter than the second (in all the specimens); subarticular tubercles strongly developed; a pair of metacarpal tubercles; toes cylindrical, without web, increasing in length in the following order: first, second, fifth, third, fourth; a strong, conical, inner metatarsal tubercle as large as the first toe, a smaller outer; the tibio-tarsal articulation of the adpressed hind limb reaches the axilla, the tarso-metatarsal articulation to the hinder edge of the orbit.

Skin above (in strong alcohol) finely granular with numerous warts and a pair of glandular ridges from behind the eyes converging and diverging as they approach the groin where they terminate. Below smooth, or minutely granular; a fold across the chest.

Coloration (in alcohol).—Above, dark brown variegated with lighter areas; usually a light transverse band across the forehead connecting the upper eyelids and sometimes fusing with a rudiment of a vertebral line above the snout; a pale cruciform mark upon the shoulders forks posteriorly

at midbody; a light line above the urostyle; hinder side of thighs pale brown. Below, throat and belly white variegated with large, brown spots; underside of thighs uniformly white or cream colored.

Measurements.—Snout to anus 21.5 mm., fore limb from axilla 11.5 mm., hind limb from anus 23 mm. All the series are about the same size and probably not quite adult.

Museum of Comparative Zoölogy,
Cambridge, Mass.

Occasional Papers
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A NEW HYLA FROM THE PANAMA CANAL ZONE.¹

BY E. R. DUNN.

WHILE in the Canal Zone in the summer of 1932, Mrs. Dunn and myself were able to spend 24 hours at Summit, where, on the night of August 2, we took five specimens of a *Hyla* which appears to be undescribed. It may be called

Hyla altæ, sp. nov.

Type.—Museum of Comparative Zoölogy no. 17,972; an adult male.

Type locality.—Summit, Panama Canal Zone.

Range.—Known only from type locality, and from El Valle (altitude 2000 feet, northwestern corner of the Province of Panama).

Diagnosis.—A *Hyla* with no cranial ossification; fingers free; toes about one-half webbed; vomerine teeth in two groups between the nares; snout long and flat; a gular and pectoral vocal sac; no modification of the male thumb; gray with four darker dorsal stripes; length 25 mm.

Description.—Snout prominent, long and flat; diameter of eye slightly less than the distance from eye to nostril; canthus rostralis obscure, rounded; upper eyelid narrower than interorbital space; tympanum $\frac{1}{2}$ the diameter of the eye; vomerine teeth in two small groups between the choanæ; a faint supratympanic fold; a very marked pectoral fold, skin finely roughened; belly coarsely rugose; proximal portion of under side of thighs rugose; vocal sac very large, extending to pectoral fold, fingers free; disk of third finger equal to tympanum; first finger much shorter than second and with smaller disk; first toe practically free; two phalanges of fourth toe free; web reaches nearly to the disks of the second and fifth toe; the heel reaches the eye; light gray; a dark-gray stripe from nostril through eye to the middle of side; a similar stripe from eyelid nearly to sacrum; a faint trace of mid-dorsal striping; a faint darker mark between

¹Contribution from the Department of Biology, Haverford College, no. 15.

eyes; arms and legs uniform light gray; white below; length of head and body 25 mm.

Variation.—Four other males obtained at the same time are practically identical.

Habits.—The specimens taken were calling from low bushes in a flooded area. The note was harsh, and may be transliterated as 'whark.' The same note was given by the specimen taken at El Valle. The note is not unlike that of *H. boulengeri* which we heard the same night and which is anatomically allied. Both at Summit and at El Valle *Hyla microcephala*, with its clicking call, given from a lower calling station, was far more abundant. At Summit *Engystomops pustulosus*, *Leptodactylus bolivianus*, *L. labialis*, *Hyla crepitans*, and *H. microcephala* were combining with *H. altæ* to produce the most maddening and confusing and deafening frog chorus I have ever heard.

Relationships.—This new *Hyla* is allied to *Hyla rubra*. I know of four Central American species of this group and a key to them follows.

Hyla rubra group. Vomerine teeth in two small groups between choanæ; snout long and flat; fingers free; disks as large as, or larger than, tympanum; tympanum = $\frac{1}{2}$ eye or smaller; toes about $\frac{1}{2}$ webbed; toe I practically free.

- A. Tympanum $\frac{1}{2}$ eye; a gular and pectoral vocal sac; disks = tympanum
- B. Rugose above; snout extremely flat and long; heel beyond eye; very marked black and yellow barring in thigh, shin, and groin; male 40 mm. *boulengeri*.
- BB. Smooth above; snout not extreme; heel to eye.
 - C. Brown, with five broken stripes; often marbling in concealed surfaces of thigh and shin; legs barred; male 35 mm. *rubra*.
- CC. Gray, with four stripes; no barring on legs or concealed color; male 25 mm. *altæ*.
- AA. Tympanum $\frac{1}{3}$ eye; vocal sac gular; disk larger than tympanum; no stripes; legs barred; heel to eye; male 25 mm. *culex*.

In Central America both *boulengeri* and *rubra* are known from Nicaragua to Panama, *culex* is known only from Honduras, and *altæ* only from Panama.

One of the Summit specimens has been carefully compared for me by the kindness of Mr. H. W. Parker with the type of *H. moquardi* (from 'Panama or Guatemala'). The two were not at all alike, but he also noticed the resemblance to *H. rubra*.

Remarks.—During our 24 hours at Summit we noticed the following species which have not yet been seen in all the intensive work that has been done on Barro Colorado Island, about 13 miles from Summit; *Leptodactylus labialis*, *Hyla crepitans*, *Hyla altæ*, *Hyla leucophyllata*, *Hyla microcephala*, *Norops auratus*, *Anolis stigmopus*, and *Ameiva præsignis*. Furthermore *Bufo marinus*, *Leptodactylus bolivianus*, and *Gonatodes fuscus* were common at Summit and are extremely rare on the island. Very occasional and brief observations at Frijoles, about a mile and a half across the lake have shown that *L. labialis*, *H. microcephala*, *N. auratus*, and *A. præsignis* are present there. Frogs very common on the island were not seen at Summit.

This difference between the faunas of Barro Colorado Island and Summit cannot have geographical significance, because all the species concerned (except the new *Hyla altæ*) are known from both the Pacific and the Atlantic coasts. That a difference does exist is quite obvious, and in my opinion, the difference is ecological.

The country around Summit is flattish and ill drained. There are numerous swamps and still-water localities. The country is also largely cleared of forest. Somewhat the same is true of Frijoles. On the contrary Barro Colorado Island is not cleared, is not flat, and there is little or no still water save for Gatun Lake. I take it that Summit and Frijoles exhibit conditions, and consequently species, which are not now, nor ever were, present in the area which is now Barro Colorado Island (formerly a forested hilltop); *vice versa*, that Barro Colorado Island exhibits hill-forest conditions and species which may not be expected to occur in flatter and less forested country. Certainly, as far as the species under consideration are concerned, there is

no evidence for the idea that Barro Colorado Island has been a 'Noah's Ark' of refuge for species from the area now under Gatun Lake.

It may be worth mentioning that I have noticed several other cases of related frogs having similar calls. *Hyla underwoodi*, *H. microcephala*, and *H. leucophyllata*, all taken the same night at Summit, are obviously allied to each other and have quite similar calls. Similarly *Engystomops pustulosus*, and *Leptodactylus pentadactylus*, *L. bolivianus*, *L. labialis*, and *L. melanotus*, all of which were heard in the course of the summer, have a striking family resemblance in the note. So also the closely related *Eleutherodactylus fitzingeri* and *longirostris* have similar calls.

This paper adds three *Hylas* to the list given for the Canal Zone in my paper of 1931 (*Occas. Papers Boston Soc. Nat. Hist.* 5:403-421). Of these the position of *Hyla altæ* has already been given. *Hyla leucophyllata* comes with *H. microcephala* in the key, but instead of five parallel dark lines above, *leucophyllata* has irregular, gaudy marbling above and a dark, lateral band. *Hyla crepitans* fits in with *H. albomarginata*, but is light tan, with barring on the sides, and has light green eyes. In daylight some specimens may be almost white, so that *crepitans* is the 'white frog with green eyes' which was mentioned to me before I had ever seen a living specimen. It is quite common at Summit and the note is a low trill.

Forty-five frogs are now known to occur in the Canal Zone.

I should like to thank Dr. H. L. Clark, Mr. J. H. K. Humphrey, Mr. J. M. Scanlon, and Mr. W. R. Lindsay for the privilege of visiting the Headquarters of the Cattle Industry and the Experimental Gardens at Summit.

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AMPHIBIANS AND REPTILES FROM EL VALLE DE
ANTON, PANAMA.¹

BY E. R. DUNN.

DURING August, 1932, Mrs. Dunn and myself were fortunately enabled to visit El Valle de Anton in the northwestern corner of the Province of Panama. We are greatly indebted to Mr. James Zetek, who very kindly made the arrangements for our trip.

El Valle is reached by road from Panama to San Carlos, along the coast, and thence by road from San Carlos northwards. It is some 60 miles to San Carlos and about 15 miles more to El Valle, but this is rather roundabout as the actual position of the valley ($8^{\circ} 36' N.$, $80^{\circ} 7' W.$) is only about 40 miles south-southwest of Barro Colorado Island.

The road climbs from San Carlos to about 2400 feet altitude; then there is a sharp descent of 500 feet to a practically flat swampy plain, roughly oval in shape, about two miles in diameter, and apparently entirely surrounded by mountains. It is, however, drained (albeit imperfectly) by the Rio Anton, which breaks out to the west. Streams from all points of the compass drain into the valley. The mountains to the north are higher than the rest of the wall, the highest peak, Cerro Gaital, reaching 3840 feet. The valley floor itself is at a level of about 2000 feet.

The cause of this peculiar valley is not known to me, as we did not see the outlet of the river. I have seen a similar valley on the island of Lombok, and there the cause was a lava flow,

¹Contributions from the Department of Biology, Haverford College, no. 16.

but we saw nothing but conglomerate at El Valle so an interesting geographical feature awaits explanation. The northern wall marks the divide between the Atlantic and Pacific.

Pacific-side conditions hold to the foot of the mountains on the north, as savanna country, with rather bare grassy slopes, is found from the coast up, but the north wall is covered with heavy forest, and at the time we were there heavy mist-clouds usually veiled the higher peaks. In the valley the frogs were pretty much those of the lower country of the Canal Zone, but once in the woods to the north we were among different animals, so that Atlantic-side conditions and fauna come a little way over the divide onto the Pacific slope. Furthermore, it was an Atlantic-side fauna of a fairly high altitude, as shown especially by such frogs as *Atelopus* and *Eleutherodactylus punctariolus*, which are found at a much higher elevation on the Atlantic slopes of the higher mountains to the west. This may be taken to mean that subtropical conditions are not only a matter of altitude, but partly a matter of the height of any given divide. Where the divide is high, cloud forest is well up on the slopes; where the divide is low the same conditions may be found at a lower elevation. We did not find any real cloud forest, but there was a distinct approach to it.

We arrived on August 5 and left on August 12, so we put in very little more than six days of collecting. The richness of the area may be indicated by the fact that in this short stay we were able to collect 1 salamander, 25 frogs, 1 turtle, 11 lizards, and 5 snakes; a total of 43 species. The combined efforts of many people for several years have resulted in a list of 30 frogs for Barro Colorado Island. The number and the nature of the novelties taken were quite surprising to me, as a considerable study of the Panamanian fauna had not led me to expect them. It was known that a peculiar race of *Atelopus varius* existed at El Valle and this led me there, but since *A. varius* breaks up into races at the slightest provocation, I did not expect much else. Now I feel that at El Valle we touched the fringe of a mountain center of speciation whose more complete richness may be found in the higher mountains of Veragua as yet unworked, and that this mountain area may show other novelties

distinct from the fairly well-worked, mountain area on the Panama-Costa Rica boundary.

We turned up only one species of Salamander, *Oedipus complex*, of which we took two specimens in the woods within a few feet of each other.

Bufo marinus was fairly common in the valley, and two specimens of *Bufo coccifer* were taken there. The note of the latter is the usual *Bufo* trill, but extremely soft and low.

Engystomops pustulosus was extremely common. Its note was heard, and its egg masses seen wherever we went in the flat area. It was accompanied by numerous *Leptodactylus labialis* and *melanonotus*. *L. pentadactylus* occurred in the valley, but was much more common in the woods, where we saw perfectly gigantic specimens. The notes of these four species (and of *L. bolivianus* also, which I have heard elsewhere), have a family resemblance, all seeming to begin with a 'wh' sound. *L. melanonotus* has much the lowest and softest note, *labialis* and *pustulosus* much the highest, *labialis* more of a whistle, and *pustulosus* more of a whine. *L. bolivianus* has a loud edition of *melanonotus*, while *pentadactylus* has a very loud deep 'whoop.'

We took a single large specimen of *Lithodytes gaigei* in the woods at night. The light markings were red in life, and there were greenish-blue marblings on the lower sides.

Of *Eleutherodactylus* all the specimens were taken in the woods. *E. longirostris* was very common. We heard its note, a short birdlike chirp, very like that of its relative *fitzingeri*, but shorter and higher. Two tiny specimens of *gollmeri* were taken, and one small *biporcatus*. The striking find in this group was that of numerous adults of *punctariolus*, out at night on big rocks in the stream or on the edge near it. We did not hear the call. The situation and the general appearance of the adults was extremely similar to that of *E. bufoniformis*, which is now quite well known. The two species are obviously closely related. The history of *E. punctariolus* is extraordinary and interesting. The original specimen was taken by Warszewicz on his explorations in Panama, in which he visited places and obtained animals

which no modern visitor has seen or duplicated. One of his finds was deposited in the Berlin Museum and received the name of *Hyla punctariola* Peters (1863, *Mon. Ak. Berlin*, p. 462, type Berlin no. 4918, Veragua). It is in the literature as a *Hyla* and has even given rise to such expressions as 'the *Hyla punctariola* group.' The type specimen in Berlin is not a *Hyla* at all, but an *Eleutherodactylus*. Furthermore it is identical with certain small specimens which I took in 1923 on the trail from Bocas to Boquete, and which Barbour described as *Syrrhopus obesus* (*Proc. New England Zoöl. Club* 10, p. 27, type, M. C. Z. no. 13,052). The El Valle collection shows clearly that *punctariola* and *obesus* were described from young specimens (22 and 24 mm. in length respectively), and that the species in question is really a giant *Eleutherodactylus*, ranking with *biporcatus* (length 103 mm.) and *bufoniformis* (length 97 mm.), as we got *punctariolus* 85 mm. long.

The close resemblance to *bufoniformis* may indicate that head shape, size, and various characters of wartiness, etc., are better indications of relationships than the characters of the feet, *punctariolus* having well-developed disks, and almost complete webs.

We found *E. lutosus molinoi* very common. The difference between *lutosus* and *molinoi* is simply a matter of the amount of dark pigment. All known Costa Rican specimens are very dark. In Panama about half are light.

Two specimens of an *Eleutherodactylus* with tiny tympanum, granulated belly, and enormous digital disks were taken. They have been compared with the following series: Boquete, Mich. no. 61,093-5, 69,474; M. C. Z. no. 10,719; Rio Chenillo, M. C. Z. no. 9966, 9968-9; Cerro Bruja, U. S. N. M. no. 54,022-3; Porto Bello, U. S. N. M. no. 45,573; Pirri Range, U. S. N. M. no. 50,207-8, and found to be the same species. One of the El Valle specimens is very dark, one very light. The Boquete specimens are fairly dark, the Darien specimens quite light. No Panamanian name is available, but comparison of specimens shows that *latidiscus* Boulenger (*Proc. Zoöl. Soc. London for 1898*, p. 121, pl. 15, fig. 4, type B. M. N. H. no. 98-4-28, 108-9, Cachabé, Ecuador) is available for the light phase, and *ventri-*

marmoratus Boulenger (1912, *Ann. Mag. Nat. Hist.* (8) 10, p. 187, type B. M. N. H. no. 1911-12-13-77, Chanchamayo, E. Peru, 2600') for the dark phase. *Eleutherodactylus latidiscus* (Boulenger) is therefore the proper name of this form.

We found *E. diastema* extremely rare, but present in a small colony in the woods at a place where *Ananas magdalenæ* was growing.

Of *Hyloxalus-Phyllobates-Dendrobates* we found four forms. One of these had the toes fringed and webbed at the base and consequently is a *Hyloxalus*. It seems to be undescribed, and may be called

***Hyloxalus panamansis*, sp. nov.**

Diagnosis.—A *Hyloxalus* with fringed toes; web only at base of toes; a light streak from groin halfway to eye, in a lateral black band; brown above, light below with dark shading; concealed patches of yellow in axilla, groin, and shin; male with swollen third finger; male 25 mm. long, female 30 mm.

Description of type.—Museum of Comparative Zoölogy no. 19,209 and paratypes 19,210-4; adult male; snout flat, blunt, longer than orbit; lores vertical, slightly concave; interorbital space wider than upper eyelid; tympanum indistinct, 1/3 eye; a gular vocal sac; disks of fingers and toes well developed, with two scales above, smaller than tympanum; third finger swollen, as wide as disk; toes webbed at base, fringed, fifth toe free; disks of toes equal except for the fifth which is half the size of the others; two metatarsal tubercles; a marked tarsal fold; heel to eye; smooth above; belly not granulate but skin finely wrinkled; dark brown above; a black lateral band; a light line from groin halfway to eye in lateral dark band; a dark line on front of thigh; legs obscurely barred; below white with brown shading; axilla, groin, and shin in life with bright yellow, concealed color; snout to vent 25 mm.

Variation.—A female, 30 mm. long has no vocal sac, a normal third finger. In light specimens the legs are conspicuously barred; there is a light line on the upper lip; the brown dorsum is frequently marbled with black.

Remarks.—I have compared these specimens with U. S. N. M. no. 50,227 and 66,319-20 from Cana in Darien. They are poorly preserved but seem to be similar save that they have the toes

half webbed. As far as I can make out, seven species of *Hyloxalus*, have been described. Of these *huigræ* Fowler is not a *Hyloxalus*, as it was described as having the toes free. Of the rest, *bocagei* from Ecuador and *chocoensis* from Colombia seem to have the toes fully webbed; while *fuliginosus* from Ecuador, *granuliventris* from near Bogota, and *collaris* from near Merida seem to have the toes one-half webbed. *Beebei* from British Guiana has rudimentary webs, but the toes are not fringed, and the coloration is different from that of *panamansis*. I do not feel at all sure that all these species are valid, and as *bocagei* and *fuliginosus* are the oldest names, I am calling the Darien form *fuliginosus*.

The El Valle species is quite remarkable in having the third finger of the male swollen, a character otherwise known only for two closely related and rather peculiar *Phyllobates*. Relationships in this whole group await considerable further elucidation. The species was extremely common and 33 specimens were taken. They were abundant in the woods and were also out in the valley to some extent. They were purely diurnal, as all the group seems to be, and the note was markedly disyllabic.

A single specimen of *Phyllobates talamanca* was taken in the woods. This is now known from Santa Cecilia, Old Harbour, and Suretka, Costa Rica; and from Gatun, El Valle, and Rio Calobre (U. S. N. M. no. 53,737), Panama.

Twelve very small *Phyllobates* were taken in the woods. The note was that of *flotator*. The characters of size, male throat color, thigh color and size of digital disks, indicate that they are intermediates between *flotator* and *nubicola*. They are bigger than *flotator*, not so large as *nubicola*; the males have pigmented throats (3 out of 4); the thighs are reddish; the disk of toe V is equal to, or less than, that of toe IV. I should call the El Valle specimens nearer *flotator*, but intergradation is proved and the beast must be called *Phyllobates nubicola flotator*.

Dendrobates auratus was not uncommon in the woods. As an indication of the poisonous nature of this form: all the *Atelopus* which we tried to keep alive reached Philadelphia safely save for three, which were for a short time in a sack with

two *Dendrobates*, and were taken out dead. The same two *Dendrobates* also killed by contact a *Rana* and an *Eleutherodactylus*.

The *Atelopus* of the region was the magnet which drew us to El Valle. I have previously recorded it as *A. varius cruciger* (Lichtenstein and Martens), but this and the synonymous *bibronii* were described on small (36 mm.) specimens, and the known El Valle specimens were about 52 mm. long. Now I have a complete series of all sizes from El Valle, and the young are not like the types of *cruciger* or of *bibronii*. Therefore I believe that *cruciger* from 'Veragoa' and its synonym *bibronii* from 'mountains not far from Panamá, 2000-3000 feet,' represent a race of *varius* not recently taken, and that the El Valle form is undescribed. It may be called:

Atelopus varius zeteki, sp. nov.

Type.—Museum of Comparative Zoölogy no. 16,018; an adult from El Valle, collected by James Zetek in 1929.

Diagnosis.—An *Atelopus varius* whose adults are either immaculate yellow above and below (about $\frac{1}{2}$ the population), or with some persistent, black markings which are always much smaller in area than the yellow; total length to 56 mm.

Remarks.—On the basis of five adults (M. C. Z. no. 16,018-20, 2 in La Salle Collegio) all from El Valle, I considered this form the same as *A. varius cruciger* 'Veragoa,' type Berlin 3381, length 33 mm., and its synonym *bibronii*, 'mountains not far from Panama 2000-3000 feet,' type Krakau 1015, 36 mm. long), a form in which there is considerable less black than yellow. Now, having observed 41 additional specimens, including young as small as 12 mm. long, I am quite sure that it is not the same, and that the locality and the adult of true *cruciger* remain to be discovered. True *cruciger* (at least the half-grown types) have a lateral, yellow band, and a peculiar mid-dorsal marking which may assume a crosslike shape on the head.

Young of *zeteki* have the dark predominating above arranged as follows: a single or double snout-spot; an X-shaped mark beginning on upper eyelid; a broad band across the middle of the body; usually a lateral, dark band from the eye connects

the ends of these markings on the sides; a single or double spot on the rump; on the arm there is an elbow spot, a wrist band, and the fingers have some black; on the leg there is a band on thigh, knee, shin, heel, tarsus and toes. In very small specimens these dark markings are brown bordered with black; in larger individuals they are all black. This description applies to nine individuals from 12-20 mm. in length. In a very heavily marked adult, 52 mm. long, all these markings are present except the lateral bar, but they are all very much reduced in size, less than half as wide as the yellow instead of twice as wide. A 27 mm. specimen has scarcely any markings left except remnants of the X and a few scattered spots. Of 30 adults at hand (43-56 mm.) 13 are immaculate, 12 show slight spotting, and 5 are quite gaudily barred with black.

Habits.—These frogs, like all other Brachycephalidae I have seen, are strictly diurnal. I have seen no statements as to their nocturnal habits, perhaps because most of the species are small. *A. v. zeteki* climbs up on big leaves at night (a situation never assumed by it in daylight) and goes to sleep. This was observed several times, and two particular leaves were both occupied on two different nights, perhaps by the same frogs.

In the daytime the adults are mostly on large rocks in the stream, where they are about as conspicuous as possible. A yellow frog on a black rock in the sunshine is not concealed. They are rather sluggish and unafraid, in fact scarcely at all alarmed and very easy to catch, as they jump and swim very poorly. I hesitate to suggest that they are poisonous and warningly colored, especially since *Dendrobates auratus* is definitely more poisonous, less strikingly colored, more wary, and more agile, but their whole behavior indicates that the adults have few or no natural enemies. We could have caught twice as many with little trouble. All the young were taken in the woods. No signs of breeding activity were noticed, nor did we hear the call in the field, but in captivity they gave vent to much low chirping, reminiscent of the note of young turkeys.

Hyla microcephala and *H. underwoodi* were common in the valley. On the night of August 8 a large spider was observed

carrying away a still living male of the latter species. A single male of the just described *Hyla altæ* was taken in the valley.

Five *Centrolene*, including a mated pair, were taken in the woods. The mated pair is undoubtedly *C. pulveratum* (Peters), and both the call and the characters show that I was mistaken in giving this name to Barro Colorado Island specimens, which represent another form, probably *C. parambæ* (Boulenger).

Remarks.—The characters of *C. pulveratum* are: bones green in life; color green in life, changing in preservative to purplish. Tympanum not concealed; finely rugose above; male and female without humeral hook; a fold of skin on outside of ulna and fourth finger; snout in lateral profile flaring, not rounded; male 27 mm.; female 35 mm.; vomerine teeth present in 7 out of 8; 2 out of 8 with few dark dots on dorsum; tips of dorsal rugosities whitish; a white line on edge of upper jaw.

The five species of *Centrolene* which I have seen in life in Panama and Costa Rica form two groups; I, those whose bones are white in life, whose skin color bleaches white in preservative, who have no vomerine teeth, and whose tympanum is either concealed or very indistinct (*fleischmanni* and *valerioi*); and II, those whose bones are green in life, whose color becomes purplish in preservative, who frequently have vomerine teeth, and whose tympanum is quite obvious (*prosolepon*, *pulveratum*, and *parambæ*). The two most distinct species of these two groups, *fleischmanni* and *prosolepon*, are tolerably common in lower Central America, while the others are relatively rare. Before I saw them alive, I was guilty of confusing the three species of the second group (1931, *Occas. Papers Boston Soc. Nat. Hist.* 5, p. 383).

Prosolepon has a rounded snout in lateral profile; males and some adult females have humeral hooks; no ulnar fold; smooth above; dark dorsal dots in all except 3 of the 37 specimens examined; vomerine teeth present in all except 2 specimens.

Parambæ has a rounded snout in lateral profile; male with no humeral hook; no ulnar fold; smooth above; no dark dorsal dots; Panamanian specimens without vomerine teeth (certain

South American specimens have them). I have seen what I here call *parambae* from Barro Colorado Island. Four of the specimens were taken by myself, and three of them were calling males. The note is very cricketlike and trilling. The fifth specimen is Mich. no. 70,663. Two specimens at hand measure 20 and 21 mm. The type agreed closely with a Barro Colorado Island specimen.

Pulveratum, as here distinguished from *parambae*, is known from the mated pair from El Valle, the Berlin type from Chiriqui (Berlin no. 7842), two specimens collected by the Gaiges at Progreso (M. C. Z. no. 10,725, U. Mich. no. 58,457), Bebedero, Costa Rica (Frankfort no. 1419, 1b, no vomerine teeth), and Turrialba, C. R. (U. S. N. M. no. 29,956, 29,958). The male from El Valle and M. C. Z. no. 10,725 have dark dots on the dorsum. The latter I regarded in my previous paper as *pro-soblepon*.

Prosoblepon without dorsal spots is known from Boquete (U. Mich. no. 58,451-2) and Progreso (U. Mich. no. 58,456b). M. C. Z. no. 12,134 from Las Cascadas, Canal Zone, and one of the types of *Hylella puncticrus* (B. M. N. H. no. 96-10-8, 70-1 from La Palma, C. R.) lack vomerine teeth.

The characters of the snout and of the ulnar fold seem to distinguish *pulveratum* from either of the two other species. The whole group is very difficult, unless one knows the forms in life or has access to quite fresh specimens, since all five species agree fairly closely in size, leg length, and amount of webbing. Fortunately, *fleischmanni* and *prosoblepon*, which vastly predominate in collections, are very different.

From a strictly taxonomic point of view, the names applied to Panamanian and Costa Rican types are easy to allocate; and five species in the area can be distinguished without too much difficulty. Whether the extension of knowledge gained in Central America is justified in dealing with Colombia and Ecuador, and whether I am justified in using an Ecuadorian name for a Panamanian species the future may show.

One *Centrolene* was a recently transformed young and completely unidentifiable except for genus.

Two others I consider *C. valerioi*. One of these (24 mm.) is quite a counterpart of the two originals (21 mm.). The other (26 mm.) agrees in most characters but the dorsal color is a general cloudy-green, not like the other three with their green chain markings. Both had the white bones and the golden iris and the prominent nostrils, differing from *fleischmanni* in the two latter characters, and the note of the cloudy-green one was a trill, quite different from the shrill 'tsee' of *fleischmanni*.

Seven specimens of the beautiful *Rana warschewitschii warschewitschii* were taken in the woods. They are perfectly typical and certainly not the color race *zeteki*.

Two specimens of the three-keeled *Kinosternon cruentatum* were brought us from the swamp.

A single *Lepidoblepharis xanthostigma* was taken in the woods at night.

Four Anoles were found in the woods. Of these the commonest was *A. humilis*, of which we got 8 specimens. A single egg containing a perfectly formed young of this species was found in debris on the ground. Three *lionotus* were taken, as always, haunting the stream. Two *limifrons* and a single *copii* were taken.

Basiliscus basiliscus was observed along the stream both in the valley and in the woods.

The most exciting find of the trip was the discovery of a considerable population of an iguanid lizard 8-10 inches long, living in burrows under great boulders on the mountainside in the woods, which is an undescribed species, a genus not previously known from North America, and which I feel should be described as a new genus.

I shall call it *Morunasaurus groi* for Gro, who about the year 385 A. C. C. explored the Moruna, where he found 'a mighty stronge and usid borow for flying serpens' (cf. *The Worm Ouroboros*, by E. R. Eddison).

Morunasaurus, gen. nov.

Type.—*groi*, sp. nov.

Diagnosis.—An iguanid lizard with 2-3 femoral pores; premaxillary

teeth conical; maxillary teeth conical anteriorly, posteriorly tricuspid; two abdominal ribs; one sternal fontanelle; clavicle simple, not expanded proximally; all coracoid fenestræ present; anterior mylohyoid simple as in *Callisaurus*, *Uma*, and *Holbrookia*; whorls of spines on tail; spines on thighs and shin; a dewlap in male and a gular fold in both sexes; hemipenes slightly bilobate, three welts; toes III and IV with flattened enlarged scales on outer lower edge; supraciliary and labial scales not imbricate.

Range.—Panama to Ecuador.

Morunasaurus groi, sp. nov.

Type.—Adult male.

Diagnosis.—Distinguishable from *Morunasaurus annularis* (O'Shaughnessy) from Ecuador by absence of dorso-nuchal crest; circular instead of compressed tail; caudal spines mostly subconical, not markedly keeled; annuli of spines on tail mostly separated by 4 transverse rows of scales dorsally and 3 ventrally (instead of 3 dorsally and 2 ventrally); small caudal scales scarcely keeled (diagnostic characters kindly furnished by H. W. Parker, who has compared specimens of *groi* with the type of *annularis*).

Description.—Type; head scales flattish, small, similar; eyelid scales larger; body and sides with granules, interspersed with larger, pointed scales; these fairly large on nape and on mid-dorsum; a dorso-lateral row of spines on crest of a lateral skin-fold; about six rows of spines between these folds; no mid-dorsal row; these spines increasing in size posteriorly; belly scales flat, squarish, in 15 longitudinal rows; tail with whorls of spines above, these conical, pointed (some trihedral, keeled); largest at base, separated by four rows of ordinary scales above; below with scales more similar and 3 rows between whorls; 31 whorls to near tip where they can no longer be made out; arms with ordinary scales; thigh and shin and foot with spines above; a moderate dewlap and gular fold; ear oval, about size of eye; brown above with obscure black crossbars; a white, black bordered bar on side of neck in front of arm; below gray, throat and center of belly black; hemipenes single, sulcus single, three welts, few and fine calyces, practically smooth; total length 240 mm., tail 140 mm.

Variation.—Females and young lack the dewlap, and the black below.

Remarks.—We took 3 males, 9 females, and 2 young of this species. The length of head and body ranged from 105 mm. in a female to 52 mm. in a young one. A female measured 203 mm., tail 150 mm.

It is related to the Ecuadorian *annularis* and the Brazilian *Hoplocercus spinosus*. *Hoplocercus spinosus* has a highly modified tail, nearly as broad as long, the spines not in whorls, and with a fringing series of long spines. It is a much more specialized form, and I think that the less modified species deserve generic separation. The difference is remarkably apparent. Any other relations are somewhat difficult to seek. The throat muscles seem very primitive, but aside from this the alliance may be with *Ctenosaura* or with *Cyclura*, or with some genus ancestral to the two.

Habits.—They live under great boulders on the mountainside. They seem to be diurnal, but none were seen more than two feet from their burrows, into which they dart at the slightest provocation. Most were shot, but a few were taken by overturning rocks, and a female and her young were taken in one burrow. None of the females examined were carrying more than one developed egg. The burrows are very short and shallow. The spiny tail obviously serves as a deterrent to pursuers, and about half of the specimens had broken tails. The 'combs' on the toes are digging tools. The food in the stomachs was Arthropod remains. They disappeared into their burrows so quickly that it was only by a chance shot at dusk that the first specimen was taken. I thought I was shooting at an *Ameiva*. The chances are that the form is widely distributed and has escaped observation by its elusive habits, as these nearly did.

Ameiva undulata and *A. festiva* were both common in the woods and up to a considerable altitude.

One specimen of *Echinosaura panamansis* was taken in the woods as was also a single *Leposoma dispar*.

We found one *Urotheca euryzona* in the woods. The ventrals are 126, caudals 18 plus. The hemipenis is single and quite as in *Rhadinaea*.

A single specimen of *Erythrolamprus aesculapii* was taken in the valley, and thought to be a *Lampropeltis polyzona* to which it bears a remarkable resemblance. Ventrals 190, caudals 36 plus. It was quite tame and acted like a *Lampropeltis* except for a trick of spreading the neck *a la Heterodon* and *Leimado-*

phis. It attacked the *Urotheca*, which was in the same sack, biting it on the tail. The *Urotheca* died in short order, which gives a hint as to the poisonous nature of this American *Opisthoglyph*.

We caught and observed a specimen of *Phyrnonax poecilnotus shropshirei* in the woods, and as far as we could tell it was exactly like Barro Colorado specimens.

An extremely beautifully colored snake which we also took in the woods seems to be undescribed, and I shall name it in honor of Dr. H. C. Clark, whose collections have added so much to our knowledge of the snakes of Central America.

Dendrophidion clarkii, sp. nov.

Type.—Museum of Comparative Zoölogy no. 34,878, from El Valle de Anton, Panama.

Diagnosis.—A *Dendrophidion* with 17 rows of heavily keeled scales; ventrals 165, anal single, caudals 142; anteriorly green, posteriorly brown; hemipenis with four very large basal hooks; tail over a third of total length.

Description.—Maxillary teeth 35, gradually increasing posteriorly, last 4 markedly larger, no gap; upper labials 9, fourth, fifth and sixth entering eye; lower labials 10, sixth largest, five in contact with anterior genials which are shorter than the posterior; oculars 1-2; temporals 2-2; scales 17-15, all keeled, fourth row lost posteriorly; ventrals 165, anal single, caudals 142; hemipenis as in *D. dendrophis* from Central America but with very large (7.5 mm.) basal hooks; head and anterior half green above; a black collar on temporals and behind parietals; upper lip white; posteriorly brown above; color of dorsum reaches onto ends of ventrals and in posterior half forms a narrow bar across anterior end of ventrals; belly white; tail light-brown above, pinkish-white below; total length 1067 mm., tail 407 mm.

Remarks.—This snake scarcely differs from the common Central American *Dendrophidion dendrophis* in dentition or scutellation. Its coloration and hemipenis are, however, remarkably different, the latter so much so that I considered seriously the possibility of a new generic name. However, Mr. L. C. Stuart, who is working on this whole group, and to whom I sent the specimen for examination, has kindly informed me that it had better be kept in *Dendrophidion*, as there is a Bolivian species which approaches it in hemipeneal characters.

The Collegio La Salle in Panama City has a specimen of *Micrurus nigrocinctus* from El Valle. We were told by the Alcalde that the 'Ece' (*Bothrops atrox*) occurs there.

A dead female of *Bothrops nasuta* was seen on the trail at an altitude of nearly 3000 feet, close to the Continental Divide.

We saw three other snakes, a *Leptophis* and a *Chironius* in the valley, and a dead *Clelia* in the woods, but specific identification was impossible.

Occasional Papers
OF THE
Boston Society of Natural History.

NOTES ON THE TABANIDÆ DESCRIBED BY THE
LATE C. P. WHITNEY.

BY J. BEQUAERT.

MR. Charles Pliny Whitney was a native of Milford, New Hampshire, where he was born on April 22, 1838, and died at the age of ninety on October 30, 1928. During the course of this long life, he took many trips to Florida and also visited Cuba and Mexico. He formed a considerable collection of horseflies from which he described at different times a total of fifteen new species. In November, 1932, this collection was presented to the Boston Society of Natural History by his former housekeeper, Mrs. Mary J. Downs. It was in very bad shape as many specimens, including types, had been completely destroyed by dermestids. From the way in which the collection was arranged, however, evidently most of these specimens had been destroyed long before Mr. Whitney's death. In fact, of the new species described in Mr. Whitney's first paper (1879) the only known cotypes are those which the Museum of Comparative Zoölogy (M. C. Z.) seems to have acquired through exchange many years ago. Since the insect collection of the Boston Society of Natural History (B. S. N. H.) is limited to New England material, these two museums have effected an exchange of several types. The final disposition of all typical material now in existence is noted below. There remains a remote possibility that some of Whitney's earlier cotypes were given away in exchange. Perhaps they will be discovered in other collections; some might be found in the collection of the late Prof. J. S. Hine, a point which cannot now be ascertained.

Mr. Whitney, without any special training, appears to have had an unusually keen taxonomic eye. Of the fifteen species

which he introduced to science, eight (*Chrysops cuclux*, *C. pikei*, *C. nigribimbo*, *C. ultima*, *Tabanus benedictus*, *T. birdiei*, *T. dodgei* and *T. superjumentarius*) are generally accepted as valid; five (*Chrysops cursim*, *Tabanus milleri*, *T. sparus*, *T. typhus* and *T. wrighti*) are doubtfully distinct from previously known species, in some cases probably representing local races; and two (*C. lupus* and *T. beatificus*) are identical with older species, although Whitney's name must be retained for *T. beatificus*.

1. **Chrysops cuclux** (1879, p. 35).

Originally described from seventeen females, collected at Milford, New Hampshire, in June. All the types in Whitney's collection were destroyed and the specimen of the 'Cambridge Museum,' mentioned in the original description, cannot now be found. However, at the B. S. N. H. there is one female, received from Whitney, which the late Mr. C. W. Johnson had labeled 'cotype'; but since the label does not indicate the year it was collected, this specimen may be only a topotype. Another possible cotype is a female from Milford, collected by Whitney and now in the Johnson Collection at the M. C. Z. However, it does not bear a cotype label. The species is well known and perfectly valid, although closely related to *C. sordida* Osten Sacken. In addition to the differences mentioned by Whitney, *sordida* has the costal border of the wing faintly infusate beyond the cross-band; in *cuclux* the apex of the wing is completely hyaline.

2. **Chrysops cursim** (1879, p. 36).

Described from six females, collected at Milford, New Hampshire, in July. All the cotypes are destroyed. Williston suggested that *cursim* was not separable from *C. pudica* Osten Sacken. It is certainly very close to that species and it is difficult to point out definite differences, those mentioned by Whitney (1914, p. 346) being all of degree. Perhaps the most reliable feature of *cursim* is the color of the hind femora, which are almost entirely pale yellowish, faintly infusate at base and apex. In *pudica* the hind femora are mostly blackish brown. I am inclined to regard *cursim* as a variant of *pudica*. I am also

unable to see how *C. sackeni* Hine can be consistently separated from *pudica*.

3. *Chrysops lupus* (1904, p. 205).

Described from nine females from Grand Lake, Colorado, and two females from Long's Peak, Colorado. Five of the cotypes from Grand Lake are preserved at the M. C. Z. (no. 17,054); two of them are more or less complete; another is represented by head and wings, and two more by wings alone. The remaining cotypes, including those from Long's Peak, appear to be lost. The types conform to the usual interpretation of this species. It is fairly common in Colorado and I have also seen it from Montana, New Mexico and Cape Breton (Nova Scotia). Mr. J. M. Brennan writes me that, according to the late Prof. Hine's notes and a specimen which Hine compared with Walker's type, *C. lupus* is a synonym of *Chrysops furcata* Walker (1848).

4. *Chrysops nigribimbo* (1879, p. 36).

Described from Milford, New Hampshire, where it was said to be 'abundant in Pine woods in July.' Two females in the M. C. Z. (no. 4023) and one in the B. S. N. H. are certainly cotypes. Another female in the B. S. N. H., from Milford, was presented by Whitney to Mr. C. W. Johnson, who labeled it 'cotype,' but as it bears no year of collecting it may be only a topotype. The types agree with the current idea of this species, which is generally accepted as valid. The spelling '*nigrilimbo*,' originated by Aldrich (1907, *Jour. New York Ent. Soc.* **15**, p. 8), is erroneous. Whitney intended to call his species the black 'bimbo' or baby.

5. *Chrysops pikei* (1904, p. 205).

Described from eleven females taken in Pike County, Missouri. Only fragments of four cotypes are preserved (M. C. Z. no. 17,055): one is represented by wings, a piece of thorax and part of abdomen; the others by wings only. In all four cotypes the wing markings are exactly as shown by Kröber for *pikei* (1926, *Stettin. Ent. Zeit.* **87**, pl. 1, fig. 26). Kröber (*op. cit.*, p. 225)

separates *sequax* and *pikoi* in his key by the apical spot which, in *pikoi* is said to extend into the first posterior cell along its entire outer margin; while in *sequax* the apical spot is said never to enter the first posterior cell. This will not work, since the apical spot extends into the tip of the first posterior cell (R_5) in Williston's type of *sequax*, according to information received from Mr. J. M. Brennan.

6. *Chrysops ultima* (1914, p. 345).

Described from West Palm Beach, Florida. The female holotype (M. C. Z. no. 17,056) has lost the head and is otherwise defective. Two females in the Johnson Collection (now at the M. C. Z.), one from Royal Palm Park, Florida (March 20 to April 4, W. S. Blatchley) and the other from St. Augustine, Florida, agree well with it. So far as I know, no other specimens have ever been taken. The species was unknown to Kröber, who misunderstood the description completely (1926, *Stettin. Ent. Zeit.* **87**, p. 224). It belongs to his 'vittatus Group,' but the entirely black abdomen with a faint and narrow, longitudinal, median band of gray tomentum places it near *C. fuliginosa* Wiedemann and *C. parvula* Daecke. In fact, *C. ultima* is exceedingly close to *C. parvula*, with which it agrees in general coloration and especially in the presence of two grayish-white bands of pollinosity on the pleura. In *C. parvula* the dorsum of the thorax is almost uniformly covered with dull-gray tomentum and the hind femora are mostly brown; while in *C. ultima* there is a conspicuous stripe of grayish white pollinosity on each side above the wings and the hind femora are extensively dirty yellow.

7. *Tabanus beatificus* (1914, p. 344).

The female holotype, 'received with other Florida Tabani from Rev. Geo. D. Hulst,' is at the M. C. Z. (no. 17,057) and in good condition. The species is identical with *Tabanus ater* Palisot de Beauvois (1811, *Ins. Rec. Afrique et Amérique*, p. 101; Atlas, Dipt., pl. 2, fig. 5) and *Tabanus lugubris* Macquart (1838, *Dipt. Exot.* **1**, pt. 1, p. 145). Since both these names,

however, are preoccupied (by *T. ater* Rossi, 1790, and *T. lugubris* Linnaeus, 1761) the species must be known as *T. beatificus*. I feel fairly certain that *Snowiellus stygius* Enderlein (1925, *Mitt. Zool. Mus. Berlin* 11, pt. 2, p. 353) was based upon an old, faded specimen of *T. beatificus* Whitney. In Enderlein's keys, *T. beatificus* will run out to *Snowiellus*; but Hine's genus of that name was misunderstood by Enderlein. True *Snowiellus* is characterized by the much enlarged first antennal segment, which is produced downward (in side view), but is not widened as seen from above. It is closely related to *Bolbodimyia* Bigot, but this has the much swollen, first antennal segment subglobular from above as well as from the sides. In *Tabanus beatificus* the first antennal segment is perfectly normal. Nevertheless, this species differs so much from the usual Tabani in the raised subcallus and the strongly swollen facial callosities, that it may well be made the type of a new subgenus, which I propose calling **Whitneyomyia**.

8. *Tabanus benedictus* (1904, p. 206).

According to the original description, there were five female cotypes, from Pike County, Missouri. Only four of them are known at present, all at the M. C. Z. (no. 17,058). The labels bear the notation 'La. Mo.,' standing for the more definite locality, Louisiana, a town in Pike Co., Missouri. Mr. Richard Dow suggests that Whitney may have omitted the specific locality lest his readers confuse the town of Louisiana with the State of that name. On the other hand, the fifth cotype (the whereabouts of which is unknown) may have been collected in another part of the County. The existing cotypes were collected in August, 1899, on the 1st, 20th and 26th. The species is quite distinct and has been properly recognized ever since the description. It is related to *T. atratus* Fabricius and *T. nigrescens* Palisot de Beauvois, differing from both in the very narrow frons and the shape of the antennæ. In *T. benedictus*, the first posterior cell is usually, but not always, closed before the margin; moreover, I also have specimens of *T. atratus* with this cell closed.

9. *Tabanus birdiei* (1914, p. 343).

Described from nine female cotypes, all now at the M. C. Z. (no. 17,059), in excellent condition. Although the type locality is West Palm Beach, Florida, only two of the specimens bear the abbreviation 'W. P. B.,' both being taken March 27, 1912. All the other specimens were taken in March and April, 1913, and five of these have no indication of a locality, while the two remaining are labeled 'Okee Rd' and 'Okee' respectively. The Okeechobee Road referred to is presumably within the type locality. The species is valid, although it superficially resembles a small *T. cymatophorus* Osten Sacken in the markings of wing and abdomen. As pointed out by Whitney, *T. birdiei* is very distinct in the broad frons, with the unusually large, nearly square, basal callus. It also differs in the cream-colored palpi (blackish brown in *cymatophorus*), and the mostly tawny legs (in *cymatophorus* black, with conspicuous, broad, white rings at the base of all the tibiæ).

10. *Tabanus dodgei* (1879, p. 37).

Described from nine females received from Glencoe, Nebraska. No types are known to exist. The species is now recognized as valid.

11. *Tabanus milleri* (1914, p. 344).

Described from twenty females taken at Miami, St. Augustine, and St. Petersburg, Florida. All the specimens in the Whitney Collection were destroyed; but in the Johnson Collection (now at the M. C. Z.) there are two females from St. Augustine, one (collected in 1919) certainly, and the other probably, not part of the original lot. According to the author, the species differs from *T. sparus* Whitney only in the presence of a well-defined dark-purple band across the eye.

12. *Tabanus sparus* (1879, p. 38).

The type locality was given as Milford, New Hampshire, where the females were said to be abundant in June and July. A male was also described from the same locality. Of all the

cotypes only three females remain, two at the M. C. Z. (no. 4039) and one at the B. S. N. H.

Specimens agreeing with the characters of *T. pumilus* Macquart, *T. sparus*, and *T. milleri* seem to occur sometimes in the same locality. On Staten Island, New York, for instance, I have taken specimens with two bands, one band or no band across the eye. The other characters mentioned by Whitney to separate *sparus* and *pumilus* are most variable and often leave one in doubt. I should not be surprised if it were found that all three names refer to one species, variable as regards the banding of the eyes.

13. *Tabanus superjumentarius* (1879, p. 37).

Described from two females, taken July 4, at Milford, New Hampshire. These cotypes are no longer in existence. A specimen in the B. S. N. H., from the type locality, but not a cotype, appears to have been given to Mr. C. W. Johnson by Whitney. The species is well known and valid.

14. *Tabanus (Theriopectes) typhus* (1904, p. 206).

Whitney had six cotypes from Milford, New Hampshire. Five of these are known at present, three at the B. S. N. H. and two at the M. C. Z. (no. 17,060). Although Whitney's collection contained a fairly long series under the name label '*T. typhus*,' part of which had been collected in 1878 and 1879, five specimens taken in July, 1900, were at the beginning of the row. Since only six specimens were mentioned in the original description, one must conclude that the earlier specimens were not recognized as this species until some time after the more recent ones had been described. *T. typhus* is, in my opinion, very doubtfully distinct from *T. astutus* Osten Sacken and seems to have been based mainly upon teneral specimens of the latter. In the collection of the B. S. N. H., Mr. Johnson apparently did not attempt to separate *astutus* and *typhus*.

15. *Tabanus wrighti* (1915, p. 380).

Described from two females taken in May at West Palm

Beach, Florida, by Dr. H. E. Wright. Both are now in the M. C. Z. (holotype, no. 17,061; paratype, no. 17,061), in defective condition. It is evident from the description that they had been relaxed and had lost much of their freshness before they were described. The species agrees with *T. hinei* Johnson (= *T. politus* Johnson, not of Walker) in the shiny, denuded subcallus, the shiny face (below antennæ), the presence of a strongly raised rudiment of the anterior ocellus on the vertex, the very slender palpi, the shiny thorax, and the partly fuliginous wings. After careful comparison, *T. wrighti* appears to be merely a dark, melanic form or race of *T. hinei*. The wings are more extensively infuscated and darker, the antennæ are almost wholly black, and the yellowish spots on the sides of the abdomen are much reduced. With regard to the abdominal spots, however, I have a female of *T. hinei* from Staten Island, New York, which has the abdomen marked almost like the holotype of *T. wrighti*.

ENTOMOLOGICAL WRITINGS OF C. P. WHITNEY.

1879. Descriptions of some new species of Tabanidæ. *Canadian Ent.* 11:35-38.
 1904. Descriptions of some new species of Tabanidæ. *Canadian Ent.* 36:205-207.
 1914. Descriptions of four new Tabanidæ, with remarks upon *Chrysops cursim*. *Canadian Ent.* 46:343-346.
 1915. A new Tabanus. *Canadian Ent.* 47:380-381.

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Occasional Papers
OF THE
Boston Society of Natural History.

A NEW GENUS AND THREE NEW SPECIES OF
CRININE FROGS FROM AUSTRALIA.

BY ARTHUR LOVERIDGE.

MR. L. Glauert, of the Western Australian Museum at Perth, recently submitted for identification certain frogs which he had had difficulty in placing. Among these was a series of a diminutive, burrowing, myrmecophagous form of Brevicipitid-like appearance, but whose shoulder-girdle apparatus is undoubtedly arciferal in type. As this series fails to conform to any known genus, I propose to erect one for its reception and with which may be associated the name of our generous correspondent who has donated a series of paratypes to the Museum of Comparative Zoölogy.

Glauertia, gen. nov.

Pupil horizontal. Tongue elliptical, entire, free behind. Maxillary teeth apparently absent. Vomerine teeth absent. Tympanum absent. Fingers free, tips undilated. Toes webbed, tips undilated. Outer metatarsals united. Omosternum absent; metasternum cartilaginous, broadly dilated. Diapophyses of sacral vertebra moderately dilated.

Most nearly related to *Pseudophryne* and *Uperoleia* but with strongly webbed toes and the narrow mouth and facial configuration of a *Breviceps*.

At Mr. Glauert's request, the type is named after Captain A. R. E. Russell of Landor Station who was his host at the time these frogs were collected.

Glauertia russelli, sp. nov.

Type.—Western Australian Museum no. R. 2608; apparently a male,

from the bank of a creek flowing into the Gascoyne River near Landor Station, Western Australia, collected by L. Glauert, Esq.

Paratypes.—Twenty-four specimens with the same history as the type; of these six are Museum of Comparative Zoölogy no. 19,424-19,429.

Description.—Size small. Habit stout (bloated with ants). Head broader than long, snout acuminate or somewhat triangular, truncate at tip; nostril slightly nearer to the tip of the snout than to the anterior border of the eye, the latter distance about equal to the orbital diameter; canthus rostralis rounded, loreal region slightly concave; interorbital space flat, from once and a half to two times as broad as an upper eyelid; pupil horizontal; tongue elliptical, entire and free behind; vomerine teeth absent. Fingers cylindrical, well developed, first and fourth about equal, shorter than the second which is only about half the length of the third; subarticular tubercles strongly developed; a pair of prominent metacarpal tubercles; toes cylindrical, strongly webbed, at most a single joint free with the exception of the fourth which has three joints free, toes increasing in length in the following order: first, second, fifth, third, fourth; two very large metatarsal tubercles, the outer shovel shaped, its cutting edge almost at right angles to the long axis of the limb, the inner more rounded, larger than the free portion of the adjacent first toe; the metatarsal tubercles of the adpressed hind-limb mark the axilla, the longest toe, just short of, or beyond, the end of the snout.

Coloration.—(In life as depicted in a water-color sketch made by Mr. Glauert.) Olive, a pink, vertebral stripe bounded on either side by a brown band of irregular width; a pair of reddish-orange blotches on the scapular region and a smaller pair above the anus, the two groups more or less connected by an irregular, lateral patch of the same hue; a few scattered, brown spots on the flanks.

(In alcohol.) Above, brown, a light vertebral line only distinguishable posteriorly; a series of yellowish patches corresponding to the reddish-orange ones described above. Below, dirty yellow, uniform, or in some paratypes freckled with brown anteriorly, most heavily upon the throat.

Measurements.

	W.A.M. R. 2608	M.C.Z. 19,424
	Type	Paratype
Snout to anus	23.5	30 mm.
Fore limb from axilla	11	14
Hind limb from anus	25	32.5

Unfortunately the taking of measurements as well as the anatomical examination for generic characters has been rendered difficult by the shrivelled condition of the series, resulting, apparently, from immersion in strong alcohol.

Pseudophryne blanchardi, sp. nov.

Type.—Museum of Comparative Zoölogy no. 19,259; a gravid female, from Millgrove, Victoria, collected by Dr. Frank N. Blanchard, April 1, 1928.

Paratypes.—Museum of Comparative Zoölogy no. 19,260; a male; also twelve other examples with the same history as the type which are in the collection of Dr. F. N. Blanchard.

Diagnosis.—Most nearly related to *P. australis* (Gray) of Perth, Western Australia, and to *P. brooksi* Loveridge from Manjimup, southwestern Australia. From the former, as well as from *P. albifrons* (Duméril and Bibron) of New South Wales, it may be readily distinguished by the absence of a light, frontal area and the possession of a pure-white throat. In limb length it occupies an intermediate position, the tip of the fourth toe of the adpressed hind-limb reaching to the eye in gravid females (as in *australis*) or to the end of the snout in males (as in *brooksi*); the hind limb is much shorter than that of *semimarmorata* Lucas from Victoria and New South Wales. In coloring it differs greatly; except for two orange-brown spots on the hinder aspect of the thighs, the hind aspect of the latter as well as the lower surface of the limbs is pure white in *blanchardi* while in our 121 examples of *semimarmorata* the hinder aspect of the thighs is dark and the lower surface of the limbs are marbled or heavily mottled with dark pigmentation.

Description.—Habit moderate, stout in gravid females. Head as broad as long; snout rounded in the type, definitely acuminate in males; the distance from the nostril to the tip of the snout is equal to that from the nostril to the anterior border of the eye, and equivalent to about two-thirds the orbital diameter; canthus rostralis feebly marked (quite absent in males), loreal region not concave; interorbital space flat, broader than an upper eyelid; pupil indistinct in type (clearly horizontally oval in some paratypes); tongue elongate, entire and free behind; vomerine teeth absent. Fingers cylindrical, first very much shorter than the second (in all the specimens); subarticular tubercles strongly developed; a pair of metacarpal tubercles indicated (masked by preservation); toes cylindrical, without web, increasing in length in the following order: first, second, fifth, third, fourth; two small, rounded, metatarsal tubercles, the inner *not more than half* as large as the first toe; the tibio-tarsal articulation of the adpressed hind-limb reaches midway between groin and axilla (in all females, almost to the axilla in males), the tarso-metatarsal articulation to axilla (in all females, to shoulder or just beyond in males).

Skin above (in formalin and alcohol) smooth, with smooth, flat warts tending to coalesce to form longitudinal, converging glandular lines from the postorbital regions to the vertebral line on a level with the axillæ.

Below, smooth, except on the throat and for a small patch in the anal and subanal region; a fold across the chest except in very bloated females.

Coloration.—(In alcohol.) Above, almost uniformly purplish-black except for the warts being a little darker; a vertical, light line just distinguishable on the tip of the snout; in some paratypes, though rarely, a light line above the region of the urostyle. Below, including the posterior aspect of thighs which carry a pair of orange-brown spots, pure white except for the belly and neck which are heavily vermiculated with purplish-black.

Measurements.

	Type ♀	Paratype ♂
Snout to anus	33	28 mm.
Fore limb from axilla	15.5	15
Hind limb from anus	31	27

Helioporus insularis, sp. nov.

Type.—Western Australian Museum no. R. 4303; a gravid female from Rottneest Island, Western Australia, collected by L. Glauert, Esq.

Paratypes.—Museum of Comparative Zoölogy no. 18,198-18,202, being five juveniles collected on Rottneest Island by Dr. P. J. Darlington in October, 1931; also Western Australian Museum no. R. 4289 with the same history as the type.

Diagnosis.—Long confounded with *H. albopunctatus* Gray, this insular species may be distinguished by its much smaller size, by the third and fifth toes being nearly of equal length (in *albopunctatus* the third is very much longer than the fifth), and its very different coloring.

I am indebted to Mr. Glauert for pointing out that the Rottneest frog was not conspecific with the mainland species which he says is more of an inland form. Mr. Glauert was inclined to apply the name *Perialia eyrei* Gray to this frog but Gray distinctly states that the type came from 'Australia, on the banks of the river Murray' which is in line with our knowledge of Eyre's journeyings in South Australia. In the *Catalogue of Salientia*, Boulenger (1882, p. 272) alters this to 'W. Australia' and refers *eyrei* to the synonymy of *albopunctatus*. I believe *eyrei* represents an entirely different species, and it appears probable that Boulenger's redescription of *albopunctatus* is a composite of the two forms under the assumption that *eyrei* was the young of *albopunctatus*.

Coloration.—(In alcohol.) Rather resembling that of *Limnodynastes ornatus* (Gray). Above, pale, sandy brown, a light, vertical streak on the snout, the streak being flanked by dark brown; a transverse bar of dark brown uniting the upper eyelids; two, heavy, longitudinal, dorso-lateral bars as well as mottlings of the same color on the flanks. Below, uniformly pure white except for a little dusky freckling at the angle of the jaws.

Measurements.

	W.A.M.R. 4303	M.C.Z. 18,198
	Type, adult ♀	Paratype, young
Snout to anus	50	23 ¹ mm.
Fore limb from axilla	28	15
Hind limb from anus	60	27

¹Less the rudiment of a tail still showing as a dark knob.

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NEW SCINCID LIZARDS OF THE GENERA *SPHENOMORPHUS*, *RHODONA*, AND *LYGOSOMA*
FROM AUSTRALIA.

BY ARTHUR LOVERIDGE.

IN completing the study of the herpetological material collected by the Harvard Australian Expedition of 1931-1932, involving a reëxamination of earlier collections in the Museum of Comparative Zoölogy, four skinks have been found which appear to be worthy of description. It is most unfortunate that only single examples of each form were obtained. Two of these were collected by members of the Expedition and have been deposited in the Queensland Museum in accordance with the agreement that typical material of all new species collected by the Expedition should be returned to Australia.

Sphenomorphus leae brooksi, subsp. nov.

Type.—Museum of Comparative Zoölogy no. 25,055, a half-grown male from Perth, Western Australia, collected by Mr. W. Sprague Brooks in 1926.

Diagnosis.—Ear opening with 3 projecting lobules anteriorly; 4 supraoculars; prefrontals forming a long median suture; 26 midbody scale-rows; subdigital lamellæ sharply keeled.

Description.—This western race differs from the typical form from Adelaide, South Australia, in the following characters: Nasals slightly separated medially; frontal markedly longer than frontoparietals and interparietal together; 5th and 6th lower labials below the eye; ear-opening with only 3 projecting lobules anteriorly; 26 (instead of 22) midbody scale-rows; fourth toe of the adpressed hind-limb reaches to the axilla; 26 subdigital lamellæ beneath the fourth toe.

Coloration.—(In alcohol.) Above, greenish gray, back and tail with a faint vertebral line which is, on the tail alone, flanked by sharply distinct, black, lateral lines; back covered with numerous series of dark specks showing a tendency to form lines; on the sides numerous, irregular, vertical black stripes; limbs streaked with black; below uniformly white.

Measurements.

Total length	103 mm.
Length of head	9
Width of head	5
Body to anus	38
Fore limb	12
Hind limb	20
Tail	56

Sphenomorphus schevilli, sp. nov.

Type.—A male from Army Downs, 35 miles northerly of Richmond, Queensland, collected by Mr. W. E. Schevill, July, 1932; presented to the Queensland Museum.

Diagnosis.—Lower eyelid scaly; ear-opening with 4-7 projecting lobules anteriorly; prefrontals separated by a small interspace, the frontonasal forming a suture with the frontal but not with the rostral; frontal in contact with the three anterior supraoculars; 40 midbody scale-rows, smooth.

Description.—Habit lacertiform, slender; the distance between the end of the snout and the fore limb is contained once and two thirds in the distance between axilla and groin. Snout moderate, obtuse; loreal region nearly vertical; lower eyelid scaly; nostril pierced in a single nasal which is in contact with its fellow behind the rostral; no supranasal; no post-nasal; frontonasal broader than long, forming a *very short suture* with the frontal; latter longer than its distance from the back of the parietals, in contact with the three anterior supraoculars; 4 supraoculars; 10-11 *supraciliaries*, first and last largest; frontoparietals distinct, *as long as* the interparietal; parietals forming a suture behind the interparietals; parietals bordered posteriorly by three pairs of scales not sufficiently differentiated to be called nuchals; 6th and 7th labials below the eye; ear-opening oval, a little *smaller* than the eye-opening, with 4 large (right side) or 7 very small (left side) lobules anteriorly; 40 *smooth scales round the middle of the body*; laterals smallest, dorsals largest; 4 preanals, the median pair much enlarged; the adpressed hind-limb reaches to the elbow of the backward-pressed fore limb. Toes long, moderate, compressed; subdigital lamellæ unicarinate, 24 beneath the fourth toe.

Coloration.—(In alcohol.) Above, pale brown; eyelids edged with white; body extensively flecked with white; a narrow, but gradually broadening,

dark brown, vertebral band commences behind the parietals and fades out halfway along the tail; flanks also dark brown with series of white spots arranged in irregular vertical lines; fore limbs uniformly pale brown; hind limbs similar but with very faint indications of dusky markings. Below, uniformly white.

Measurements.

Total length	207 mm.
Snout to anus	80
Fore limb	25
Hind limb	36
Tail	127

Remarks.—I have carefully explored the possibilities of affinities with *Egernia whitii*, but the new skink has the palatine bones in contact on the median line of the palate and is undoubtedly a *Sphenomorphus* closely related to *strauchii* (Boulenger) from Gayndah, Queensland. The latter, however, has only 28 midbody scale-rows and differs principally in those characters which in the above description are in italics. The ill-described *Egernia kintorei* Stirling and Zietz (1893) should be compared with the above description.

***Rhodona nicholli*, sp. nov.**

Type.—Museum of Comparative Zoölogy no. 33,252 from Dalgaranger Station, 50 miles northeast of Yalgoo, Western Australia, collected and presented by Professor G. E. Nicholls of Perth, after whom it is named.

Diagnosis.—Intermediate between *R. punctata* Gray (*i. e.*, *Lygosoma lincopunctulatum* of Boulenger) and *miopus* (Günther). Differs from the former in the much shorter rudiment of a fore limb and in coloration. From *miopus* it differs in the didactyle hind-limbs and coloration; from *R. picturatum* (Fry) of Boulder, Western Australia, and *R. wilkinsi* (Parker) of Torrens Creek, Queensland, in the 22 midbody scale-rows and the fused frontoparietals and interparietal, etc., and in addition from *wilkinsi* by possessing the budlike remnant of a fore limb, etc.

The Museum of Comparative Zoölogy has 9 of the 19 species of this genus, which many authors prefer to regard as a subgenus of *Lygosoma*.

Description.—Midbody scale-rows 22; fore limb a bud, half as long as an adjacent scale; hind limb didactyle; prefrontals present, though widely separated; frontoparietals and interparietal fused into a single large shield.

Coloration.—(In alcohol.) Above, pale; three sharply-defined, chocolate-brown, longitudinal bands, the median commencing behind the nuchals and

extending backwards to the tip of the tail, each dorso-lateral stripe commencing at the nostril, passing across the eye and also extending backwards to the tip of the tail. Below, uniformly white.

Measurements.

Total length	127 mm.
Snout to anus	63
Hind limb	10
Tail	64

Lygosoma darlingtoni, sp. nov.

Type.—An adult female, from Millaa Millaa, Atherton Tableland, Queensland, collected by Dr. P. J. Darlington, April, 1932; presented to the Queensland Museum.

Diagnosis.—Lower eyelid scaly; no supranasals; prefrontals widely separated; frontal broader than supraocular region; ear-opening large and conspicuous; midbody scale-rows 22; limbs short, pentadactyle.

Most nearly related to *L. mülleri* (Schlegel) from which it differs in midbody scale-rows (34 in *mülleri*); 4th and 5th labials beneath the eye; distance between end of snout and fore limb contained two and a half times in the distance between axilla and groin, etc. It agrees surprisingly with the description of *Siaphos scutirostrum* (Peters), but differs in important generic characters such as presence of prefrontals, width of frontal, and size of ear-opening.

Description.—Body elongate, limbs moderate; the distance between the end of the snout and the fore limb is contained two and a half times in the distance between axilla and groin. Head small, depressed; snout obtusely acuminate; lower eyelid scaly; nostril pierced in a single nasal; no supranasal; rostral narrowed posteriorly between the nasals, where it forms a moderate suture with the frontonasal, which is broader than long and in contact with the frontal; latter as large as frontoparietals and interparietal together, nearly as broad as long, broader than the supraocular region, in contact with the two anterior supraoculars; four supraoculars; seven supraciliaries; frontoparietals and interparietal distinct, subequal; parietals forming a suture behind the interparietal; 2 or 3 pairs of nuchals; 4th and 5th upper labials below the eye; ear-opening oval, but little smaller than the eye-opening; no auricular lobules; 22 smooth scales round the middle of the body, the median dorsals not broader than those adjacent to them; a median pair of enlarged preanals. Limbs not nearly meeting when adpressed; digits short, fourth toe longer than the third; subdigital lamellæ undivided, smooth, 14 beneath the fourth toe. Tail thick, once and a half the length of the head and body.

Coloration.—(In alcohol.) Above, brown, each scale flecked or edged with black. Below, white, the throat streaked or spotted with gray.

Measurements.

Total length	190 mm.
Snout to anus	75
Fore limb	10
Hind limb	18
Tail	115

Occasional Papers
OF THE
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NEW MOLLUSKS IN THE GENUS *LIGUUS* FROM CUBA
AND THE ISLE OF PINES.

WEST INDIAN MOLLUSKS NO. 8.

BY WILLIAM J. CLENCH.

EXPLORATIONS in various parts of Cuba and the Isle of Pines during the past few years have brought to light several new races of *Liguus*.

For much of this material I am deeply indebted to Dr. C. de la Torre and his two former students, Dr. C. G. Aguayo and Dr. P. Bermudez and to E. G. Feria, P. P. McGinty and W. F. Shay. In addition, my grateful thanks are due to several students, especially Messrs. Bates, Bowen, Dow, Fairchild and Welch, who spent much time collecting material at the Atkins Institution of the Arnold Arboretum at Soledad, Cienfuegos, Cuba.

During July, 1930, Mr. A. F. Archer made an extended trip to Viñales, Pinar del Rio, for the Museum of Comparative Zoölogy, to collect *Liguus*. A superb series of more than nine hundred specimens was obtained from several isolated localities in the region.

My own collecting has been carried on mainly in Sierra Rangel and at Candelaria, both in Pinar del Rio; Pena Blanca and Jamaica in Havana Province; Soledad, Cienfuegos in Santa Clara; Preston and the United States Naval Base, Guantanamo, Oriente. No *Liguus* was obtained at the two Oriente localities.

The genus *Liguus* as far as it is now known to occur, appears to be fairly well distributed throughout the island of Cuba, though it is to be admitted that there are very extensive areas in all provinces that await investigation. As a consequence, records are still scattered and more intensive collecting must be carried

on to trace especially the many subspecies through transitional regions.

The following is a list of Cuban *Liguus* with notes and references to their original citations.

Liguus vittatus (Swainson).

Achatina vittata Swainson 1822, Zoölogical Illustrations 2, text and pl. 84, middle figures.

Achatina poeyana Pfeiffer 1857, Malakozoologische Blätter 4, p. 173, pl. 4, fig. 3-4 (Cabo Cruz, Cuba).

Liguus fasciatus fasciatus (Müller).

Bulla virginea β Linné 1767, Syst. Nat., ed. 12, 1, pt. 2, p. 1186.

Buccinum fasciatum Müller 1774, Verm. Terr. et Fluv. 2, p. 145 [refers to Seba, Thesaurus 3, pl. 39, fig. 62-74].

Bulimus vexillum Bruguiere 1792, Encyclopédie Méthodique 1, pt. 2, p. 362 [refers to Lister, Synopsis, pl. 12, which is typical *fasciatus*].

Helix hepatica Bolten 1798, Mus. Boltenianum 2, p. 106, no. 1358¹.

Helix testa-ovi Bolten 1798, Mus. Boltenianum 2, p. 106, no. 1359¹.

Achatina lineata Valenciennes 1833, in Humb. and Bonpl. Rec. de Obs. Zool. 2, p. 248, pl. 55, fig. 2 (non *Liguus lineatus* Simpson 1920).

Achatina lutea Anton 1839, Verzeich. der Conchylien., p. 44, no. 1588 [nude name].

Achatina murrea Reeve 1849, Conch. Icon. 5, fig. 22a. [Type selected Clench, *Nautilus* 1932, 45, p. 106. Not fig. 22b, which is *L. fasciatus roseatus* Pils.].

Liguus murreus vignalensis 'Pilsbry' Richards 1933, Proc. Pennsylvania Acad. Sci. 7, p. 171 [nude name].

Liguus fasciatus crenatus (Swainson).

Achatina crenata Swainson 1821, Zoölogical Illustrations 1, text and pl. 58, fig. 1-2 (Cuba).

Achatina anais Lesson 1840, Revue Zoologia 3, p. 356.

This is the albinistic form of several color races in Cuba. Certain of the white forms, however, can be very definitely defined when characters other than color are recognizable. *L. f. crenatus*

¹Bolten defined these forms by a reference to Gmelin who had referred to Müller's description and figures. Pilsbry (*Nautilus* 1929, 42, p. 141) selected for the type of *L. fasciatus* fig. 74, of pl. 39, in vol. 3 of Seba's Thesaurus. As Bolten's names refer to the same figures in Seba, they become absolute synonyms of *fasciatus* Müller.

itself has but little value in a consideration of distribution, its origin is polyphyletic and it occurs usually associated with the other race or races of its region. In a few instances it has been found in pure colonies, and the color factor is capable of segregation. *L. fasciatus eburneus* Simp. holds exactly the same position in Florida, occurring generally associated with one or more colored races in a single hammock and occasionally as a pure race in others.

L. fasciatus subcrenatus Pils., *L. f. septentrionalis* Pils., and *L. f. capensis* Simp., all of Florida, are white forms and are sufficiently diagnostic in their general shape to be well-recognizable races. *L. f. feriai* Cl. and *L. f. pinarensis* Cl. from Cuba and the Isle of Pines are in the same category.

***Liguus fasciatus pictus* (Reeve).**

Achatina picta Reeve 1849, Conch. Icon. 5, *Achatina*, pl. 10, fig. 34 (Cuba).

This form, originally described from Cuba, is in all probability not a Cuban shell. It is definitely known to occur on the lower Florida Keys and no recorded Cuban localities are authentic. It is exceedingly rare, not more than twenty specimens being known.

***Liguus fasciatus cingulatus* Simpson.**

Liguus crenatus cingulatus Simpson 1920, Proc. Biol. Soc. Washington 33, p. 123 (Brickell Hammock, Miami, Florida).

Dr. P. Bermudez collected specimens of this form at Caibarien, Santa Clara, that are indistinguishable from Florida *cingulatus*. They are a little larger than the average of the Florida race.

***Liguus fasciatus viridis*, subsp. nov., p. 105.**

- “ “ ***archeri*, subsp. nov., p. 106.**
- “ “ ***achatinus*, subsp. nov., p. 107.**
- “ “ ***feriai*, subsp. nov., p. 108.**
- “ “ ***aguayoi*, subsp. nov., p. 109.**
- “ “ ***angelæ*, subsp. nov., p. 110.**
- “ “ ***goodrichi*, subsp. nov., p. 111.**
- “ “ ***helianthus*, subsp. nov., p. 112.**
- “ “ ***xanthus*, subsp. nov., p. 113.**
- “ “ ***nobilis* Clench and Aguayo.**

Liguus fasciatus nobilis Clench and Aguayo 1932, Nautilus 45, p. 98, pl. 6, fig. 9 (Cayo Juan Tomas, Cabañas Bay, Pinar del Rio, Cuba).

Liguus fasciatus pallidus (Swainson).

Achatina pallida Swainson 1821, Zoölogical Illustrations 1, text and pl. 41, fig. 1-2.

This is a very well-defined form. Dr. C. G. Aguayo recently sent a specimen of this subspecies from Cayo Magueyal, near Cortez, on the south coast of Pinar del Rio. It agrees almost exactly with the description and figure published by Swainson.

Liguus fasciatus torrei, subsp. nov., p. 114.

“ “ **mcgintyi**, subsp. nov., p. 116.

“ “ **pinarensis**, subsp. nov., p. 116.

“ **blainianus blainianus** Poey.

Achatina blainiana Poey 1851, Mem. Sobre la Hist. Nat. de la Isla de Cuba 1, p. 206, pl. 12, fig. 4-6 (Loma de Rangel, Pinar del Rio).

Liguus blainianus jaumei Clench and Aguayo.

Liguus blainianus jaumei Clench and Aguayo 1932, Nautilus 45, p. 99, pl. 6, fig. 10 (between Mangas and Candelaria, Pinar del Rio, Cuba).

Liguus blainianus fairchildi, subsp. nov., p. 117.

“ **flammellus flammellus**, sp. nov., p. 119.

“ “ **cervus**, subsp. nov., p. 120.

“ “ **carbonarius**, subsp. nov., p. 121.

“ “ **bermudezi**, subsp. nov., p. 122.

“ “ **cubensis**, subsp. nov., p. 123.

“ “ **organensis**, subsp. nov., p. 124.

Liguus fasciatus fasciatus (Müller).

Plate 6, figure 10.

The typical form varies from a decided greenish cast (rare) to a general cast of bluish gray. With very few exceptions, all specimens of this form possess strong, broad, bluish gray, axial flames on the fourth to sixth whorls, occasionally the flames extending to the body whorl. There is a strong tendency in this race to widen the subperipheral white band with a consequent reduction of the

flamed area. This arrangement of color pattern appears to be distinctly spiral and not axial as is the case when the flamed area is wide, extending from suture to suture on the early whorls and from the narrow subperipheral region to the suture on the body whorl. This is, of course, disregarding the appearance of the periostracal green lines. The subperipheral white band is usually divided through its approximate center by a band of brown which varies somewhat, but seldom exceeds a width of more than one millimeter. The 3-4 mm. band that encircles the columella varies from pale reddish-brown to brown. Parietal glaze clear and glass-like, usually faintly pinkish. The nuclear whorls are pale pink.

This form is common between Havana and Matanzas, especially near the latter. Most of the early descriptions of *Liguus* by European writers were based on material from this region.

Liguus fasciatus viridis, subsp. nov.

Plate 6, figure 11.

Description.—Shell subsolid, rather elongate and somewhat dull. Whorls $7\frac{1}{2}$ -8, rather convex, regularly increasing in size. Color: first $2\frac{1}{2}$ whorls deep pink, the first $\frac{1}{2}$ whorl faintly tinged with brown. Succeeding 2 whorls white with dull red, axial flames or bars somewhat irregularly shaped. These axial flames gradually change to bluish gray and they tend to disappear on the body whorl. From the fifth whorl onward there is superimposed over these flames a smooth grayish-green wash in the form of a band which changes to a yellowish green or full green on the body whorl. This wash of color is nearly as wide as the flamed area, leaving only the insertion areas of these flames fully exposed along the sutures. Superficially, the flame ends appear as interrupted bands a little above and below the sutures. In a few specimens the flames entirely disappear on the last half of the body whorl. Subperipheral band of white, fairly wide and divided in its near center by a narrow band of deep chocolate-brown. The remaining color below the subperipheral band washed with faint brown over green. Columella pink, encircled with a 3-4 mm. band of dark brown, separated from the brownish-green wash by a narrow band of white. Parietal callus glazed with pink. Periostracal green lines numerous, varying in number in material from different localities.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
48.0	23.0	22.0 × 12.5 mm.	Holotype
61.5	28.0	26.5 × 14.5	Paratype
56.5	26.5	25.0 × 15.5	“
52.5	26.0	23.0 × 15.0	“
56.0	26.5	25.0 × 14.5	“

Holotype.—M. C. Z. no. 59,507, La Caoba, near Dolores, Central Soledad, Cienfuegos, Santa Clara, Cuba. Collected by W. J. Clench, Sept., 1928.

Paratypes.—All of the following localities in the vicinity of Central Soledad. Iguana Pt., Caonao River; La Caoba, Dolores; Guaos; Belmonte; Seboruco de Vilches¹; Limones; Hoyo de la Cantera; Monte de la Caldera, San Antón and Santa Teresa, La Vega. Collected by T. Barbour, M. Bates, R. E. Bowen, W. J. Clench, G. B. Fairchild, and J. Welch.

Remarks.—This is a distinctive greenish subspecies generally distributed throughout the Soledad region, and very probably extends well into the Trinidad Mountains. It is exceedingly rare at all of the above localities, a series in a few cases being collected by natives. This form shows a decided preference for the strangling fig and the Ceiba trees. They secrete themselves during the dry periods in crevices or other protected places about the buttress roots and lower limbs of these trees.

In relationship, this subspecies is near to the typical form, differing mainly by its very greenish appearance, its strong pink tip and parietal area and the nearly solid colored surface area.

Liguus fasciatus archeri, subsp. nov.

Plate 7, figure 5.

Description.—Shell produced, rather solid, somewhat dull. Whorls 7-7¼, rather convex and regularly increasing in size. Tip of spire flesh pink (two whorls). Columella pale pink, thickened and usually truncated. Parietal wall glazed porcelaneous white and margined with a 2-4 mm. area of deep chocolate-brown. This brownish band has its insertion at the superior margin of the aperture and terminates at the base of the columella. Color: early whorls pinkish. Third whorl with brown to bluish-brown axial flames which increase in size on the fourth and then gradually disappear because of a flat wash of superimposed color of light buff to dull ivory. Insertion areas of the flames continued as sutural lines, colored a dark brown to blackish green. These bands appear as the margins of the subperipheral line on the body whorl, usually coalesced to form a single band. Periostracal green lines numerous and fairly wide, importing a greenish cast to the entire shell. Sculpture of very fine, nearly indistinguishable growth lines.

¹In the region of Soledad, and generally elsewhere in Santa Clara, the term 'Seboruco' is used in exactly the same sense as 'Mogote' is used in the province of Pinar del Rio. Dr. Aguayo reports that 'Sierra' is an equivalent term in Oriente.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
55.5	25.0	23.5 × 13.0 mm.	Holotype
55.5	25.0	24.5 × 13.5	Paratype
53.0	24.0	23.4 × 13.0	“
56.5	26.0	24.0 × 13.5	“
56.0	25.0	23.5 × 13.5	“

Holotype.—M. C. Z. no. 80,901, Mogote de Ramon Millo, Viñales, Pinar del Rio, Cuba. Collected by A. F. Archer, July, 1930.

Paratypes.—All of the following localities are in the vicinity of Viñales. Mogotes: de Ramon Millo; el Queque; de Basilio Torre; de Vigil and Yglesias. Also from Hoyo de la Majagua. Collected by A. F. Archer.

Remarks.—A very much darker race than typical *L. f. fasciatus*, the deeper color being due to the excessive development of the periostracal green lines and the sutural and subperipheral, blackish-green bands.

This subspecies and other members of the genus *Liguus* probably extend well beyond their present known limits in this area.

Liguus fasciatus achatinus, subsp. nov.

Plate 7, figure 1.

Description.—Shell large, solid, dull, and usually truncated in adult specimens. Whorls 8-8½, rather convex. Spire produced, first 1½ whorls pale flesh-pink to white. Color: ground color white, flames weak reddish-brown shading to bluish gray and prominent only on the third to fifth whorls. Insertion areas of the flames strong, generally forming an upper and a lower continuous, though occasionally interrupted, brown to bluish-brown line. Subperipheral band rather wide, leaving the flamed area reduced to a band on each whorl. After the disappearance of the flames on the later whorls, the band color becomes yellow, which is margined above and below by brownish lines. On large adult specimens, the yellow entirely disappears, and with it the two marginal lines. The subperipheral white band possesses a center line of brown. This line apparently always persists. There is, in addition, a second brown sutural line persisting which is immediately below the suture, and is not to be confused with the delimiting brownish bands of the central area. On young specimens, the area below the subperipheral band is usually dark greenish-brown. Columella white to pink. Encircling brownish band reduced to a narrow, somewhat indefinite colored area. Parietal wall glazed a porcelainous white, margined brownish red to brown. Periostracal lines variable, usually quite prominent.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
82.5	39.0	36.5 × 20.0 mm.	Holotype
81.0	37.0	35.0 × 19.0	Paratype
68.0	33.0	29.5 × 17.0	"
67.0	30.5	27.0 × 15.0	"
67.5	29.5	27.5 × 16.0	"

Holotype.—M. C. Z. no. 58,803, Los Arroyos, Holguin, Oriente, Cuba. Collected by C. G. Aguayo.

Paratypes.—Los Arroyos; La Sierra; Pedernales; Santa Cruz; Cacocum; Punta Roja; Provedencia and La Guinea. All of the above localities are in the vicinity of Holguin. Collected by C. G. Aguayo and E. G. Feria.

Additional records.—La Gloria (ex. G. L. Parker); Punta Judas and Sierra de Judas, Santa Clara (T. Barbour).

Remarks.—This subspecies possesses the largest specimens in the genus. I believe the above measurements of 82.5 mm. to be the largest so far published, though Dr. Aguayo has specimens slightly larger in his collection.

Variation in this subspecies is considerable, especially between the young and fully adult shells. Yellow appears to be exceedingly fugitive, and consequently the old shells have lost much of this color through fading. It ranges over a wide territory, extending from the northeastern portion of Santa Clara to Holguin in Oriente, a distance of some 200 miles.

It is differentiated from *L. fasciatus fasciatus* by its much larger size, its lack of coloration on the later whorls, and the presence of yellow as a basal coloration under the flames. In addition, the spire is proportionately narrower and the whorls flatter than in specimens of the typical form.

Liguus fasciatus feriai, subsp. nov.

Plate 7, figure 6.

Description.—Similar in all general shell characters to *L. f. achatinus*, but lacking entirely all trace of color other than the periostracal green lines. It is the albinistic form of *L. f. achatinus*.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
58.5	27.0	24.0 × 14.5 mm.	Holotype
73.5	33.0	31.5 × 18.0	Paratype
62.5	29.0	27.0 × 15.5	"
57.5	27.0	24.5 × 15.0	"

Holotype.—M. C. Z. no. 72,559, La Sierra, Holguin, Oriente, Cuba. Collected by E. G. Feria.

Paratypes.—La Sierra, Holguin (E. G. Feria and C. G. Aguayo); Holguin (ex. J. Morrison).

Remarks.—A form well deserving a name to differentiate it from *L. f. crenatus*. It is rarer than *L. f. achatinus*, judging by the few specimens obtained by Sr. Feria and Dr. Aguayo.

Liguus fasciatus aguayoi, subsp. nov.

Plate 7, figure 2.

Description.—Shell rather small for the species, rather thin and dull. Spire somewhat flat-sided and extended. Whorls 7-7½ and only slightly convex. Color: flames on the early whorls a deep reddish-brown on white, changing to bluish green on the fourth whorl. From the fifth whorl onward the flames widen and finally disappear on the last half of the body whorl which is due, at least in part, to a strong greenish wash, appearing to be superimposed over the flames. Insertion areas of the flames are free of this wash of color and develop solid subperipheral sutural bands of deep brown. Columella pink, encircled by a wide band of brown to blackish brown, not separated as in many other races by a white band from the remaining coloration of the shell. Parietal wall glazed with porcelaneous white, margined on its outer edge by a wash of pink. Periostracal green lines present, but not numerous.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
53.0	25.5	23.0 × 14.0 mm.	Holotype
44.5	22.0	20.5 × 11.6	Paratype
37.5	19.5	16.5 × 11.0	“
34.5	18.5	15.5 × 10.0	“
35.0	18.0	16.0 × 10.5	“

Holotype.—M. C. Z. no. 76,696, Punta Roja, Holguin, Oriente, Cuba. Collected by E. G. Feria.

Paratypes.—Punta Roja, Holguin.

Remarks.—This form is solidly colored on the later whorls. The subperipheral band is not indicated by white and no white band exists between this and the columella. It is of interest to note that this subspecies and *L. f. achatinus* occur in the region of Punta Roja, yet the latter subspecies is almost double in size with an equal number of whorls.

Liguus fasciatus angelæ, subsp. nov. Clench and Aguayo.

Plate 7, figure 3.

Description.—General shell characters and pattern similar to *L. f. aguayoi*, color, however quite different. Tip of spire and parietal wall pink, remaining coloration of the shell entirely brownish red, differing only in intensity and tone. Inter-flame areas pale; flame insertions and subperipheral bands deep brownish-red. Periostracal green lines present but not numerous.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
49.0	21.5	20.0 × 11.5 mm.	Holotype
47.0	20.5	19.5 × 11.5	Paratype
48.0	20.0	18.0 × 11.5	“
40.0	18.5	16.5 × 10.0	“

Holotype.—M. C. Z. no. 76,698, Punta Roja, Holguin, Oriente, Cuba. Collected by E. G. Feria.

Paratypes.—Punta Roja, Holguin, Cuba.

Remarks.—This race is very close to *L. f. aguayoi*, and differs only in its coloration, the pattern being similar in both cases. The presence of green in addition to the reddish brown in *aguayoi* would indicate that *angelæ* had suffered a loss of this unit character and in addition there had taken place an intensification of the reddish-brown pigment. These two subspecies parallel the condition found in Florida between *L. fasciatus barbouri* and *L. f. farnumi* of the Pinecrest area and *L. f. versicolor* and *L. f. castaneus* of the Long Pine Key region.

Perhaps the most important fact to be observed is that many of the Cuban races have parallel races in Florida. In all cases but one (*L. f. cingulatus*) these are quite distinctive and can be readily differentiated from one another. Though Florida still possesses many forms that are as yet unknown in Cuba, further exploration in the island may bring more of these to light.

The advent of *Liguus* into Florida has been comparatively recent, probably not earlier than the Pleistocene, and it is remarkable that so many races should have appeared in such a relatively small area in this time. This is best explained by the present conditions of isolation that exist in this region. With the exception of Key Largo, all colonies of *Liguus* are confined to very small areas and as a consequence there is a definite limit to the size of

the population. Such conditions allow a very rapid diffusion of any character between all members of a colony. This is always appreciated when a study is made of any pure race and of many mixed colonies. Hammock number 28 at Pinecrest, Florida, possessed a pure race of *L. f. floridanus* that had a distinctive bluish-gray cast not found in any other specimens of the form from this region. The infusion of this color was complete for this particular colony. All specimens of *L. f. walkeri* from hammock number 9 at Pinecrest are characterized by shouldered and globose whorls, not encountered in specimens found elsewhere in the region. In this hammock, *walkeri* exists as a pure race and it would appear that this different structural condition became fixed for this particular colony, and its complete diffusion is due to its isolation. Even in mixed colonies, size, shape, or other structural characters may dominate all individuals regardless of color values. Such conditions of isolation and population limits would appear to be responsible for the remarkable differentiation of this genus in Florida. Isolation of this sort rarely occurs in Cuba, but where such isolation exists, the same multiplicity of color races is to be found.

Liguus fasciatus goodrichi, subsp. nov.

Plate 7, figure 7.

Description.—Shell rather elongate, solid, somewhat shining. Whorls $6\frac{1}{2}$ - $7\frac{1}{2}$, rather convex. Spire extended, tip pink to pale pink. Color: axial flames in the early whorls reddish brown, changing to greenish and bluish brown on the middle whorls. On the body whorl these flames usually coalesce forming a solid band, and in certain specimens, leaving only their upper and lower margins to form two spiral brownish bands. There is a yellowish band of color in the form of a wash, narrower than the length of the flames, and in appearance painted over them, leaving their insertion points clear. This is in agreement with this same sort of coloration found in other subspecies of this species, both in Cuba and Florida. The flamed area in this form quite narrow, due to the material widening of the subperipheral white band, the pattern as a consequence becoming distinctly spiral. Colored area below the subperipheral white band usually reduced to a very narrow greenish or bluish-brown band. Parietal wall mottled white and pink, always margined with pink. Columella pale pink to white, the encircling pale brownish band nearly obsolete. Between this and the colored area above is a very wide white area. Periostracal green lines almost entirely absent.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
41.0	21.0	18.0 × 11.0 mm.	Holotype
47.5	22.5	21.0 × 12.5	Paratype (Castillo de la Jagua)
55.0	25.0	23.5 × 14.5	Paratype (Gavilan)
55.0	23.5	22.0 × 12.5	“ “
56.0	25.5	23.5 × 14.5	“ “

Holotype.—M. C. Z. no. 59,533, three-fourths of a mile below Castillo de la Jagua, entrance of Cienfuegos Harbor, Santa Clara, Cuba. Collected by W. J. Clench and C. Goodrich, Sept., 1928.

Paratypes.—Castillo de la Jagua (W. J. Clench and R. P. Dow), Punta de la Sabanilla and Carleton de Don Bruno (W. J. Clench), all from the west side of the harbor entrance of Cienfuegos; in addition, a series of fine shells collected by G. B. Fairchild at Finca el Guiro, one mile west of Gavilan. This locality is about ten miles east of the harbor entrance. All were 'crab-shells' (*Pagurus*).

Remarks.—This is a banded race approaching quite closely the Florida subspecies, *L. f. castaneozonatus*. It does not show pattern relationship with any other Cuban form except to certain atypical specimens of *L. f. fasciatus*, and here only superficially. No specimens of *L. f. viridis* and *L. f. goodrichi*, however, were found associated in the same region, though *L. f. crenatus* was found with both.

The specimens obtained by Mr. Fairchild at Gavilan are much larger than those collected in the vicinity of Castillo de la Jagua.

Liguus fasciatus helianthus, subsp. nov.

Plate 7, figure 9.

Description.—Shell rather solid, medium to rather small for the species and somewhat dull. Whorls 7, slightly convex. Tip of spire and parietal area deep pink. Color with a full wash of deep orange-yellow with only the subperipheral band, sutures and columellar encircling area white. Occasionally these last two regions are colored yellow. Rarely there is a mid-line of deep orange or orange brown through the center of the subperipheral band. Inner face of columella white, outer edge and parietal glaze pink. The orange of the main portion of the shell is usually much intensified on the body whorl. Green periostracal lines numerous and usually quite dark.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
43.5	21.5	20.0 × 11.5 mm.	Holotype
48.0	23.0	21.5 × 13.0	Paratype
45.0	22.0	20.0 × 12.5	“
47.5	22.0	21.5 × 12.5	“
48.5	22.5	20.0 × 11.5	“

Holotype.—M. C. Z. no. 80,911, Mogote del Palmarito, Viñales, Pinar del Rio, Cuba. Collected by A. F. Archer, July, 1930.

Paratypes.—All the following localities near Viñales. Mogotes: del Palmarito; de Ramon Millo; de Roja; de Basilio Torre; el Queque and Dos Hermanos. Collected by A. F. Archer.

Additional records.—Luis Lazo, Pinar del Rio (P. Bermudez); and along the road between San Nicolás and Guines, Havana (P. McGinty and M. Smith).

Remarks.—This subspecies is similar to *L. f. ornatus* Simp. from Florida. It differs from that form in having less convex whorls, and the sutures, subperipheral band and basal-columellar area white. It differs mainly from the following subspecies in possessing a pink tip and pink parietal area.

The specimens from San Nicolás have but very faint periostracal green lines, though these green lines are regional characteristics and not usually associated with any one color race. Usually the abundance or absence of these lines characterizes all of the specimens of a single unit locality. Though exceedingly variable even in a single locality, the variation is more or less equal with all associated color races.

Liguus fasciatus xanthus, subsp. nov.

Plate 6, figure 12.

Description.—Shell rather solid, somewhat shining, a little smaller than the average for the species. Whorls $6\frac{1}{2}$ -7, a little convex. Tip of spire and columellar area white. Ground color white, with two broad bands of yellow on the body whorl. Earlier whorls with a broad band of yellow. Subperipheral and columellar encircling bands white. Suture and a small margin above and below the suture white. Periostracal green lines few and pale.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
45.0	22.0	20.5 × 11.5 mm.	Holotype
43.0	21.5	19.0 × 11.0	Paratype
39.0	19.5	17.5 × 10.0	“
36.5	19.5	16.5 × 9.5	“
33.5	18.5	16.0 × 10.0	“

Holotype.—M. C. Z. no. 47,380. Road between San Nicolás and Guines, Havana Province, Cuba. Collected by P. P. McGinty, 1930.

Paratypes.—From the above locality collected by C. G. Aguayo.

Remarks.—This is a form somewhat similar to *L. f. cingulatus* Simp. from Florida. It differs from that subspecies, however, in

being smaller, having much wider bands of yellow and having less convex whorls. From *L. f. helianthus*, the preceding species, it differs in lacking all pink coloration of the tip and columellar area, and having the yellow coloration in distinctive bands. Dr. P. Bermudez has recently sent two specimens of *Liguus* that are referable to *L. f. cingulatus* Simp. These are from Caibarien on the north coast of Santa Clara and possess all of the essential characters of the Florida subspecies.

The following new subspecies, *L. f. torrei*, *L. f. mcgintyi* and *L. f. pinarensis* form a small group that appear to be a little different from all other races of *fasciatus*. To this group, *L. f. pallidus* (Swain.) (Pl. 7, fig. 8) is to be added. They are all smaller, a little more solid, and possess very much flatter whorls. They are somewhat intermediate between the species *fasciatus* and *blainianus* and for the present are here provisionally considered as the species *fasciatus*. So far, they have been found only in the Isle of Pines and the Province of Pinar del Rio. Subsequent investigation may show that they are of specific rank. If so, the name *pallidus* (Swain.) will stand for the species.

Liguus fasciatus torrei, subsp. nov.

Plate 6, figures 5 and 6.

Description.—Shell solid, somewhat shining and rather produced. Whorls $7\frac{1}{2}$, only slightly convex. Tip of spire and parietal area white. Color: ground color of early whorls ($4-4\frac{1}{2}$), white, shading imperceptibly into yellow which deepens materially on the body whorl. Brownish flames appear on the third whorl and change rapidly to dark blue to bluish black on the later whorls. The insertion areas of these flames are especially dark. Certain of the flames are incomplete, not extending across the full width of the upper whorls. The sutures are margined above and below with a narrow band of brown. In addition to the basic, yellow ground-color there is a superimposed wash of light yellow over the flames, a little narrower in width than the flames. Subperipheral band of light brown (this is the superior sutural band of the earlier whorls). Columella encircled with a 3 mm. band of light chocolate-brown. No indication of periostracal green lines on the two specimens at hand, though a larger series may indicate their presence.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
43.5	20.5	19.0 × 10.0 mm.	Holotype

Holotype.—M. C. Z. no. 58,805 (Pl. 6, fig. 5), Punta del Este, Isle of Pines, Cuba. Received from Dr. Carlos de la Torre.

Additional record.—Cayo Magueyal, near Cortez, Pinar del Rio, Cuba. Collected by L. Pequeño; received from C. G. Aguayo.

Remarks.—This is a very distinctive race, quite different from any other known subspecies of *Liguus*. Its occurrence in both the Isle of Pines and in Western Cuba in exceedingly interesting as it indicates a possible introduction by mechanical means from the Isle of Pines to Cuba. Another colony in Cuba, from Ensenada de Corrientes, has been reported by Dr. C. de la Torre and in a letter he states, ' . . . justamente en el lugar por doade recurvan generalmente los ciclones procedentes del mar Caribe.'

It is certainly within the realm of possibility that hurricanes would aid in the definite drift from the Isle of Pines to western Cuba. The axis of several hurricanes within a period of 35 years have passed over the islands in this manner¹. As yet only a very few specimens of *Liguus* have been obtained on the Isle of Pines and no relationships can be inferred.

Three specimens only of this form from the Isle of Pines are known, the holotype and two paratypes in the collection of Dr. C. de la Torre.

Liguus fasciatus pinarensis, subsp. nov.

Plate 6, figure 9.

Description.—Similar in all shell characters to *torrei*, other than color. This form is pure porcelaneous white. Two hairlike lines, similar to pencil lines, outline a spiral band. From this point alone, it would indicate that this may be a derivative of a banded shell and not the albinistic race of *torrei*. Additional material may show such a relationship. If such proves to be the case, *Liguus*, as well as the other mollusks, indicate a land connection with Santa Clara, as the only banded *fasciatus* subspecies from Cuba, is *L. f. goodrichi* from the entrance of Cienfuegos Harbor in Santa Clara.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
44.5	20.0	20.0 × 11.0 mm.	Holotype

Holotype.—M. C. Z. no. 58,806, Punta del Este, Isle of Pines, Cuba. Received from Dr. C. de la Torre.

¹Fassig. O. L. 1913, U. S. Dept. of Agriculture, Weather Bureau, Bulletin 10. Maps, (Pl. 2-6).

Liguus fasciatus mcgintyi, subsp. nov.

Plate 7, figure 10.

Description.—Shell similar to the last in general features other than color. Color: tip of spire pink, parietal area pink, pinkish purple or white. Ground color white below the pink tip. Flames of bluish gray, appearing first on the fourth whorl, obsolete or limited to patches at the insertion areas on the body whorl. Superimposed color of yellow over the flames, more intense on the later whorls. Subperipheral band faint and colored a purplish brown, margined above and below with a narrow area of white. Columella encircled with a narrow 2-3 mm. band of light chocolate-brown, margined on its outer face with a narrow white area. Periostracal green lines present, but fine and not numerous.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
42.0	19.5	17.5 × 10.0 mm.	Holotype
43.5	19.0	18.5 × 10.5	Paratype
41.5	18.5	17.0 × 10.0	“
38.0	17.5	16.0 × 9.0	“

Holotype.—M. C. Z. no. 47,384, Cueva del Chivo, Mariel, Pinar del Rio, Cuba. Collected by P. P. McGinty and C. G. Aguayo, 1930.

Paratypes.—Cueva del Chivo, Mariel.

Remarks.—This species is only known, as yet, from the type locality. More material may show a relationship between this form and *L. f. nobilis* Cl. and Ag., especially when the coastal area between Mariel and Cabañas has been carefully investigated. It appears to be connected to *L. f. torrei*, principally by its shape and its color pattern arrangement.

Liguus blainianus Poey.

Shells of this species are characterized by being somewhat small, rather elongate-ovate in outline and having a blackish-brown tip. *L. b. jaumei* Cl. and Ag. is the albinistic subspecies and, in this case, a reduction of color has left only the pink color on the spire tip. So far only three subspecies are known and their relationships are not at all clear. As stated elsewhere, there is still a vast amount of territory in Cuba from which *Liguus* is unknown, and most of this territory will have to be covered before any clear picture can be obtained.

Liguus blainianus fairchildi, subsp. nov.

Plate 7, figure 4.

Description.—Shell small for the genus, rather thin and somewhat dull. Whorls 7, slightly convex. Spire somewhat produced. Color: first 1-1½ whorls blackish brown, shading to reddish brown on the second to third whorls. From here on the ground color becomes white, the flames first appearing and colored red or brownish red which continue so colored until about the middle of the fifth whorl, then shading rapidly into bluish gray or smoky gray. There is a slight over-wash of gray in a band nearly the width of each whorl, becoming quite heavy on the body whorl. Insertion areas of the flames (which are irregularly single, bifurcated or trifurcated at their upper terminations) are usually free of this wash and appear superficially as interrupted infra- and supra-sutural lines. Subperipheral line present, bordered above, but usually divided by a hairlike line of brown. Columella white encircled by a 2-3 mm. band of pale brown and this band separated from the main body whorl coloration by a narrow white band. Parietal glaze a deep pink, terminating at the mid-region of the columella and overlaying the 2-3 mm. band of brown. Periostracal green lines few in number and obscure.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
37.0	17.5	16.5 × 9.5 mm.	Holotype
39.0	18.0	15.5 × 9.5	Paratype
39.0	19.0	17.0 × 10.0	“
37.5	17.5	15.0 × 9.5	“
35.0	16.0	15.0 × 9.0	“

Holotype.—M. C. Z. no. 91,907, road between Havana and Santiago de las Vegas, Havana Province, Cuba. Collected by G. B. Fairchild and M. Bates, July, 1932.

Paratypes.—From the above locality.

Additional records.—Pinar del Rio: Artemisa (P. Bermudez); road near Guanajay (C. G. Aguayo); Havana: Sierra de Anáfe, Guayabal (T. Barbour); San Antonio de los Baños (T. Barbour and W. S. Brooks) and Hoyo Colorado (ex. R. Jackson).

Remarks.—Based upon the above records, this form covers an area of some 8 by 18 miles in the western part of Havana, and the eastern portion of Pinar del Rio, Provinces.

Its small size, shell outline and blackish-brown tip place it as a subspecies of *L. blainianus*.

The following new species and several new races of *Liguus flammellus* form an assemblage of color races quite different from other species of this genus in Cuba. At this writing, they are only

known to occur in the vicinity of Viñales, a small town at the edge of the Sierra de los Organos, some 160 kilometers southwest of Havana. This little town is located near the entrance of a rather narrow valley that cuts through the mountains to the north. Along the south escarpment of the mountains are several small limestone hills or 'mogotes,' many of which exceed 300 feet in altitude. These are sharply defined and form a very distinctive and characteristic feature of the landscape. They are usually well forested especially at the base and lower slopes, the upper portions being chiefly exposures of rock. The areas between the 'mogotes' are cultivated mainly with tobacco which forms the principal crop. Most of the *Liguus* obtained in the region were found on these 'mogotes' and along the slopes of the mountains proper.

Liguus flammellus and its several subspecies differ in many points from *L. fasciatus* and its associated forms. Proportionately, *L. flammellus* is a narrower shell, having whorls that are nearly flat sided as opposed to the more convex whorls of *L. fasciatus*. In *L. flammellus*, the parietal wall is never glazed with white, but usually with a thin glaze of brown, or glazed clear, through which the color of the body whorl shows. With but very few exceptions, *L. fasciatus* is glazed with a porcelaneous white on the parietal wall, its outer margin pigmented a pale to deep pink or a deep brown. The columella in this new form is always white even though the spire tip be pinkish. In *L. fasciatus*, the columella is nearly always margined with pink if the spire tip is pink.

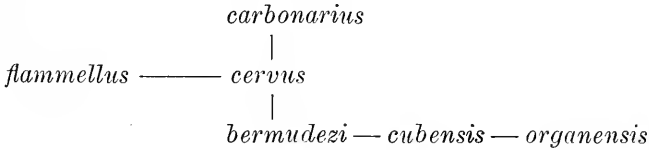
None of the color forms of this new species exhibit the narrow banded phase found in certain forms of *L. fasciatus* such as *L. fasciatus castaneozonatus* Pils. and *L. f. roseatus* Pils. of Florida and *L. f. goodrichi* Cl. from Cuba. Even the typical form of *L. fasciatus* occasionally exhibits this character to a limited extent (Pl. 6, fig. 10).

Key to the subspecies of Liguus flammellus.

1. Basal 3-4 mm. band that encircles the columella a deep chocolate-brown2.

- Basal 3-4 mm. band that encircles the columella yellowish orange or absent5.
2. Axial flames grayish green or bluish green, sharply contrasting with the remaining color3.
 Axial flames inconspicuous or differing only in shade from the same ground color4.
3. Shell greenish with very prominent flames, in strong contrast with the general shell color*L. f. flammellus*.
 Shell fawn colored, flames bluish green or grayish green*L. f. cervus*.
4. Shell a deep chocolate-brown, flames a reddish brown when present on the early whorls*L. f. carbonarius*.
 Shell yellow, flames conspicuous, alternating opaque and translucent areas (flames and interspaces)*L. f. bermudezi*.
5. Shell yellow, basal 3-4 mm. band yellowish orange*L. f. cubensis*.
 Shell white, no basal band*L. f. organensis*.

These several subspecies appear to exhibit the following relationships:



***Liguus flammellus flammellus*, sp. nov.**

Plate 6, figure 7.

Description.—Shell somewhat dull, solid, and elongate. Whorls 6-7¼, and rather flat sided. Spire extended, the tip (2-3½ whorls) a dull flesh pink. Color: ground color very pale ivory, exposed only between the axial streaks or flames of dull grayish-green and brownish green. On the fourth whorl the flames appear as brown or brownish red, zigzag markings, changing to brownish green then grayish green on the later whorls. Color on the body whorl at the subperipheral region separated by a narrow, whitish band which is usually margined along its superior border by a hairlike line of brown. This same white band appears as a very narrow inferior sutural line on the earlier whorls. The color flames above and below this subperipheral band are continuous in alignment, though occasionally they are slightly offset. Columella straight, occasionally truncated, white, but encircled by a 4-5 mm. band of dark chocolate-brown. This band is in turn separated from the remaining coloration of the shell by a narrow whitish band similar in width to the subperipheral band. Periostracal green lines numerous but usually faint, a considerable variation in number exhibited in material from different localities. Sculpture of very faint and irregular growth lines.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
45.0	20.5	19.0 × 11.0 mm.	Holotype
45.5	21.5	20.0 × 12.0	Paratype
47.5	21.0	21.5 × 12.0	“
48.5	21.0	20.0 × 12.0	“
46.0	22.0	19.5 × 11.0	“

Holotype.—M. C. Z. no. 80,924, Mogote de Roja, Viñales, Pinar del Rio, Cuba. Collected by A. F. Archer, July, 1930¹.

Paratypes.—All from the following localities are in the vicinity of Viñales. Mogotes: Abascal, de Vigil, de Capon; de Lorenzo Lopez; de Ramon Millo and Yglesias. Also Mogote de Justo and Sierra de la Chorrera in the San Vicente Valley. Collected by A. F. Archer.

Remarks.—This is the most widely distributed race locally of all the forms with the exception of *L. flammellus organensis*, the albinistic form of this species. It appears to be the pivotal element of all the forms encountered, and the one from which the others have been derived. It is the analogue of *L. fasciatus* Müll., and, similar to the latter, has been selected as the type color race of the species. Color intergrades exist between this and *L. flammellus cervus*, but not between it and any of the other subspecies so far collected. Hybrids with other forms of course may exist, but their expression is not exhibited by color intergrades. This factor is more or less consistent with all other color races of *Liguus*, as few specimens are known that are absolute color intergrades between two forms that occupy the same unit area.

Liguus flammellus cervus, subsp. nov.

Plate 6, figure 4.

Description.—General shell character similar to *L. flammellus flammellus*, differing only in color. First 2-4 whorls pale flesh-pink faintly tinged with brown. This coloration shades imperceptibly into light buff-brown, intensifying into a much deeper shade of the same color on the body whorl. Axial flames of dull brown-green to grayish green, varying irregularly in intensity and most prominently developed at the sutural insertions. On the main

¹Most of the color races of *L. flammellus* were collected as well by Mr. W. F. Shay. His localities, however, were not mentioned by name but only given in approximate distances from Viñales. To save any possibility of error, no attempt has been made to connect his localities with those of Mr. Archer, though his specimens have been used in the diagnosis of each race.

portion of each whorl these flames are faint and appear as though painted over by a wash of color. The arrested growth periods are usually characterized by bold, clear, brown or grayish-green flames. Subperipheral band of white usually present. This narrow band is generally margined by a hairlike, brown thread. On the early whorls the sutures are built along this white band, leaving an exposed edge as a hair line just below and bordering the suture. Green periostracal bands present but faint. Columella white, encircled by a 3-4 mm. band of deep chocolate-brown, which in turn is separated from the remaining coloration of the shell by a fairly wide white band. Parietal wall thinly glazed, usually colorless, occasionally faintly pinkish.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
47.0	22.0	20.0 × 11.5 mm.	Holotype
46.0	21.5	20.5 × 12.5	Paratype
48.0	21.5	20.0 × 11.5	“
46.5	21.5	20.0 × 11.5	“
45.5	20.0	18.5 × 11.0	“

Holotype.—M. C. Z. no. 80,935, Mogote de Vigil, Viñales, Pinar del Rio, Cuba. Collected by A. F. Archer, July, 1930.

Paratypes.—All of the following from the vicinity of Viñales. Mogotes: de Vigil; la Gueca; de Lorenzo Lopez; Pequeño; de Pita and Abascal. Also, Puerta del Ancon and Hoyo de la Majagua in the San Vicente Valley. Collected by A. F. Archer.

Remarks.—This subspecies of *Liguus* possesses a very distinctive coloration which differs materially from any other in the genus. As stated elsewhere, it is the only subspecies in this species that intergrades with any other form as far as their colors indicate though such specimens showing the color relationship with *L. f. flammellus* are quite rare.

Liguus flammellus carbonarius, subsp. nov.

Plate 6, figure 3.

Description.—Similar in shell characters to *L. flammellus flammellus*, differing only in color. First 2 or 3 whorls dark reddish-brown to brown, shading evenly to a deep mahogany-brown on the later whorls and finally to a brownish black on the body whorl. Definite axial flames of darker color plainly indicated on the early whorls, gradually becoming indistinct on the later whorls, the insertion areas of the flames persisting as interrupted lines at the sutures. There is a narrow subperipheral band of reddish brown, very definite on young specimens, disappearing on a few of the fully adult shells. Periostracal lines present but usually indistinct. Columella white, en-

circled by a 3-4 mm. band of brownish black to black, bordered by a hairlike line of reddish brown, similar in color to the subperipheral band.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
46.5	21.0	18.5 × 11.5 mm.	Holotype
49.5	21.5	20.5 × 12.0	Paratype
48.0	21.5	20.0 × 11.5	“
46.0	20.5	20.0 × 11.5	“
43.0	19.5	18.5 × 11.0	“

Holotype.—M. C. Z. no. 80,933, Mogote de Pita, Viñales, Pinar del Rio, Cuba. Collected by A. F. Archer, July, 1930.

Paratypes.—Mogote de Pita, Viñales. Collected by A. F. Archer.

Remarks.—This subspecies is rare and known only from the above mogote at Viñales. The outer surface of the shell is pigmented throughout except the narrow white columella. In this respect it exceeds all other known *Liguus*. Certain specimens of *L. fasciatus castaneozonatus* Pils. and *L. fasciatus marmoratus* Pils. from Florida possess a full black in their coloration, but there are remaining areas that are white or only lightly colored.

Liguus flammellus bermudezi, subsp. nov.

Plate 6, figure 2.

Description.—General shell characters similar to *L. f. flammellus* differing only in color. First 3-4 whorls pale flesh-pink, gradually shading into pale pinkish-yellow, then into a deep yellow. Axial flames of darker shades of the same basic color on all of the whorls. In transmitted light the flames are nearly opaque, the interspaces are translucent. Parietal callous glazed with light brown. Columella white and encircled with a 3-4 mm. band of dark chocolate-brown, separated in turn from the remaining coloration of the shell by a narrow band of white. Subperipheral white band usually present, generally margined with reddish brown, occasionally the white band is absent, the fine reddish-brown lines uniting to form a single band. Periostracal green lines present, but very faint and tinged bronze to yellowish green.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
50.0	20.5	19.5 × 11.0 mm.	Holotype
46.0	20.5	20.0 × 11.0	Paratype
46.0	19.5	19.5 × 11.5	“
46.0	19.5	18.5 × 11.5	“
46.0	20.0	19.5 × 11.5	“

Holotype.—M. C. Z. no. 80,945, Mogote la Gueca, Viñales, Pinar del Rio, Cuba. Collected by A. F. Archer, July, 1930.

Paratypes.—All of the following localities are in the vicinity of Viñales. Mogotes: la Gueca, Dos Hermanos, de Lorenzo Lopez and de Capon. Also at Puerta del Ancon in the San Vicente Valley. Collected by A. F. Archer.

Remarks.—This distinctive form is characterized chiefly by the opaque yellow flames and the translucent interspaces. It is rather common, occurring at many of the localities visited by Mr. Archer.

Liguus flammellus cubensis, subsp. nov.

Plate 6, figure 1.

Description.—Similar in general shell characters to *L. f. flammellus*, differing particularly in color. Early 2-4 whorls whitish to pale flesh-pink, shading gradually into lemon yellow, then to a deep yellow on the body whorl near the outer lip. Axial flames absent or only faintly indicated on the second to fourth whorls. Subperipheral band white and narrow, occasionally bordered by a deep orange-yellow band appearing on the body whorl near the outer lip. Columella white, encircled by a 3-4 mm. band of yellow or yellowish orange, separated from the main portion of shell by a narrow thread of white. The suture is usually margined by a fine line of white, which later develops into the subperipheral band of the body whorl. Periostracal lines present but usually few in number and generally colored a pale yellowish-green.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
58.5	21.5	20.0 × 11.0 mm.	Holotype
44.0	20.0	20.0 × 11.5	Paratype
45.0	20.5	19.5 × 11.0	“
42.0	19.0	18.0 × 10.5	“
44.5	20.0	19.0 × 10.5	“

Holotype.—M. C. Z. no. 80,951, Mogote la Gueca, Viñales, Pinar del Rio. Collected by A. F. Archer, July, 1930.

Paratypes.—All the following localities are in the vicinity of Viñales. Mogotes: la Gueca; el Queque; de Roja; and Dos Hermanos. Collected by A. F. Archer.

Remarks.—This subspecies, though fairly well distributed, is rare at all of the above localities. It differs from *L. flammellus bermudezi*, the only other yellow shell in this species, in lacking flames and not having a brown band encircling the columella.

Liguus flammellus organensis, subsp. nov.

Plate 6, figure 8.

Description.—General shell characters essentially the same as in *L. f. flammellus*. Shell proper entirely white, the body whorl possessing a slight tinge of yellow. This color, however, is invested in the periostracum and not impregnated in the line of the shell as in the other forms of this species. Periostracal green lines faint and not abundant.

<i>Length</i>	<i>Width</i>	<i>Aperture</i>	
54.0	25.0	23.5 × 13.0 mm.	Holotype
53.0	22.5	22.5 × 12.5	Paratype
48.0	21.5	21.0 × 11.5	“
50.5	23.0	21.0 × 12.5	“
51.5	22.0	22.0 × 11.5	“

Holotype.—M. C. Z. no. 80,958, Ensenada del Valle, Viñales, Pinar del Rio, Cuba. Collected by A. F. Archer, July, 1930.

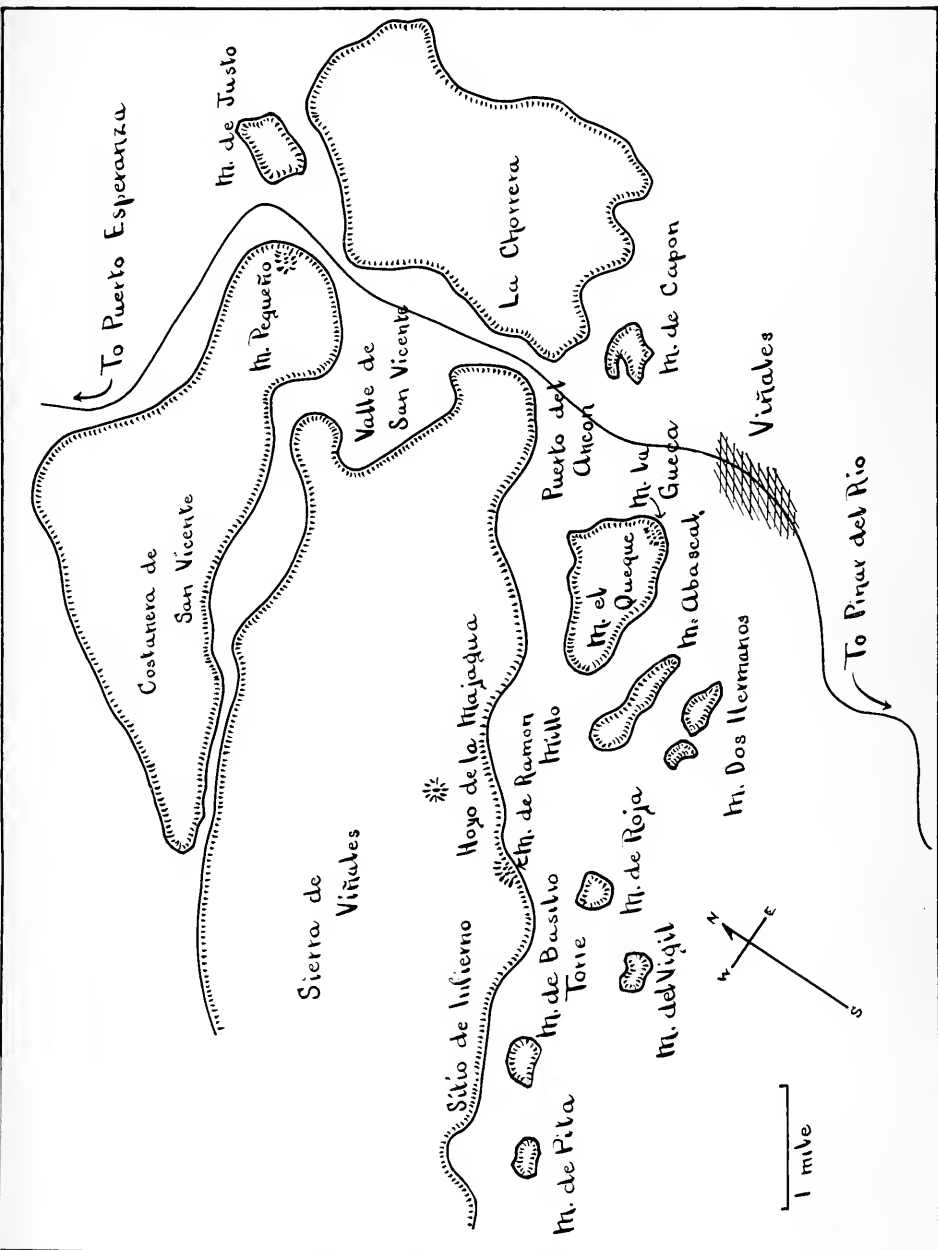
Paratypes.—Mogotes: de Basilio Torre; de Guasasa; de Justo; Dos Hermanos; el Queque; and Pequeño. Also Puerta del Ancon, Ensenada del Valle and Sierra de la Chorrera in the San Vicente Valley.

Remarks.—Well distributed throughout the region of Viñales, not occurring, however, at all of the localities. It is of interest to note that this form was not collected at Mogote de Pita, the only locality where *L. f. carbonarius* was found.

Museum of Comparative Zoölogy,
Cambridge, Mass.

EXPLANATION OF PLATE 5.

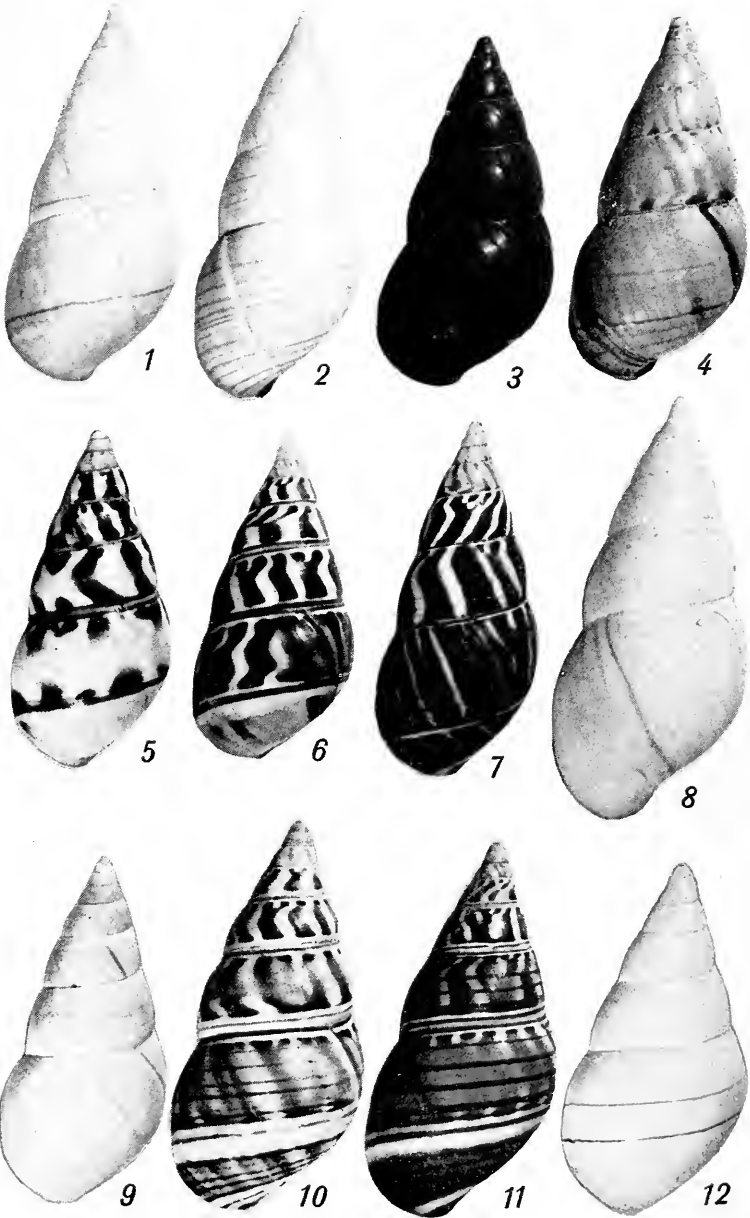
Map of the Viñales region indicating most of the localities from **which** collections were made. The names of these places were all obtained **locally** by Mr. Archer from various persons in the region.



CLENCH ON MOLLUSKS FROM CUBA.

EXPLANATION OF PLATE 6.

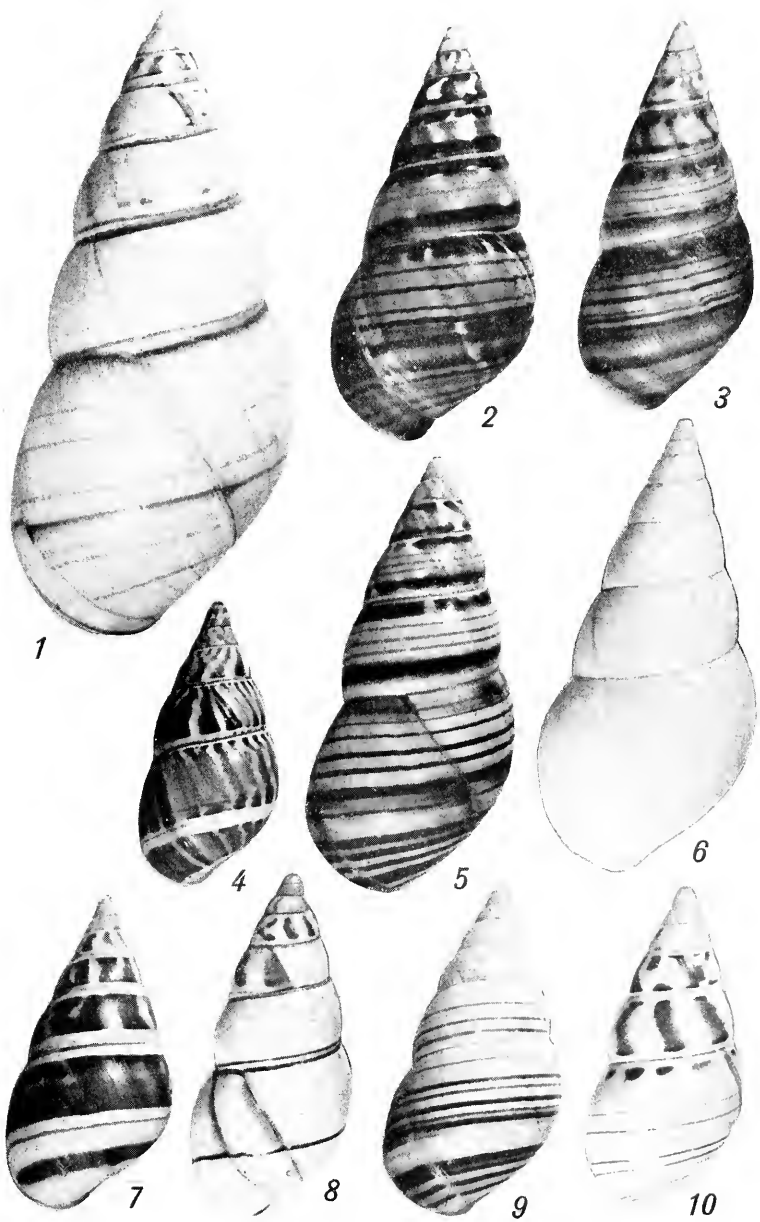
- FIG. 1. *Liguus flammellus cubensis* Clench. Holotype.
FIG. 2. " " *bermudezi* Clench. Holotype.
FIG. 3. " " *carbonarius* Clench. Holotype.
FIG. 4. " " *cervus* Clench. Holotype.
FIG. 5. " *fasciatus torrei* Clench. Holotype.
FIG. 6. " " " Clench. Cayo Magueyal.
FIG. 7. " *flammellus flammellus* Clench. Holotype.
FIG. 8. " " *organensis* Clench. Holotype.
FIG. 9. " *fasciatus pinarensis* Clench. Holotype.
FIG. 10. " " *fasciatus* (Müll). Monserrate, Matanzas.
FIG. 11. " " *viridis* Clench. Holotype.
FIG. 12. " " *xanthus* Clench. Holotype.



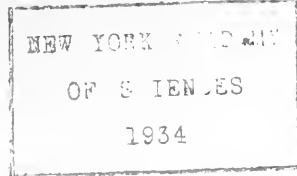
CLENCH ON MOLLUSKS FROM CUBA.

EXPLANATION OF PLATE 7.

- FIG. 1. *Liguus fasciatus achatinus* Clench. Holotype.
FIG. 2. " " *aguayoi* Clench. Holotype.
FIG. 3. " " *angelæ* Clench and Aguayo. Holotype.
FIG. 4. " *blainianus fairchildi* Clench. Holotype.
FIG. 5. " *fasciatus archeri* Clench. Holotype.
FIG. 6. " " *feriai* Clench. Holotype.
FIG. 7. " " *goodrichi* Clench. Holotype.
FIG. 8. " " *pallidus* (Swainson). Cayo Magueyal.
FIG. 9. " " *helianthus* Clench. Holotype.
FIG. 10. " " *mcgintyi* Clench. Holotype.



CLENCH ON MOLLUSKS FROM CUBA.



Occasional Papers
OF THE
Boston Society of Natural History.

NOTES ON ECUADORIAN SNAKES.

BY BENJAMIN SHREVE.

RECENTLY while identifying a collection made in Ecuador by Mr. C. Spencer I found two species of snakes that appear to be undescribed and two others which seem to be species which have long been sunk in the synonymy of *Liophis undulatus* (Wied) but which I believe to be perfectly distinct. All specimens described were collected by Spencer along the Pastaza River, from Canelos to the Marañon River, between January, 1931, and August, 1932.

I am indebted to Dr. E. R. Dunn, Dr. T. Barbour and Mr. H. Hechenbleikner for assistance rendered.

Lygophis boursieri (Jan).

Dromicus boursieri Jan, Icon. Gen. 25, 1867, pl. 2, fig. 2.

Coronella whymperi Boulenger, Ann. Mag. Nat. Hist. (5), 9, 1882, p. 460, 1 fig.

?*Enicognathus joberti* Sauvage, Bull. Soc. Philom. (7), 8, 1884, p. 146.

Specimens.—Museum of Comparative Zoölogy nos. 36,948-50, ♂, ♀, ♂, respectively, the last with the head damaged.

Diagnosis.—Externally this species resembles *Liophis undulatus*¹ from which it differs in coloration; the shape of the frontal, labials and postoculars; the shape of the dorsal scales (much longer and narrower in *undulatus*); in having a smaller eye; the fact that the ventrals average slightly more numerous; in having less numerous subcaudals, and in general build. See also *Rhadinæa brevirostris*.

¹ Probably should be *Rhadinæa undulata*. The hemipenis appeared to be unidentifiable in the specimens at hand, this organ being the means of separating *Rhadinæa* from *Lygophis*.

Snakes of this group are in rather systematic confusion. When a revision is made some of the now existing genera may be merged into one.

Description.—Rostral broader than deep, scarcely visible from above; internasals about as long as broad, shorter than the prefrontals (in no. 36,950 there is a small scale at the normal common intersection of the two prefrontals and the two internasals); frontal approximately $1\frac{1}{2}$ to $1\frac{1}{3}$ times as long as broad, longer than its distance from the end of the snout, shorter than the parietals (in no. 36,950 the right parietal has a division into a small scale in the region where the right meets the frontal and the left parietal); loreal a little longer than deep or as long as deep, one preocular, sometimes with a pseudodivision (no. 36,950 has two preoculars the lowest on the right side is very long extending beneath the loreal, and bordering on it, to the lower edge of the posterior part of the nasal; the lower, on the right, is similar but is divided into three scales, that touching the eye being minute; postoculars two; temporals 1 plus 2, the anterior in contact with both postoculars (in no. 36,950 the anterior temporal on each side is divided more or less vertically, into two scales); eight upper labials, the third, fourth and fifth entering the eye (no. 36,950 has the fifth and sixth labials on the left side and the seventh on the right divided into two scales, the division being more or less horizontal); two pairs of chin shields the anterior shorter than the posterior, the anterior in contact with four lower labials (no. 36,949 has five lower labials in contact with the anterior chin shields on the right side; no. 36,950 has five in contact on the left); scales smooth, without apical pits, in 17 rows at mid-body: ventrals 148-160, anal divided, subcaudals 64-68.

Color in alcohol.—Dark brown above (bluish gray where epidermis has peeled off; no. 36,949, the female, is light brown above, perhaps an indication of sexual dichromatism, and is also more slender than the other two specimens). Head above dark, lighter on the rostral, internasals, prefrontals and temporal region; a dusky spot in about the center of each internasal and sometimes each prefrontal, rostral more or less spotted; labials brownish white or white, marked with black and white; a white streak bordered by the black markings on the labials begins on the fifth labial near the eye; there is really an obscure beginning on the third labial, extending to the angle of the mouth where it bends slightly downward and on to the neck, still bordered by black, where after a short distance it becomes obsolete (no. 36,950 has two very small white black-edged spots, on the upper side of the nape); upper black border of this white line while still on the labial consists of a black streak from the eye to the corner of the mouth usually including parts of the scales immediately above the labials, lower black border of labial line almost solid black or broken up into spots; chin shields, lower labials and region of throat whitish, spotted or marbled with black, dorsal scales dark brown, many of them bordered with black (no. 36,950 lighter than 36,948: 36,949 lightest of all); an obscure darker ver-

tebral line on the median row of scales beginning on the nape and extending to the end of the tail, very obscure anteriorly. On each side, on about the fifth row of scales there is a rather obscure, light-brown line which begins at the nape and extends to the end of the tail, sometimes bordered below by an obscure dark line which is scarcely discernible on the tail. The first two rows of scales are grayish brown, lighter than the rest of the dorsals; ventrals whitish more or less spotted and edged with black. The posterior ventrals tend to have the outer edge more strongly marked with black than the anterior ones; subcaudals white, outer edges strongly marked with black, other edges of subcaudals unmarked or marked with black.

Measurements.

	Head and body	Tail	Total length
36,950	425 mm.	135 mm.	560 mm.
36,949	423 mm.	144 mm.	567 mm.
36,948	430 mm.	156 mm.	586 mm.

Remarks.—*Dromicus boursieri* Jan was one of the species placed by Boulenger in the synonymy of *Liophis undulatus* (Wied). As Boulenger apparently never saw any material really representing Wied's *undulatus* he did not realize how distinct *buorsieri* is.

The specimens used in this redescription agree almost exactly with Jan's plate.

Dr. E. R. Dunn examined the specimens and decided the species was a member of the genus *Lygophis*.

***Rhadinæa brevirostris* (Peters).**

Dromicus brevirostris Peters, Mon. Berl. Akad. 1863, p. 280 and 1871, p. 400.

?*Enicognathus tæniolatus* Jan, Arch. Zoöl. Anat. Phys. 2, 1863, p. 272, and Icon. Gen. 16, pl. 2, fig. 4 (1866).

Dromicus viperinus Günther, Ann. Mag. Nat. Hist. (4), 1, 1868, p. 418. This name was put into this synonymy by Peters (*loc. cit.*, 1871). He said the specimens differed only in intensity of coloration.

Rhadinæa nicaga Cope (non 1868), Proc. Amer. Phil. Soc. 23, 1886, p. 102. This is apparently the same as *Dromicus viperinus* Günther as the two descriptions check up closely and the specimens used by each were collected by the same person at the same place.

Specimen.—Mus. Comp. Zoöl. no. 36,957, a male.

Diagnosis.—Externally this species resembles *Liophis undulatus* from which it differs in the shape of the labials, and postoculars, the fact that usually only the lower postocular is in contact with the anterior temporal instead of both postoculars; in coloration, in having a smaller eye, and in the larger number of ventrals (possibly only averages larger), and the smaller number of subcaudals. Also resembles *Lygophis boursieri* from which it differs in the shape of the frontal, the dorsal scales, and loreal. Other differences are the fact that the anterior temporal usually only borders on the lower postocular instead of on both; in general build; in coloration; and in the generic character of hemipenis.

Description.—Rostral broader than deep almost invisible from above; internasals broader than long, shorter than the prefrontals; frontal approximately $1\frac{3}{4}$ times as long as broad, longer than its distance from the end of the snout, shorter than the parietals; loreal deeper than long; one preocular and two postoculars; eight upper labials, the third, fourth and fifth entering the eye; a small extra scale on the third labial left side; temporals 1+2, the anterior in contact with the lower postocular only; two pairs of chin shields, the anterior shorter than the posterior, the anterior in contact with three lower labials; scales smooth, without apical pits, in 17 rows at mid-body; ventrals 166; anal divided; subcaudals 61; general build rather slender.

Color in alcohol.—Dark brown above; lighter on the parietal and temporal region; internasals and prefrontals obscurely spotted with darker; labials whitish, heavily marked with dark brown, especially at their sutures; rostral with a vertical darker streak through its middle; a black line from the eye to the neck; underneath this a broad white line; dorsal region dark brown, somewhat lighter anteriorly, minutely speckled with lighter; two, light-brown streaks one on either side of the median line, three scale rows apart, about four scale rows up from the ventrals, and about three scale rows wide beginning on the nape and going to the end of the tail, the two lines being zigzag anteriorly and with almost straight edges posteriorly, in some places more than three scale rows apart; a light median line on the tail on all but the most anterior part, which near the end of the tail merges with the two other streaks; underside of lower jaw heavily spotted with dark brown also a few very small spots on the first few ventrals; ventrals and subcaudals brownish-white, darker sometimes or lighter, outer edges bluish black.

Measurements.

	Head and body	Tail	Total length
36,947	290 mm.	90 mm.	380 mm.

Remarks.—*Dromicus brevirostris* Peters was another name put by Boulenger into the synonymy of *Liophis undulatus*

(Wied). The specimen at hand agrees with Peters' description closely except for a few points in coloration. In Peters' type specimen the light, median line extends the length of the back in interrupted form, and the rear edges of the ventrals are black on the anterior half of the body according to him.

Dr. E. R. Dunn, after examining the specimen, placed the species in the genus *Rhadinaea*.

***Helicops pastazæ*, sp. nov.**

Type.—Mus. Comp. Zoöl. no. 36,963, apparently an immature specimen.

Paratypes.—Mus. Comp. Zoöl. nos. 36,944-37,000, also apparently immature.

Diagnosis.—Allied to *Helicops polylepsis* from which it differs in the shape of the frontal, in that the anterior chin shields are appreciably longer than the posterior, in that the rostral and internasal are less frequently in contact, and in coloration; also the number of ventrals and subcaudals average larger.

Description.—Rostral broader than deep, visible from above, separated from the internasal by the nasals which are joined together in a short suture (in paratype 36,998 the nasal is in contact with the rostral), frontal approximately one and a half times as long as broad (approximately one and a quarter to one and two-thirds in the paratypes), as long as its distance from the end of the snout (shorter in paratype 36,995, longer in paratypes 36,994, 36,996 and 36,998), shorter than the parietals, loreal more or less trapezoid, broader than deep or as deep as broad; one preocular, two postoculars; temporals 2+2 (temporals 2+3 in paratypes 36,997, 36,999 and 37,000 and 2+3 on the left in paratype 36,996, and 2+3 on the right in paratype 36,995); eight upper labials the fourth entering the eye (in paratype 36,999 division between 6th and 7th labial on left side incomplete, in paratype 36,995 nine labials on the right side with the fifth entering the eye, in paratype 37,000 nine labials on the left with the 4th and 5th entering the eye); two pairs of chin shields the anterior considerably longer than the posterior; five lower labials in contact with the anterior chin shields (four in contact in paratype 36,997); dorsal scales keeled, in 23 rows at mid-body (25 rows in paratypes 36,994, 36,996, 36,997 and 37,000, scale rows often different than amounts given even only a little beyond mid-body), outer row rather feebly keeled; ventrals 141, anal divided subcaudals 94 (in the paratypes, ventrals 128-143, subcaudals 86-110).

Color in alcohol.—Above with grayish-brown confluent spots; head dark grayish-brown with the labials marked with brownish white (in paratypes 36,994, 36,997, 36,998 and 37,000 the brownish white of the labials extends

above them, across the rostral and above it, and in the other direction extends to the eye or nearly so; labials and rostral in these specimens marked also with dark grayish-brown); on the dorsum four series of confluent spots, the upper two series often so merging as practically to lose their identity, more clearly defined posteriorly; ground color whitish brown. The lower two series are smaller black spots which alternate and coalesce with the upper series but not extending down to the first three or four rows of dorsal scales (posteriorly two) which are whitish like the ventral ground color; ventrals with large black spots extending into the light lateral area alternating with the lower rows of dorsal spots. Sometimes there are transverse stripes, or alternating spots, sometimes confluent spots, all specimens all very variable in the shape of the ventral markings. The ventral ground color and light lower dorsals are suffused with a brown wash over a varying part of the anterior region but only very obscurely in the type. Elsewhere the ventral ground color is suffused more or less with pink, including the subcaudals. This is especially extensive and brilliant in the largest specimen (paratype 36,995). The lower sides of neck, throat and lower jaw with black spots; coloration of tail above similar to dorsal coloration but with only two series of grayish brown confluent and more or less alternating spots; coloration of subcaudals similar to that of ventrals.

Measurements.

		Head and body	Tail	Total length
Type	36,993	225 mm.	97 mm.	322 mm.
Paratypes	36,994- 37,000	142-249 mm.	62-103 mm.	204-352 mm.

***Bothrops albocarinata*, sp. nov.**

Type.—Mus. Comp. Zoöl. no. 36,989, a female with part of tail missing.

Diagnosis.—Allied to *Bothrops chloromelas* from which it differs in the number of labials, in that the third labial forms the anterior border of the pit and not the second, in that the subcaudals are chiefly single, in the number of scale rows and in coloration.

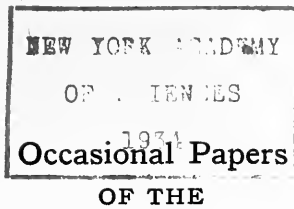
Description.—Snout rounded with moderately elevated canthus; rostral as broad as deep, nasal divided; internasals large, rather long and narrow, separated from each other by one scale behind the rostral, canthals about the same size and shape; upper head scales not enlarged, strongly keeled, in 6 longitudinal series between the supraoculars; suboculars three on the left and two on the right, separated from the labials by one row of scales; post-oculars three, the lowest more or less fused with the last subocular; pre-oculars three, two above the pit, the other long and narrow, below, forming its lower posterior border; 9 upper labials on the right, 8 on the left, the third forming the anterior border of the loreal pit; temporal scales keeled;

10 lower labials; scales strongly keeled (except for the outer dorsal row on each side which is unkeeled or very weakly keeled), keel extending to the end of the scale, scales in 21 rows at mid-body; ventrals 181 (some missing ?); anal undivided; subcaudals $59+n$ all single except 1, 4, and 56-58; tail prehensile.

Color in alcohol.—Brown above (bluish or greenish gray where epidermis has peeled off) marked with black crossbands or alternating spots, the anterior markings very obscure the posterior plainly evident, the spots or crossbands rather irregular in shape, also the brown areas are mottled with black, and the black areas with brown; head marked with black and brown, a black streak extending from the eye to the angle of the mouth, another one just above it starts from a region just in front of the supraocular, and borders its inner edge extending to the back of the head, another pair of black lines more or less obscure, on top of the head; labials and chin shields whitish yellow more or less marked with black. The keel on almost all of the dorsal, upper head, and upper caudal scales is whitish giving the snake a finely striated appearance; coloration of tail virtually the same as the posterior dorsal coloration except that the brown spaces are narrower; end of tail brownish white, above as well as below, mottled with darker; ventrals, subcaudals and the first row of dorsals greenish white; ventrals and subcaudals marked with black squarish spots which arrange themselves roughly into longitudinal lines; first row of dorsals in alternate groups colored black and greenish white.

Measurements.

	Head and body	Tail	Total length
36,989	456 mm.	$71+n$ mm.	$527+n$ mm.



Boston Society of Natural History.

NEW LEPIDOPTERA FROM THE BAHAMAS.

BY MARSTON BATES.

THE fauna of the Bahamas, although very inadequately known, is of great zoögeographical interest. The islands have perhaps never been connected with any of the surrounding land masses, and in consequence, the present inhabitants may have arrived over seas. The different groups of islands show considerable diversity of fauna, indicating relationships with Florida, Cuba and Hispaniola. I hope presently to be able to write a somewhat detailed account of the butterflies of these islands; in the meanwhile, the new forms described here seem to be of sufficient general interest, from the point of view of animal distribution in the West Indies, to warrant separate consideration.

A large part of the Bahaman material in the Museum of Comparative Zoölogy was collected on two trips made by the research yacht *Utowana*, owned by Allison V. Armour, in the winters of 1933 and 1934. Most of the butterflies taken on these expeditions were collected by Dr. Thomas Barbour, Dr. David Fairchild, and Mr. and Mrs. James Greenway. In addition, the museum collection contains an interesting series of specimens collected by C. J. Maynard on New Providence in 1897, and many other specimens, mostly from New Providence and Andros, taken by various collectors in the early part of the present century.

PIERIDÆ.

Eurema dina helios, subsp. nov.

Description.—Male. The upper side is uniform dark orange; the costal and outer margins of the forewing are narrowly edged with brown in most specimens, although in some specimens this brown is scarcely discernible. The under side in summer specimens (June) is immaculate yellow, except for the double cell spot of the hindwing. In winter specimens (Jan., Feb.),

a few irregular, diffuse, purple-brown spots are present on the hindwing, and the apex of the forewing is edged with pink, with minute brown spots at the vein endings. There are many intermediate specimens between these extremes. Length of f.w., 15-19 mm.

Female. The upper side is yellow, becoming orange toward the apex of the forewing and the outer margin of the hindwing. The apex of the forewing is narrowly marked with brown in most specimens. The under side is always more heavily marked than in the male, and there is usually a pink or red-brown spot in the apex of the forewing, and another on the outer margin of the hindwing, between veins Rs and M_1 . Length of f.w., 15-21 mm.

Types.—Holotype (male) and allotype (female) no. 19,564 in the Museum of Comparative Zoölogy, from New Providence (Nassau), June, 1897, C. J. Maynard; 30 paratypes from New Providence, 2 from Andros, in the M. C. Z.; 2 paratypes from New Providence in the American Museum of Natural History.

Remarks.—The male genitalia of this subspecies show the same general structure as those of *dina* (Cuba) and *parvumbra* (Jamaica). The Bahaman form is markedly different from either of those subspecies and from the typical Central American *westwoodi* in the uniform orange ground color of the male and the greatly reduced markings of both sexes. The male is most similar to a variety with reduced markings sometimes found in northern Central America and Arizona, but I have seen no specimens from that region that would quite match the uniform orange upper surface and the clear yellow under surface of *helios*.

***Eurema chamberlaini chamberlaini* (Butler).**

Terias chamberlaini Butler 1898, Ann. Mag. Nat. Hist. (6), 1, p. 295.

A series of five males and one female from Great Inagua (Feb. 1934, Armour Exp.) agree very well with Butler's description, and may be considered as typical until specimens from other islands are available for study, so that the exact status of the name (described from the Bahamas) can be determined.

The female is similar to the male on the upper side, but with the apical brown border of the forewing less extensive. On the under side a tiny cell spot is present on both wings; the white patch of modified scales on vein 2A of the forewing is prominent, and there is a pink patch on the outer margin of the hindwing between veins Rs and M_1 .

The male genitalia are similar to those of *E. dina*, except that the free part of the uncus is long, and that there are fewer teeth on the distal process of the valve.

***Eurema chamberlaini mariguanae*, subsp. nov.**

Description.—Male. The upper side is uniform orange; the costal and outer margins of the forewing are narrowly bordered with dark brown, the border of the outer margin excavated between the vein endings. A tiny cell spot is present on the forewing, and the vein endings are tipped with black on the outer margin of the hindwing. The under side is yellow, the fringe and a narrow border on both wings orange. The cell spot on the forewing may be single or double; on the hindwing it is double, and there are a few scattered brown scales on the disc of this wing. Length of f.w., 12-13 mm.

Female. The upper side is yellow, becoming orange toward the apex of the forewing and the outer margin of the hindwing. The apex of the forewing is bordered with brown, which extends along the outer margin as far as vein Cu_2 ; the vein endings of the hindwing are inconspicuously tipped with brown. The under side is yellow, the apex of the forewing and part of the outer margin of the hindwing narrowly bordered with orange. The cell spot of the forewing is single, of the hindwing double; there is a conspicuous pink patch on the outer margin of the hindwing between veins Rs and M_1 , and some irregular, indistinct dark spots on the disc of this wing. Length of f.w., 15 mm.

Types.—Holotype and paratype (males) from Mariguana Is., Feb. 23, 1933, Armour Exp.; allotype (female) from Mariguana Is., Feb., 1934, Armour Exp. Type, M. C. Z. no. 19,565.

Remarks.—The male of this form differs from that of *chamberlaini* in the narrower and more deeply excavated border of the forewing above, in the presence of a cell spot on this wing, and in the more contrastingly marked borders of the under side of both wings. The female of *mariguanae* is not uniform orange above, like *chamberlaini*, and on the under side it is uniform yellow, while *chamberlaini* is orange.

There are three other specimens of the species in the M. C. Z. collection: a female from Crooked Is. (March 1, 1934) and two females from Watling Is. (Feb. 17, 1933). They seem to differ from both *chamberlaini* and *mariguanae*, but their exact status cannot be determined until males from the same localities are available for study.

SATYRIDÆ.

Calisto herophile apollinis, subsp. nov.

Description.—Male and female. The upper side is uniform dark gray, immaculate. The under side is lighter gray, with an orange patch in the cell of the forewing, a dark postmedian line, and two wavy submarginal dark lines; the apical ocellus is black, ringed with yellow, and with two tiny central white spots. The hindwing is marked with a broken sub-basal line, a straighter postmedian line, a row of four white spots, and two wavy submarginal lines; the ocellus, between veins Cu_1 and Cu_2 , is black, ringed with yellow, with a small basal white pupil. Length of f.w., 16-18 mm.

Types.—Holotype (male) and allotype (female), M. C. Z. no. 19,566 from Clarencetown, Long Is., Feb., 1934, Armour Exp.; 5 paratypes with the same data, and 4 paratypes from New Providence (Nassau), June, 1897, C. J. Maynard.

Remarks.—The Bahaman subspecies of *herophile* differs from the typical (Cuban) form in the reduced markings of the under side: the wavy lines on both wings are lighter, finer; the postmedian line of the fore- and hindwings is not bordered externally by a light shading; the bluish scaling surrounding the white postmedian spots of the hindwing is reduced or absent.

Calisto sibylla, sp. nov.

Description.—Female. The upper side of both wings is immaculate dark brown, somewhat lighter toward the outer margins. The under side is somewhat lighter. The forewing is marked on the under side by two wavy dark lines in the cell, a heavier median line just beyond the cell, curved posteriorly toward the outer angle, and by two wavy submarginal lines. The apical ocellus of this wing is black, ringed with yellow, with two small bluish-white central spots. The hindwing is marked by a broken sub-basal line, a somewhat straighter postmedian line, followed by an area powdered with bluish scales, and two irregular submarginal lines. The postmedian bluish area includes a row of four small white spots and, between Cu_1 and Cu_2 , a prominent oval ocellus, black ringed with brown, with an irregular, bluish-white basal pupil. The anal angle is touched with bluish-black. Length of f.w., 25 mm.

Type.—Holotype (female), M. C. Z. no. 19,567, from New Providence (Nassau), June, 1897, C. J. Maynard.

Remarks.—This species differs from the Cuban *herophile* in its much larger size, in the absence of the red cell patch of the under side of the forewing, in the less convex outer margin of the fore-

wing, and so forth. It seems to be a distinct species, occurring together with *herophile* in New Providence. It is curious that neither *herophile* nor *sibylla* has turned up in recent collections from the island; perhaps they do not fly in the winter season.

HESPERIIDÆ.

Phemiades antiqua eleutheræ, subsp. nov.

Description.—Male. The forewing above is dark brown, the base covered with orange hairs and scales. There is a rectangular orange spot in the outer third of the cell, and a row of similar postmedian spots extending from the anal vein to the costa, curving around the apex of the cell, where the spots become small and indistinct. The hindwing is dark brown with the discal area orange. The under side of the forewing is gray, tinged with purple, with the orange spots of the upper side repeated except for those between the radial veins. The hindwing is immaculate purplish-gray. Length of f.w., 24 mm.

Type.—Holotype (male), M. C. Z. no. 19,568, from Bannerman Town, S. Eleuthera Is., Feb., 1934, Armour Exp.

Remarks.—This subspecies is, on the upper side, more or less intermediate between the Hispaniolan form (? *antiqua*) and the Jamaican form (*jamaicensis*); it may be quickly distinguished from any of the other known forms by the immaculate under side of the hindwing. If the species occurs in Florida, as has been reported, it may well be represented there by this form.

AMATIDÆ.

Empyreuma heros, sp. nov.

Description.—Male. The head and its appendages, except for the yellow tips of the antennæ, are black, with some blue sealing. The thorax is blue-black, with a few small white spots, as in *affinis*. The abdomen is blue, with the white maculation greatly reduced, limited to three or four rather indefinite lateral spots.

The wings, on the upper side, are bright scarlet, the forewing lighter toward the outer margin, which is narrowly bordered with brown. The outer margin of the hindwing is also narrowly bordered with brown. The pattern and coloring of the under side are the same as those of the upper. Length of f.w., 20 mm.

Types.—Holotype and paratype (males), M. C. Z. no. 19,569 from Mari-guana Is., Feb. 25, 1933, Armour Exp.

Remarks.—This species may be distinguished from any other by the uniform bright ground color of both wings, above and below, and by the narrow, light-colored wing borders. The genitalia are quite distinct from those of typical *affinis* (Cuba).

Museum of Comparative Zoölogy,
Cambridge, Mass.

Occasional Papers
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NOTES ON TABANIDÆ.

BY G. B. FAIRCHILD.

IN working on the Tabanidæ in the collection of the Museum of Comparative Zoölogy preparatory to writing up the Tabanidæ of Connecticut, a few observations were made which, at the suggestion of Dr. Joseph Bequaert, are here recorded.

Tabanus zonalis Kirby and **T. flavipes** Wiedemann.

The distinctions pointed out by Osten Sacken (1876) seem to hold very well, but in spite of this the two species have been often confused. *Zonalis* has a narrower, parallel-sided frons, a pollinose subcallus, brown palpi, and reddish antearlar tubercles. It seems to range over the whole of northern North America, from Alaska to Newfoundland and Labrador, south into the northern United States. *Flavipes* has a broad, divergent frons, denuded subcallus, black and rather more slender palpi, and black antearlar tubercles. I have seen a considerable number of both species, but as far as I can discover *flavipes* is confined to Labrador and Anticosti Island, where it does not replace *zonalis*, but where it appears to be the more abundant species. Graenicher's (1913) record from Wisconsin I doubt, as he does not mention any of the true diagnostic characters. Unfortunately Wiedemann's (1828) name appears to be preoccupied by *T. flavipes* of Gravenhorst (Vergl. Uebersicht Linn. u. einiger neuern Zoologischer Systeme, p. 363, 1807). Gravenhorst's description is only three lines long and does not seem to apply to any known species. No locality is given. For Wiedemann's *flavipes* of Labrador, I propose the name *Tabanus nigrotuberculatus*, referring to its main diagnostic character.

The three species, *Tabanus longus* O. S., *T. fulvulus* Wied., and

T. sagax O. S., have been a stumbling block for a considerable time. Hine (1914), without having seen any of the types, as far as I can make out, wrote a key and a rather lengthy discussion of the three species and of what he considered their varieties. After trying to use his key, I discovered that his ideas of the species bore little resemblance to those of the original describer, at least in the case of Osten Sacken's species, so it seemed desirable to make a new key, based at least in part on the type material.

***Tabanus longus* Osten Sacken.**

Plate 8, fig. *A*, *a*.

Description.—Frons broad, parallel-sided, about two and one-half times as high as wide. Basal frontal callus square, median frontal callus small, oval, connected with the basal by a fine line. Annulate portion of the third antennal segment nearly two-thirds the length of the basal portion, the dorsal angle rounded, nearly obsolete. Thorax faintly striped, dark blackish-brown with gray pollen. Abdomen chocolate brown, the mid-dorsal stripe narrow, faint to obsolete posterior to the second segment. Dorso-lateral spots prominent, gray pollinose, oval, oblique, not quite reaching the margins of the segments. Posterior margins of the segments whitish, wider in the middle. Costal cell of wings fuscous. Legs brown, unicolorous. Length, 12-14 mm.

Localities.—There are two female types in the M. C. Z., both labelled 'Middle States.' Aside from the types, I have seen specimens from Connecticut, New Jersey, and Illinois.

***Tabanus fulvulus* Wiedemann.**

Plate 8, fig. *E*, *c*.

Description.—Frons of medium width, about four times as high as wide, wider above. Basal frontal callus higher than wide, median callus elongate, unconnected with the basal. Annulate portion of the third antennal segment about one-half the length of the basal portion, the latter at least one-half as broad as long, strongly angled above and bowed below. Thorax unstriped, golden yellow pollinose, as is the face and frons. Abdomen dark golden brown to nearly black, with a wide, yellow mid-dorsal stripe formed of contiguous truncated triangles, their bases resting on the posterior margins of the segments and their sides concave. Dorso-lateral spots large, oval, yellow, often becoming so large as to reduce the dark ground color to a series of crescents on each side of the median stripe, causing the abdomen to appear almost wholly yellow. Costal cell of wings dilute fuscous. Legs yellow, except femore, distal one-half of front tibiae, and tarsi, which are nearly black. Length, 12-15 mm. I believe Osten Sacken's interpretation of this

species is correct. I have examined specimens from Connecticut, New Jersey, Virginia, North Carolina, Kentucky, Alabama, Kansas, and Ohio.

***Tabanus sagax* Osten Sacken.**

Plate 8, fig. *B, b*.

Tabanus dawsoni Philip 1931, p. 105.

Description.—Frons broad, parallel-sided, about three times as high as wide. Basal frontal callus square, median callus oval, connected with the basal by a fine line in two of the types, not in the third. Annulate portion of the third antennal segment hardly one-half the length of the basal portion, the latter narrow, its dorsal angle obtuse and rounded. Thorax unstriped, gray pollinose, as is the face and frons. Abdomen very light brown, darker at the apex, and with a wide mid-dorsal gray stripe running its whole length, widened somewhat on the posterior margins of the segments. The hind margins of the segments are not lighter, and the gray dorso-lateral spots are rather faint. Costal cell of wings fuscous. Legs yellowish, unicolorous. Length, 13-15 mm.

Types.—There are three female types in the M. C. Z., one labelled 'Min.' (Minnesota), the others without locality, probably from Illinois.

Remarks.—Through the courtesy of Prof. William A. Riley and Prof. C. E. Mickel, I have been able to examine the type female of *Tabanus dawsoni* Philip, from Itasca Park, Minnesota. After comparing it with a series of specimens of *T. sagax*, including the three cotypes, one of which is from Minnesota, I can find no differences of specific value. The abdomen is darker than in the types of *sagax*, and the dorso-lateral spots somewhat more prominent, but the frons and antennæ are exactly the same as in the types. Dr. Bequaert, after examining the types of both species, agrees with me in placing *dawsoni* in the synonymy of *sagax*.

In addition to the three species just mentioned, I have discovered in the collections of the M. C. Z. an apparently unrecognized form which seems sufficiently distinct to warrant a name.

***Tabanus sackeni*, sp. nov.**

Plate 8, fig. *D, d*.

Description.—Female. Length, 13-14 mm. Width of head 4-5 mm. Length of wing, 11-13 mm. Frons about four and one-half times as high as the basal width, distinctly wider above, yellowish-gray pollinose with scattered black hairs about the vertex. Basal frontal callus one-half higher

than wide, black or chestnut brown, the median callus oval, unconnected with the basal. Subcallus yellowish-gray pollinose in fresh specimens. Face and cheeks silver-gray pollinose with a sparse bearding of long white hairs on the lower parts. Palpi white or pale grayish, with abundant black hairs, moderately swollen at the base of the terminal segment, but tapering abruptly to a slender apex. Third antennal segment four and one-half times as long as its greatest width, the annulate portion about two-thirds the length of the basal portion. The dorsal angle of the third segment short, abrupt, placed at about one-fifth of the distance from the base to the apex of the basal portion. First two and base of the third antennal segments generally reddish, the annulate portion darker. There are numerous black bristles on the first two segments, and a small tuft of them on the apex of the dorsal angle. Eyes (from relaxed specimens) with three green bands, a short upper and two long lower ones. Thorax sparsely covered with grayish pollen and gray hairs, the reddish ground color showing through. The usual longitudinal stripes are faint, and there is a tuft of black hairs before the wings. Scutellum red, often with a faint, transverse, dark band basally. Abdomen rather light chocolate brown, with a more or less distinct narrow, gray, median line, which becomes fainter on the posterior parts of the segments and is bounded laterally by darker areas. There is a series of dorso-lateral, oblique, oval, light gray patches which fail to reach either margin of the segments. The posterior margins of the segments are narrowly edged with lighter brown. The legs are uniform reddish brown, the tarsi darker. The wings are entirely hyaline, with a light brown stigma, and there is no appendix on the upper fork of the third longitudinal vein.

Remarks.—This species has been heretofore confused with *T. longus* O. S., from which it seems to be quite distinct. The frons is narrower and convergent anteriorly; the basal frontal callus is oblong, not square; the antennæ are quite differently shaped and proportionately larger; and the wings have the costal cell entirely hyaline. It is apparently this species which was considered to be typical *longus* by Hine (1914). Osten Sacken's amended description of *longus* in the Appendix to the Prodrôme (p. 559) was drawn from specimens of this species, and one of his specimens has been selected as the holotype.

Types.—Holotype, female M. C. Z. no. 19,527 Cumberland Gap, Ky., Geo. Dimmock. Paratypes, 7, Cumberland Gap, Ky., Geo. Dimmock. 4, Holliston, Mass., N. Banks, July 31 and August 8, 9, and 15. 1, Redding, Conn., July, 1933, F. Tudor. 1, Ledyard, Conn., Aug. 14, 1917, C. B. Graves. 1, Ira, Summit Co., Ohio, Aug. 8, 1904. (in collection J. Bequaert) 2, Sherborn, Mass., Aug. 12, 1913, E. J. Smith, and July 31, 1904,

A. P. Morse. (both in collection Boston Society Natural History) 3, Louisiana, Mo., July 19. (in C. W. Johnson collection in the M. C. Z.)

In addition there are four specimens from the C. P. Whitney collection, probably from Missouri, a specimen from the Banks collection labelled 'University of Kansas,' and a male without antennæ labelled 'Cambridge, Mass., Sept., N. Banks.' which are in too poor condition to be sure of, but which are probably this species.

The types of *Tabanus fulvicallus* Philip and *T. longiglossus* Philip were made available to me at the same time as that of *T. dawsoni* through the courtesy of Prof. Riley and Prof. Michel, and it seems advisable to record a few observations on them at this time.

Tabanus fulvicallus Philip.

Plate 8, fig. C, c.

Description.—Frons of medium width, about three and one-half times as high as wide. Basal frontal callus oval, considerably narrower than frons, and merging into the elongate median callus above. Annulate portion of third antennal segment hardly two-thirds the length of the basal portion, the dorsal angle well developed but rounded. Thorax faintly striped, though this and the abdomen are not sufficiently well preserved to admit of accurate description. The abdomen appears to have been reddish brown with gray dorsal triangles and dorso-lateral spots. Wings with the costal cell hyaline. Legs brown, unicolorous.

Remarks.—This species seems to be near *longus* and *sackeni*, but the structure of the frons and antennæ should serve to distinguish it. I have seen three specimens from Texas which are very close to *fulvicallus*, but differ in having the fore femora and distal half of the fore tibiæ blackish.

Tabanus longiglossus Philip.

This species belongs to the group with an ocelligerous tubercle, and can be easily recognized by the elongate proboscis and greatly attenuated palpi. I have a specimen which I collected in Cape Breton Island, Nova Scotia, July 1, 1931, and which agrees very well with the type.

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EXPLANATION OF PLATE 8.

- FIG. *A*, *a*. *Tabanus longus* Osten Sacken. Cotype.
FIG. *B*, *b*. " *sagar* Osten Sacken. Cotype.
FIG. *C*, *c*. " *fulvicallis* Philip. Holotype.
FIG. *D*, *d*. " *sackeni* Fairchild. Holotype.
FIG. *E*, *e*. " *fulvulus* Wiedemann.

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DESCRIPTIONS OF A NEW GENUS AND TWO NEW
SPECIES OF SQUIDS FROM THE NORTH ATLANTIC.

BY RODERICK MACDONALD AND W. J. CLENCH.

THE new genus and new species here described were received from Dr. H. B. Bigelow from towsings made in 1929 and 1931.

Bigelowia, gen. nov.¹

This genus differs from all other genera in the subfamily Chiroteuthinæ by having the ventral arms greatly elongated, being nearly four times the length of the dorsal arms; the head is very long with conspicuously protruding eyes and the olfactory tubercles located at a much greater distance from the eyes than is known in any genus in the family Chiroteuthidæ. Genotype, *Bigelowia atlanticus*.

Bigelowia atlanticus, sp. nov.

Figures 1-4, 6.

Description.—Our specimen is slightly mutilated in the head region and the right tentacular arm is represented only by a small stump; the distal portion of the left tentacular arm (Fig. 3) is missing. The general appearance of the body is long and cylindrical and singularly free from any evidence of pigmentation. The eyes are prominent, protruding conspicuously from the sides of the head and have no luminescent organs. The fin is somewhat circular, with the pen extending slightly beyond the base of the fin. The formula representing the length of the arms is 4, 3, 2, 1. The ventral arms are much thicker than the other arms and are by far the longest, being about four times the length of the dorsal arms, 1. All the arms are beset with moderately sized suckers arranged in two rows, the suckers in one row alternating, or offset, in position with the suckers in the other rows. The suckers are more crowded in arms 1, 2, and 3 than they are on the ventral arms (Fig. 2 and 4). In all the arms the suckers become increasingly smaller towards their distal ends. The suckers are

¹Named for H. B. Bigelow, Director of the Woods Hole Oceanographic Institution.

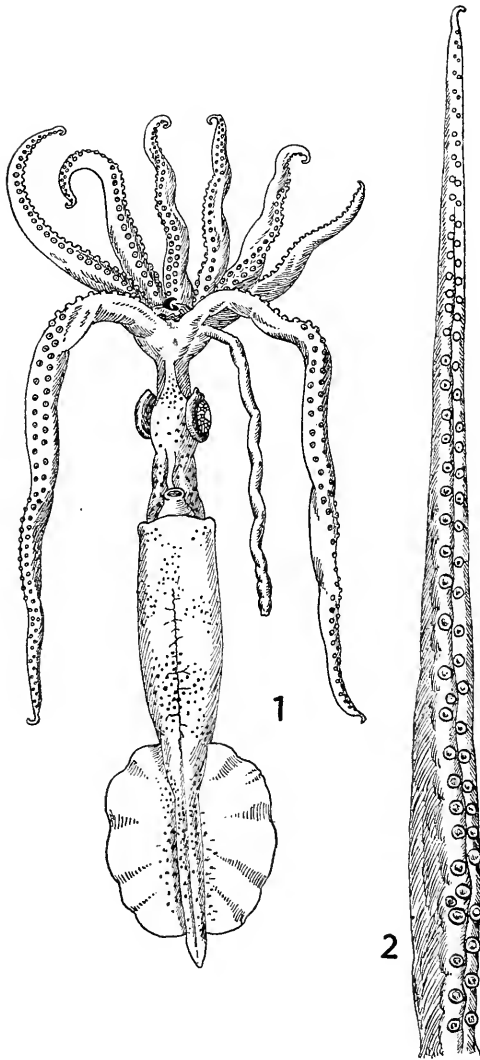


FIG. 1. *Bigelowia atlanticus*. Drawn by R. F. Deckert.

FIG. 2. *Bigelowia atlanticus*, ventral arm. Drawn by R. F. Deckert.

cup-shaped and each is borne on a short stalk. The diameter of the largest suckers at the base of the ventral arms measures 0.87 mm. The head of the sucker has a circular mouth measuring 0.63 mm. in diameter. There

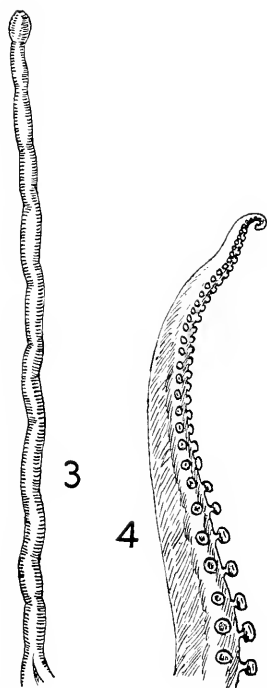


FIG. 3. *Bigelowia atlanticus*, tentacular arm. Drawn by R. F. Deckert.

FIG. 4. *Bigelowia atlanticus*, dorsal arm. Drawn by R. F. Deckert.

is a chitinous rim surrounding the mouth which is expanded dorsally and ventrally with the dorsal expanded portion bearing one row of small flattened circular tubercles, whereas the ventral widened portion is reticulated. The inner margin of the dorsal part of the rim bears a semicircle of twelve pointed spines. Ventrally on each side, following these pointed spines, are three truncated spines. A small portion of the rim on the mid-ventral edge of the mouth of the sucker is smooth. This smooth region in some of the suckers on the ventral arms may show slight indications of crenulation. The suckers on the sessile arms other than the ventral arms show a slight modification of the armature on the chitinous rim. The rim on the dorsal side of these suckers bears fourteen to sixteen sharp spines on the dorsal side, and the portion of the rim not bearing sharp spines has a notched appearance resembling closely the condition described for *Mastigoteuthis glaukopis* Chun. All the arms have a thin marginal membrane. The ventral arms have a single row of large luminescent organs about 1 mm. in diameter, each lying midway between the suckers on the ventral row and all the way to the distal end of the arms.

Measurements (in millimeters).

Total length (to base of ventral arms)	122.0
Length of head (from edge of mantle to base of tentacles)	31.0
Width of head in region of olfactory tubercles	7.0
Length of olfactory tubercle, which is stalked	1.5
Width of eyes	7.5
Distance between eyes and base of ventral arms	12.0
Distance between eyes	8.0
Length of mantle	91.0
Greatest width of mantle	12.0
Length of fin	38.0
Width of fin	34.0
Length of arms: 1	27.0
2	37.0
3	38.0
4	105.0
Length of left tentacular arm (distal portion apparently lost)	57.0

Holotype.—Mus. Comp. Zoöl. no. 98,971, N. 37° 00', W. 67° 12'. Towing depth, 1500 meters of wire.

Remarks.—Chun (1910, p. 218) has divided the family Chiroteuthidæ into three subfamilies: Chiroteuthinæ, Mastigoteuthinæ, and Grimalditeuthinæ. According to the above author's classification, our specimen would be classed as belonging to the subfamily Chiroteuthinæ by the following characters: (1) fin circular in form; (2) the funnel cartilage ear-shaped with a tragus and antitragus; (3) head region long and cylindrical; (4) olfactory tubercle long and stalked; (5) eyes large; (6) ventral arms longer than the other pairs of arms, with a broad marginal membrane and bearing a regularly arranged row of luminescent organs.

On the other hand, our specimen possesses the following characters which would place it in the subfamily Mastigoteuthinæ: (1) the pointed end of the body extends only a short distance beyond the base of the fin; (2) the eyes are without luminescent organs; (3) the suckers on the arms are moderately well developed; (4) the tentacular arm is whip-lash shaped, bearing no glandular swellings.

With the Grimalditeuthinæ, it possesses but few characters

that are in agreement, which are: (1) the head long and cylindrical; (2) olfactory tubercle long and stalked.

The presence of an azygous or median spine on the dorsal rim of the sucker in the genus *Mastigoteuthis* is another character which we believe differentiates this genus from *Chiroteuthis* where this character is absent. *Bigelowia atlanticus* agrees with *Chiroteuthis* in the lack of this spine.

The characters which distinguish our specimen from the various members of the family Chiroteuthidæ are as follows: (1) the greatly elongated ventral arms; these being about four times the length of the dorsal arms; (2) the long slender-shaped head; (3) the position of the olfactory tubercles; these lie farther from the eyes than in other members of this family; (4) the conspicuously protruding eyes.

From the above diagnosis, it appears that *Bigelowia* is about intermediate between the two subfamilies, Chiroteuthinæ and Mastigoteuthinæ as delimited by Chun. Because of this intermediate position on our findings, it seems inadvisable to retain this second subfamily, and to consider the genus *Mastigoteuthis*¹ a member of the Chiroteuthinæ. As a genus, *Bigelowia* can be placed between *Chiroteuthis* and *Mastigoteuthis*.

A few characters are held in common between the Chiroteu-

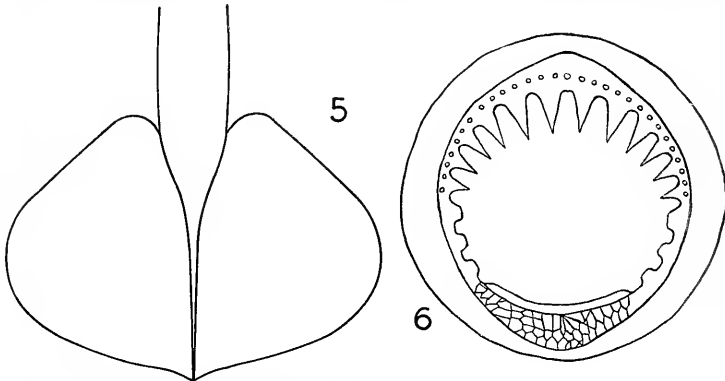


FIG. 5. *Mastigoteuthis iselini*, dorsal view of fin.

FIG. 6. *Bigelowia atlanticus*, mouth of sucker on ventral arm.

¹The subfamily Mastigoteuthinæ was established by Chun on the single genus *Mastigoteuthis*.

thinæ and the Grimalditeuthinæ; the differences, however, are sufficiently striking for the retention of this latter subfamily.

Mastigoteuthis iselini, sp. nov.²

Figures 5, 7-9.

Description.—We have been unable to find luminescent organs on the eyes or on any other part of the external surface of this species. Olfactory organs are also absent. The tentacular arms, but for small stumps, are missing in this specimen. The fin (Fig. 5) is definitely elliptical in shape and relatively very large, being about three-quarters of the length of the mantle. In this respect it differs from all other described species in *Mastigoteuthis* except *M. cordiformis* Chun. The base of the fin is rounded as in *M. magna* Joubin, and shows a slight curvature inwards on either side of and in close proximity to the distal end of the pen, with the pen not extending beyond the base of the fin. The visceral sac narrows abruptly pen at a point one-quarter of the length of the fin from its anterior end.

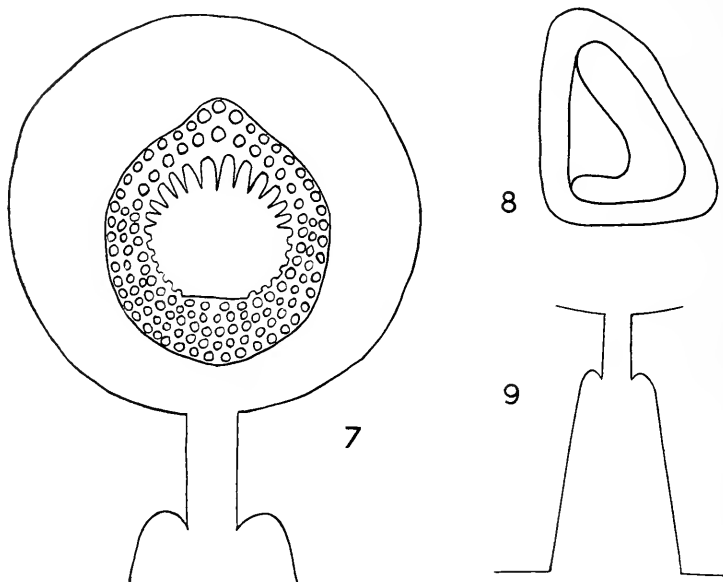


FIG. 7. *Mastigoteuthis iselini*, sucker on ventral arm.

FIG. 8. *Mastigoteuthis iselini*, left articulatory cartilage on funnel.

FIG. 9. *Mastigoteuthis iselini*, arm swelling and stalk of sucker.

²Named for C. O. Iselin, Research Associate in the Woods Hole Oceanographic Institution.

The pen is practically naked from this point to its distal end. In these respects the specimen resembles *M. grimaldi* Joubin and differs from the other species of this genus so far described.

The funnel articulatory cartilage (Fig. 8) is somewhat ear-shaped and has the tragus well developed, but no trace is found of the antitragus. Owing to the relatively great development of the tragus and its consequent encroachment on the aperture, this latter is much reduced in size. This feature, as Robson (1924, p. 618) remarks in describing *M. sp. A.* (an in the region of the anterior fin origin, and it tapers to the width of the unknown species), has a tragus somewhat similar, although a small antitragus is present, giving the present species and *M. sp. A.* an appearance unlike any other known form.

The sessile arms have marginal membranes: those on arms 1, 2, and 3 are not so strongly developed as those on the ventral arms. Arms 1, 2, and 3 show a peculiarity not mentioned or figured in descriptions of other species of this genus, namely that about 11 mm. from their distal ends they narrow abruptly to thread-like proportions, being not more than 1-2 mm. thick. The ventral arms bear two rows of suckers for about half their length, the distal half bearing a slightly sinuous single row of suckers resembling the condition found in *M. magna* Joubin. The other sessile arms bear two rows of suckers. The suckers on the ventral arms are much more widely spaced than those on the other sessile arms. The suckers on all the arms are continued to their distal ends, in which region they are microscopic in size. The suckers (Fig. 7) resemble in size those found in *M. cordiformis* Chun and *M. grimaldi* Chun. The spines of the chitinous rim are 13 in number, the median spine most strongly developed. Ventrally along the rim these sharp pointed spines are followed on each side by six blunt spines, the median ventral portion of the rim being slightly crenulated. The suckers have a short stalk but the stalks are located on tall, truncated, cone-shaped, gelatinous swellings on the surface of the arms (Fig. 9). Of the suckers in *M. cordiformis*, Chun (1910, p. 225) says: 'Ihre Stieleverbreitern sich zu kegelformigen Polstern.'

Measurements (in millimeters).

Total length (to base of ventral arms)	59.0
Length of head (from edge of mantle to base of ventral arms)	7.0
Width of eyes	10.0
Distance between eyes	8.0
Greatest width of mantle	15.0
Length of mantle	52.0
Length of fin	35.0
Width of fin	50.0
Length of arms: 1	36.0
2	40.0
3	42.0
4	70.0

Holotype.—Mus. Comp. Zoöl. no. 98,967, N. 39° 04', W. 71° 29', station no. 1106, haul 9, no. 2. Towing depth, 1600 meters of wire. 'Atlantis,' November 4, 1931¹.

Remarks.—The general characters of the pen associate this new form with *M. grimaldi*, though in most other characters it appears to be quite different. Upon the above external morphological characters, this species can be placed next to *M. grimaldi*; its exact relative position must await the study of the internal organs when more material is available.

Taonius tenera (Verrill).

Mus. Comp. Zoöl. no. 98,968, N. 39° 04', W. 71° 29', station 1106, haul 9, no. 2. Towing depth, 1600 meters of wire. 'Atlantis,' November 4, 1931¹.

A single specimen of this species was obtained with *M. iselini*. It agrees with Verrill's (1880, p. 412-416) description except that our present specimen possesses a carina that crosses the pen at right angles to its length about one-fifth of its length from the anterior fin origin. Possibly this character was overlooked by Verrill.

¹Material collected with a two-meter net, towing at a calculated depth of 1100 meters. Fishing occurred, however, both up and down from the surface.

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Occasional Papers
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A NEW LIZARD, *LEIOCEPHALUS PERSONATUS*
LUNATUS, FROM THE DOMINICAN REPUBLIC.

BY DORIS M. COCHRAN.

A small but extremely interesting collection of Hispaniolan reptiles and amphibians belonging to the Field Museum of Natural History has been loaned to me for study through the courtesy of Mr. Karl P. Schmidt. It is particularly valuable to my zoögeographical survey of the island because many of the specimens are from the southeastern part of the Dominican Republic, a region from which too little material has hitherto been available.

In a recent paper (1932) entitled 'Two new subspecies of lizards of the genus *Leiocephalus* from Hispaniola'¹ I noted the scarcity of specimens from the southeastern and south central part of the island, and postulated the finding of other forms in that region more or less distinct from those already known from other parts of the island. One such form has come to light in the Field Museum collection, which I now describe as

***Leiocephalus personatus lunatus*, subsp. nov.**

Type.—Field Mus. Nat. Hist. no. 166; an adult male from Santo Domingo City, Dominican Republic, collected in 1895 by George K. Cherrie.

Paratypes.—Seven other specimens from the same place and by the same collector are now catalogued as F. M. N. H. 109, 125, 136, 139, 152, 158, 163. Another example, F. M. N. H. 10,922, came from Jaina, a little coastal town to the southwest of Santo Domingo City, and was secured by S. T. Danforth.

Diagnosis.—Resembles *Leiocephalus personatus mentalis* in having the mental shield edged with sepia; differs from it in having the remainder of

¹Proc. Biol. Soc. Washington 45: 177-182.

the throat and chest very heavily spotted with large brown spots in about a dozen transverse series; sides of head nearly immaculate or more or less heavily spotted or striped with sepia, the infraocular region usually pale; in adult males usually three crescentic sepia markings in front of the shoulder, the two posterior ones the largest and corresponding to the hollows behind the skinfolds occurring between ear and shoulder; prefrontals not touching the canthals; 23 to 28 lamellae on the fourth toe; hind leg adpressed reaches to between ear and eye; 57 to 70 scales between the occiput and the tail, not highly mucronate or noticeably bristling.

Description.—Head shields enlarged, the posterior distinctly ridged, the anterior nearly smooth; three scales (an internasal and 2 prefrontals) between the rostral and the supraorbital ring; posterior prefrontals much the larger; nasals in contact with rostral; internasals somewhat elongate, broadly in contact with each other; prefrontals separated from the canthals by a series of about four small scales; two heavy, rounded canthal scales followed by three long and narrow superciliaries and two small terminal ones; six distinctly ridged supraoculars separated from the superciliaries by one row of small keeled scales anteriorly and posteriorly, with two rows between them in the middle of the series, and from the frontals by a single row; occipital small, bordered by two distinct pairs of parietals on each side, the inner about four times the size of the occipital and a little larger than the outer; an enlarged latero-nuchal scale beyond the outer parietal which is almost two-thirds its area; four upper and five lower labials to a point below the center of the eye; temporal scales increasing gradually in size, the last one, just above and in front of the ear, the largest and most conspicuous; anterior border of the ear with five coarse projecting scales, the middle ones the largest. Nuchal scales rather small; dorsal scales large, imbricate and moderately mucronate; laterals only slightly smaller than the dorsals; ventrals slightly larger than the dorsals, smooth, their posterior edges slightly denticulate; about 50 scales around the middle of the body; about 66 scales from the occiput to a point directly above the vent; about 17 dorsal scales the equivalent of the distance from snout to occiput; nuchal scales small, those on the sides of the neck like the dorsals but smaller, those behind the ear very small, keeled and imbricate, not granular. Shoulder folds present, very distinct; no lateral folds. The adpressed hind limb reaches to the posterior border of the eye. Digits compressed; the fourth toe with 28 tricarinate lamellae. A distinct crest beginning on the occiput, increasingly developed on the back and prominent on the proximal part of the tail, then decreasing distally; the other caudal scales keeled and mucronate; no verticils. The keels of the lateral and dorsal scales are directed upwards and backwards so that the scale-rows converge on the back. Tail scarcely compressed. A pair of postanals in the male.

Coloration.—(In alcohol.) Body color pale olive green above, chromium

green below; very faint indications of sepia crossbars on the nape of the neck; the body-scales above and below the light dorsolateral line only slightly tinted with sepia; tail without crossbars or markings of any kind in the adult male; hind limbs immaculate; fore limbs with a few small sepia spots on the upper part, and faint traces of crossbars on the wrists; mental shield edged with sepia; sutures between the labials sepia; remainder of throat heavily dotted with large sepia spots in about ten or twelve irregular transverse rows from the chin to the chest; sides of head from tip of snout to above the ear (in the type specimen) pale olive, almost immaculate; two small brown spots just behind the ear, followed by three prominent crescentic sepia markings, the two posterior ones the largest and corresponding to the hollows behind the skinfolds occurring between ear and shoulder; a black axillary spot below the last of these spots; top of head pale olive, without markings.

Measurements.

Snout to vent	64 mm.
Head to posterior ear	16
Tail (reproduced)	78
Fore leg	25
Hind leg	49
Width of head	12

Variation.—Among the series of nine there is considerable variation, as one might expect. The dorsal scales from occiput to above vent range between 57 and 70, with a corresponding variation of 13 to 17 dorsals in a head-length. There are about 44 to 52 scales around the body, but as is always the case, this count is never made twice alike, due to the slanting of the lateral rows. The lamellae under the fourth toe vary between 23 and 28. The length of the hind leg is between 74 and 83 per cent of the combined length of head and body. The median snout scales are constantly present as a patch of 2 to 4 scales. There are six supraoculars in every case but one, in that one there are five large and two small supraoculars. Not every adult male shows the crescentic sepia or black shoulder patches which give the subspecies its name. F. M. N. H. 139, for instance, lacks the black shoulder patches and the axillary spot; it is, however, heavily pigmented with sepia on the side of the head and neck above a faint pale lateral stripe beginning on the loreal region. Below this lateral light stripe is another intense concentration of sepia on the jaw in front of the ear, while the

sutures of some of the labials are heavily marked with sepia. The dorsal region of this specimen is likewise suffused with sepia, and traces of dark crossbands are apparent almost to the sacral region.

Relationships.—While the new subspecies is related to *Leiocephalus personatus mentalis*, the type locality of which is Jovéro, R. D., it is still more closely related to a form which Dr. Thomas Barbour has recently collected on Saona Island, the description of which has not yet been published.

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FOUR NEW BEMBIDIINI (COLEOPTERA: CARABIDÆ)
FROM COSTA RICA AND COLOMBIA.

BY P. J. DARLINGTON, JR.

THE following previously undescribed species are from collections made by Ferd. Nevermann in Costa Rica and by the writer in the Sierra Nevada de Santa Marta, Colombia. The species of *Bembidion* are especially interesting, for the genus, which has hundreds of representatives in the North and South Temperate Zones, has relatively few, mostly isolated alticoline species in the American tropics. *Bembidion subapterum* is of additional interest as an example of a rather unusual and striking sort of dimorphism.

***Bembidion (Peryphus) vulcanium*, sp. nov.**

Description.—Broad, moderately convex; elytra very broadly and evenly oval. Dark piceous to brown, legs and base of antennæ rufescent; elytra with base, sutural intervals, and narrow lateral margin and epipleuræ more or less distinctly rufescent. Head with moderately prominent eyes; front not alutaceous; frontal sulci moderate, nearly parallel; antennæ with outer joints about twice as long as wide; mentum tooth large, entire, triangular. Prothorax subeordate, $1/4$ or $1/3$ wider than long (by measurement), constricted basally but not unusually so; sides strongly and evenly rounded anteriorly, sinuate and subparallel for about $1/6$ of length before the acute (but not much more than right) basal angles; side margins rather narrow; base squarely truncate; disk convex, not alutaceous, base subrugose, longitudinal and transverse lines normal; basal foveæ short, deep, and oblique, separated from the margins by slightly convex areas which are not costiform. Elytra very broadly and evenly oval, humeri rounded out; margin somewhat sinuate before apex; latter angulate nearly on line of suture; striæ finely punctulate, inner ones slightly impressed, with inter-

vals slightly convex, outer ones very superficial, but all (even seventh) visible; striæ apically very faint, but visible; intervals distinctly (σ) or indistinctly or not (ξ) alutaceous; 2 small dorsal punctures on each elytron, nearly on third stria. Inner wings vestigial; metepisterna short. Length $\pm 4\frac{1}{2}$ mm.

Types.—Holotype (male) M. C. Z. no. 19,625, from south slope, Volcan Irazú, 2800-3000 meters, Jan. 15, 1926, F. Nevermann. Twelve paratypes with identical data in M. C. Z. and Nevermann Collection.

Remarks.—This species is quite unlike anything known before from Central America. Its nearest known geographical relative is *B. fulvocinctum* Bates, described from 11-13,000 ft. altitude on Mt. Chimborazo, Ecuador. Bates' species is described as smaller ($3\frac{1}{2}$ mm.), with the elytral intervals flat (partly convex in the Costa Rican species), and is probably more distinctly marked (though on the same pattern) and with better defined carinæ in the prothoracic angles. The broad, oval elytra are conspicuously different from those of most American *Bembidion*.

Bembidion (*Peryphus*) *sanctae-marthæ*, sp. nov.

Description.—Slender, somewhat depressed; black, upper surface aeneous, strongly alutaceous; legs, mouth parts, and base of antennæ more or less rufous. Head with moderately prominent eyes; frontal sulci shallow, parallel; antennæ with outer joints about three times as long as wide; mentum tooth entire, triangular. Prothorax narrow, about $\frac{1}{4}$ wider than long (by measurement), moderately constricted behind; sides rounded anteriorly, sinuate and subparallel for about $\frac{1}{6}$ of length before the right or slightly acute posterior angles; side margins rather narrow; base nearly squarely truncate; disk convex, with usual impressed lines, with faint transverse strigulation especially basally; basal foveæ short and deep, separated from margins by acute carinæ. Elytra rather narrow; humeri distinct; sides only slightly arcuate anteriorly, sinuate before the independently narrowly rounded apices; striæ shallow, especially externally, but practically entire, irregular but not distinctly punctate; intervals flat or barely convex, third on each elytron with two broadly impressed foveæ (each with a setigerous puncture, a little outside of middle of interval). Inner wings well developed; metepisterna long. Length ± 5 mm.

Types.—Holotype (male) M. C. Z. no. 19,626 and 3 male paratypes, from the northwestern part of the Sierra Nevada de Santa Marta, Colombia, 8,500-11,000 ft., July 21, 1928, taken by myself in wet moss beside a stream in 'Temperate Zone' forest.

Remarks.—The important characteristics of this species are

the slender form, strongly alutaceous surface, carinate thoracic angles, and position of the dorsal punctures of the elytra. The species is related to *rogersi* Bates of the Costa Rican mountains (I have three specimens before me) but is more depressed and much duller. It must be much larger and more slender than *putzeysi* Csiki (*ovatum* Putz.) and much duller than *angulicolle* Putz., both of Colombia (known to me by description only). I know of no other species with which it could be confused.

Bembidion (Peryphus) subapterum, sp. nov.

Description.—Rather slender, convex; black, aeneous above, legs, mouth parts, and base of antennæ more or less rufous. Head with eyes moderately prominent; occiput alutaceous but front smooth and shining; frontal sulci moderate, slightly converging; antennæ with middle joints slightly more than twice as long as wide; mentum tooth entire and triangular. Prothorax subcordate, about 1/4 wider than long (by measurement), moderately constricted basally, sides rounded anteriorly, sinuate and very briefly subparallel before the right or slightly obtuse basal angles; side margins narrow; base truncate, slightly oblique near angles; disk convex, faintly alutaceous, base slightly rugose, impressed lines normal; basal foveæ deep, rounded, separated from side margins by acute carinæ. Elytra moderately narrow, *either* narrowed anteriorly and with humeri nearly obliterated (typical) *or* subparallel and with humeri prominent; margins slightly sinuate before apex, which is narrowly subtruncate; striæ faint, very faint externally, irregular but not distinctly punctate; intervals nearly flat, third on each elytron with two irregular impressions, each containing a setigerous puncture not far from third stria; surface of intervals moderately alutaceous, with traces of scattered punctuation near the scutellum. Inner wings vestigial (typical) or well developed; metepisterna rather long in both cases. Length 3 1/2 - 4 1/3 mm.

Types.—Holotype (male) M. C. Z. no. 19,627 and 2 (male and female) paratypes (all with narrowed humeri and vestigial inner wings) and 1 (female) specimen, not a type (humeri broad, inner wings long) all from the northwestern part of the Sierra Nevada de Santa Marta, Colombia, 8,500 - 11,000 ft., July 21, 1928, and Sept. 10-12, 1929, taken by myself under stones on the edge of the open, grassy páramo just above tree line.

Remarks.—The long-winged specimen (which is from the exact date and locality of two of the short-winged ones) is slightly larger than the others, with a little more punctuation near the scutellum, but is certainly the same species, for other characters (especially the unusual sculpture of the head and the form of

the elytral apices) correspond perfectly. Dimorphic Carabidæ of this sort are, of course, well known, though not common.

The typical form of this species is probably similar to *Bembidion chimborazonum* Bates (Mt. Chimborazo, Ecuador), which, however, is described as larger, with the basal angles of the prothorax acute. *B. putzeysi* Csiki of the Bogotá region may also be similar, but is described as only 2½ mm. long, and *B. angulicolle* Putz. differs in being shining black, with acute prothoracic angles.

Tachys (Pericompsus) nevermanni, sp. nov.

Description.—Form average, convex; surface glabrous, shining. Rufotestaceous, more rufescent below; elytra with a very large, not very contrasting nor sharply defined castaneous cloud which is very broad in anterior 2/3 (reaching margin at or just behind middle) but suddenly narrowed to a sutural stripe apically; antennæ and legs entirely pale testaceous. Head with eyes moderately prominent; front impunctate, shining, but faintly micro-reticulate; mentum very conspicuously bi-foraminate basally, toothed in emargination. Prothorax subquadrate, 1/4 or less wider than long (by measurement); sides broadly rounded anteriorly, sinuate and subparallel before the slightly obtuse or finely right basal angles; base oblique at sides; disk impunctate, shining, but finely micro-reticulate; median line distinct, anterior transverse impression obsolete, posterior strong and punctulate. Elytra each with six lightly impressed, moderately punctate striæ, sutural entire, others abbreviated, sixth scarcely passing middle; intervals slightly convex, somewhat shining but with faint alutaceous luster, third with two very inconspicuous punctures just before 1/3 and 2/3 of length; outer edge of elytron with a very deep, conspicuous fovea at middle of length. Length 2 1/2 mm. or slightly less.

Types.—Holotype M. C. Z. no. 19,629 and 28 paratypes, from Hamburg Farm, near Port Limon, Costa Rica, March 25, 1928, on a sand bank; 1 paratype each from the same locality, Feb. 9, May 5 (at light), and July 25; all taken by F. Nevermann. Paratypes in M. C. Z. and Nevermann Collection.

Remarks.—The outstanding structural character of this species is the huge submarginal fovea of each elytron. The variation in the structure of the elytral margin in different species of *Pericompsus* is surprising. In *P. ephippiatus* Say of the United States to Guatemala, which the new species resembles closely in form (*nevermanni* is slightly broader, with the elytral cloud larger and less well defined), in *tabasconus* Bates of Mexico and

Guatemala, in *laetulus* Lec. of Arizona, and in *blandulus* Schaum of the West Indies the margin is moderate or narrow, with scarcely a trace of special median fovea. In *sellatus* Lec. of Sonora and the southwestern United States the explanate margin is strikingly broad, without special median fovea. In *jucundus* Schaum of Central and northern South America and *sticticus* Bates of Guatemala and Costa Rica the margin is moderate, with moderate median fovea. I have seen all of these species. There are four Central American species I have not seen (*histrionellus* Bates, *longulus* Bates, *mexicanus* Csiki, and *oculaticauda* Casey), but all have color patterns which are not only more contrasting but of a different type from *nevermanni*. There are ten additional species apparently referable to *Pericompsus* known from Colombia, Venezuela, and Brazil, but all of them appear to differ by positive characters (color pattern, pubescence, punctuation, etc.) from *nevermanni*.

Museum of Comparative Zoölogy,
Cambridge, Mass.





Occasional Papers
OF THE
Boston Society of Natural History.

HERPETOLOGICAL COLLECTIONS MADE IN
HISPANIOLA BY THE *UTOWANA*
EXPEDITION, 1934.¹

BY DORIS M. COCHRAN.²

THROUGH the kind hospitality of Mr. Allison V. Armour, Dr. and Mrs. Thomas Barbour and their daughters Julia and Louisa recently visited the Bahama Islands and Hispaniola on Mr. Armour's yacht, the *Utowana*. The joint efforts of the party resulted in securing much fine herpetological material during the time allowed for exploring the different places at which the expedition touched. Dr. Barbour has generously turned over to me for study the 475 lizards, 88 snakes and 17 frogs taken in Hispaniola and its outlying islets, including several forms new to science. While in Port-au-Prince, Dr. Barbour's friend, M. André Audant, of the Service National de la Production Agricole, gave him some reptiles and amphibians from Peak La Selle, a range of mountains known to contain rare and specialized forms of animal life. M. Audant's collection from the peak has yielded a new genus and species of iguanid lizard and a new species of frog of the genus *Eleutherodactylus*, which are named for him.

The entire collection is now in the Museum of Comparative Zoölogy in Cambridge, Massachusetts, excepting 22 specimens, mostly paratypes, donated to the United States National Museum. When no collector's name is given in the following report, it is to be understood that Dr. Barbour and his wife and daughters collected the specimens.

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The Bahaman material will before long be reported upon by Dr. Barbour.

CLASS AMPHIBIA.

ORDER SALIENTIA.

Family Hylidæ.

Hyla dominicensis (Tschudi).

Hysiboas dominicensis Tschudi, Class Batr., Mém. Soc. Sci. Nat. Neuchâtel, vol. 2, 1838, p. 30.

3 (M. C. Z. 19701-3) Cap Haïtien, Haiti, were taken in March, 1934.

Eleutherodactylus audanti, sp. nov.

Diagnosis.—Belly and thighs heavily granular; upper eyelid without a spinelike tubercle; toes and fingers rounded at the tips; snout somewhat truncate in profile, not shovel shaped; femur very short; tibio-tarsal articulation usually not reaching eye. Young specimens pink (or white in preservative) spotted very unsymmetrically with brown; older specimens increasingly darker and more evenly colored; adults dark drab-grey, usually with a brown interorbital bar, always with a dark triangular postanal mark extending onto the lower posterior part of the femur.

Description of the type.—An adult, M. C. Z. 19704, from Peak La Selle collected by André Audant. Tongue moderately broad, very slightly emarginate behind; vomerine teeth in two very short, straight, widely separated patches between and well behind the choanæ, their outer ends not extending as far as the inner borders of the choanæ; head moderate, without ridges, its greatest width equal to distance from end of snout to occiput; no subgular pouch evident, although a distinct fold occurs across the chest between the forelimbs; nostril much nearer snout than eye, its distance from eye slightly less than the diameter of the latter; upper eyelid much narrower than interorbital space; tympanum equal to one-third the diameter of the eye, its distance from the eye somewhat less than its own diameter; disks of fingers moderate in size, that of the third finger covering about two-thirds the tympanic area; first finger much shorter than second; inner toes free, outer ones with a slight rudiment of a web; disks of toes about equal in size to those of the fingers; first toe reaching almost to base of disk of second toe; subarticular tubercles well developed; two prominent metatarsal tubercles; no plantar tubercles; no tarsal fold; femur very short; the limbs being pressed along the side, the knee and elbow are considerably separated; hind limb being extended forward, the heel reaches the tympanum; hind limbs being placed vertically to axis of body, heels just overlap; a series of elongate glands forming an interrupted dorso-lateral line from above tympanum to groin; another series of glands forming a middorsal line from tip of snout to vent; skin above shagreened, with rather regular glandular ridges or tubercles, especially

on the sacral region, where they lie diagonally on each side of the mid-line; throat smooth; chest, belly and thighs heavily granular.

Dimensions.—Tip of snout to vent, 25 mm.; width of head, 9 mm.; tip of snout to posterior tympanum, 9 mm.; diameter of eye, 3 mm.; fore leg from axilla, 13 mm.; hind leg from vent, 32 mm.; vent to heel, 17 mm.

Color in alcohol.—Dorsal surface drab-gray; a seal-brown interorbital bar; canthal region with a dark brown stripe; a narrow brown bar from eye to tympanum; a brown dorso-lateral stripe following the narrow glandular ridges of that region; an X-shaped brown mark behind the occiput and a Λ -shaped mark across the middle of the back; sides and sacral region with irregular, indistinct dark vertical bars; a wide, dark, light-edged crossband on the femur and another on the tibia, and paler ones on the feet; lower posterior part of femur and entire postanal region covered by a uniform dark seal-brown triangle; a brown diagonal mark on the lower proximal surface of the upper arm; forearm with some irregular dark vermiculations; lower surfaces drab gray to olive gray, immaculate; upper and lower lips with a faint brown spotting.

Paratypes.—Thirteen additional specimens of half-grown and adult frogs (M. C. Z. 19701-13, and U. S. N. M. 95111-3) were secured at the same time and place as the type. Three half-grown examples (U. S. N. M. 72595-7), rather badly mutilated, were secured at Morne Cabaio, Massif de la Selle on April 10, 1927, by Dr. A. Wetmore. Another young frog (U. S. N. M. 85009), was secured in the Morne La Selle Range at 7000 feet altitude in 1932 by Lt. Comder. S. S. Cook.

Variation.—The coloration in the half-grown specimens is rather remarkable because it not only fails to be constant in several individuals but also lacks bilateral symmetry in a single individual. The entire body of a young specimen (M. C. Z. 19705) is a pale pinkish buff (in alcohol), and there are a few pale brown dots on the back and some darker ones on the left leg, although there are no heavy patches of dark color anywhere on the left side. The right femur, on the contrary, has a large dark blotch on its posterior surface, and the anterior part of the right tibia and foot have some lighter blotches which are noticeably greater in area than those on the left tibia. Below the skin is pale and immaculate except for some brown spots on the lower aspect of both tibiae and tarsi, and the dark tips to the toes and fingers. The next example (19706) in the series grading from a light to a dark coloration, is also pale in body color. Its nostrils are outlined with brown; it has an unpaired brown spot on the posterior part of the right eyelid, then a small median occipital brown spot, another slightly larger on the median line between the shoulders, then no more dark pigment on the body except a small brown spot which occurs on the right side of the vent. On the legs a heavy brown blotch appears on the right anterior face of the femur, while the left anterior femur bears a

smaller and paler brown spot. No blotches appear on the posterior part of the femur in this specimen. There is a heavy dark band across the left tibia, and a small pale brown spot on the right tibia. The tarsi and feet are faintly spotted with brown. The forearms each have a brown band, that on the right the heavier. The ventral surface is immaculate, excepting the toe- and finger-tips; even the lower surfaces of the legs are free from spots. The next example (19707) in our series shows a considerable widening of the bars on the legs, so that most of the femur is dark, and the tibia has a wide dark median crossbar, while the tarsi are barred and the soles of the feet are dark. In this specimen some of the tips of the toes are pale. The skin of head and body is pale and immaculate, except for a large brown scapular blotch on the *left* shoulder only! The ventral surface is immaculate except for the continuations of the dark blotches on the legs and arms, and a dark patch at the insertion of the arm. The other examples evidently represent older phases of coloration. Some have a good deal of dark pigment appearing anteriorly on top of the head, while the back is more faintly blotched with dark, and the femur may be pale, crossbarred or dark. In some examples the lower surfaces are heavily spotted, in others only faintly so. The markings at this stage become more symmetrical also, and the dark postanal patch appears in most of the examples. The adult frogs are dark brown above, although a little of the original pale body color may show between the bars on the legs and above the postanal patch on the back of the femur. Some of the adults are more heavily spotted ventrally than is the case in the type specimen, but the variation among the adults is not as great as one might expect, considering the asymmetry of the young. The three young examples taken by Dr. Wetmore show the same peculiar asymmetry as do the young of the type series just described. The example taken by Lt. Commander S. S. Cook (U. S. N. M. 85009), belongs to the intermediate stage when darkening of the skin is well under way. A field note with this individual says that it was 'found under pine logs near the overnight camp' and that when caught it was 'distinctly green in color.'

The heel in two of the four adult paratypes is like that of the type in reaching the tympanum. The heels of the other two adults, as well as those of the young, reach to the posterior corner of the eye. All the adults agree in having a very glandular skin on the back, with a concentration of these glands in a dorso-lateral line, and numerous other patches of glands from the occiput to the sacral region and on the flanks. The skin of the ventral surface in all specimens is highly granular, the granules extending as far forward as the fold across the chest between the arms. In one adult paratype, the width of the head is slightly greater than the distance between snout and occiput.

Relationships.—The new species falls in the key in the subdivision with *E. montanus*, *auriculatoides*, *wetmorei* and *armstrongi*, all these having short

hind legs and a granular belly, and no unusual features in regard to shape of eyelid, snout or toe-tips. *E. audanti*, however, has a shorter femur than any of the related forms, and its heel does not generally reach beyond the tympanum, although in soft specimens it may be stretched to the posterior corner of the eye. Its unusual juvenile coloration is a feature which distinguishes it also from its allies.

Since writing the above, I have received twenty additional specimens of all ages from M. Audant, who has supplied the following notes on his collection:—

'The frogs and skinks [see *Wetmorena haetiana*] were collected under stones or in earthen tunnels under stones. The skinks were caught in soft soil, while I had to turn the stones to see the little frogs trying to conceal themselves. I am not positive about this, but I believe that these creatures whistle at night, because, while we were over there, we could hear the sounds of the animals, but we did not succeed in capturing them at night while whistling. The specimens were caught near the Rivière des Bois Pins, 200 feet south of the Caballo summit. The little frogs are brown in color and pink spotted when alive. That pink changes to white in the preservative.'

CLASS REPTILIA.

ORDER SQUAMATA.

SUBORDER SAURIA.

Family Gekkonidæ.

Sphærodactylus cinereus Wagler.

Sphaeriodactylus cinereus Wagler, Syst. Amph., 1830, p. 143.

Two males and a female of this species (M. C. Z. 37401-3) from Cul de Sac, Thomazeau, Haiti, were collected by André Audant. The largest, a male, measures 36 mm. from snout to vent; the tail, 40 mm.

Family Iguanidæ.

Anolis chloro-cyanus Duméril and Bibron.

Anolis chloro-cyanus Duméril and Bibron, Erp. Gén. vol. 4, 1837, p. 117.

11 (M. C. Z. 37404-13) Sanchez, Dominican Republic, Apr. 6, 1934.

3 (M. C. Z. 37414-6) Cap Haïtien, Haiti, Mar. 31, 1934.

6 (M. C. Z. 37417-20) Isle Tortue, Haiti, Apr. 2-3, 1934.

None of the lizards from Isle Tortue can be distinguished from those found on the mainland of Hispaniola. Evidently this is one of the least plastic of Hispaniolan species, not being subject to the great amount of local variation exhibited by the *Anolis dominicensis* group.

Anolis caelestinus Cope.

Anolis (Ctenocercus) caelestinus Cope, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 177.

19 (M. C. Z. 37421-30 and U. S. N. M. 95123-6) Isle Vache, Apr. 12, 1934. Also a non-plastic species related to *A. chloro-cyanus*.

Anolis cybotes cybotes (Cope).

Anolis cybotes Cope, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 177.

41 (M. C. Z. 37431-40) Cap Haïtien, Haiti, Mar. 30-31, 1934.

2 (M. C. Z. 37451 and U. S. N. M. 95120) Isle Tortue, Haiti, Apr. 2, 1934.

49 (M. C. Z. 37458-67) Sanchez, Dominican Republic, Apr. 6, 1934.

2 juv. (M. C. Z. 37468-9) Saona Id., Dominican Republic, April 8, 1934.

13 (M. C. Z. 37441-50) Isle Vache, Haiti, Apr. 12, 1934.

6 (M. C. Z. 37452-7) Thomazeau, Haiti, collected by André Audant.

If some adult lizards from Saona Island can be secured, it may be possible to separate a subspecies from that island, but with the immature material at hand, such a procedure would be unwise at present.

Anolis cybotes doris (Barbour).

Anolis doris Barbour, Proc. Biol. Soc. Washington, vol. 38, July 25, 1925, p. 101.

24 (M. C. Z. 37470-9) Anse à Galets, Gouave Id., Apr., 1934.

Anolis cybotes longitibialis (Noble).

Anolis longitibialis Noble, Amer. Mus. Novit., No. 64, Mar. 29, 1923, p. 4.

3 (M. C. Z. 37480-2) Beata Island, Dominican Republic, Apr. 11, 1934.

Anolis dominicensis dominicensis (Reinhardt and Lütken).

Anolis dominicensis Reinhardt and Lütken, Vid. Medd. nat. For. Kjöbenhavn, 1862 (1863), p. 261, extr. p. 109.

79 (M. C. Z. 37483-92) Cap Haïtien, Haiti, Mar. 30-31, 1934.

3 (M. C. Z. 37493 and U. S. N. M. 95121) Isle Tortue, Haiti, Apr. 2, 1934.

11 (M. C. Z. 37497-506) Sanchez, Dominican Rep., Apr. 6, 1934.

2 (M. C. Z. 37495-6) Thomazeau, Haiti, collected by A. Audant.

Anolis dominicensis caudalis Cochran.

Anolis dominicensis caudalis Cochran, Proc. Biol. Soc. Washington, vol. 45, Oct. 25, 1932, p. 185.

20 (M. C. Z. 37507-16) Anse à Galets, Gonave Id., Apr., 1934.

These further illustrate the differences between the race found on Gonave Island and the one occurring in Haiti and the Dominican Republic.

***Anolis dominicensis wetmorei* Cochran.**

Anolis dominicensis wetmorei Cochran, Proc. Biol. Soc. Washington, vol. 44, June 29, 1931, p. 89.

1 (M. C. Z. 37520) Beata Island, Dominican Republic, Apr. 11, 1934.

This is the second example to be recorded, as the type was unique. The 'series' is still too small to allow any observations on variation. Dr. Barbour found this species very rare, as a special effort was made to secure it. The feral cats and dogs will probably gradually exterminate all the land reptiles sooner or later. They are now far less abundant than when he visited the island a few years ago and a very large proportion of the lizards seen were tail-less.

***Anolis dominicensis juliae* subsp. nov.**

Diagnosis.—Dorsal scales juxtaposed, imbricate, granular, unlike the ventrals which are larger; a fairly regular paired median series of scales on the upper anterior portion of the snout; a distinct preoccipital scale half as large as the occipital itself; tail with very indistinct verticils, every ninth or tenth row of scales more vertical but not enlarged, the intervening scales in curving or irregular rows, the whole surmounted by a weakly serrate caudal crest with five triangular, keeled and pointed scales to a verticil, the first and fifth quite small, the others subequal.

Type.—An adult male, M. C. Z. 37517 from Isle Vache, Haiti, collected April 12, 1934, by the *Utowana* Expedition. Head short, with two very weakly developed ridges which slightly diverge in front of the eyes; forehead slightly concave between these ridges; head scales smooth, somewhat rugose around rostral, which is low and about half the width of the mentals; four scales between the nasals; a paired median series of rather rectangular, somewhat enlarged scales on the snout from the rostral to the middle of the frontal depression, where there is a median patch of smaller scales, the posterior ones not paired; supraorbital semicircles closely in contact; occipital slightly larger than ear opening, roughly circular in shape, with a smaller but equally noticeable preoccipital in contact with the supraorbital semicircles and completely filling the area between them and the occipital; the extreme outer points of the occipital nearly completely separated from the supraorbital semicircles by a small scale on each side; supraocular disk composed of nine or ten smooth polygonal scales of very unequal size, separated from the supraorbital semicircles by two to three rows of granular scales anteriorly, and by four rows posteriorly; two medium-sized scales bordering the inner anterior edge of the

second superciliary and surrounded by the supraocular granules; canthus rostralis rather strongly developed, the posterior two of the four enlarged scales which distinguish it having a comparatively heavy median ridge which projects over the loreal region; superciliary ridge continuous with the scales of the canthus rostralis, composed of one very elongate and sharply keeled scale followed by a double series of small but differentiated scales, the anterior of which is separated from the supraocular disk by four or five rows of granules: scales of the subocular semicircle keeled, narrowly in contact with the upper labials; supralabials about ten, the last four very small, the seventh coming below the center of the eye; temporal granules slightly smaller than the dorsals, with a rather poorly-marked double series of small scales forming the supratemporal line; back and sides covered with granules, the dorsals about the same in size and structure as the laterals; no enlarged series of median dorsal scales; ventrals small, smooth, imbricate, quite irregular in shape but often approximately square, only the most anterior being broader than long; throat covered with small, flat granules; skin of leg granular, with about five series of enlarged scales on the anterior face of the lower arm, none of these scales being much larger than the largest of the ventrals; anterior scales of femur and tibia smooth, similarly enlarged, gradually diminishing posteriorly and below; scales covering hands and feet above enlarged, perfectly smooth; digital expansion wide, about nineteen lamellæ under second and third phalanges of fourth toe, about thirty-five under the whole toe; tail moderate, slightly compressed, with very indistinct verticils, every ninth or tenth row of scales more vertical but not enlarged, the intervening scales in curving or irregular rows, the whole surmounted by a weakly serrate caudal crest, with five triangular, keeled and pointed scales to a verticil, the first and fifth quite small, the others subequal; skin of gular fan naked, set with distant series of small, flat scales considerably smaller than the ventrals: edge of fan not thickened posteriorly; postanal scales scarcely developed: no distinct nuchal or dorsal folds (in type specimen).

Dimensions.—Head and body, 48 mm.; tail (defective), $47\frac{1}{2}$ mm.; snout to posterior ear, 14 mm.: snout to center of eye, 8.5 mm.: width of head, 9 mm.; fore leg, 22 mm.; hind leg, 40 mm.

Color (in alcohol).—Upper surfaces of head and back plumbeous, turning to pale china-blue above the shoulders and becoming azure blue on the center of the head, deepening to dark cerulean on the occipital scale: some faint gray mottlings, suggesting transverse bars across the back, more prominent on the head where they form a dark interorbital bar and outline the posterior orbital region; a few scattered gray marks on the temporal region; upper parts of legs and tail pale olive gray with faint irregular darker spots and bars; ventral surface pearl gray, the scales powdered with minute black dots; skin of dewlap claret brown on the

sides lightening to buff pink posteriorly and in the center, its scales pearl gray with minute dark dots.

Paratypes.—Three adult specimens, all of them males, were taken at the same time and place as the type (M. C. Z. 37518-9 and U. S. N. M. 95122).

Relationships.—The new subspecies shows its close relationship to *Anolis dominicensis dominicensis* of the mainland of Hispaniola particularly in its coloration, as it lacks the prominent scapular spots and lines which usually characterize the subspecies from Beata and Gonave Islands respectively. The scaling of the tail, the projection of the canthus rostralis and other features separate the Isle Vache species clearly from its neighbors on the mainland.

I take pleasure in naming the subspecies for Miss Julia Adelaide Barbour.

Anolis olssoni Schmidt.

Anolis olssoni Schmidt, Bull. Amer. Mus. Nat. Hist., vol. 41, 1919, p. 522. 1 (M. C. Z. 37521) Anse à Galets, Gonave Id., Apr., 1934.

1 (M. C. Z. 37522) Thomazeau, Haiti, collected by André Audant.

This species was taken at En Café, Gonave Id. by A. J. Poole and W. Perrygo in March, 1929 (U. S. N. M. 76797-8). It is apparently not common on that island.

Audantia, gen. nov.

Diagnosis.—Femoral pores absent; digits dilated and depressed, with smooth transverse lamellæ inferiorly, the distal joint narrower and compressed, raised above the penultimate; lateral teeth tricuspid; tail apparently not prehensile, compressed; tympanum distinct; body somewhat depressed, covered with small keeled granules above, and with imbricate smooth scales below; no nuchal or dorsal crests, and only a very slight serration on the tail. Male with both a transverse and a longitudinal gular fold; the transverse fold sometimes rather indistinct in preserved specimens; the short longitudinal fold often prominent, obscuring somewhat the presence of the transverse fold; sides of neck much wrinkled, with a transverse fold extending downwards in front of the shoulders. A pair of well-developed postanal plates in the male. The genus is named for its collector, M. André Audant, zoologist at the Government Agricultural School at Damien.

Audantia armouri, sp. nov.

Type.—Mus. Comp. Zool. 37523, an adult female from Peak La Selle, Haiti, collected by André Audant.

Description of the type.—Head relatively short and blunt, the distance from anterior corner of eye to tip of snout slightly more than one-half the greatest width of the head (just anterior to the ears); canthus rostralis sharp, composed of three or four keeled scales of which the second is considerably enlarged, the last merging indistinguishably into the superciliary ridge which has two very elongate scales followed posteriorly by a double row of much smaller ones; loreal region slightly concave, with six transverse rows of keeled, rectangular scales, the lowest one continued backwards, completely separating the suboculars from the upper labials; nostrils lateral, somewhat elevated, with four rugose scales between the supranasals; rostral nearly four times as broad as deep, a little narrower than the mentals, incompletely separated from the nasal scales by a row of small scales; frontal region with broad low ridges covered with large, nearly smooth, rhomboidal scales which converge anteriorly and surround a median group of six smaller, very unequal scales; scales of the frontal ridges continuous posteriorly with those of the supraorbital semicircles which are in contact; supraorbital region covered with three longitudinal rows of keeled scales, the inner (largest) row incompletely separated from the supraorbital semicircles by a partial row of small scales, the outer (smallest) row separated from the superciliaries by two or three rows of granular scales; occipital scale moderate in size, separated from the supraorbital semicircles by two scales; eight supralabial scales, each with a deep longitudinal median groove bordered below by a sharp keel in all except the two anterior ones; suture between sixth and seventh supralabials below center of eye; subocular semicircle composed of eight or nine keeled scales, separated from the supralabials by one row of elongate, keeled scales; a pair of triangular mentals closely in contact medially, their outer borders extending slightly beyond those of the rostral; eight or nine smooth infralabials, the first six subequal, the last ones quite small; a row of malar scales, quite distinct anteriorly where they border the mental and infralabials, becoming indistinct posteriorly and merging with the other rows of scales which border the posterior infralabials; temporal region granular; a weak lateral ridge extending from the posterior corner of the eye, covered with a double row of hexagonal scales, some of which are keeled; a group of enlarged, keeled scales in front of the tympanum, which is equal to half the eye-opening at its greatest diameter; no projecting scales on the tympanic border.

Body stout, somewhat depressed, its dorsal surface covered with tubercular granules with the two middorsal rows enlarged and keeled from the shoulder-level almost to that of the groin; no nuchal or dorsal folds; laterals granular, very small, not differentiated from the dorso-laterals; chin covered with rounded granules, large anteriorly, becoming much smaller posteriorly; a heavy gular fold running across the throat and behind the ears and ending in front of the shoulders in numerous heavy, plicate wrinkles, in which the granules are very minute; another fold extending transversely inwards across the front part of the chest; the longi-

tudinal gular fold scarcely apparent in this specimen; the skin between these folds, as well as that of the chest, covered with small, smooth, imbricate scales; scales of the belly also smooth, imbricate, but larger than those of the chest; no femoral or preanal pores; (a pair of prominent enlarged postanal scales in the male); tail compressed, apparently not prehensile, verticillate, with about five rows of smaller, keeled scales between verticils on the side of the tail, and about three enlarged scales to a verticil on top, the profile of these scales appearing very slightly serrate; fore and hind limbs granular above, scales below like those on the belly; digits dilated and depressed, with smooth lamellæ inferiorly, the distal joint narrower and compressed, raised above the penultimate; about 30 transverse lamellæ under the fourth toe. The hind limb being adpressed, the tip of the fourth toe reaches to the center of the eye.

Dimensions.—Snout to vent, 46 mm.; tail (reproduced), 43 mm.; hind leg, 37 mm.; fore leg, 23 mm.; width of body, 14 mm.; depth of body, 10 mm.; width of head, 10 mm.; snout to posterior border of tympanum, 14 mm.

Coloration in alcohol.—Upper surfaces dark sepia, with a paler sepia area along the mid-dorsal region; a wavy clove brown band beginning behind the eyes and running upwards and backwards to fade out at the pale sepia area on the nuchal region; a pair of small clove brown spots anterior to them on the nape; four transverse series of large, irregular, rhombic clove brown spots on the body, the anterior pair the most irregular in outline, the others larger and more definite; a continuation of these paired spots on the tail for a short distance; dark crossbars on upper surfaces of fore and hind limbs; labial scales with a brown spot in the middle of each; throat and ventral surfaces heavily mottled with light and dark drab; scales between the folds across the throat dull burnt umber; a wide band of black turning posteriorly to indigo blue across the anterior half of the belly; lower surfaces of tail dark drab.

The species is named for Mr. Allison V. Armour in recognition of the opportunities for travel and research which he has made possible to many naturalists for many years.

Paratypes.—Another example of this interesting new form, M. C. Z. 37524, accompanied the type specimen, having been given to Dr. Barbour by Monsieur Audant. Two additional specimens, which are the property of the museum at the Agricultural School at Port-au-Prince, have recently been sent to me by M. Audant for examination. In 1927 Dr. A. Wetmore secured four which unfortunately reached the National Museum in poor condition. These are U. S. N. M. 72593-4 from the head of Rivière Choctard, and U. S. N. M. 72598-9 from Morne Cabaio, both localities in Massif de la Selle. An immature individual, now U. S. N. M. 85008 was taken also on Morne La Selle at 7000 feet by Lt. Comder. S. S. Cook in 1932.

Variation.—With a series now numbering nine individuals, some attention may be given to variation. The keeling of the supraocular disks may be distinct, faint or absent. The supraorbital semicircles are fully in contact in four cases, barely touching in one case, and separated by a row of scales in four cases. The number of loreal rows is 4 in one case, 5 in six cases, and 6 in two cases. The lowest loreal row extends backwards, completely separating the subocular from the upper labials in four examples; the separation is partial in one instance, and the lowest loreal row stops anterior to the subocular in the remaining four. There may be 5, 5½ or 6 upper labials to a point beneath the center of the eye. The lamellæ under the fourth toe vary between 27 and 31. In three of the lizards the longitudinal gular fold is the more apparent, partly or almost completely obscuring the transverse fold. In one, the transverse and the longitudinal folds are equally prominent. In one specimen, the type, the transverse fold is by far the more apparent. The other four examples, including the two males, were too badly preserved in the region of the throat to show any characters there. The degree to which either the longitudinal or the transverse fold shows apparently depends a great deal on the preservation.

The two males (U. S. N. M. 72593 and 72594), having a pair of prominent, enlarged postanals, measure 44 mm. and 59 mm. respectively from snout to vent. The five females are between 43 mm. and 50 mm., while the two young specimens without enlarged postanals (U. S. N. M. 72599 and 85008) are 36 mm. and 37 mm. respectively from snout to vent.

The verticils on the tail are only slightly apparent in any of the specimens. Each verticil is composed of a straight vertical row of somewhat enlarged and more regular scales, preceded by four or five very irregular, curving and sometimes incomplete rows of scales.

The four transverse sets of two or three dark rhombic or quadrangular spots on each side of the mid-dorsal region are evident in most of the specimens. In two, the spots are reduced to several narrow, elongate, dumbbell-shaped marks which join across the back, with the wide light dorsal stripe very apparent. In one young example, U. S. N. M. 72599, the light dorsal stripe is bordered on each side by two dark stripes which do not yet show a tendency to break up into rhombs or squares.

Relationships.—While the possession of dilated toes allies the new genus indisputably to *Anolis* and its close relatives, the squat flattened body and the wrinkles on the side of the neck suggest at first glance a *Leiocephalus* or a *Plica*, to neither of which genera can *Audantia* be truly closely related. The possession of the transverse gular folds might suggest a closer correlation to *Deiropyx*, but as a matter of fact these two genera do not resemble one another closely when actually seen together.

In body build, as well as somewhat in coloration, *Audantia armouri* is slightly suggestive of *Anolis cybotes cybotes* also of Hispaniola, but there the resemblance ends, for the well-developed longitudinal gular fold of

the latter, as well as its distinctly verticillate tail and many other details, separate them readily.

Audantia is the third new genus of lizard to be described from Haiti in the past seven years, and one of the two others (*Wetmorena*) also came from Massif de la Selle.

***Leiocephalus melanochlorus* Cope.**

Leiocephalus melanochlorus Cope, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 184.

31 (M. C. Z. 37525-34) Isle Vache, Haiti, Apr. 12, 1934.

Numerous examples of this species were collected on Isle Vache in 1930 by L. H. Parish and W. Perrygo, but even with the help of so large a series it has not yet been possible to distinguish any features which would separate the Isle Vache lizard from the one on the Hispaniolan mainland.

***Leiocephalus personatus aureus*, subsp. nov.**

Diagnosis.—Anterior part of snout much swollen (in adult male), appearing highly convex when seen in profile; no lateral fold; three scales between rostral and supraocular ring; frontals and prefrontals smooth; frontals separated from canthals by a wedge-shaped scale; throat with a series of about four regular transverse rows of spots running across it, the posterior ones continued as stripes onto the labials and nearly to the upper part of the head; under surfaces of legs and tail gamboge yellow.

Type.—An adult male, U. S. N. M. 75909, from Jaemel, Haiti, collected by J. S. C. Boswell in 1928.

Description of the type.—Headshields enlarged, the posterior distinctly ridged, the anterior smooth; anterior part of snout much swollen (in adult male), appearing highly convex when viewed in profile; three scales (an internasal and 2 prefrontals) between the rostral and the supraorbital ring; posterior prefrontals much the larger; nasals in contact with rostral; internasals in contact with each other behind rostral, broader than long; prefrontals separated from the canthals by a wedge-shaped scale; two heavy, rounded canthal scales followed by four elongate superciliaries; six distinctly ridged supraoculars, the posterior one quite small, separated from the superciliaries by one row of small keeled scales; occipital very small, bordered by two distinct pairs of parietals on each side, the inner about eight times the area of the occipital and about one-third that of the outer pair; no distinctly enlarged latero-nuchals beyond the outer parietals; three very elongate upper and five lower labials to a point below the center of the eye; temporal scales increasing posteriorly in size, the last one (just above and in front of the ear), abruptly larger and very conspicuous; anterior border of the ear with three large, coarse, projecting scales. Dorsal

scales large, imbricate and moderately mucronate; laterals considerably smaller than the dorsals; ventrals equal to dorsals in size, smooth, their posterior edges denticulate; about 44 scales around middle of body; about 48 scales from occiput to a point directly above the vent; about 11 dorsal scales the equivalent of the distance from snout to occiput; nuchal scales small, those on the sides of the neck like the dorsals, those behind the ear keeled and imbricate, not granular. Shoulder folds present; no lateral folds. The adpressed hind limb reaches almost to the posterior corner of the eye. Digits compressed; the fourth toe with 23 tricarinate lamellæ. A distinct crest beginning on the occiput, moderately developed on the back and becoming a little higher on the proximal part of the tail; the other caudal scales mucronate and keeled above, smooth below; no verticils. The keels of the lateral and dorsal scales are directed upwards and backwards, so that the scale rows converge on the posterior part of the back; the convergence is less pronounced anteriorly. Tail somewhat compressed proximally, so that its section would appear squarish. A pair of enlarged postanals in the male.

Dimensions.—Snout to vent, 68 mm.; head to posterior ear, 17 mm.; tail (reproduced) 82 mm.; fore leg, 25 mm.; hind leg, 40 mm.; width of head, 14 mm.

Color in alcohol.—Body color dull sage green above, with a wide light dorso-lateral stripe beginning behind the eye, running above the ear and continuing along the sides onto the tail; this light stripe bordered above and below by wide sepia stripes; scarcely any traces of dorsal crossbars in the adult male; throat indigo blue with a series of about four regular transverse rows of spots running across it, the posterior ones continued as stripes onto the labials and nearly to the upper part of the head; mental and rostral shields with pale buff immaculate borders; chest and belly wax yellow, the under surfaces of fore and hind legs and tail deepening to gamboge yellow; sides of body dull indigo with some brighter china-blue scales edged with sepia; no spots or bars on posterior part of body or tail or on upper parts of limbs (in adult male); no dark axillary spots; top of head and loreal region dull drab with a powdering of minute gray dots.

Paratypes.—Four other adults, U. S. N. M. 75910-13, and two young ones, U. S. N. M. 75914-5, were collected at the same place and time as the type specimen. Four fine half-grown individuals, now M. C. Z. 37535-8, were taken at Jacmel, the type locality, by M. André Audant. An example from the Artibonite Valley, Haiti, U. S. N. M. 75916, collected by J. S. C. Boswell also appears to belong to this subspecies although it may represent an intergrading form.

Relationships.—Because of the peculiarly swollen nose, this new subspecies strongly suggests its close neighbor *Leiocephalus personatus* per-

sonatus, which likewise has a highly convex profile in the adult male. But the new subspecies is even more suggestive of the one found on Beata Island, *Leiocephalus personatus beatus*, for both have essentially the same coloration—wide dark and light stripes on the body without crossbands in the adult, and with the spots on the chin arranged regularly in transverse rows which continue on the sides of the head. The hind legs and tail of the Beata lizard are suffused with a brilliant cadmium orange or cinnamon, while these regions of the Jaemel lizard are similarly but less vividly colored with gamboge. The coloring everywhere is brighter in the Beata lizard, and the dark crossbars in that race occur not only on the throat but well back onto the chest also, unlike the condition in the new subspecies.

***Leiocephalus personatus beatus* (Noble).**

Leiocephalus beatus Noble, Amer. Mus. Novit., No. 64, Mar. 29, 1923, p. 5.

15 (M. C. Z. 37539-50) Beata Id., Dominican Republic, Apr. 11, 1934.

Freshly preserved examples of this handsome species are easily distinguishable from its allies in color characters alone.

***Leiocephalus personatus louisæ*, subsp. nov.**

Diagnosis.—No lateral fold; three scales between rostral and supraocular ring; frontals and prefrontals rugose; throat with numerous scattered black crescentic spots, each extending over one or two scales; hind leg reaching to between ear and eye; dorsal scales relatively small, about 15 in a head-length.

Type.—An adult male, M. C. Z. 37551, from Saona Island, Dominican Republic, collected April 8, 1934, by the *Utowana* Expedition.

Description of the type.—Head shields enlarged, the anterior slightly rugose, the posterior ones more strongly ridged; three scales (an internasal and 2 prefrontals) between the rostral and the supraorbital ring; posterior prefrontals much the larger; nasals in contact with rostral; internasals somewhat elongate, barely separated from each other by the first of a series of three median scales; prefrontals separated from the canthals by a wedge-shaped scale; two heavy, rounded canthals followed by three long and narrow superciliaries which precede a short one and a longer terminal one; six distinctly ridged supraoculars separated from the superciliaries by two irregular rows of small keeled scales, and from the frontals by a single, quite regular row of scales; occipital small, bordered by two distinct pairs of parietals on each side, the outer the smaller; the inner parietal plate about four times the size of the occipital, and in contact with its fellow behind the occipital; a group of five or six small latero-

nuchal scales, none of them more than one-fourth the area of the outer parietal; four upper labials to a point below the center of the eye; middle of fifth lower labial under center of eye; temporal scales gradually increasing in size, the last one, just above and in front of the ear, the largest and most conspicuous; anterior border of the ear with five coarse projecting scales, the middle ones the largest. Dorsal scales moderate in size, imbricate and mucronate; laterals somewhat smaller than the dorsals; ventrals considerably larger than the dorsals, smooth, their posterior edges denticulate; about 48 scales around the middle of the body; about 58 scales from the occiput to a point directly above the vent; about 15 dorsal scales the equivalent of the distance from snout to occiput; nuchal scales small, those on the sides of the neck like the dorsals, those behind the ear keeled and imbricate, not granular. Shoulder folds present; no lateral folds. The adpressed hind limb reaches to half-way between the ear and the eye. Digits compressed, the fourth toe with 24 tricarinate lamellæ. A pronounced crest beginning on the occiput, equally developed on the back and on the proximal part of the tail; the other caudal scales mucronate, keeled above, faintly keeled below; no verticils. The keels of the lateral and dorsal scales are directed upwards and backwards so that the scale rows converge strongly on the back. Tail (stump) slightly compressed. A pair of enlarged post-anals in the male. Size rather small.

Dimensions.—Snout to vent, 55 mm.; head to posterior ear, 15 mm.; tail incomplete; fore leg, 22 mm.; hind leg, 41 mm.; width of head, 12 mm.

Coloration in alcohol.—Body color pea green above, with a prominent dorso-lateral light stripe beginning on the upper temporal region and continuing to the end of the body where it gradually fades out; the dorsal scales between these light stripes mottled with dark sage green, with traces of black pale-edged crossbands appearing on neck and above shoulders; a pale olive-buff lateral stripe beginning on the loreal region, continuing beneath the eye and through the ear, and gradually fading out in the groin; the area between the lateral and dorso-lateral light stripes sepia, with many of the scales tipped with cadmium orange or turquoise blue; four or five irregular black spots in the anterior part of this sepia stripe, the foremost covering the scales over the ear, the last one above the shoulder, followed by a small black axillary spot; top of head pale drab, immaculate, except for a pair of sepia spots on the outer parietals; labials pale olive buff clouded with drab, with a few sepia spots near the commissure of the lips and on the sutures of the lower labials; mental and rostral shields drab; ventral surfaces pale blue, deepening in color on the belly; throat with numerous scattered black crescentic spots, each extending over one or two scales; region about groin and under surface of tail heavily spotted with cadmium orange, with this same color appearing in some of the lateral scales together with turquoise blue; upper part of limbs sage green suffused with gray mottlings, the forearms with black spots on the elbows;

the crest of the tail sage green mottled with turquoise blue, the other caudal scales suffused with dull orange.

Paratypes.—There are four paratypes, including two young, taken at the same time and place as the type (M. C. Z. 37552-4, and U. S. N. M. 95117).

Relationships.—This subspecies is undoubtedly derived from the recently described *Leiocephalus personatus lunatus*¹ which lives on the mainland near Santo Domingo City, as the peculiar pattern on the throat and sides of neck testifies. But the spotting on the throat is not so heavy in the subspecies from Saona Island, nor are the spots on the side of the neck so regular in shape. The mainland form is larger in size, while the scales appear to be more mucronate.

I take pleasure in naming the new Saona subspecies for Miss Louisa Bowditch Barbour.

Leiocephalus schreibersii (Gravenhorst).

Pristinotus schreibersii Gravenhorst, Nova Acta Acad. Caes. Leop.-Carol., vol. 18, pt. 2, 1838, p. 739, pl. 54, figs. 15-16.

45 (M. C. Z. 37555-64) Isle Tortue, Haiti, Apr. 2-3, 1934.

1 (M. C. Z. 37565) Jaemel, Haiti, collected by André Audant.

This species has been known to occur on Isle Tortue ever since 1917 when Dr. W. L. Abbott took it there (U. S. N. M. 59442-54). It appears to be as abundant on the islands north of Haiti as does its ally *Leiocephalus melanochlorus* on Isle Vache off the south coast of Haiti.

Family Anguidæ.

Wetmorena haetiana Cochran.

Wetmorena haetiana Cochran, Proc. Biol. Soc. Washington, vol. 40, June 30, 1927, p. 91.

1 (M. C. Z. 37566) Peak La Selle, Haiti, collected by André Audant.

This, and one other recently loaned to me by M. André Audant, are the only examples known to have been taken since the original series of 5 individuals was secured by Dr. Wetmore on April 10, 1927.

Family Teiidaë.

Ameiva rosamondæ, sp. nov.

Diagnosis.—Eight rows of ventral plates; caudal scales oblique, distinctly keeled above, smooth on sides and bottom of tail; nostril anterior to the

¹A new lizard, *Leiocephalus personatus lunatus*, from the Dominican Republic, by Doris M. Cochran. Oec. Papers Boston Soc. Nat. Hist., vol. 8, July 13, 1934, p. 153.

nasal suture; three large supraoculars, the first not in contact with loreal; a black dorso-lateral band beginning behind the eyes, widening greatly on the body and continuing on the tail; no light spots except on anterior surface of femur; 40 lamellæ under the fourth toe; 25 scales in the fifteenth verticil of the tail.

Type.—An adult, M. C. Z. 37567, from Saona Island, Dominican Republic, collected on April 8, 1934, by the *Utowana* Expedition.

Description of the type.—Profile of head flat on top, curved only at the very end of the snout; nostril anterior to the nasal suture; rostral forming a right angle behind; anterior nasals broadly in contact behind the rostral; frontonasal as long as wide, narrowly in contact with the large loreal; prefrontals broadly in contact; frontal in contact with three supraoculars on each side; three large supraoculars, the anterior one not touching the loreal; a very minute scale behind the third supraocular; frontoparietals in close contact with the third supraocular; seven superciliaries, the three anterior ones on the left side in contact with the first supraocular, the two anterior on the right; the remaining superciliaries separated from the posterior supraoculars by a row of granules; two frontoparietals, followed by a transverse row of five subequal occipitals, these in turn being followed by three rows of irregular post-occipitals; ear-opening large; five upper labials to a point directly beneath the center of the eye, the third and fourth the longest; the keeled subocular nearly reaching to the lip between the fifth and sixth supralabials; first infralabial very minute; sixth infralabial under center of eye; the wedge of granular scales on the chin extending to the posterior border of the first pair of chin shields, which are nearly completely in contact; chin and throat covered with granular scales, with a patch of enlarged scales in the middle; mesoptychium covered with two rows of rather regular, enlarged scales bordered by one or two smaller rows. Dorsal scales granular, uniform, 37 in the standard distance (from tip of snout to center of eye); laterals similar but smaller. Ventral plates in eight longitudinal series bounded by two very small external series, and in 35 transverse series; brachials and antebrachials well separated; six wide straplike scales across the forearm; post-brachials present as a group of three or four larger and several smaller scales at the elbow, all the post-brachials considerably larger than the dorsal granules; femoral pores 18; anterior face of thigh covered with five or six rows of flat scales; two tibial rows, the external row composed of four scales, the second and third very large; no enlarged postanals; a pair of enlarged plates at the anterior border of the anus and two single median scales in front of them, the anterior the smaller; 25 scales in the fifteenth verticil of the tail. The hind leg being adpressed, the fourth toe reaches to the anterior edge of the tympanum. Hands and feet long and slender, the small 'combs' very evident on the toes; fourth toe with 40 lamellæ beneath it; fifth toe longer than first. Tail (reproduced) slender, long, almost square in section in its

proximal half; the scales obliquely set, strongly keeled above, becoming keeled to smooth on the sides, smooth below.

Dimensions.—Head and body, 100 mm.; tail (reproduced), 199 mm.

Coloration in alcohol.—Ground color lilac-gray on the back, washed with fawn color on the head and turning to pale blue and glaucous-blue on the tail; a black dorso-lateral band beginning behind the eyes, widening greatly on the body and continuing on the tail; this black band edged below by a narrow light area which becomes a definite white stripe in the groin and breaks up on the anterior surface of the femur into a number of light spots but continues down the tail as a definite stripe; lower half of loreal, labials and throat orange-buff lightening to buff-yellow on the center of the throat; rest of under surfaces of body and limbs glaucous-blue suffused anteriorly with cream color; tail azure blue beneath, with a black stripe on each side beginning a short distance behind the anus and fading out before the middle of the tail is reached.

Relationships.—The new species at once suggests *Ameiva barbouri* in its striking coloration, and this relationship is fully borne out by details of scalation. They both have eight⁸ longitudinal rows of ventral plates (in my original diagnosis of *Ameiva barbouri*, there were said to be ten rows, but the number is afterward correctly stated in the complete description), the caudal scales are oblique and keeled, and both have three large supra-oculars. The new species differs from *barbouri* in having a longer fourth toe, a greater number of scales around the tail, a wider black dorso-lateral band, and in being somewhat larger in size.

The new species is named for Mrs. Barbour. Dr. Barbour saw but two individuals of this beautiful species. They were excessively shy and he secured the unique type with great difficulty on account of its being almost impossible to use a collecting gun in the very dense, thorny scrub.

Ameiva chrysolæma chrysolæma (Cope).

Ameiva chrysolæma Cope, Proc. Acad. Nat. Sci. Philadelphia, vol. 20, 1868, p. 127.

34 (M. C. Z. 37568-77) Anse à Galets, Gonave Id, Apr. 9, 1934.

Ameiva chrysolæma abbotti (Noble).

Ameiva abbotti Noble, Amer. Mus. Novit., No. 64, Mar. 29, 1923, p. 1.
5 (M. C. Z. 37578-82) Beata Id, Dominican Republic, Apr. 11, 1934.

Ameiva chrysolæma woodi, subsp. nov.

Diagnosis.—Scalation similar to that of *Ameiva chrysolæma chrysolæma*, but with usually ten subequal longitudinal ventral rows and with a row

of small scales as the only traces of the two additional rows which are well developed in the typical form; a wide black dorso-lateral stripe invaded by spots of the ground color, these spots tending to form vertical bars by running together, making a rather prominent series of irregular vertical bars when this pattern is fully carried out.

Type.—An adult male, M. C. Z. 37583, from Isle Tortue, Haiti, collected on April 3, 1934, by the *Utowana* Expedition.

Description of the type.—Profile of head flat on top, curved at the end of the snout; nostril anterior to the nasal suture; rostral forming a right angle behind; anterior nasals broadly in contact behind the rostral; frontonasal as wide as long, narrowly in contact with the large loreal, very broadly angulate in front; prefrontals broadly in contact; frontal in contact with the two anterior preoculars; three large preoculars, the anterior one not touching the loreal, the third partly separated from the frontoparietal by granules; seven superciliaries, the first two in contact with the first supraocular, the remaining superciliaries separated from the other supraoculars by two rows of granules; two frontoparietals followed by a transverse row of five occipitals, the median one much smaller than the two adjoining it, these in turn followed by about three rows of very unequal post-occipitals; ear-opening large; the sixth (last) supralabial below the center of the eye, the third and fourth the longest; sixth lower labial also directly below the eye, the third and fourth the longest; the wedge of granular scales on the chin scarcely entering between the first pair of chin shields, which are in contact for three-fourths of their length; chin and throat covered with granular scales, only slightly enlarged on the central gular region; mesoptychium covered with one or two irregular rows of enlarged scales, bordered by some successively smaller ones. Dorsal scales granular, uniform, about 60 in the standard distance from tip of snout to center of eye; laterals similar but smaller. Ventral plates in ten longitudinal series bounded by two exceedingly small external ones, and in 38 transverse series; brachial scales conspicuously enlarged, in three or four fairly regular rows, the longest of these rows having about a dozen scales, each about as wide as long; three or four conspicuously widened post-brachial scales surrounded by smaller scales soon merging with the surrounding granules; antibrachials in about three rows of enlarged scales, the median the widest, having four or five large straplike scales across the wrist; brachials and antibrachials separated by numerous small scales; femoral pores 21 (left) and 22 (right); anterior face of thigh covered with eight or nine rows of enlarged flat scales; 4 tibial rows, the external row composed of six scales of which the second and third (proximal) are much larger than the others; no enlarged postanals; four enlarged plates at the anterior border of the anus, the median pair the largest, with a single large scale in front of these and a smaller single scale preceding it; 40 scales in the fifteenth verticil of the tail. The hind leg being ad-

pressed, the fourth toe reaches to the posterior edge of the tympanum. Hands and feet long and slender; the small combs very evident on the toes; fourth toe with 42 lamellæ beneath it; fifth toe slightly longer than first. Tail (reproduced) nearly twice the length of head and body, rather depressed in its proximal portion, the scales straight, keeled above and on the sides, smooth below proximally.

Dimensions.—Head and body, 125 mm.; tail (reproduced), 233 mm.

Color in alcohol.—Ground color pea green to dull china-blue above, with a wide black dorso-lateral stripe invaded by spots of the ground color which tend to form vertical bars by running together, making a rather prominent series of irregular vertical bars when this pattern is fully carried out; four dark dorsal stripes, much narrower than the lateral stripes, the inner pair quite indistinct anteriorly, the outer pair with a row of light spots appearing posteriorly; upper surface of tail china blue with rather regular black spots; lower lips immaculate pale china-blue; sides of head, chin and ventral surfaces french-gray, suffused with olive-buff on the belly, legs and tail. A few light turquoise blue spots on the anterior forearm and tibia, as well as on the edges of the ventral plates; posterior thigh and upper part of tibia with a dark reticulation.

Paratypes.—There are 34 paratypes (M. C. Z. 37584-92 and U. S. N. M. 95127-32) of all ages taken on April 2-3, 1934, at the same place as the type. In addition, a rather mutilated specimen taken by Dr. W. L. Abbott on Isle Tortue on January 31, 1917, represents this subspecies, although its pattern is not fully developed, while the outer ventral row is composed of scales larger than those of most of the paratypes taken by the *Utowana* party.

Relationships.—The color pattern of more or less vertical bars on the black dorso-lateral stripe distinguishes the new species both from *c. abbotti*, an entirely spotted form, and from *c. chrysolema*, in which the spots have not taken so regular an arrangement across the dark stripes. It appears to be very close to *c. chrysolema*, however, in most other characteristics.

Named in honor of Corey F. Wood, Esq., for long years the American Consular agent at Cap Haïtien, who was a guest on the *Utowana*. His hospitality at Cap Haïtien greatly facilitated Dr. Barbour's collecting in that area.

***Ameiva tæniura* Cope.**

Ameiva tæniura Cope, Proc. Acad. Nat. Sci. Philadelphia, vol. 14, 1862, p. 63.

♂ (M. C. Z. 37593-4) Cap Haïtien, Haiti, Mar. 31, 1934.

Family Amphisbænidae.

Amphisbæna innocens Weinland.

Amphisbæna innocens Weinland, Abh. Senckenb. Naturf. Ges. (Frankfurt-a-M.) vol. 4, pt. 2, 1863, p. 137, pl. 5, fig. 2.

3 (M. C. Z. 37595-7) Thomazeau, Haiti, collected by André Audant.

SUBORDER SERPENTES.

Family Boidæ.

Epicrates fordii (Günther).

Pelophilus fordii Günther, Proc. Zool. Soc. London, 1861, p. 142.

1 (M. C. Z. 37601) Cap Haïtien, Haiti, Mar. 31, 1934.

There are about 70 dorsal spots on the body, much fused posteriorly, in this fine specimen of one of the rarest of the boid snakes. It has 36 scalerows at mid-body; 256 ventrals; an undivided anal; caudals 53 + missing tip; upper labials 12.

Epicrates striatus (Fischer).

Homalochilus striatus Fischer, Abh. Nat. Ver. Hamburg, vol. 3, 1856, p. 102, pl. 2, figs. 2a-2b.

1 (M. C. Z. 37598) Cul de Sac, Port-au-Prince, Haiti, collected by A. Audant.

Scale rows 55; ventrals 284; an undivided anal; caudals 51 +; upper labials 15 (right) and 16 (left); ocular ring complete on both sides (!); anterior prefrontals and supraoculars normal; posterior prefrontals broken up into very irregular small scales; 'frontal' represented by two scales between the supraoculars; loreal undivided, with two scales between it and the upper labials. Lateral dark band breaking up into very regular spots on the neck, continuing on anterior third of body before enlarging and becoming irregular or indistinct.

Tropidophis maculatus hætianus (Cope).

Unqualia hætiana Cope, Proc. Amer. Philos. Soc., vol. 18, 1879, p. 273.

2 specimens (M. C. Z. 37602-3) Isle Tortue, Haiti, Apr. 12, 1934.

The darker specimen (M. C. Z. 37602), partly mutilated, has 27 scale-rows, 190 ventrals, an undivided anal, 36 caudals, 10 upper labials, one pre- and three postoculars, and dorsal spots between 55 and 58, being unequally fused on the right and left sides.

The lighter one (M. C. Z. 37603) has 27 scale rows, 185 ventrals, an undivided anal, 39 caudals, 10 upper labials, one pre- and three postoculars, and between 51 and 55 dorsal spots.

Neither has an interparietal. In the dark specimen, both pairs of prefrontals are distinct on the left side, but appear to be fused on the right. In the lighter specimen, both pairs of prefrontals are completely fused on both sides. The lighter one has a few enlarged mid-dorsals on the posterior part of the back; the dark one does not have any conspicuously enlarged dorsals anywhere.

Family Colubridæ.

Uromacer catesbyi (Schlegel).

Dendrophis catesbyi Schlegel, Phys. Serp., vol. 2, 1837, p. 226.

3 (M. C. Z. 37604-6) Cap Haïtien, Haiti, Mar. 31, 1934.

1 (M. C. Z. 37607) Isle Tortue, Haiti, Apr. 2, 1934.

16 (M. C. Z. 37608-23) Isle Vache, Haiti, Apr. 12, 1934.

1 (M. C. Z. 37599) Cul de Sac, Port-au-Prince, Haiti, collected by A. Audant.

Uromacer dorsalis Dunn.

Uromacer dorsalis Dunn, Proc. New England Zool. Club, vol. 7, Jan. 20, 1920, p. 43.

3 (M. C. Z. 37624-6) Anse à Galets, Gonave Id., Apr., 1934.

Uromacer frenatus (Günther).

Ahætulla frenata Günther, Ann. Mag. Nat. Hist., (3), vol. 15, 1865, p. 94, pl. 2, fig. B.

16 (M. C. Z. 37627-42) Isle Vache, Haiti, Apr. 12, 1934.

Uromacer oxyrhynchus Duméril and Bibron.

Uromacer oxyrhynchus Duméril and Bibron, Erp. Gén., vol. 7, 1854, p. 722, pl. 83, fig. 1.

3 (M. C. Z. 37643-5) Isle Tortue, Haiti, Apr. 2, 1934.

18 (M. C. Z. 37646-63) Cap Haïtien, Haiti, Mar. 31, 1934.

1 (M. C. Z. 37600) Cul de Sac, Port-au-Prince, Haiti, collected by A. Audant.

Hypsirhynchus ferox Günther.

Hypsirhynchus ferox Günther, Cat. Col. Snakes Brit. Mus., 1858, p. 49.

3 (M. C. Z. 37664-6) Carrefour, Haiti, collected by André Audant.

Alsophis anomalus (Peters).

Zamenis anomalus Peters, Monatsber. Berlin Akad. Wiss., 1863, p. 282.
1 juv. (M. C. Z. 37667) Isle Tortue, Haiti, Apr. 2, 1934.

Scales 21, ventrals 213, anal divided, caudals 126, upper labials 9 (right) and 8 (left), one pre- and three postoculars. Its headscales are similar in every respect to those of U. S. N. M. 49934 from Santo Domingo City, the latter slightly larger and albinistic in color. In the M. C. Z. specimen, faint dark narrow crossbars are visible posteriorly, with even fainter suggestions of chevron-shaped blotches on the neck and anterior part of body. The head shields have very narrow dark margins. The entire under surface is pale, with a powdering of gray dots across the posterior border of each ventral.

Dromicus parvifrons rosamondæ, subsp. nov.

Diagnosis.—Melanistic in coloration, the dorso-lateral line being reduced to a pale straight stripe through the middle of the sixth scale row on the body, widening slightly on the neck to embrace the lower part of the seventh scale row; each scale of the outer row of dorsals with a large black spot; a similar spot on the outer ends of the ventrals; ventrals 148-153; caudals 115-131.

Type.—An adult male, M. C. Z. 37668, from Isle Vache, Haiti, collected April 12, 1934, by the *Utowana* Expedition.

Description.—Rostral broader than deep; internasals slightly shorter than prefrontals; length of frontal slightly exceeds its distance from the end of the snout, a little shorter than the parietals, separated from the preocular; supraocular about two-thirds as wide as the frontal; nasal divided, a little longer than its distance from the eye; loreal moderate in size, rectangular, a little broader than deep; one preocular; two postoculars, the upper the larger; temporals 1 + 1 on the right side, 1 + 2 on the left; 8 upper labials, the second in contact with the posterior nasal and loreal but not reaching the preocular, the third, fourth and fifth entering the eye; 10 lower labials, five in contact with the anterior chin shields and two with the posterior ones, which are slightly larger than the anterior; scales in 19 rows, without pores; ventrals 149; anal divided; caudals 131.

Color (in alcohol).—Top and sides of head and body black; a pale blue dorso-lateral stripe beginning rather indistinctly on the canthus rostralis, continuing above the eye and through the temporal scales, and becoming much more distinct on the sides of the neck, where it occupies the upper part of the sixth and the lower part of the seventh scale rows, and narrowing on the body to some elongate white spots down the middle of the sixth scale row, with some fainter pale marks on the upper margins of

the fifth scale row; the black dorsal area, which is $\frac{1}{2} + 7 + \frac{1}{2}$ scales wide, showing traces of a pair of very narrow broken white lines composed of the white margins between the eighth and ninth scale rows (in the type specimen), these broken lines very faint on the neck, more pronounced on the anterior part of the body but disappearing completely at mid-body; labials pale china-blue, lightening on chin, this color darkening on belly where it becomes heavily suffused with indigo; a remnant of a pale lateral stripe from the labials along the sides of the neck on the second and third scale rows, and another on the lower half of the first scale row, both these fading out on the first third of the body; a large black spot at the outer border of each ventral plate, also continued on the tail nearly to its end; a median series of indistinct black spots on the third to the seventeenth ventrals, thereafter appearing as a pair of black spots gradually diverging from the center posteriorly and becoming quite small and indistinct just anterior to the vent; tail black above, with a faint continuation of the light dorso-lateral stripe; lower part of tail pearl gray with a mottling of small indigo spots.

Dimensions.—Head and body, 406 mm.; tail, 301 mm.

Paratypes.—There are five additional specimens, M. C. Z. 37669-72 and U. S. N. M. 95116, taken at the same time and place as the type. In addition, U. S. N. M. 80919 was taken on Isle Vache by C. R. Oreutt on June 5, 1929. A badly spoiled specimen, U. S. N. M. 84292, also from Isle Vache, was taken by L. H. Parish and W. Perry in 1930.

Variation.—The specimens are uniformly melanistic, and the width of the dorso-lateral light stripe is greatly reduced in all of them, so that by this color character alone this subspecies may be told from all the other related forms inhabiting Hispaniola and its neighboring islets. The traces of a pair of narrow intermediate white lines are almost lacking in two of the paratypes, and are less distinct in the three others than in the type. In two of the paratypes the dorso-lateral light stripe occurs only on the sixth scale row on the neck.

The ventrals vary between 148 and 153, the caudals between 115 and 131. A decided tendency towards having a single scale in the second temporal series is noticeable, since two of the paratypes resemble the type in having a single scale on one side of the head, one paratype has a single scale on both sides of the head, while only two specimens have the normal temporal count of $1 + 2$ scales on both sides.

Relationships.—The amount of melanism in the new subspecies from Isle Vache places it between *D. p. lincolni* which has the light stripes more undulating, and *D. p. niger*, in which the stripes are almost entirely lacking. In position the stripes on the sixth, or sixth and seventh, scale rows correspond to those of *D. p. tortuganus*. And in its low scale-count, the new subspecies seems to agree with some of the snakes in the subspecies

protenus having the lowest scale-counts. Its tendency towards having a single scale in the second temporal series is a character peculiar to this subspecies. It is on the whole an easily recognizable form.

I take pleasure in naming this new subspecies in honor of Mrs. Thomas Barbour.

***Dromicus parvifrons protenus* (Jan).**

Dromicus protenus Jan, Icon. Gén., vol. 25, 1867, pl. 3, fig. 2.

2 (M. C. Z. 37673-4) Cap Haïtien, Haiti, Mar. 31, 1934.

1 (M. C. Z. 37675) Thomazeau, Haiti, collected by A. Audant.

1 (M. C. Z. 37676) Cul de Sac, near Port-au-Prince, Haiti, collected by A. Audant.

***Dromicus parvifrons tortuganus* (Dunn).**

Leimadophis tortuganus Dunn, Proc. New England Zool. Club, vol. 7, Jan. 20, 1920, p. 40.

7 (M. C. Z. 37677-81 and U. S. N. M. 95114-5) from Isle Tortue, Haiti, Apr. 2, 1934.

***Ialtris dorsalis* (Günther).**

Philodryas dorsalis Günther, Cat. Col. Snakes Brit. Mus., 1858, p. 126.

1 (M. C. Z. 37682) Isle Vache, Haiti, Apr. 12, 1934.

Scales 19, ventrals 189, anal divided, caudals 68+, upper labials 7, oculars 1 + 2, temporals 1 + 2. About ten regular black blotches on the neck and anterior part of the body. Black W-mark very conspicuous on parietals. Labials each with a round black spot; chin and anterior ventrals also spotted, the spots soon changing to a dark edge on each ventral.



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NEW *GEOCAPROMYS* FROM THE BAHAMAS.

BY BARBARA LAWRENCE.

LAST year the Antillean cruise of the Research Yacht *Utowana*, belonging to Mr. Allison V. Armour, enabled Mr. James C. Greenway to procure an excellent series of skins and skulls, topotypes of *Geocapromys ingrahami*, from East Plana Cay in the Bahamas. This year another expedition was fortunate in securing for study much additional material from caves on Great Abaco Island, on the Little Bahama Bank, from two widely separated parts of the Great Bahama Bank, Eleuthera and Long Islands, and from Crooked Island, one of a third small, but distinct, group of islands between the Great Bank and the Plana Cays. Remains of short-tailed hutias are numerous amongst these bones. They were undoubtedly used as food by the aborigines and probably were common over all three of these island groups. Distribution was evidently at an early date, allowing time for local differentiation. I have found two very distinct new forms, related to *ingrahami* but differing in size and skull proportions. Curiously, remains of the long-tailed *Capromys* are entirely absent from the material examined, implying that it may never have occurred on these islands. All of the material was secured in the course of anthropological excavations by Mr. Froelich Rainey, an Associate Anthropologist of the Peabody Museum at Yale University, who was in charge of excavations carried on during the expedition of 1933-1934 of the *Utowana*. Mr. Armour has shown his interest in the advancement of scientific knowledge by making possible many voyages to the West Indies.

A few bones of domestic sheep, a skull of *Otopterus* and a

few remains of *Rattus rattus alexandrinus* were also found as recent intrusives. Skeletal parts of the hutia include numerous long bones, pelvic girdles, scapulæ, some ribs and vertebræ as well as many lower jaws, palates, a few cranial fragments, and a few fairly complete anterior portions of the skull. The material is sufficient to prove conclusively the existence in this area of two easily recognizable and hitherto undescribed forms. As might be expected, they are most closely related to typical *ingrahami*. Of the undescribed forms the more southerly may be known as

***Geocapromys ingrahami irrectus*, subsp. nov.**

Figure 2.

Type.—Right ramus of adult lower jaw, M. C. Z. no. 2107, from 'burial cave no. 1,' Gordon Hill Caves, Crooked Island, Bahamas, collected by Froelich Rainey.

Description.—Differs from typical *ingrahami* in the longer tooth row and greater individual width of the teeth, and in the markedly shorter and rather more orange-colored lower incisors. Lower alveolar length, 16.45 mm.; width of the lower molars: m_2 , 4.3 mm.; m_3 , 3.95 mm.

Size difference is always an uncertain characteristic in octodont rodents. In this particular case, however, a large series of lower jaws of both typical *ingrahami* and *irrectus* is available. Those of *ingrahami* are fully adult with a well-developed keel at the posterior end of the alveolar row, and yet seem to equal in size the youngish individuals of *irrectus* in which the keel is but slightly developed and the bone in this region rather porous. It is quite significant that in spite of the larger size of *irrectus* the exposed portion of the lower incisors is very markedly shorter than in *ingrahami*. Topotypical cranial material shows other important differences. The skull as a whole is larger in the Crooked Island hutia. Proportionally the length of the frontals is greater and the zygomatic arch (as measured from the posterior angle of the squamosal to the maxillo-premaxillary suture in front of the zygomatic root) is longer. The condition in *ingrahami* is more nearly approximated by the length of the premaxillaries (as measured from their posterior margin to their most anterior projection) and the length from the maxillo-premaxillary suture in front of the zygomatic root to the most anterior portion of the premaxillaries. (Fig. 1.) This increase in skull length is not accompanied by a constant and definite increase in palatal width, temporal width, or width across the premaxillaries. Certain differences rather difficult to describe, but nevertheless very noticeable, in the shape of the rostrum as viewed from above, and in the relative size and position of the frontals

and the premaxillaries are indicated in the accompanying drawings. The constriction of the rostrum about midway in *irrectus* distinguishes it from the evenly-tapering condition in *ingrahami*. The flaring posterior end of the premaxillaries, and the frontals, truncated at the nasal suture, distinguish it from *abaconis*.

For measurements see Table 1 (p. 000).

Material examined.—Crooked Island: about ten palates with teeth, thirty lower rami with teeth, thirty without teeth, six portions of rostra, five portions of crania, and one almost complete anterior part of the skull; Eleuthera Island: two palates with teeth, two lower rami with teeth, one without teeth, one portion of a rostrum, and one of a cranium; Long Island: one palate, one lower ramus with one tooth.

The form from Great Abaco Island may be known as

***Geocapromys ingrahami abaconis*, subsp. nov.**

Figure 3.

Type.—Left ramus of adult lower jaw, M. C. Z. no. 2108, from Imperial Lighthouse Caves, Hole in the Wall, Great Abaco Island, Bahamas, collected by Froelich Rainey.

Description.—Very similar in length of tooth row and size of the individual teeth to *irrectus*, but pm_4 slightly more tapering anteriorly with the anterior lobe somewhat smaller and more slender.

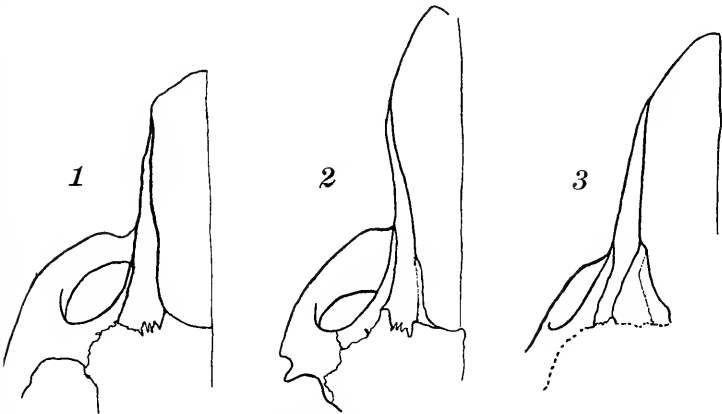


FIG. 1. *G. ingrahami ingrahami*, left side of rostrum to show outline of premaxillary and anterior margin of frontal.

FIG. 2. *G. i. irrectus*, same.

FIG. 3. *G. i. abaconis*, same.

Cranial differences include certain peculiarities in the shape and relative positions of the premaxillaries and the frontals indicated in the accompanying figures. Particularly important is the pointed projection of the frontals reaching anteriorly between the nasals and the premaxillaries, and the narrow posterior end of the latter. The frontals themselves are very much longer than in any other form of similar size. In two comparable individuals with upper tooth rows of about the same length, the frontals of *ingrahami* were 2.2 mm. shorter than those of *abacensis* exclusive of the anterior projections of the latter. As the increase in minimum width across the frontals is only slight, the difference becomes one of proportion as well as of actual size. The orbital margin is a smooth, rounded, slightly overhanging ledge with no pointed postorbital process.

For measurements see Table 1 (p. 000).

Material examined.—Great Abaco Island: two palates with teeth, six lower rami with teeth, two anterior portions of the skull, one cranial fragment.

Compared with the three subspecies of *ingrahami*, the extinct form from Cuba, *G. columbianus*, is still larger. The total alveolar length is greater and the individual teeth, particularly m_1 and m_2 , are larger, with the result that the outer margin of the tooth row, particularly in the lower jaw, bows outward rather strongly here instead of being parallel to the inner margin as in the *ingrahami* subspecies. (Fig. 1.)

The genus *Geocapromys* includes three living species, *Geocapromys thoracatus* (True) of Little Swan Island, *Geocapromys ingrahami ingrahami* (J. A. Allen) of East Plana Cay, Bahamas, *Geocapromys brownii* (Fischer) of Jamaica; in addition, three extinct forms are now known: *Geocapromys columbianus* (Chapman) of Cuba (with its synonym, *G. cubanus* G. M. Allen), *Geocapromys ingrahami irrectus*, subsp. nov., Crooked Island, Bahamas, and *Geocapromys ingrahami abacensis*, subsp. nov., Great Abaco Island, Bahamas.

Adequate work has already been done on this group so I have not attempted a general revision. In 1929 Mr. Gerrit S. Miller published a paper on the history and present status of the genus *Geocapromys*, 'The Characters of the Genus *Geocapromys* Chapman,' G. S. Miller, Jr., *Smithsonian Misc. Coll.*, vol. 82, no. 4, Dec., 1929; while Dr. G. M. Allen in his

paper, 'Mammals of the West Indies,' Bull. M. C. Z., Harvard Coll., vol. 54, no. 6, pp. 210-212, July, 1911, has given an account of the four species then known. For this reason it will suffice to summarize the characters of the described members in the following key.

Key to the Forms of *Geocapromys*.

Size larger (lower alveolar row usually more than 18.0).

- A. Frontals inflated anteriorly; interorbital region markedly pinched in posterior to postorbital processes; postorbital processes short and bluntly triangular. Lower jaw: Tooth row parallel-sided, gradually increasing in width toward posterior end *Geocapromys brownii*.
- B. Frontals not inflated, their lateral edges parallel to frontal suture without postorbital constriction or postorbital processes. Lower jaw: Outer margin of alveolar row strongly bowed out in region of m_1 and m_2 *Geocapromys columbianus*.

Size smaller (lower alveolar length rarely more than 17.5).

- A. Lower posterior margin of jugal forming nearly a right angle with a more or less pronounced backwardly projecting spine. Total length of skull 69.5-70.5 *Geocapromys thoracatus*.
- B. Lower posterior margin of jugal sloping strongly forward forming a long obtuse angle; no posterior projection.
 - 1. Postorbital processes present; frontals truncated anteriorly.
 - a. Exposed portion of lower incisors longer (14.1-15.0 mm.), nearly white; postorbital processes well developed; total length of skull 61.8-64.6.
Geocapromys ingrahami ingrahami.
 - b. Exposed portion of lower incisors shorter (10.6-13.5 mm.), orange colored; postorbital processes small; size somewhat larger than in *ingrahami*.
Geocapromys ingrahami irrectus.

- 2. Postorbital processes absent; frontals long, tapering anteriorly between premaxillaries and nasals.

Geocapromys ingrahami abaconis.

Supplementary Comments by T. Barbour.

It is extremely unfortunate that almost no undisturbed caves are to be found in the Bahamas. The islands are not high;

the caves are mostly easily accessible and the wasteful agriculture of old times, with repeated burning off of brush, has made it necessary to search far and wide for earth to supplement the meagre covering left over the rocky lands. Earth was to be found in the caves. Rich, deep deposits, consisting of the result of the accumulation of eroded materials, the detritus derived from long aboriginal habitation and the guano from abundant cave-inhabiting animals. So in many cases enormous masses of 'cave earth' were found easily available for exploitation. In some cases earth was put into sacks and carried far and wide by schooners to other islands. In many cases the contents of the caves were used by the owner to improve his own fields where the deposit was perhaps on his property. But the result was the same and the caves were generally stripped clean, and the fast renewed deposits of pure bat-guano are now removed from time to time. Mr. Rainey deserves great credit not only for finding an occasional small cavern or rock shelter which had been overlooked but also for searching out small pockets of the old deposit which had not been carried away. One thing is certain, we have but a tiny sample of what might have been found had exploration taken place say one hundred and fifty, or two hundred years ago. For this reason the finding of these new rodents is very significant. A land mammal occurred on each of the island groups. Who can say that this was the only land mammal? No others may ever be found but these new forms taken in connection with the reptiles taken during the same expedition show that the whole Bahama archipelago from north to south had a much more homogeneous and a much more abundant fauna than has been suspected in the past. It is not impossible that we are studying and trying to interpret, simply the relics of the old, original Bahaman fauna,—that part which has been able to withstand the ravages of man and his fires, feral dogs, cats, rats, and even larger animals as well. These rocky islands, which perhaps always had a scrubby vegetation, probably never supported a fauna like that of Cuba or Hispaniola; but Columbus speaks of forest trees and indeed there are a few big trees on San Salvador still, in a valley sheltered from hurricanes.

TABLE I.

Skull Measurements of Geocapromys.

	G. I. INGRAHAMI Plana Cay	G. I. IRRECTUS			G. I. ABACONIS Abaco Id.	G. COLUM- BIANUS Cuba
		Crooked Id.	Long Id.	Eleuthera Id.		
Lower alveolar length	14.4-16.0	15.7-17.5	17.0	16.7-18.0	15.6-16.9	17.8-19.2
Width of m ₂	3.4-3.9	3.8-4.4	4.6	...	3.8	4.4-5.2
Width of m ₃	3.3-3.7	3.6-4.0	...	4.0-4.5	3.6	4.0-4.8
Length of exposed portion of lower incisor	14.1-15.0	10.6-13.5	...	12.1	12.2-13.8	appears short; alv. margins broken.
Length of frontal taken on lateral edge	19.3-21.6	22.4	...	...	24.6	...
Length of premaxillaries from post. margin to most ant. projection	25.0-26.8	26.8	...	26.7	28.2	...
Total length from angle of squamosal to most ant. projection of premaxillaries	46.3-47.4	50.1	...	...	...	...
Length from angle of squamosal to maxillo-premaxillary suture in front of root of zygoma	32.5-33.3	36.2	...	...	...	...
Length from maxillo-premaxillary suture to most ant. projection of premaxillaries	13.2-14.5	14.1-14.3	...	14.3-15.7	15.7	...
Max. exterior width of palate	13.0-13.5	13.2-14.6	...	13.0-14.9	14.2	15.9-16.0
Length of femur from inner margin of epiphysis to capitulum	...	58.5-62.7	...	...	58.6	...
Length of femur from outer margin of epiphysis to tip of first trochanter	...	59.8-64.1	...	...	...	...

Did the hurricanes of four hundred years ago do the damage that they do now? Perhaps not. With more soil the old trees would have been better rooted and clearing land makes trees left for shade or shelter more easily destroyed by these terrific windstorms. There is some evidence in the great coral heads cast far ashore by recent storms that they have been of unprecedented violence during the last few years. However, the remains of the work of prehistoric hurricanes upon the reef corals may have been removed by subsequent rain solution after the great chunks of coral were cast ashore. So it goes. One thing is certain. Every scintilla of evidence which aids in reconstructing past conditions on the islands is greatly to be welcomed and the groups all look less and less like groups of oceanic islands in Wallace's sense.

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A NEW RACE OF ROCK IGUANA.

BY THOMAS BARBOUR AND BENJAMIN SHREVE.

WHILE examining some specimens of rock iguana from the Colombian islands of Old Providence and St. Andrews, we were struck with the fact that they looked markedly different from those of the mainland of Central America. Having only one example from Old Providence we have had the good fortune to see two more from the collection of the Field Museum of Natural History in Chicago, thanks to the courtesy of Mr. Karl P. Schmidt.

The type of the new race was taken during the Caribbean voyage of the Research Yacht *Utowana* in 1933. During this voyage Dr. David Fairchild, Mr. J. C. Greenway, Jr., and the senior author were the naturalists on board as guests of Mr. Allison V. Armour.

The new form may be known as:

Ctenosaura similis multipunctata, subsp. nov.

Type.—Museum Comparative Zoölogy no. 36,830, from Old Providence Island, collected by J. C. Greenway, Jr., March 13, 1933.

Paratypes.—Field Museum Natural History no. 210 (2 specimens) from Old Providence Island.

Diagnosis.—Very much like *C. similis similis* of the mainland in every characteristic except coloration. The coloration also is alike in general pattern except that the gray pigment of the sides is broken up into roundish spots some of which have a dark center the same color as the dark ground color. In some of the light areas there are more than one dark spot included. In *C. s. similis* from the mainland the gray coloration is irregularly distributed on the sides but does not exhibit the type of

spotting which we have described. Very young individuals from the mainland show the same type of coloration as the new form but *none* of the adults from the mainland show this type of marking. This makes the adults appear very differently indeed one from the other.

Measurements.

	<i>Length Head to Anus</i>	<i>Length to Tail</i>	<i>Total Length</i>
M. C. Z. 36,830	230 mm.	470 mm.	700 mm.
F. M. N. H. 210	260 mm.	410+n mm.	670+n mm.
F. M. N. H. 210	335 mm.	500+n mm.	835+n mm.

Remarks.—There are also two specimens of *Ctenosaura* in the Museum of Comparative Zoölogy from St. Andrews Island and these are directly intermediate between those from the mainland and the iguanas from Old Providence. They tend toward being more spotted on the sides than do the mainland individuals but distinctly less spotted than those from Old Providence. It is not improbable that with long series of specimens in hand three races might be recognized.

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CRITICAL NOTES ON RARE PANAMA BIRDS.

BY LUDLOW GRISCOM.

THE brief systematic notes that follow are submitted in advance of a distributional check-list of Panama birds, now in press. The nature of this check list precludes systematic discussion and the description of new forms, which should have priority of publication.

Once again it is a pleasant duty to thank the authorities of the Bird Department of the British Museum for the opportunity of examining some of their treasures.

Mecocerculus superciliaris (Sclater and Salvin).

One of the rarest and least known Tyrant Flycatchers in the world is the subject of the present notes. It was originally described as *Leptotriccus superciliaris*, and the description was based on two specimens collected by Arcé at Chitra and Calovevora, two small hamlets in the humid strip at the base of the mountains on the Pacific slope in Veraguas, western Panama. The species was next reported from northeastern Costa Rica, where Ridgway secured a female on March 29, 1908. The next specimen to be secured, though previously unrecorded, was collected at Tapalisa, Pacific slope of extreme eastern Darien, on Feb. 24, 1915. It is in the American Museum of Natural History, no. 135,932. The latest contribution to our knowledge of this species is Hellmayr's note in the Catalogue of the Tyrannidæ. While his transfer of the species to the genus *Mecocerculus* does not seem very satisfactory to me, he reports a trade skin from Bogota in the Paris Museum, of which he gives a minute and critical description, as the only specimen seen by him.

One of my objects in visiting Europe during the summer of 1934 was to examine the types or other specimens of all species

of Central American birds, which were not represented in American collections at least by topotypes. One of these, naturally, was *Mecocerculus superciliaris*. I had long been familiar with the New York specimen, and had suspected that it would not be racially identical with West Panama or Costa Rica birds.

In addition to the two original Arcé specimens, the British Museum proved to have a third specimen, here recorded for the first time: ♂, Carrillo, northeast Costa Rica; Nov. 17, 1898; coll. C. F. Underwood.

An examination of the types revealed at once the great pallor of the Darien specimen, and Hellmayr's minute comparative description of the Bogota specimen in Paris shows that this bird's characters agree with the Darien specimen. There are consequently two subspecies, as follows:

1. *Mecocerculus superciliaris superciliaris* (Selater and Salvin).

Known at present from two specimens from northeast Costa Rica and two more from the Pacific slope of Veraguas. Much brighter green above and yellower below. Pileum dark slate gray to blackish in sharper contrast with back, which is bright olive green. Throat and chest relatively darker gray, with a distinct clouded and mottled effect. Abdomen, vent and underwing coverts brighter and deeper lemon yellow. The ♂ from Carrillo, Costa Rica, measures, wing, 53 mm.; the underwing coverts are much brighter yellow than the two Veraguas specimens, which are sexed ♀, the wings 48 and 50 mm. One of these females has the throat very slightly darker gray than the other two, while the other Veraguas female has the pileum distinctly blacker than the other two.

2. *Mecocerculus superciliaris palloris*, subsp. nov.

Known at present from the type, Amer. Mus. Nat. Hist., no. 135,932, from Tapalisa, eastern Panama, as recorded above, and the 'Bogota' trade skin in Paris. Generally paler and duller than typical *superciliaris*. Pileum grayer, less black, less sharply contrasted with the duller olive green back. Throat and chest paler gray, without the clouded and mottled effect. Belly and vent paler lemon yellow, the underwing coverts whitish with a faint yellowish tinge.

A final word on the generic position of this species. I agree heartily with Dr. Hellmayr that it is not congeneric with the genotype, *sylviolus* of southeastern Brazil, though I qualify this statement by adding that the basis for it is the current criterion for 'generic' characters in these small Tyrants. It is equally true that *Leptotriccus flaviventris* Hartert, transferred by Hellmayr to *Pogonotriccus*, is not strictly congeneric with *sylviolus* either. However it is also true that *superciliaris*, a humid tropical zone species, is not really congeneric with the Andean *Mecocerculus*, nor is *flaviventris* strictly congeneric with *Pogonotriccus*, on exactly the same criteria used in comparing them with *Leptotriccus sylviolus*. We have in this family of birds a welter of small, obscurely colored little birds, which have been placed in various genera, on the basis of characters, which would not be given the slightest weight in an older and more stabilized group. Here and there, very rare and little-known species, known only to two or three specialists in each generation, and widely scattered in the museums of the world, refuse to fit even into the minute divisions currently recognized.

One modern school, as an arbitrary rule of thumb, contentedly describes the necessary number of monotypic genera, based inevitably on even poorer and slenderer characters. This system has the merit of eliminating practically all necessity for thinking, judgment, or critical opinion in ornithology, which becomes a branch of technology rather than biology. It is much simpler to be an ornithologist, as nothing is required to become one save acute powers of observation and a sufficient working vocabulary to record the observations.

But another school of thought considers that such a summary affords prima facie evidence of there being too many genera already. Dr. Hellmayr's footnotes amply describe in just what respects these two little Tyrants do not fit into the genera to which he provisionally refers them. I shall gladly follow his classification, until it is improved on the only possible basis. A satisfactory revision of the genera of the Tyrannidæ will be made by the man who can compare *every species* simultaneously. It will not be made by the man who has seen almost every species at one time or another, nor by the man who has two thirds of them

before him, and reads up on the other third or ignores them altogether. I wish Dr. Hellmayr would undertake it. But in the meantime, as I am unable to undertake this revision, I leave the species *superciliaris* in *Mecocerculus*. I agree with Dr. Hellmayr that it did not fit in *Leptotriccus*, I agree with him as to just what respects it does not fit in *Mecocerculus*, presumably we agree that it is not worth describing as a monotypic genus, and I can find no genus in which it fits perfectly, that Dr. Hellmayr overlooked. I consequently do not refer it to any other genus, as this would be about as much scientific progress, as another throw of dice in a game of craps.

Vireo carmioli Baird.

This little mountain Vireo is now a comparatively well-known bird in the highlands of Costa Rica. In Panama, however, there are only two specimens on record from the Volcan de Chiriqui; one collected by Arcé many years ago, now in the British Museum; the other secured by W. W. Brown, now in the Museum of Comparative Zoölogy. It is consequently worth recording that Rex R. Benson secured 6 specimens in November and December, 1931, at a coffee finca known as El Quiel on the Volcan de Chiriqui.

Hylophilus viridiflavus Lawrence.

This species is endemic in the Arid Tropical Zone of the Pacific Slope from southwestern Costa Rica to the Rio Chepo in Darien just east of the Canal Zone. Contrary to the relative paucity of specimens in museums, it is really quite a common scrub-inhabiting bird in this area. Mrs. Davison has recently described a proposed paler race, *pallescens*, from Costa Rica and western Chiriqui (*Proc. Biol. Soc. Washington*, 1932, p. 168). While she does not list her material, she mentions a 'series' from southwestern Costa Rica, 2 specimens from Concepcion, Chiriqui (one, the type) and 2 from eastern Chiriqui, which are stated to agree very well with Lawrence's original description of a bird from Panama City. Much to my regret, I am unable to recognize this race. I have seen 5 birds from southwestern Costa Rica, 3

from western Chiriqui, 1 from eastern Chiriqui, 1 from Veraguas, 2 from Coclé, 10 topotypes from Panama City and 3 from Rio Chepo, Darien. I can find no differences whatever between series from the two opposite ends of the range, but I note that birds in fresh post-nuptial moult are greener, less ashy above, and yellower, less white below than other birds taken at other seasons of the year. There is an excellent contrast between June and December specimens before me from southwestern Costa Rica.

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A NEW *PSEUDEMYIS* FROM CAT ISLAND, BAHAMAS.

BY T. BARBOUR.

IN a recent paper on Bahamian reptiles (Barbour and Shreve, 1935, *Proc. Boston Soc. Nat. Hist.* 40, p. 354), attention was drawn to the occurrence of a fresh-water tortoise of the genus *Pseudemys* on Cat Island and its curious, specialized habits there.

After passing the page proof, I have been able to secure four of these reptiles from Cat Island through the generous cooperation of Messrs. Wilton G. Albury and Charles S. Dooley of Nassau. I desire to take this opportunity of expressing my appreciation of their help.

Owing to the present uncertain status of the nomenclature of the West Indian species of *Pseudemys*, it appears inadvisable at this juncture to make it a race of the Cuban species which should probably be called *P. decussata*. Though it stands in some such relationship to that reptile, I propose to designate this unnamed Bahamian tortoise

***Pseudemys felis*, sp. nov.**

Type.—Museum of Comparative Zoölogy, no. 38,385, an adult female from Tea Bay, Cat Island, Bahamas, collected by Messrs. Wilton G. Albury and Charles S. Dooley, January, 1935.

Paratypes.—Museum of Comparative Zoölogy, nos. 38,386-38,388 being a male and two females with the same data as the type.

Diagnosis.—Closely related to the Cuban *decussata* with which it agrees in proportions but differs in the more strongly embossed first vertebral, the faint, or almost entire absence of markings on head and limbs, and the obsolescent markings of the carapace and plastron.

Description.—Snout acuminate, sloping sharply to the buccal border; edges of the jaws slightly serrated. Shell moderately depressed, its height included in its length from 2.4 to 2.6 times, in its width 1.8 to 2.1 times, and the breadth 1.1 to 1.3 times in the length. Nuchal narrow, with almost

parallel sides; five vertebrae, the first distinctly swollen, the rest bearing a well-defined, though obtuse, median keel, second and third vertebrae broader than long, or slightly narrower or as broad as long, lengths of the four anterior vertebrae subequal, the fifth rather shorter, subpentagonal and much broader than the rest; twelve marginals on either side, the four posterior pairs with well serrated edges; gulars not projecting except at their outermost corner, their median suture shorter than that of the anal, that of the humerals shortest of all, of the abdominals much the longest; inguinal separated from the lower surface of the fifth marginal in the type and on the left side of M. C. Z. 38,386, but in contact on the right side and in the other paratypes. Digits broadly webbed, fore limb with five strong claws, hind limb with four.

Coloration in life.—Head above, dark olive, an ill-defined greenish yellow streak from the eye backwards, a yellowish green one from below the eye, past the corner of the mouth to below the greenish tympanum; throat yellowish with faint traces of longitudinal streaks; fore limbs yellow in front, olive behind; hind limbs and tail dark olive above, somewhat lighter below.

Carapace above, dark brown (dark olive in the younger paratypes) with yellowish margins, each marginal shield with an ill-defined, median, vertical, yellow streak. Plastron uniformly yellowish white with very faint olivaceous traces of the marginal ocelli of *decussata*, scarcely noticeable except in youngest paratype.

Measurements.

M. C. Z.	Sex	Total length	Greatest breadth	Depth	Depth into length	Depth into breadth	Breadth into length
38,385	♀	236 mm.	186 mm.	98 mm.	2.4	1.8	1.3
38,386	♂	190 mm.	145 mm.	79 mm.	2.4	1.8	1.3
38,387	♀	180 mm.	142 mm.	67 mm.	2.6	2.1	1.2
38,388	♀	160 mm.	128 mm.	64 mm.	2.5	2.0	1.1

The above gives some idea of the variation in proportions in relation to age. For purposes of comparison, examples of *decussata* from Cuba of comparable sizes were selected for measurement with the following result. Of these the first two are from Soledad, Cienfuegos, the third from the Rio Jobabo, the last from Santiago.

Measurements.

M. C. Z.	Sex	Total length	Greatest breadth	Depth	Depth into length	Depth into breadth	Breadth into length
33,395	♀	236 mm.	174 mm.	97 mm.	2.4	1.7	1.3
33,405	♀	191 mm.	143 mm.	72 mm.	2.6	1.9	1.3
34,134	♂	180 mm.	132 mm.	61 mm.	2.9	2.0	1.3
6,929	♀	161 mm.	121 mm.	51 mm.	3.1	2.3	1.3

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CUBAN RED-TAILED HAWK.

BY T. BARBOUR.

WHEN in 1923 I wrote the 'Birds of Cuba' (*Mem. Nuttall Ornith. Club* 6) I said that Red-tailed hawks in Cuba were undistinguishable from those from Florida. That, however, is not so. They are distinctly smaller.

While I was staying at Harvard House this winter several pairs of hawks bred in the vicinity of the Harvard Botanical Garden at Soledad, near Cienfuegos. A pair nested there, raising young in the wild reserve adjacent to the Garden itself. These birds were not disturbed, but my friend Mr. William Harris shot two other birds which were making trouble for natives who raise poultry in more distant parts of the Soledad plantation. I skinned these birds at Soledad and sent them to Cambridge. They are two magnificent females, in fully adult plumage. Mr. Harris has since sent us an immature bird but I have left this one unmeasured along with a number of immature birds from Florida so that all the birds with measurements recorded below are really comparable.

I wish to thank my colleagues Messrs. Greenway and Peters for advice and criticism in making this description.

The measurement of a Cuban specimen in the American Museum of Natural History is taken from Peters. (*Bull. Mus. Comp. Zool.* 61, 1917, page 400.)

The small Cuban bird may be known as:

Buteo borealis solitudinis, subsp. nov.

Similar in coloration to *Buteo borealis umbrinus* Bangs from Florida but differing in being distinctly smaller in size as shown by the much shorter wing.

*Measurements.**Buteo borealis solitudinis* Barbour

M. C. Z.	168467	Cuba, Soledad, near Cienfuegos,	20 Mar. 1935 (type)	w. 395 ♀
"	168466	Cuba, Soledad, near Cienfuegos,	15 Mar. 1935	w. 411 ♀
A. M. N. H.	57400	Cuba		w. 376 ♂

Buteo borealis umbrinus Bangs

Thayer coll. ¹	17876	Florida, Dade Co., Pine Island	17 May 1911	w. 430 ♀
Bent coll. ¹	11618	Florida, Glades Co.	16 Jan. 1930	w. 436 ♀
" "	11620	" "	15 Feb. 1930	w. 439 ♀
M. C. Z.	103314	" Manatee Co.	Apr. 1888 (type)	w. 422 ♀
Bent coll.	11619	" Glades Co.	14 Feb. 1930	w. 403 ♂
" "	11617	" "	16 Jan. 1930	w. 412 ♂

Red-tailed hawks in Cuba are by no means rare birds. They are singularly bold and fearless in attacking poultry and for that reason the hand of every man is against them. They spend most of their time in perfect safety sailing lazily in wide circles high in the air. I believe now that they are somewhat more abundant than they used to be, inasmuch as far fewer of the country people own firearms than was once the case.

The pair which bred this year in the Soledad Garden is probably the same one which has nested and raised young there successfully for the last three years. The nests are singularly well concealed for they are built in high Ceiba trees amongst great masses of epiphytic vegetation. As one draws near the nesting site the old birds circle about shrieking constantly at the intruder, a habit which is distinctly unwise. It is only at this time of year that the birds run much of any risk of coming to harm by the arms of man.

¹The Thayer and Bent collections are in the Museum of Comparative Zoölogy.

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ON A NEW TEIID AND AMPHIBIA FROM
PANAMA, ECUADOR, AND PARAGUAY.

BY BENJAMIN SHREVE.

WHILE identifying South American material in the Museum of Comparative Zoölogy several specimens not readily identifiable were put aside for further study. This paper deals with the outcome of these researches which also resulted in the detection of the Central American novelty described here.

I am indebted to Mr. A. Loveridge and Mr. H. Hechenbleikner for much valuable assistance.

***Neusticurus tuberculatus*, sp. nov.**

Type.—M. C. Z. no. 37,711, a male; about half grown, from Sarayacu, Ecuador, collected by O. C. Felton in 1933.

Paratypes.—M. C. Z. nos. 37,264-6, a male and two juvenile specimens collected along the Pastaza River from Canelos to the Marañon River, Ecuador, by C. Spencer, January, 1931, to August, 1932.

Diagnosis.—Allied to *Neusticurus ecpleopus ecpleopus* from which the new species differs in that its enlarged lateral scales are smaller, in that its enlarged temporal scales are smaller, tubercular, and more widely spaced, in that its frontonasal is undivided (in typical *ecpleopus* that scale is usually longitudinally divided). This new form also differs from typical *ecpleopus* in coloration.

Description.—Snout rather pointed; canthus rostralis strong; transparent disk of eyelid in one piece; diameter of ear opening about equal to that of the eye; frontonasal single; a pair of prefrontals; (the right prefrontal in paratype 37,264 is transversally divided, its posterior portion causing asymmetry of the anterior border of the frontal); frontal not grooved medially behind (in paratype 37,264 the frontal is grooved medially behind); frontoparietals followed by a large interparietal which has on each side a smaller parietal; interparietal produced posteriorly beyond the parietals; occipital scales smaller but very variable in shape and size in all specimens, roughly arranged in transverse rows; temporal scales granular with many larger

tubercular scales intermixed; 4 supraoculars; 4 superciliaries on left, 5 on right (also in paratype 37,266 while the rest of the paratypes have 4 on both sides); 7 upper labials (6 in paratypes); 6 lower labials (6 or 7 in paratypes); a single chin shield followed by 3 pairs; gular scales relatively large becoming larger as the collar is reached, some rather tubercular; collar consisting of about 6 large plates. Nape granular with about 8 longitudinal series of roundish keeled or tubercular scales; dorsal scales rather granular, similar to those of the nape; 4 equidistant dorsal rows of greatly enlarged, strongly keeled scales, 2 outer rows irregular in the type (much more regular in paratypes); sides with regular vertical folds each of which supports a row of enlarged keeled scales which are decidedly smaller than those of *N. cecpleopus cecpleopus*, nearer in size to those of *N. cecpleopus ocellatus*; each enlarged scale surrounded by much smaller, rather granular scales; abdominal plates squarish, in 8 longitudinal rows, plates of outer row on each side smaller, keeled, other ventrals smooth; 22 transverse rows (21-22 in paratypes); a pair of anterior preanal plates followed by 3 larger posterior ones in a transverse series, the median one smaller than the other two; limbs with large keeled scales above, those of the hind limbs intermixed with smaller scales in places; femoral pores 17 in paratype 37,264, in the other specimens undeveloped or so feebly developed that their number cannot be ascertained; caudal scales form regular annuli of which the lateral scales are strongly keeled, above a double denticulated crest.

Coloration in alcohol.—Above brown, spotted with darker; on each side about four black ocelli, with white centers, becoming more indistinct posteriorly; labials and chin shields heavily marked with black; lower surfaces spotted with black, tail strongly suffused with black below.

The coloration of the paratypes is substantially similar to that of the type. In paratype 37,264 there are several additional, ill-defined ocelli, also a very small one with a very large white center near the insertion of the fore limb and confluent with one of the main lateral ocelli, and another very small white-centered ocellus at the corner of the mouth on the right side; lower surfaces of breast and abdomen almost entirely free of markings. In the two very young specimens the sides are almost black resulting in the ocelli being very indistinct; heavily suffused with dark brown below.

The ocelli of this form are in general smaller, more numerous and their white centers larger in proportion to the amount of black than is the case with typical *cecpleopus*.

Measurements.

	Head and body	Tail	Total length
Type no. 37,711	47 mm.	78 mm.	125 mm.
Paratype no. 37,264	54 mm.	94 mm.	148 mm.
“ “ 37,265	31 mm.	part of tail missing	
“ “ 37,266	32 mm.	54 mm.	86 mm.

The tip of the tail is regenerated in the type and in no. 37,264.

Remarks.—Under ordinary circumstances this form would be described as a subspecies of *eupleopus*. The reason for it not being described as such is that there is in the M. C. Z. a specimen of typical *eupleopus*, from Canelos, which is only approximately twenty-four miles from Sarayaçu. This information therefore indicates that possibly the two forms may occur together. At all events material is insufficient to show that there is a subspecific intergradation between the two, hence, a binomial is better for this form at present.

***Hyla albopunctata* Spix.**

Owing to obscurities in the published description of this species, it seems advisable to redescribe it as under

Hyla albopunctata Spix, 1824, Spec. Nov. Test. Tan., p. 33, pl. vi, fig. 5: No type locality; Peters 1872, Monatsb. Akad. Wiss. Berlin, p. 207.

Hyla oxyrhina Reinhardt and Lütken 1861, Vidensk. Meddel. Kjöb., p. 189: Minas Geraes and Lagoa Santa, Brazil; Cope 1863, Proc. Acad. Nat. Sci. Phila., p. 48.

Hypsiboas raniceps Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 353: Rio Vermejo, Paraguay.

Hyla boans Boulenger (part) 1882, Cat. Batr. Sal. Brit. Mus., p. 360.

Hypsiboas ^{*boans*} *boans* Cope 1887, Proc. Am. Phil. Soc. 24, p. 48: Chupada, Matto Grosso, Brazil.

Specimen.—M. C. Z. no. 19,940, a gravid female, from Buenavista, North-east of Caaguazu, Department of Yhu, Paraguay, collected by Donald Wees, February 16, 1932.

Diagnosis.—Allied to *Hyla boans* and *Hyla spgazzini* but differs from both in its decidedly less extensively webbed feet, in its much longer fourth toe, two (instead of one) phalanges of which extend beyond the disk of the adpressed third and fifth fingers. This species also differs from both *spgazzini* and *boans* in coloration.

Redescription.—Tongue suboval, entire, and adherent; vomerine teeth between the large choanæ in two series; head slightly longer than broad; snout subacuminate, about one and a half times as long as the diameter of the orbit; the distance between the nostril and the orbit about equal to the diameter of the latter, canthus rostralis distinct and straight, loreal region slightly oblique and somewhat concave; interorbital space broader than the upper eyelid; tympanum very distinct about two-thirds the width of the eye; a rudiment of web between the three outer fingers, none between the

inner; toes about half webbed, the last two phalanges of the fourth toe free (the disk not being counted as a phalange); no rudiment of pollex¹; disks of fingers and toes smaller than the tympanum; subarticular tubercles well developed; fourth toe long (see diagnosis); the tibiotarsal articulation of the adpressed hind limb reaches beyond the tip of the snout; skin smooth, granular on the belly and under the thighs; a dermal fold across the chest and another from eye over tympanum.

Coloration in alcohol.—Pinkish brown above marbled with darker; on the upper sides of the limbs the darker markings taken the form of irregular narrow crossbands; a black streak from the end of the snout to the eye; another, narrower, extending from the eye above the tympanum then widening until it ends slightly beyond the insertion of the fore limb: a narrow white line extends across the tibiotarsal articulation, along the tarsus and the outer edge of the fifth toe; a similar line above the anus: another on the forearm, extending along the outer edge of the outer finger: outer edges of limbs also washed with black in places: rear of femur black, abundantly and prominently spotted with white as are also the sides where the ground color is gray, or bluish gray, rather than black: upper lip white: lower lip white, bordered with blackish: below, immaculate except for a very fine punctillation of black on underside of lower jaw, throat and chest, and a small amount of bluish on belly.

Measurements.

	Length of head and body	Head	Hind limb	4th toe
No. 19,940	55 mm.	15 mm.	119 mm.	20 mm.

Remarks.—This species was considered by Boulenger to have been the same as *Hyla boans*. Although the two are closely related, in my opinion there is no doubt that it is specifically distinct not only from *boans* but also from *spagazzini* which seems to be the southern representative of *boans*.

The abnormally long second finger in Spix's plate of *Hyla albopunctata* is without doubt an error.

Dendrobates minutus minutus, sp. nov.

Type.—M. C. Z. no. 15,255, a gravid female from Barro Colorado Island, Panama Canal Zone, collected by E. R. Dunn in 1925.

Paratypes.—M. C. Z. no. 16,016 (2 specimens) from Nicensa San Blas, Panama, collected by T. E. Snyder, February 25, 1929.

Diagnosis.—Allied to *Dendrobates lugubris* but differs in much smaller size, the first finger not extending nearly as far as the second, and in some-

¹According to Reinhardt and Lütken (*loc. cit.*) some specimens of this species have a rudiment of pollex.

what different coloration. In *lugubris* the first finger extends as far, or almost as far, as the second.

Description.—Snout truncate, a little longer than the diameter of the eye; loreal region vertical, interorbital space as broad as the upper eyelid, slightly broader in the paratypes; tympanum about half the diameter of the eye. Fingers rather short; the first extending much less far than the second; disks of toes smaller than those of fingers; subarticular tubercles not very distinct; two rather obscure metatarsal tubercles; the tarso-metatarsal articulation of the adpressed hind limb reaches the tip of the snout (beyond the tip of the snout in one paratype). Skin, above and below, somewhat granular.

Coloration in alcohol.—Dark brown, almost black, above, limbs somewhat lighter brown; a narrow, rather obscure, longitudinal grayish line commences near the tip of the snout, passes over the eyelid to the end of the back, anteriorly to the eyelid scarcely distinguishable; a third line, median in position, starts in the prefrontal region and terminates on a level with the insertion of the fore limbs; a short whitish streak on each side a short distance in front of the hind limbs. Below, dark brown, almost black, marbled with grayish, limbs lighter brown; upper lip pale grayish, this color extending beyond the lip as far as the shoulder.

The coloration of the two paratypes is very similar to that of the type, but the median line is shorter and the pale gray on the upper lip more obscure.

Measurements.

	Length of head and body	Head	Hind limb	4th toe
Type no. 15,288	15 mm.	6 mm.	21 mm.	4 mm.
Paratypes	13 mm.	5 mm.	17 mm.	3 mm.
no. 16,016	13 mm.	5 mm.	19 mm.	3 mm.

Remarks.—This small species has been confused with the young of *Dendrobates lugubris* in the past.

Dendrobates minutus ventrimaculatus, subsp. nov.

Type.—M. C. Z. no. 19,734, a male, from Sarayacu, Ecuador, collected by O. C. Felton in 1933.

Paratypes.—M. C. Z. nos. 19,735-41, with the same data and history as the type, and M. C. Z. nos. 19,684-90, including eleven uncatalogued specimens collected along the Pastaza River from Canelos to the Marañón River, Ecuador, by C. Spencer, January, 1931, to August, 1932. Gravid females are included in the paratype series.

Diagnosis.—Similar to *Dendrobates minutus minutus* but differs from it in coloration and in the generally larger disks of its fingers and toes.

Coloration in alcohol.—Black above, three prominent, longitudinal, grayish lines extending from the head almost the entire length of the back, the outermost starting about the posterior border of the upper eyelid, the median about on a level with the anterior border of the upper eyelid (in the paratypes these dorsal lines are often rather pinkish, in some the outer ones extending over the eyelid and meeting on the end of the snout). Toes brown, barred with darker. Below, including lower surfaces of limbs, gray heavily marked with roundish black spots, upper surfaces of limbs similarly though more obscurely spotted. Upper lip pale grayish, this color extending beyond the lip as far as the shoulder. Fifteen of the paratypes have substantially the same dorsal markings as the type; ten show an alternative set of dorsal markings. In these the median dorsal line is very much shortened and sends out a pair of branches on the head (sometimes one of the pair is missing); the back in such specimens may, or may not, be crossed by a transverse line including, or not including, the lower end of the median line; in addition the outermost lines throw out a curved branch onto the sides, also the outermost lines are often joined by a transverse line at their posterior ends. Even in this pattern further variations occur in the form of an extra transverse line, an incomplete transverse line, or branch lines failing to meet the main ones. This color pattern just described is apparently the female one of a sexual dichromatism. In addition, the fingers and toes and their respective disks appear to be larger in specimens with this type of coloration than are those with the other.

Measurements.

	Length of head and body	Head	Hind limb	4th toe
Type no. 19,734	18 mm.	6 mm.	21 mm.	3 mm.
Paratypes no. 19,735-41, 19,684-90 and 11 unnumbered	17-15 mm.	6.5 mm.	23-20 mm.	4-3 mm.

Remarks.—This subspecies has long been confused with *Dendrobates tinctorius* and formed part of Boulenger's *Dendrobates tinctorius* var. *D* (Catalogue of the *Batrachia Salientia*, 1882, p. 143). Apparently it was not realized that this was a small form and not the young of *tinctorius*.

Phyllomedusa feltoni, sp. nov.

Type.—M. C. Z. no. 19,941, a male from Sarayacu, Ecuador, collected by O. C. Felton in 1933.

Diagnosis.—Allied to *Phyllomedusa burmeisteri* from which it differs in that the vomerine teeth are more anterior, further apart, and hence nearer the choanæ, in its longer parotid glands in its slightly more acuminate snout; in its narrower interorbital space which is only the same width as

the upper eyelid instead of wider as is the case with *burmeisteri*. (This last character is probably of little diagnostic value.) In addition the two species in question differ slightly in coloration, the white markings in the new form being rather less distinct than the corresponding ones in *burmeisteri*.

Description.—Tongue entire; vomerine teeth in two oblique groups near the choanæ, the anterior edges of the former about on a level with the anterior borders of the latter; snout longer than the diameter of the eye, obliquely truncate; loreal region, nearly vertical; interorbital space as broad as the upper eyelid; tympanum about half the diameter of the eye. Fingers free, the first shorter than the second, the fourth nearly as long as the third; toes free, the first longer than the second; disks of fingers and toes much smaller than the tympanum; inner metatarsal tubercle not prominent; tibiotarsal articulation of the adpressed hind limb reaches the eye. Skin above minutely granular; parotids distinct, longer than the head; belly and lower surfaces of thighs granular.

Coloration in alcohol.—Dark blue above, excepting the three inner fingers and the four inner toes which are brownish white like the ventral surfaces; outer digits dark blue, or dark brown, marked with whitish brown; third toe slightly marked with dark blue or dark brown; a narrow white line on the outer side of the forearm and tarsus extending on to the outer digit; on the light-colored portions of the limbs and feet, near the point where the dorsal and ventral colorations meet, are many small, and some fairly large, purple-edged, whitish spots which may sometimes coalesce; a lateral row of similar spots. Below brownish white; lower lip, and to some extent the upper also, white; two prominent, purple-edged whitish spots on the under side of the lower jaw in addition to numerous other, rather ill-defined, whitish spots; a very large purple-edged spot with a prominent violet center on the chest; sides of belly marbled with purple.

Measurements.

	Length of head and body	Head	Hind limb	4th toe
Type no. 19,941	44 mm.	15 mm.	57 mm.	8 mm.

This species is named for the collector, Mr. O. C. Felton.

Hyla leucophyllata sarayacuensis, subsp. nov.

Type.—M. C. Z. no. 19,729, a gravid female, from Sarayacu, Ecuador, collected by O. C. Felton in 1933.

Paratype.—M. C. Z. no. 19,730, apparently a male, with the same data and history as the type.

Diagnosis.—Similar to typical *leucophyllata* but strikingly different in coloration.

Coloration in alcohol.—Light brown above, very minutely and densely punctulate with black resulting in a general effect, when not observed closely, of a uniform fairly dark brown; a triangular white spot covering most of the snout and on each side sending a branch on to the anterior part of the upper eyelid; upper eyelid suffused with dark gray; from the posterior part of the upper eyelid a narrow white streak extends backward over the tympanum and then broadens considerably to form an irregular, longitudinal blotch which extends along about one-third the length of the body; on the right side the narrow white streak above the tympanum is not joined to the longitudinal blotch; a few white spots of irregular outline on the limbs, one at the femoro-tibial articulation, one about the middle of the tibia, one near the tibiotarsal joint, smaller ones disposed as follows: the middle of the tarsus, the tarsometatarsal articulation, and the outer side of the foot; similar spots to those on the legs near the elbow, on the metacarpal area, and the outer side of the hand; a small white spot at the end of the coccyx, two very small ones on the back; all the white spots described are edged with darker; fingers and toes less densely punctulate than the back, inner fingers and toes little, or not at all. Below, immaculate, orange-brown, hind limbs with a purplish tinge, hinder side of thighs an immaculate purplish tinge.

The coloration of the paratype is similar to that of the type except that it is rather darker above and lighter below with the hind limbs showing more purplish; the white streak over the tympanum is not connected on either side with the scapular spot, which is smaller than that of the type. In addition the two very small spots present on the back of the type are absent in the paratype.

Measurements.

	Length of head and body	Head	Hind limb	4th toe
Type no. 19,729	33 mm.	10 mm.	55 mm.	9 mm.
Paratype no. 19,730	30 mm.	10 mm.	52 mm.	8 mm.

Remarks.—This subspecies was included under *Hyla leucophyllata* by Boulenger (Cat. Batr. Sal. Brit. Mus., 1882, p. 387-8), his specimens 'i' and 'k' from Sarayaçu and Paitanga, Ecuador, respectively, representing this form, the coloration, according to his description, coinciding with that of the type series of this new race. His specimen 'h' from Sarayaçu, while differently colored, also seems to differ in coloration from all other material representing *leucophyllata* and is probably only a color phase of this subspecies.

The type of this subspecies shows no vomerine teeth; while in

the paratype, though vomerine teeth appear to be present, they are not hard. The explanation for this is difficult to find as similar conditions exist in other amphibia in this same collection, these belonging to species which normally have perfectly well-developed vomerine teeth.

***Eleutherodactylus acuminatus*, sp. nov.**

Type.—M. C. Z. no. 19,951, a male (?), from Canelos, Ecuador, collected by O. C. Felton in April, 1932.

Paratypes.—M. C. Z. nos. 19,949-50, from Sarayaeu, Ecuador, collected by O. C. Felton in 1933. Apparently 19,949 is a male, and 19,950 immature.

Diagnosis.—Allied to *Eleutherodactylus cajamarcensis* but with a very differently shaped snout, longer hind limbs, larger disks on the fingers and toes (possibly only due to preservation), and different coloration.

Description.—Tongue oval, entire (slightly nicked in paratype 19,950); vomerine teeth in two rather small groups behind the choanæ; snout sub-acuminate with a short appendage at its end (this appendage is less evident in paratype 19,949) snout slightly longer than diameter of eye (slightly longer, or about as long, in paratypes); canthus rostralis distinct, straight; loreal region *nearly* vertical; nostril nearer tip of snout than eye; inter-orbital space broader than upper eyelid; tympanum about half the diameter of eye (tympanum indistinct in type due to shrivelling; tympanum less than half in paratype 19,950); first finger shorter than second; toes quite free, disks moderate, roundish; subarticular tubercules indistinct; two metatarsal tubercules, outer rather indistinct; the tibiotarsal articulation of the adpressed hind limb reaches between the eye and the tip of the snout. Skin smooth above (very slightly warty in paratype 19,950); belly granular.

Coloration in alcohol.—Dorsal ground color yellowish white, head suffused with blackish this suffusion extending on to the anterior part of the dorsum sides and fore limbs, a few indistinct dark spots on upper side of hind limbs and back; ventral ground color the same as that of the dorsum lower side of underjaw suffused with brownish.

Coloration in paratypes substantially similar to that of type but ground color of both rather a light pinkish hue, and the head not suffused with black; in no. 19,949 a prominent black canthal streak extending through the eye over the tympanum to about half way along the side of the body; the streak just mentioned also present on the other paratype but is less extensive and not so prominent. In no. 19,950 a dark brown triangular spot between the eyes which sends out two longitudinal streaks of the same color along the back. In no. 19,949 back and upper part of head, obscurely spotted with black and limbs faintly banded with the same color.

Measurements.

	Length of head and body	Head	Hind limb	4th toe
Type no. 19,951	24 mm.	9 mm.	38 mm.	7 mm.
Paratype no. 19,950	15 mm.	6 mm.	23 mm.	3 mm.
“ “ 19,949	21 mm.	8 mm.	23 mm.	5 mm.

Eleutherodactylus pseudoacuminatus, sp. nov.

Type.—M. C. Z. no. 19,948, a gravid female, from Sarayacu, Ecuador, collected by O. C. Felton in 1933.

Description.—Similar to the preceding species but differs in the following characters: above decidedly warty, warts very numerous on right upper eyelid but less noticeable on the left eyelid, tongue decidedly broader and larger than that of *acuminatus* and *prominently* nicked behind: the canthus rostralis strongly marked and incurved and the loreal region is somewhat more oblique than in the preceding species.

Coloration in alcohol.—Coloration somewhat similar to that of preceding species but the ground color decidedly darker, being rather a brownish pink: the reason for the dorsal ground color appearing darker than in the previous species is obvious when the dorsum is closely scrutinized, then it will be seen to be densely and minutely punctillate with black; a narrow dark brown or black canthal streak and another similarly colored streak over the tympanum, an obscure dark streak between the eyes, a few dark brown bars on the upper lip and some irregular dark brown or black spots on back and limbs; below immaculate except for a faint black stippling on the lower side of the lower jaw and on the under side of the lower jaw and on the throat.

Measurements.

	Length of head and body	Head	Hind limb	4th toe
Type no. 19,948	20 mm.	8 mm.	31 mm.	5 mm.



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ON THE SKULL OF *KRONOSAURUS*
QUEENSLANDICUS LONGMAN.

BY T. E. WHITE.

THE Harvard Australian Expedition of 1931-1932 secured in north-central Queensland, through the activities of Mr. William E. Schevill, four specimens of Lower Cretaceous plesiosaurs, two of which proved to belong to that giant species, *Kronosaurus queenslandicus* Longman. One is an incomplete skeleton and bears the number 1285 in the collection of Fossil Reptiles and Amphibians in the Museum of Comparative Zoölogy. It was collected on 'Army Downs,' 35 miles northerly of Richmond, Queensland. The second, number 1284, from 'Grampian Valley,' 30 miles northerly of Richmond, represents a younger individual, and consists chiefly of a complete rostrum with nearly all of the teeth. The rostrum has the upper and lower jaws in contact. The posterior termination is a little way back of the union of the two rami of the lower jaw.

Heretofore this species was known only from a fragment of the mandibular symphysis bearing six teeth (the holotype) and the proximal ends of two humeri. These were described in two papers by Mr. Heber A. Longman (Longman 1924, 1930). I would like to call attention to the remarkable acumen of Mr. Longman in allocating this species to the Pliosauridæ. It is all the more noteworthy when one considers the fragmentary material with which he dealt, and is deserving of the highest praise. Very early in the work on the skull evidence in support of Mr. Longman's statement began to appear, and before the work was half completed it was evident that he was entirely correct in his determination.

The identification of our material has been facilitated by

comparison with an excellent cast of the holotype, generously furnished by the Queensland Museum. Only the skull has been prepared and the missing parts restored. The remainder of the skeleton will be cleaned and reported upon later. It seemed expedient to make the morphology of the skull of this giant pliosaur available to others working on this group at the earliest possible date. It is the Cretaceous survivor of a group which was abundant during the Middle and Upper Jurassic.

Diagnosis.—This material permits us to give the following diagnosis of the species:—A giant pliosaur with four teeth in the premaxillary, narial opening midway of the length of the skull, no medial palatal vacuity, epipterygoid broad and plate-like, pterygoids covering the brain case ventrally, brain case compact, basioccipital short, basisphenoid exposed on the sides of the neck of the condyle and dorsally through the foramen magnum, paroccipital bar suturally united with quadrate ramus of the pterygoid; dentaries fused at the symphysis.

DETAILED DESCRIPTION.

The skull of the larger individual, no. 1285, is incomplete, and it was necessary to draw heavily on *Pliosaurus ferox* for details in restoration. As restored the skull is 3720 mm. (9 ft., 8 in.) from a line between the quadrates to the tip of the rostrum, and 1210 mm. (47 in.) across the quadrates. The parts of the skull preserved are:—the brain case with left quadrate attached and the posterior end of the left lower jaw, a section of the face containing the anterior border of the left orbit and the left external naris, a portion of the rostrum showing the maxillary-premaxillary suture, and a portion of the mandibular symphysis showing the division of the two rami. (Fig. 1.)

Occiput.—This specimen gives us the first view of the undistorted occiput of a member of this group (pl. 9, upper figure). The undistorted condition is probably due to the rapid growth of the concretion which enclosed the specimen before sufficient sediment accumulated to crush it.

The large, transversely oval condyle occupies the central position in the occiput. Above this is the relatively small foramen magnum, which is tilted forward at an angle of about 20° from the vertical. Its lower border falls approximately on the suture between the basioccipital and basisphenoid. The extreme shortness of the upper surface of the basioccipital is one of the unusual features of this species.

On either side of the condyle is an elongated fontanelle which probably

led to the ear. No stapes was found in association with the specimen. The fontanelle is bounded laterally and dorsally by the opisthotic, medially by the exoccipital and basisphenoid, and ventrally by the pterygoid. It communicates with the temporal region through the opisthotic-ptyergoid fenestra. This fontanelle is a result of the extreme modification of the posterior end of the skull by the growth of the pterygoids and the forward migration of the condyle.

Below the fontanelles lie the poculiform tubera basioccipitalia, which are directed postero-laterally rather than ventro-laterally as in other members of the family. This is a result of the growth of the pterygoids over the ventral surface of the brain case. The lateral thirds of the tubera are formed by the basisphenoid. The tubera are surrounded ventrally, laterally, and dorsally by the pterygoids, which are excavated in this region to accommodate the longis capitis and rectus capitis anterior.

The pterygoids extend across between the ventral sides of the tubera, thus forming a large oval recess which extends forward beneath the basioccipital. At the anterior end of the pit is a pair of foramina separated by a pillar formed by an upgrowth of the pterygoids and a corresponding downgrowth of the basioccipital. These foramina undoubtedly are the entrance of the internal carotids.

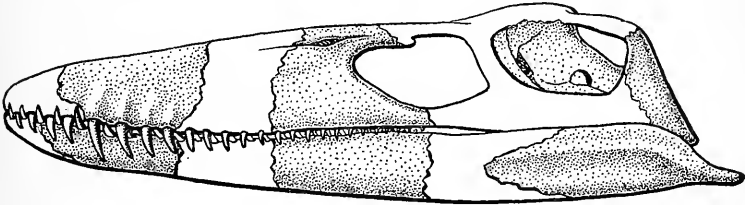


FIG. 1. Diagrammatic side view of the skull of *Kronosaurus queenslandicus* Longman. $\times 1/30$. The restored parts are left blank.

Basioccipital.—The basioccipital forms the whole of the oval condyle, whose transverse diameter is one and one-half times the vertical. The condyle is roughly conical with the apex of the cone a little below the median point. The surface of the condyle is very rough and pitted and probably bore a heavy cartilaginous cap in life. A notochordal pit is not discernable.

The longitudinal extent of the basioccipital is proportionately much less than in other members of this family. The basisphenoid-basioccipital suture on the dorsal surface is 35 mm. in front of the superior border of the occipital condyle. The union of the basioccipital with the basisphenoid on the ventral side of the basis cranii is hidden by the pterygoids. The basioccipital can be followed forward in the sub-condylar recess to a point below the superior border of the foramen magnum. On the ventral

side the condyle is separated from the remainder of the basioccipital by a deep groove. The poculiform tubera basioccipitalia project posterolaterally from the anterior border of this groove. They are about one-fourth the size of the condyle. The medial two-thirds are made up by the basioccipital and the remainder by the basisphenoid. The ventral rim of the cup is much thicker and heavier than in the other pliosaurs.

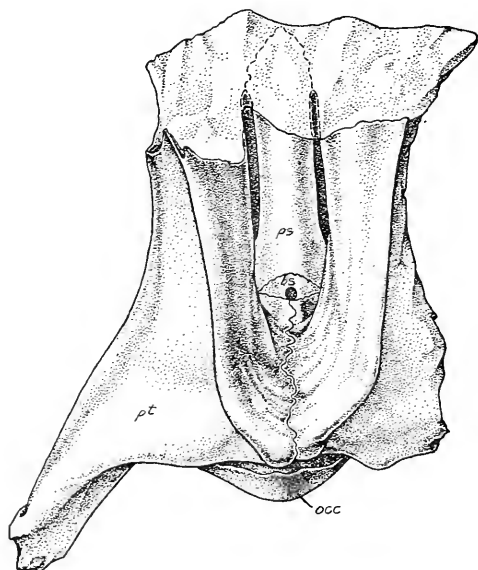


FIG. 2. Ventral view of the brain case of *Kronosaurus queenslandicus* Longman. $\times 1/9$; bs—basisphenoid, ps—parasphenoid, pt—pterygoid, occ—occipital condyle.

Basisphenoid.—Owing to the hardness of the matrix and friability of the bone it was impossible to make out the full extent of the basisphenoid. Its posterior portion is visible through the foramen magnum. It is broadly in contact with the exoccipitals and furnishes at least three-fourths of their attachment to the basis cranii. Below the exoccipitals it extends posteriorly to the face of the condyle and downward to form the lateral thirds of the tubera basioccipitalia. On the palate it is exposed in a very small area between the posterior end of the parasphenoid and the pterygoids (Fig. 2). There is a small foramen at the junction of the basisphenoid and the underlying pterygoids. It is impossible to determine whether this foramen perforates the basisphenoid or only passes between it and the pterygoids.

Opisthotic.—The opisthotic forms the side walls of the foramen magnum and about half of the side of the brain case. The exoccipital is pierced for the twelfth nerve above the suture between the basioccipital and basisphenoid. The opisthotic extends posteriorly and unites with the quadrate and pterygoid. It is greatly expanded in this region.

Supraoccipital.—The supraoccipital forms the superior border of the foramen magnum and lies above the opisthotic on the side of the brain case. It underlaps the parietal. It is a single bone and not paired as Williston (1903) describes in *Trinacromerum* and *Elasmosaurus*.

Proötic.—The proötic appears as a rectangular bone on the side of the brain case. The extreme modification of the skull has brought it in contact with epipterygoid and pterygoid. The proötic fenestra is reduced to a relatively small triangular opening bounded dorsally by the parietal, anteriorly by the broad epipterygoid and posteriorly by the proötic. On the proötic, at the bottom of the fissure, is a well-defined notch for the passage of the vena capitis lateralis. Ventrally the proötic overlaps the pterygoid alongside the opisthotic. The extent of this overlap cannot be determined definitely but it can be traced to the bottom of the proötic fenestra.

Epipterygoid.—The epipterygoid is a broad vertical plate in a deep groove on the dorsal side of the pterygoid. It forms nearly half of the side wall of the brain case. It extends posteriorly below the proötic for about two-thirds of the length of the latter. It forms the anterior border of the proötic fenestra and overlaps the descending process of the parietal. The median portion of the anterior edge is produced into a winglike process which projects forward and outward for about 50 mm. This may have been influenced by the vena capitis lateralis and the profundus branch of the fifth nerve. The foot of the epipterygoid is very heavy and is about twice as thick as the rest of the bone. The longitudinal extent of the foot is about twice that of the median portion of the bone.

Pterygoid.—Unfortunately a break in the concretion passed through the anterior portion of the pterygoid and about 250 mm. of it is weathered away. However, the portion under the brain case is very little damaged. The posterior interpterygoid vacuities lie under the anterior portion of the brain case. In this respect *Kronosaurus* resembles *Peloneustes* rather than *Pliosaurus*. Along the sides of the posterior interpterygoid vacuities the pterygoids are produced into rather high ridges which curve downward and outward. The same condition exists to a much lesser degree in the other genera of this family. The ridges meet behind the vacuities, but continue to the posterior edge of the pterygoids. In this median ridge a troughlike depression passes forward to the vacuities. The condition of the pterygoids in this form is another stage beyond that in *Pliosaurus*.

The quadrate ramus of the pterygoid in *Kronosaurus* is essentially the same as in *Pliosaurus*. However, it has a larger area of contact and is

suturally united with the paroccipital bar. The proximal portion of the quadrate ramus has been brought into contact with the proötic through the extreme modification of the brain case. On its anterior side the quadrate ramus bears a rather deep groove which extends from the flange of the quadrate to the posterior end of the epipterygoid. In life this groove was doubtless occupied by cartilage uniting these two elements.

Very little can be said about the anterior portion of the pterygoids, since that portion is badly weathered. Enough is left to determine that they met in front of the posterior interpterygoid vacuities. The limit of their forward extent is a short distance in front of the narial opening. Anteriorly they are thickened on either side of the midline. On the dorsal side a rather high sharp ridge commences about opposite the middle of the orbit and continues forward onto the palatine. This, with its fellow, bounds a broad shallow groove which probably harbored the base of the interorbital septum. The latter was probably cartilaginous with scattered ossifications. Numerous ossicles, which are not attached to any bones, lie in this groove. These probably came from the interorbital septum and median ethmoid. They can be traced forward in the cross sections nearly to the tip of the snout.

Ectopterygoid.—The major portion of the ectopterygoid is missing and only the anterior end remains. This portion forms the lateral border of the palatine foramen, while the pterygoid forms the posterior and medial boundaries. It unites anteriorly with the maxillary, lachrymal, and palatine. This genus differs from *Pliosaurus* in that the ectopterygoid does not reach the palatine foramen in the latter.

Parasphenoid.—The parasphenoid unites posteriorly with the basisphenoid, but does not conceal it as Andrews (1913) describes in *Pliosaurus* and *Peloneustes*. Anteriorly it lies on the dorsal side of the pterygoids and disappears a short distance in front of the posterior interpterygoid vacuities.

Palatine.—Only the posterior portion of the palatine is preserved. It is in contact with the maxillary throughout its length, and not free at the posterior end as in *Pliosaurus*. Nothing can be said concerning the internal nares except that they probably lay anterior to the external, because both the palatines and the pterygoids extend forward of the external nares. There is no trace of the former, but the left external naris is well preserved.

Vomer.—The anterior portion of the vomer is preserved in a large fragment of the rostrum. It extends forward between the premaxillaries as far as the posterior premaxillary tooth. It forms a low rounded ridge between the maxillaries in the anterior portion of the palate. The vomer shows no sign of being paired in the part preserved.

Premaxillary.—The full extent of the premaxillary cannot be determined

in either specimen, but enough is present to show that it was not greatly different from *Pliosaurus* and *Peloneustes*. In specimen no. 1284 in which the rostrum is complete, the premaxillary bears four teeth which diminish in size anteriorly. The first tooth is about one-half the length of the fourth.

Maxillary.—The maxillary can be traced posteriorly only to the middle of the orbit. It probably extended as far as in *Pliosaurus*. There is a short diastema at the maxillary-premaxillary suture. In no. 1284, the smaller of the two specimens, the diastema has a length of 100 mm. The anterior maxillary teeth are about three times as large as the posterior premaxillary tooth, which was about the same size as the posterior maxillary teeth, as indicated by their sockets. The first two maxillary teeth in no. 1284 have a length of 100 mm. to the base of the enamel and a diameter of 50 mm. at the base of the enamel. It is not possible to determine whether the change in size from the anterior to the posterior maxillary teeth is gradual or abrupt. The teeth are plicated as in *Pliosaurus* and *Peloneustes*. Longman (1924, p. 26) describes a mandibular tooth bud 10 mm. in length without plications on the enamel. No. 1284 shows a tooth bud in a more advanced state of development with smooth enamel, but the fully erupted teeth bear strong plications. It would seem that the plications appeared only after the tooth was fairly well developed.

Lachrymal.—The lachrymal is a relatively small triangular bone lying in the anterior inferior angle of the orbit. It extends downward on the inner side of the maxillary and articulates with the ectopterygoid in an overlapping suture. No opening for the lachrymal duct can be positively identified.

Nasal.—The rim of the left external naris is well preserved. As in *Pliosaurus* and *Peloneustes*, the nasal extends from the anterior border of the orbit to the external naris. The posterior end sends a broad process downward alongside the lachrymal, and articulates with the posterior end of the palatine and the anterior end of the pterygoid. The surface of the bones in this region has been etched by the weather so badly that it is impossible to make out the sutures with any degree of certainty.

Parietal.—Only that portion of the parietal remains which forms the roof of the brain case. In cross section this portion forms an inverted V. Posteriorly it unites with the supraoccipital, and anteriorly and ventrally with the epipterygoid.

Quadrate.—A small portion of the quadrate is eroded away on the outer side, otherwise it is preserved in its entirety. The lateral half of the upright portion is thin; the heaviest portion is that at the base of the pterygoid flange. The pterygoid flange extends along the quadrate ramus of the pterygoid for about half the length of the latter. The axis

of the quadrate condyle points downward and inward at an angle of about 30°. Details of the condyle are obscured by the lower jaw. The descending process of the squamosal has been preserved on the posterior medial side of the quadrate.

Lower jaw.—There are three fragments of the lower jaw preserved in the larger specimen, and the mandibular symphysis in the smaller. The general form of the lower jaw is similar to that of *Pliosaurus*, and the length of the mandibular symphysis is proportionately the same. The two dentaries are fused at the symphysis. In front of the maxillary-premaxillary suture the mandible is broader than the rostrum. This portion carries very large laniary teeth. Behind the symphysis the outer surface of the dentary curves inward abruptly to accommodate the large anterior maxillary teeth.

The fragment of the lower jaw which lies below the orbit is so weathered that only the alveoli remain.

The coronoid extends nearly the full length of the mandible. Posteriorly it unites with the articular and angular. In the middle portion of the lower jaw it forms more than half of the inner side. The posterior limit of the splenial cannot be determined. Anteriorly it and the coronoid form the posterior half of the mandibular symphysis. The angular extends forward below the coronoid on the inner side. Because of poor preservation of the articular end of the lower jaw its limits cannot satisfactorily be determined. The outer half of the postarticular process has been removed by weathering. It differs from *Pliosaurus* and *Peloneustes* in that the medial border curves smoothly inward and describes an arc of about 90°.

The teeth of the lower jaw posterior to the maxillary-premaxillary suture are small and lie medial to maxillary teeth. In front of this point are five large teeth which project outside the rostrum. The third and fourth are as large as the anterior maxillary teeth. The second is smaller, and the first and fifth still smaller, measuring some 50 mm. from tip to base of enamel.

SUMMARY.

The following characters shown by these specimens confirm Longman's allocation of *Kronosaurus* to the *Pliosauridae*:—The skull is moderately long compared to the width. The calculated length is about two and one-half times the quadrate breadth. The mandibular symphysis is relatively short. It is contained in the length of the skull a little less than seven times. The relationship of the large laniary teeth in the upper and lower jaws is not found in the other families of plesiosaurs. The absence of a large median palatal vacuity excludes this genus from the other families of plesiosaurs. The unpaired supra-

occipital is a character which seems to be limited to the *Pliosauridæ*.

Kronosaurus resembles *Pliosaurus* in that it has the same major skull proportions, as nearly as can be determined by projecting the lines of the fragments preserved. Both genera have a relatively short mandibular symphysis compared to *Peloneustes*. All three genera have few teeth in the premaxillaries. *Kronosaurus* resembles *Peloneustes* in that the posterior interpterygoid vacuities lie beneath the brain case rather than in front of it as in *Pliosaurus*.

As shown by the pterygoids and the posterior end of the skull, *Kronosaurus* is the most advanced form of the *Pliosauridæ*. Although *Brachauchenius* of the Upper Cretaceous of North America is a later form it is only a little more advanced than *Pliosaurus*. The unusual feature of the pterygoids of *Kronosaurus* is that in the palatal view of the skull they conceal the brain case, leaving only the occipital condyle visible. This posterior extension of the pterygoids and their sutural union with the brain case provides a stronger support for the quadrates. As the pterygoids extended posteriorly they carried the tubera basioccipitalia with them so that the latter face posteriorly rather than ventrolaterally as in other pliosaurs.

The very broad epipterygoid of this genus is easily derived from that of *Pliosaurus*, which is elongate oval in cross section.

The extreme shortness of the basioccipital is a character not shared by either *Pliosaurus* or *Peloneustes*. The reduction in length of the basioccipital has exposed the basisphenoid at the lower border of the foramen magnum. It is also exposed on the sides of the basioccipital above the tubera.

Acknowledgments.—I wish to express my gratitude to Prof. A. S. Romer, whom I have repeatedly consulted during the study of these specimens, and to Mr. L. I. Price for the excellent drawings.

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EXPLANATION OF PLATE 9.

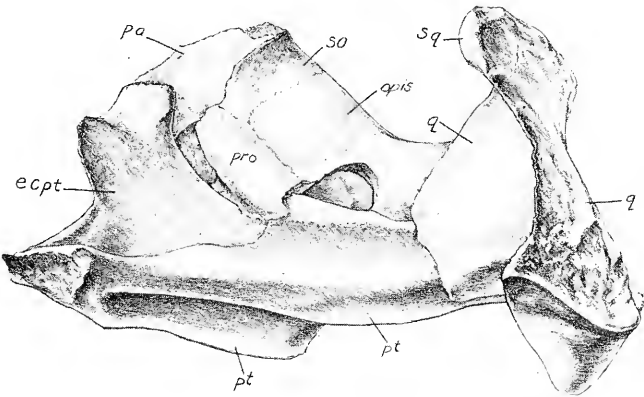
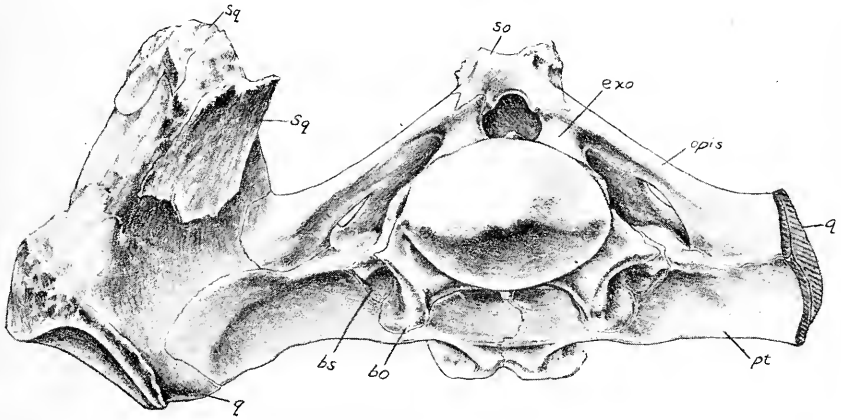
Brain case of *Kronosaurus queenslandicus* Longman. $\times 1/16$.

UPPER.—Occipital view.

LOWER.—Lateral view, left side.

ABBREVIATIONS.

bo—basioccipital
bs—basisphenoid
exo—exoccipital
eopt—ectopterygoid
opis—opisthotic
pa—parietal
pro—proötic
pt—pterygoid
q—quadrate
so—supraoccipital
sq—squamosal



WHITE ON KRONOSAURUS.

Occasional Papers
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THE SATYRID GENUS *CALISTO*.

BY MARSTON BATES.

LATHY (1899, *Trans. Ent. Soc. London*, p. 221) in his monograph of *Calisto*, recognized seven species, three of which he described as new. Weymer in Seitz (1911, *Macrolepid.* 5, p. 240) reduced this number to six. I described two forms from the Bahamas in 1934 (Bates, *Occas. Papers Boston Soc. Nat. Hist.* 8, p. 136) but otherwise no changes have been made in the taxonomy of the genus since the account of Weymer. In the present paper fifteen species are recognized, seven of which are described as new. Undescribed species of butterflies—forms that are distinct both in structure and pattern from their relatives—are not often found these days, and the discovery of seven such forms in one genus from one region is a striking demonstration of our ignorance and neglect of the Antillean fauna.

The known species of *Calisto* are all Antillean. The genus is defined by the position of the radial branches of the forewing, which all arise from beyond the end of the cell. Schatz and Röber (1892, in Staudinger, *Ex. Tagf.* 2, p. 219) and others have considered the genus to be most closely related to the Andean *Pseudomaniola*, *Steroma* and so forth. My knowledge of the Satyridæ is too limited to permit an evaluation of this opinion, but it seems reasonable enough.

I am indebted to Mr. S. C. Bruner and his colleagues in the Estacion Experimental Agronomica of Cuba for specimens of two new forms from that island, and to Prof. W. T. M. Forbes for specimens of the Puerto Rican *Calisto nubila*. Dr. P. J. Darlington took an enthusiastic interest in collecting specimens

of the genus when we were together in Haiti, and later secured two new forms in the mountains of the Tiburon Peninsula; my own collecting in Hispaniola was made possible by a Sheldon Fellowship from Harvard University.

Taxonomy.

An examination of the venation, male genitalia and secondary sexual characters shows wide divergences between some of the species of the genus. On a basis of the position of vein R_1 of the forewing, *Calisto* might be divided into two sections, of comparable taxonomic import: the one section including *C. archebates* and two related species, with R_1 arising at the apex of the cell; the other including all of the remaining species, with this vein arising at some distance beyond the end of the cell. A significant difference in pattern is correlated with this division: the species of the first section have the ocelli of both wings symmetrical, while they are asymmetrical in the second section. In both of these characters, the first section resembles the average satyrid more closely than does the second section, and in that respect it might be considered as more 'primitive'—closer to the ancestral generic type.

When we examine the male genitalia of the different species, we find an amazing diversity of form; when we try to analyze this diversity, we find that eleven of the fifteen species agree more or less closely in general characters, while the four remaining species differ from the first eleven and from each other very radically. These four aberrant species are: *eleleus*, *zangis*, *pulchella* and *nubila*. It seems most satisfactory to consider these to be derivatives of the common type, represented by the first eleven species of the genus: some characters, like the valves of *nubila*, modified through simplification; others, like the valves of *zangis*, through complication. It has not been possible to trace any very evident relationship between any of these four species, and it may be that each is an independent modification of the ancestral generic type: hence each has been treated in this paper as a separate 'species group' within the genus.

We are able, then, to recognize one group of species by venational characters, and four groups by genitalic characters, leav-

ing a central group of eight species. An examination of these eight species shows that they in turn fall into two natural groups, characterized by a difference in the uncus of the male; this difference assumes an increased significance when we find that the four members of one group are all from Hispaniola, the four of the other from the Bahamas and Cuba, and to emphasize this geographical correlation, it has seemed best to rank these two groups as taxonomic units on a par with the five other groups previously recognized. The classification of the genus, then, may be outlined as follows:

Genus *Calisto* Hubner.

Section *A*: vein R_1 of forewing at end of cell.

I. Archebates Group.

1. *loxias*, sp. nov. Hispaniola.
2. *archebates* (Ménétriés). Hispaniola.
3. *chrysaoros*, sp. nov. Hispaniola.

Section *B*: vein R_1 of forewing at some distance beyond cell.

II. Hysius Group.

4. *tragijs*, sp. nov. Hispaniola.
5. *hysius* (Godart). Hispaniola.
6. *confusa* Lathy. Hispaniola
7. *lyceius*, sp. nov. Hispaniola.

III. Herophile Group.

8. *herophile*: a. *herophile* Hubner. Cuba.
b. *apollinis* Bates. Bahamas.
9. *smintheus*, sp. nov. Cuba.
10. *delos*, sp. nov. Cuba.
11. *sibyla* Bates. Bahamas.

IV. Eleleus Group.

12. *eleleus*, sp. nov. Hispaniola.

V. Zangis Group.

13. *zangis* (Fabricius). Jamaica.

VI. Pulchella Group.

14. *pulchella* Lathy. Hispaniola.

VII. Nubila Group.

15. *nubila* Lathy. Puerto Rico.

Key to *Calisto*.

- | | |
|---|----|
| A. Cell of f.w. below marked with red or ferrugineous. | B. |
| — Cell of f.w. below fuscous, or sometimes with a diffuse ferrugineous shading (<i>nubila</i> , <i>archebates</i>). | G. |
| B. Red of f.w. below not extending distad of the end of the cell. | D. |

- Red of f.w. extending beyond the cell, or an isolated post-median patch of red present below the ocellus. C.
- C. Basal half of f.w. almost entirely red. (7), *lyceius*
- Two spots of red on this wing: one in cell, the other in the post-median area. (5), *hysius*
- D. Red cell mark small, sharply demarcated distad by a dark line (Cuba and Bahamas). E.
- Red of cell not so demarcated: either extending to the end of the cell (Hispaniola) or in the form of an oval spot (Cuba). F.
- E. Ground color of underside gray. (8), *herophile*
- Ground color of underside dark fuscous. (9), *smintheus*
- F. Red filling the cell, sometimes extending below into the cubital area. (Hispaniola). G.
- Red in the form of an oval spot, not reaching the posterior, or cubital, margin of the cell. (Cuba). (10), *delos*
- G. Small species (f.w. less than 16 mm. long); h.w. on underside usually conspicuously marked with light lines, always with at least an indication of such lines. (6), *confusa*
- Large species (f.w. more than 20 mm. long); lines of h.w. darker than ground color. (12), *eleleus*
- H. Underside of h.w. with a prominent orange or white median band. I.
- Not so marked. J.
- I. A single, solid band from the costal to the inner margin of h.w. (2), *archebates*
- This band seems to fork at the end of the cell, one branch going to the middle of the inner margin, the other to the anal angle. (3), *chrysaoros* ♂
- J. Ocellus of f.w. with a single central bluish-white dot; R_1 of this wing arising near the end of the cell. K.
- Ocellus of f.w. with a central dot and a basal dot; R_1 of this wing arising at some distance beyond end of cell. L.
- K. Outer margin of h.w. distinctly produced at the anal angle; ocellus of this wing minute or absent. (3), *chrysaoros* ♀
- Outer margin of h.w. evenly rounded to anal angle; ocellus of this wing distinct. (1), *loxias*
- L. Underside of h.w. fuscous or dark gray, with no trace of ferruginous. O.
- Underside of h.w. with a distinct ferruginous cast to the ground color. M.
- M. White postmedian spots of h.w. forming an even row, from the ocellus toward the costal margin (Jamaica, P. R.). N.
- M_3 - Cu_1 white dot absent, the M_2 - M_3 spot close to the end of the cell. (Hispaniola). (14), *pulchella*
- N. ♂ with a prominent, complex scent patch, consisting of a silky ring of coarse scales around a central area of fine closely appressed scales;

- ♀ with ferrugineous cast of underside of f.w. limited to basal half of wing, (Jamaica). (13), *zangis*
- Scent patch of male diffuse, not sharply marked into zones; ♀ with ferrugineous cast on underside of f.w. extending between the cubital veins to the submarginal area (Puerto Rico). (15), *nubila*
- O. Anal ocellus of h.w. small, round, with a central white spot; no postmedian row of white spots (Hispaniola). (4), *tragi*
- Anal ocellus of h.w. ovoid, with a basal white spot; a postmedian row of four white spots extending from the ocellus to the costal margin. (Bahamas.) (11), *sibyla*

I. ARCHEBATES GROUP.

In this group, vein R_1 of the forewing arises very close to the end of the cell, while in all of the other species of the genus it arises at some distance beyond the end of the cell. The position of the androconia patch of the male is shown by the stippled area of fig. 1; in *loxias* and *archebates* the androconia have only one form, that of simple rods, which are arranged in compact bunches so that they resemble scales. The androconia of *chrysaoros* are larger, flattened, usually with a shallow terminal notch. The uncus is short in *loxias* and *archebates*, strongly arched dorsally, and separated from the tegumen by a deep groove; in *chrysaoros* the uncus is longer, and the pre-tegumenal groove is comparatively broad and shallow. The side lobes are thin, spinelike; the valves are simple.

This group is considered to be closest to the ancestral type largely because of the position of vein R_1 of the forewing, which more closely approximates the usual satyrid condition; because of the centrally located ocellar pupils of the wing pattern, which seems more generalized than the asymmetrical form found elsewhere in the genus; and because of the comparatively simple genital structure of the male.

Three species are placed in the group, all from Hispaniola.

1. *Calisto loxias*, sp. nov.

♂ ♀. *Upper side*: Dark fuscous. *Under side*: *Forewing*: Fuscous, with a small patch of reddish brown in the upper angle of the cell; apical ocellus black, faintly and narrowly ringed with yellow, with a single minute bluish central spot; a faint brownish shading on the outer margin in fresh specimens. *Hindwing*: Fuscous, irrorated with brown scales; median band broad, contrasting but slightly with the ground color, edged proximally

and distally by faint lines; anal ocellus black, almost round, encircled with light brown, with a minute white central spot; four white spots between the veins indicating the ocellar row; some diffuse brown shadings discernible in the submarginal area. Length of f.w., 19–22 mm.

♂. Androconia patch as described for the group. Genitalia very similar to the same structures in *archebates*: uncus somewhat heavier than in *archebates*, valve slightly excavated before the apex, uniformly rounded in *archebates*.

Distribution.—Type (♂) and 4 ♂♂, 1 ♀ from Roche Croix, La Hotte Mountains, at an elevation of about 5000 feet (P. J. Darlington, Jr.).

Remarks.—This form may well be the representative of *archebates* Tiburon Peninsula, the mountains of which are separated from those of the La Selle range by the valley of the Rivière Gauche. *Loxias* differs strikingly in appearance from *archebates* because of the absence of the white or creamy band of the under side, but the two forms are very close in structure.

2. *Calisto archebates*.

Fig. 1, venation.

Satyrus archebates Ménétriés 1832, Bull. Soc. Nat. Moscow, p. 431; *id.* 1834, Nouv. Mém. Soc. Nat. Moscow, 3, p. 38.

Euptychia archebates: Westwood et al. 1851, Gen. Diurn. Lepid., p. 374.

Calisto archebates: Butler 1868, Cat. Satyr. Br. Mus., p. 97; Kirby 1871, Syn. Cat. Diurn. Lepid., 1, p. 103; Lathy 1899, Trans. Ent. Soc., London, p. 224, pl. 4, f. 4; Weymer 1911, in Seitz, Macrolepid. 5, p. 240; Hall 1925, Entom., 58, p. 165; Gaede 1931, Lepid. Cat., pars 46, p. 479.

♂ ♀. *Upper side*: Male usually with a brownish patch on outer margin of hindwing, between veins M_3 and Cu_2 : this patch always well developed in female, usually light brown surmounted by reddish brown. *Under side*: *Forewing*: Fuscous, with no red in the cell, and no median lines; apical ocellus black, with a simple minute central white spot; yellow ring of ocellus barely indicated, or well developed; outer margin usually with some light shadings. *Hindwing*: Fuscous, crossed by a conspicuous, broad median band: in the male yellow or orange, in the female, usually white, with yellowish green central scaling; anal ocellus small, round, symmetrical; submarginal area variegated with diffuse brown shadings. Length of f.w. 19–24 mm.

♂. Androconia patch and genitalia as described for the group.

Distribution.—19 ♂♂, 12 ♀♀, all from the La Selle mountain complex, at altitudes between 5000 and 7000 feet: Kenskoff, Mt. Bourette, La Visite.

3. *Calisto chrysaoros*, sp. nov.*Fig. 2, venation.*

♂. *Upper side*: Fuscous, with a small diffuse brown spot at the anal angle of the hindwing, and sometimes with brown shadings on the disk of this wing. *Under side*: *Forewing*: Fuscous, without markings except for the apical ocellus and some diffuse brown apical shadings; ocellus circled by an obscure yellowish ring, and with a single central dot. *Hindwing*: Dark brown, with a conspicuous creamy white median band crossing the apex of the cell, where it is narrowly separated from a similar, but more irregular band, which extends to the anal angle; ocellus very small; outer margin with some diffuse shadings.

♀. Hindwing above with more brown on the disk than in the male; base of this wing with a distinct greenish tinge. Creamy band of underside of hindwing absent: this wing instead with a diffuse pattern of brown shadings; anal ocellus minute. A female from La Visite has a small extra ocellus on the forewing, between veins Cu_1 and Cu_2 . Length of f.w. (♂ ♀), 17–20 mm.

♂. Androconia patch shown by stippled area of fig. 2. Most of the androconia bladelike, with a terminal notch, but there is a narrow peripheral band of simple, rodlike androconia around the end of the patch. Uncus moderately long, not arched dorsally above the tegumen; pre-tegumenal groove comparatively broad and shallow in profile; side-lobes spine-like, about half as long as uncus; valves simple.

Distribution.—Type (♂) and 9 ♂♂, 2 ♀♀ from the La Selle-La Hotte complex of southern Haiti, at elevations between 3000 and 7000 feet: Roche Croix, Targi, La Visite, Mt. Bourette, Mt. Robin (above Kenskoff), all taken in September and October by Darlington and Bates. Type from Roche Croix, La Hotte, 5000 ft.

Remarks.—The development of an anal lobe on the hindwing, including veins Cu_2 and 2A, is a structural peculiarity of this species. Its relationship with *archebates*, is shown by the position of vein R_1 of the forewing, but the differences in wing shape, in the male uncus, and in the androconia may indicate a comparatively ancient species.

II. HYSIUS GROUP.

In this group, the uncus of the male is short, very strongly arched dorsally, and separated from the tegumen by a deep groove; the side lobes are comparatively broad; the valves are simple. The position of the androconia patch is shown by the stippled area of fig. 3; the androconia are rodlike. The group

is distinguished from the Herophile Group principally on the structure of the uncus. The two groups are closely related, but it is clear that they have had a divergent history, which may date from the separation of the islands that they respectively inhabit.

The four species are all from Hispaniola.

4. *Calisto tragi*us, sp. nov.

Fig. 3, venation.

♂ ♀. *Upper side*: Fuscous, lighter toward the outer margins. *Under side*: *Forewing*: Fuscous, the markings obscure; cell and postmedian area with a faint indication of reddish brown; ocellus distinct, though sometimes small, with central and basal white dots; postmedian line present, but faint. *Hindwing*: Fuscous, the pattern almost entirely obscured (type ♂), or fairly well developed, with antemedian and postmedian lines, and two submarginal zigzag lines; ocellus small, round, with a central white dot: not elliptical, as in the other species. Length of f.w., 18–21 mm.

♂. Androconia patch as described for the group. Uncus longer and more slender than in *hysius*, the dorsal elevation pointed anteriorly, not evenly rounded as in *hysius*; tegumen smooth, without a transverse crease; the genitalia in general heavier and larger than in *confusa*, the distal section of the valve proportionately longer.

Distribution.—Type (♂) and 6 ♀♀ from La Visite, in the La Selle range, 5000 to 7000 feet (September, Darlington and Bates).

Remarks.—The proportion of the sexes in this series is curious, but no question of their proper association seems possible. The outer margin of the forewing is straighter than in *hysius* or *confusa*, giving the species a distinct facies.

5. *Calisto hysius*.

Fig. 10, genitalia.

Satyrus hysius Godart 1823, *Encycl. Meth.*, 9, p. 525.

Calisto hysius: Kirby 1871, *Syn. Cat. Diurn. Lepid.*, p. 103; Grimshaw 1898, *Trans. Royal Soc. Edinburgh*, 39, p. 3.

♂ ♀. *Upper Side*: Fuscous, with an indication of red in the postmedian area on both wings of the female; the male immaculate except for the darker androconia patch. *Under side*: *Forewing*: Red in cell sharply limited distally at the base of the median vein, except that it may extend below into the cubital interspace; an additional red spot just below the ocellus, between veins M_2 and Cu_1 , sometimes limited to the M_2 – Cu_1 area; apical ocellus varying considerably in size, with two minute blue dots;

postmedian and submarginal lines sometimes prominent, accentuated by light-colored scaling, or obscure. *Hindwing*: Pattern showing considerable variation in intensity: in two females from Kenskoff, it is almost exactly like the pattern of typical *confusa*, while in a male from La Visite it is almost entirely obscured; ocellus oval, with a basal white dot. Length of f.w. 16–18 mm.

♂. Androconia patch as described for the group. Uncus short, strongly arched dorsally, separated from the tegumen by a deep groove; tegumen with a transverse central depression, as shown in fig. 10.

Distribution.—6 ♂♂. 3 ♀♀ from Kenskoff (Aug.), La Visite (Sept.) and Mt. Bourette (Sept.): all in the La Selle mountain complex, at elevations between 4500 and 7000 feet.

Remarks.—Godart's description is as follows:

'Il est petit, d'un brun-obscur en dessus, avec un espace d'un rouge-ferrugineux vers le bord terminal de chaque aile.

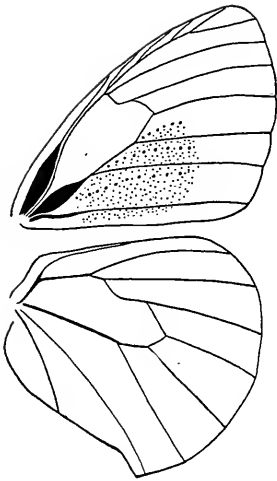
'En dessous, sa couleur est la même qu'en dessus, avec un oeil noir à iris jaunâtre & à double prunelle bleuâtre au sommet des ailes supérieures; avec un oeil semblable, mais à prunelle simple, à l'angle anal des inférieures. Celles-ci ont en sus trois points blancs, alignés entre l'oeil & la côte. Les ailes supérieures ont l'espace rouge du dessus & un autre plus grand pris de la base. Outre cela, les quatre ailes offrent, sur le milieu, une ligne grisâtre, transverse, sinuée; & vers le bout, qui est aussi grisâtre, une ligne noirâtre en feston.

'Sa patrie nous est inconnue; mais nous le supposons de l'Amérique septentrionale.'

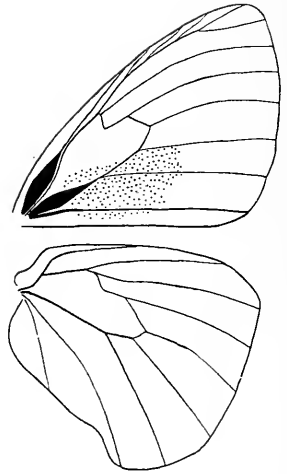
The application of this name is admittedly a guess. Godart's specimens probably came from the Cap Haitien region, and may very well represent a distinct form. The description (of a female) clearly states that there are two red areas on the under side of the forewing, and one on the upper; and of the forms before me, this is the only one showing that character. I can find no justification for Lathy's interpretation of the name, which has been generally followed by subsequent students (Weymer, Hall).

6. *Calisto confusa*.

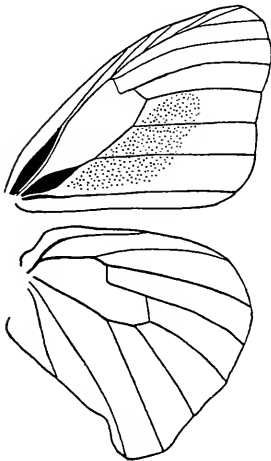
Satyrus lysius: Ménétriés (*nec hysius* Godart), 1832, Bull. Soc. Imp. Nat. Moscou 5, p. 314; *id.*, 1834, Nouv. Mem. Soc. Imp. Nat. Moscou 3, p. 131.



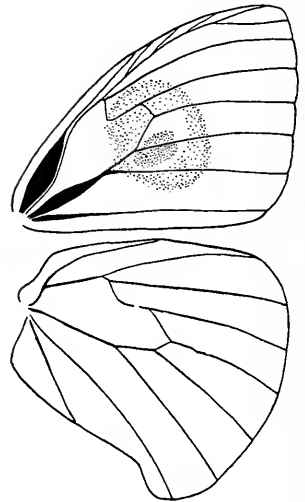
1



3



2



4

FIG. 1. *C. archebates*, venation.
 FIG. 2. *C. chrysaoros*, venation.

FIG. 3. *C. tragijs*, venation.
 FIG. 4. *C. zangis*, venation.

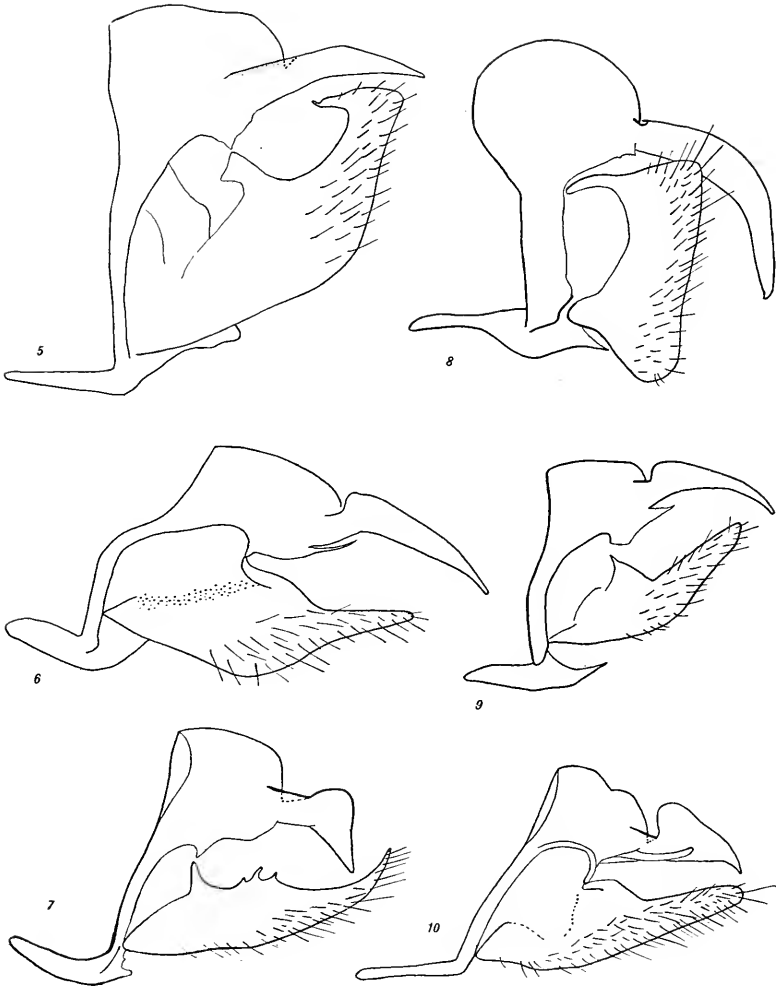


FIG. 5. *C. cleleus*, ♂ genitalia. FIG. 8. *C. pulchella*, ♂ genitalia.
 FIG. 6. *C. herophile*, ♂ genitalia. FIG. 9. *C. smintheus*, ♂ genitalia.
 FIG. 7. *C. zangis*, ♂ genitalia. FIG. 10. *C. hysius*, ♂ genitalia.

Calisto hysius: Butler 1868, Cat. Satyridae Brit. Mus., p. 97; Sharpe 1898, Proc. Zool. Soc. London, p. 362; Lathy 1899, Trans. Ent. Soc. London, p. 226, pl. 4, f. 10, 11; Weymer 1911, in Seitz, Macrolepid., 5, p. 240; Hall 1925, Entom., 58, p. 165.

Calisto confusa Lathy 1899, Trans. Ent. Soc. London, p. 227, pl. 4, f. 12, 13; Weymer 1912, in Seitz, Macrolepid., 5, p. 241, pl. 51g; Hall 1925, Entom., 58, p. 165; Gaede 1931, Lepid. Cat., pars 46, p. 479 (*partim*).

Calisto lysius: Gaede, 1931, *ibid.*

♂ ♀. The pattern of the wings is essentially the same as that of *herophile*. *Underside*: *Forewing*: Cell entirely red, this color sometimes extending into the cubital area. *Hindwing*: Disk more or less extensively irrorated with light scales. Length of f.w., 13–15 mm.

♂. Androconia patch as described for the group. The uncus proportionately longer and more slender than in either *hysius* or *tragi*: not so strongly arched dorsally; tegumen smooth; distal section of the valves short. There seem to be no significant differences in the genitalia of specimens from Ennery, Kenskoff or Bonao; but the form on the Tiburon Peninsula (Targi, La Hotte) has the valves proportionately shorter. This is not, however, correlated with any pattern characters.

Distribution.—15 ♂♂, 6 ♀♀ from Haiti: Debarriere, La Hotte Mts. (4000 ft., Oct., Darlington); Targi, La Hotte (3000 ft., Oct., Darlington); Camp Perrin, La Hotte (Oct., Darlington); Mont Rouis (sea level, Aug., Bates); Ennery (1200 ft., 3000 ft., Aug., Bates); Kenskoff (4000 ft., Aug., Bates). Rep. Dom.: Bonao (Aug., Bates).

Remarks.—There are two distinct pattern forms in the series before me: variety A, with the markings of the under side of the hindwing prominent, the lines heavily bordered with whitish, and variety B, with these markings obscure. A, the typical form figured by Lathy, seems to be the most common, and all of our low altitude specimens belong to it. B, the form figured by Lathy as *hysius*, is represented by three specimens, from three and four thousand feet (Debarriere and Ennery). One of the Ennery specimens, taken at three thousand feet with the others, is, however, typical A, so that the altitude correlation seems uncertain.

7. *Calisto lyceius*, sp. nov.

♂ ♀. *Upper side*: Dark fuscous, the female with a postmedian indication of reddish on the h.w. *Under side*: *Forewing*: entirely reddish brown, except the outer margin and the apex around the ocellus, which are gray; ocellus with central and basal white dots; postmedian and submarginal lines present. *Hindwing*: Base and disk reddish, outer margin gray;

antemedian line faint, postmedian line definite; ocellus oval, with basal white spot, and four white spots in ocellar row; a small black and white spot at the anal angle. Length of f.w., 15-16 mm.

♂. Androconia patch as described for the group. Genitalia proportionately much larger than in *confusa*, more closely resembling those organs in *tragi*; penis much more slender than the same organ in *confusa*, and straight, whereas the equally slender penis of *tragi* is bowed; uncus and tegumen similar to those structures in *confusa*; valves as in *tragi*, with an elongate distal section.

Distribution.—Type (♂) and 1 ♂, 1 ♀ from Saona Island, Dominican Republic, Jan. 21, 1931, Armour Exp. There is a strongly marked male in the collection of Cornell University from Monte Christi, June 7, 1916, Carl P. Schmidt.

III. HEROPHILE GROUP.

The androconia patch is very similar to the same structure in Group II. The androconia of *C. herophile* are slightly larger and stouter than those of *C. hysius*, but the form is essentially the same. The uncus is long, comparatively slender, separated from the tegumen by a conspicuous groove; the side lobes are reduced; the valves are simple, the basal section proportionately longer than in the *Hysius* Group.

Five choromorphs, here ranked as four species, from the Bahamas and Cuba, are placed in this group.

8. *Calisto herophile*.

♂ ♀. *Upper side*: Fuscous, the basal scaling somewhat darker than the distal on both wings. *Under Side: Forewing*: Ground color gray, the basal red spot confined to the middle of the cell, sharply limited distally by a dark line; postmedian and submarginal lines distinct; ocellus with two bluish-white spots. *Hindwing*: Antemedian, postmedian and two submarginal lines distinct; ocellus oval, black, often with considerable blue basal scaling. Length of f.w., 15-19 mm.

♂. The androconia patch is partially covered by long hairs which arise along the cell and curve over the anterior part of the patch. Uncus elongate, somewhat longer than the tegumen, separated from the tegumen by a narrow groove, about half as deep as the basal width of the uncus; tegumen smooth, only slightly rounded dorsally; side lobes narrow, spinelike; valves with a very broad basal section, a comparatively short and narrow apical section.

Distribution.—Cuba and the Bahamas: two subspecies, the exact limits of which must remain uncertain until the Bahamas have been more thoroughly explored.

8a. *Calisto herophile herophile*.*Fig. 6, genitalia.*

Calisto herophile Hübner 1823, Ex. Schm., Zutr., 2nd Hndrd., p. 16, f. 269, 270; Herrich-Schäffer 1864, Coorespbl. Zool. Min. Ver. Regensb., 18, p. 161; Doubleday et. al. 1851, Gen. Diurn. Lepid., 2, p. 399; Butler 1868, Cat. Satyridae Brit. Mus., p. 97 (! Honduras); Kirby 1871, Syn. Cat. Diurn. Lepid., p. 103; Gundlach 1881, Ent. Cubana, Lepid., p. 26; Lathy 1899, Trans. Ent. Soc. London, p. 226, pl. 4, f. 8, 9; Weymer 1911, in Seitz, Macrolepid 5, p. 240, pl. 51f; Holland 1916, Ann. Carnegie Mus., Pittsburgh 10, p. 494; Gaede 1931, Lepid. Cat., pars 46, p. 479; Bates 1935, Bull. Mus. Comp. Zoöl., 78, p. 152, f. 11. *Satyurus herophile*: Poey 1847, Mem. Real. Soc. Econ., Habana (2), 2, p. 179.

Cuban specimens have, in general, the markings of the under side of the wings much more sharply developed than Bahaman specimens: the postmedian lines are accentuated by light distal scaling, the hindwing may show extensive bluish scaling around the postmedian white spots, the submarginal lines are sharper.

Distribution.—90 specimens from Pinar del Rio, Habana, Santa Clara and Oriente provinces in Cuba. Holland (*l.c.*) records the species from the Isle of Pines.

Remarks.—It is interesting that no appreciable differences have developed between specimens from the mountains of Oriente and those from the Pinar del Rio.

8b. *Calisto herophile apollinis*.

Bates 1834, Occas. Papers Boston Soc. Nat. Hist. 8, p. 136.

The differences which characterize this choromorph were pointed out above. A single specimen from Cat Island is very like the Cuban form except, curiously, that the red cell spot is larger than the average, and that there is a slight red shading in the Cu-2A area.

Distribution.—12 ♂♂ and 1 ♀ from New Providence and Long Islands; 1 ♀ (mentioned above) from Cat Island.

9. *Calisto smintheus*, sp. nov.*Fig. 9, genitalia.*

♂ ♀. *Upper side*: Uniform dark fuscous, ♀ with a touch of reddish brown at the anal angle of the hindwing. *Under side*: *Forewing*: Ground color dark fuscous, darker than in *herophile*; markings essentially the same as in *herophile*, red of cell darker, more extensive. *Hindwing*: Dark fuscous; antemedian line fine, black; postmedian line accentuated by distal green scaling, sometimes forming a broad band; a variable amount of blue

or lavender scaling between the postmedian and submarginal lines; ocellus oval, with a basal white spot. Length of f.w., 18–21 mm.

♂. Genitalia similar to those of *herophile*, but larger, heavier; uncus proportionately somewhat longer; side lobes short, thick at the base, sharply pointed; valves with a broad basal section and a narrow apical section, the latter proportionately much longer than in *herophile*.

Distribution.—Type (♂) and 8 ♂♂, 4 ♀♀ from the Loma del Gato, Sierra del Cobre, Oriente, Cuba, 2750 to 3325 feet, Sept. 25–30, 1935, collected by J. Acuña, S. C. Bruner and L. C. Scaramuzza.

Remarks.—This form, because of its larger size, darker ground color and brighter markings, appears very different from *herophile*, but the differences are mostly of degree. The distinct genitalia and the overlapping ranges demonstrate, however, that two 'species'—by any definition of the word—are involved. Mr. Bruner writes me that '*C. herophile* occurs in the same region up to at least 2750 ft., at which elevation the ranges of the two species evidently overlap somewhat, but the habitat is not identical, as the new form is found only in the deep shady forest growth, while *C. herophile* occurs in more or less shady spots around fields, along roadsides, and so forth.'

10. *Calisto delos*, sp. nov.

♂ ♀. *Upper side*: Dark fuscous. *Under side*: *Forewing*: Cell patch dark red, oval; ocellus as in *smintheus*; postmedian and submarginal lines indistinct. *Hindwing*: Antemedian, postmedian and submarginal lines fine, indistinct; ocellus oval, with a basal white spot; three tiny white spots in the ocellar row. Length of f.w., 27 mm.

♂. Very close in genital structure to *smintheus*; tegumen proportionately slightly longer, apical section of valves somewhat more pointed, sacculus slightly shorter and not as blunt.

Distribution.—Type (♂) from Loma Cordero, Pico Turquino, Oriente, Cuba, 4000–6000 ft., Aug. 1, 1935, J. A. Acuña; 1 ♂ from Pico Turquino, July 20, 1922, S. C. Bruner and C. H. Ballou. Both types are in rather poor condition.

Remarks.—Perhaps this is the representative of *smintheus* on Pico Turquino. The differences between the two are more of subspecific than of specific nature, despite the very different facies. Since the two localities are not widely separated, it seems best to give the names specific status until more material is available for study. It is curious that *smintheus* shows an

intensification of the *herophile* pattern, *delos* a reduction of this pattern, although structurally *smintheus* and *delos* are much closer to each other than either is to *herophile*.

11. *Calisto sibyla*.

Bates 1934, *Occas. Papers Boston Soc. Nat. Hist.* 8, p. 136.

♀. *Upper side*: Dark brown, a small black spot at the anal angle of the hindwing. *Under side*: *Forewing*: Brownish gray, a dark antemedian line across the cell, a similar postmedian line, and two submarginal lines; ocellus black, yellow-ringed, with two white pupils. *Hindwing*: Antemedian, postmedian and submarginal lines well developed; ocellus oval, very dark blue, with a basal white pupil; four white spots in the ocellar row, surrounded by some bluish scaling; a black spot at the anal angle. Length of f.w., 25 mm.

Distribution.—A single female, from New Providence, Bahamas, June 1897, C. J. Maynard.

Remarks.—This species is similar to *herophile*, except for its much larger size, and the complete absence of red markings. Its taxonomic position must remain uncertain until males are available for study.

IV. ELELEUS GROUP.

The androconia patch is not developed as a distinct area on the wing. In scales scraped from the base of the cubital veins, a few slender, bladelike ones may be found, which may be androconia; no whole mounts were made of wings, so that it was not possible to study the scales *in situ*, with high magnification. The uncus is comparatively short, but slender, separated from the tegumen by a shallow but definite groove, which is somewhat obscured in lateral view by the considerable development of the wings of the uncus. The side lobes are apparently absent. The structure of the valves is distinctive: the apical section curved upward, terminated by a backward and inward curving hook, as shown in fig. 5.

The absence of the androconia patch in this and in the Nubila Group may be coincidence, as there is no other evidence of close relationship.

One species, from Hispaniola.

12. *Calisto eleleus*, sp. nov.*Fig. 5, genitalia.*

♂ ♀. *Upper side*: Uniform fuscous, except for a brown post-discal shading on the hindwing of the female. *Under side*: *Forewing*: Gray; cell entirely reddish brown; postmedian and submarginal lines present; ocellus black, with central and basal white dots; ocellar ring light brown. *Hindwing*: Antemedian and postmedian lines present; anal ocellus small, ovoid, with a white basal dot; no postmedian white spots present; two zigzag submarginal lines, clear in ♀, obscure in ♂. Length of f.w., 21–23 mm.

♂. Genitalia as described above.

Distribution.—Type (♂) from Mt. Bourette (5000 ft., 15 Sept. 1934, Bates); 1 ♀ from the hills south of Port-au-Prince (2000 ft., Oct. 1934, P. J. Darlington).

Remarks.—The ground color of the under side of the female is lighter than that of the male, and the markings are more prominent, the dark lines all edged distally with bands of lighter scaling. With only two specimens it is impossible to be sure whether this difference is individual, sexual, or geographical.

V. ZANGIS GROUP.

The andoconia patch is circular, extending over the end of the cell, as shown by the stippled area in fig. 4. The scales of the outer ring seem to be modified only in the possession of unusually heavy pigment, although on the unmounted wing they present the rough, contrasting appearance of true androconia. These latter, however, seem to be confined to a small area at the base of the cubital and third median veins; they are elongate, narrow, bladelike, usually not notched at the end.

The uncus is short, very strongly arched dorsally, as in Group II; the pretegumental groove is comparatively shallow; the side lobes seem to be absent. The valves are slender, terminating in a point, and the upper edge is curiously notched and toothed, as shown in fig. 7.

One species, from Jamaica.

13. *Calisto zangis*.*Fig. 4, venation, Fig. 7, genitalia.*

Papilio zangis Fabricius 1775, Syst. Ent., p. 486.

Papilio agnes Cramer 1782, Pap. Exot., 4, p. 73, pl. 325, f. A, B.

Hipparchia zangis: Hübner 1816, Verz. Bek. Schmett., p. 57.

Satyrus zangis: Godart 1823, Encycl. Meth. 9, p. 525.

Calisto zangis: Doubleday et al. 1851, Gen. Diurn. Lepid. 2, p. 399, pl. 66, f. 5; Butler 1868, Cat. Satyr. Brit. Mus., p. 97; Kirby 1871, Syn. Cat. Diurn., Lepid., p. 103; Möschler 1886, Abh. Senckenb. naturf. Ges., Frankfurt 14, (3), p. 27; Staudinger 1888, Exot. Tagf., 1, p. 232, pl. 83; Lathy 1899, Trans. Ent. Soc. London, p. 222, pl. 4, f. 1, 2; Weymer 1911, in Seitz, Macrolepid., 5, p. 240, pl. 51f; Kaye 1926 Trans. Ent. Soc. London, 1925, p. 477; Gaede 1931, Lepid. Cat., pars 46, p. 480.

♂ ♀. *Upper side*: Fuscous, the disk of the hindwing reddish brown in ♀; anal angle of this wing with a small black spot in both sexes. *Under side*: *Forewing*: Cell with diffuse reddish brown shading in ♀; postmedian line, obscure or absent in ♂, well developed in ♀; apical ocellus large, conspicuously circled with yellow, with central and basal bluish dots; two zigzag submarginal lines. *Hindwing*: Reddish brown, with conspicuous antemedian and postmedian lines; ocellus oval, with basal white pupil and a reddish encircling line; two distinct, dark zigzag submarginal lines; a small black and yellow spot at the anal angle. Length of f.w., 21–24 mm.

♂. As described for the group.

Distribution.—Jamaica: 5 ♂♂, 8 ♀♀ in the M. C. Z.

VI. PULCHELLA GROUP.

The androconia patch is reduced, the modified scales limited to an area around the bases of the two cubital veins. In untreated wings, the patch is very similar to the same structure in the *Hysius* Group: a heavily pigmented area, showing fine transverse striæ under low magnifications. The androconia are mixed, including narrow, rodlike scales, in large part overlaid by more normal, broad, scales, with one or two shallow terminal notches. The uncus is long, slender, curved downward, separated from the rounded tegumen by a shallow groove; the side lobes are represented by short stubs; the valves are reduced to narrow, vertical flaps, apparently through the complete loss of the apical section.

One species, from Hispaniola.

14. *Calisto pulchella*.

Fig. 8, genitalia.

Calisto pulchella Lathy 1899, Trans. Ent. Soc. London, p. 225, pl. 4, f. 5, 6, 7; Weymer 1911, in Seitz, Macrolepid., 5, p. 240, pl. 51g; Hall 1925, Entom., 58, p. 165; Gaede 1931, Lepid. Cat., pars 49, p. 480.

Calisto pulchella form ♀ *tenebrosa* Lathy 1899, l.c., p. 225, pl. 4, f. 7.

♂. *Upper side*: Fuscous, a black spot surmounted by a short yellowish gray bar, at the anal angle of the hindwing. *Under side: Forewing*: No markings except the apical ocellus and an indication of submarginal lines; ocellus black, with central and basal bluish-white pupils. *Hindwing*: Suffused with ferrugineous, except the area along the outer margin and the distal half of the costal margin; antemedian and postmedian lines present, zigzag; anal ocellus ovoid, ringed with ferrugineous, with a basal white spot; anal black spot of upper side repeated; submarginal lines indistinct; three white dots between veins R_s and M_s .

♀. Similar to the male, but usually with a conspicuous orange or ferrugineous patch on the outer margin of the hindwing above; markings of forewing below more distinct; ferrugineous suffusion of hindwing not so obvious.

Length of f.w., 22–27 mm.

♂. As described for the group.

Distribution.—4 ♂♂, 3 ♀♀ from Camp Perrin (La Hotte, 1000, 2500 ft., Oct., Darlington), Port-au-Prince (sea level, Aug., Bates), 'Hayti, P. R. Uhler.'

VII. NUBILA GROUP.

There is no androconia patch, and no androconialike scales were found on mounted wings. The uncus is curiously modified into a blunt, curved rod, which seems to overlap the dorsum of the tegumen, although this appearance seems to have come about through caudal and lateral growth of the tegumen itself. The valves are much reduced, with the form of short, narrow rods.

One species, Puerto Rico.

15. *Calisto nubila*.

Callisto zangis: Dewitz (*nec* Fabricius) 1877, Stettiner ent. Zeit. 38, p. 241; Möschler 1890, Abh. Senckenb. naturf. Ges. Frankfurt 16, p. 99; Gundlach 1891, An. Soc. Esp. Hist. Nat. Madrid 20, p. 132.

Calisto nubila Lathy 1899, Trans. Ent. Soc. London, p. 223, pl. 4, f. 3; Weymer 1911, in Seitz, Macrolepid. 5, p. 240, pl. 51f; Wolcott 1924, Jour. Dept. Agric. Porto Rico 7, p. 144; Gaede 1931, Lepid. Cat., pars 46, p. 480.

♂♀. *Upper side*: Fuscous, hindwing with a small black anal spot, surmounted by a small yellow spot; outer margin showing some ferrugineous suffusion near the anal angle. *Under side: Forewing*: Suffused with ferrugineous over the base and disk: a dark antemedian line across cell, and a postmedian line from costa almost to outer angle: ocellus large, black, with two bluish-white pupils, the yellow outer ring broad and con-

spicuous; two dark, wavy, submarginal lines. *Hindwing*: Somewhat variable, usually suffused with ferruginous; antemedian line faint, postmedian line distinct, extending to anal angle; ocellus ovoid, moderately large, with a basal white pupil and narrow ferruginous ring; anal spot present; one or two small white dots present in the ocellar row; subapical lines distinct. Length of f.w., 19–24 mm.

♂. As described for group.

Distribution.—3 ♂♂, 6 ♀♀ from Puerto Rico: El Yunque, Luquillo Mts., 1500–2000 ft., March (Cornell Univ.); Dorado, March (Cornell). I am indebted to Prof. Forbes for the opportunity of studying these specimens.

Museum of Comparative Zoölogy,
Cambridge, Mass.

Occasional Papers
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NOTES ON CUBAN ANOLES.

BY T. BARBOUR AND B. SHREVE.

NOT long since Doctor G. K. Noble and Mr. W. F. Hassler described a new giant Anolis from Cuba (*Copeia* 3, Oct. 15, 1935, p. 113-115). Reading this article caused us to undertake a careful examination of all the Cuban giant Anoles in the Museum of Comparative Zoölogy. We must admit that we have always assumed that there was but a single giant Anole on each of the islands where they occurred and for this reason have paid singularly little attention to the Cuban individuals. It now appears that there are not only two but apparently four of these lizards in the Cuban area. We have evidence of intergradation between the form long known as *Anolis equestris* Merrem and that recently described by Noble and Hassler. We have no reason to doubt that there may be similar intergradations between the typical form and the new Oriental race which we are now naming. Under these circumstances we prefer trinominals and recognize *A. equestris equestris* from the provinces of Havana, Matanzas (we have it from the western border of this province), Santa Clara and the lowlands of western Oriente and of this form *Anolis rhodolaemus* Bell, type locality Guanabacoa, is a straight synonym.

Anolis equestris luteogularis Noble and Hassler, is from the province of Pinar del Rio, and *Anolis equestris noblei*, subsp. nov. from Central Oriente. *Luteogularis* occurs as far eastward as San Antonio de los Baños which is in Havana Province.

The dewlap color mentioned by Noble and Hassler as being yellowish for their form and pinkish in true *equestris* is not as

stable as they suspected and this is a very interesting fact as the color of the dewlap in Anoles is regularly highly diagnostic. We have, however, a series of five specimens from Los Baños de San Vicente, all typical *luteogularis*, except that one of these specimens has a dewlap distinctly pinkish, another with a slight pink tinge, while three are yellowish.

***Anolis equestris noblei*, subsp. nov.**

Type.—Museum of Comparative Zoölogy no. 26,653, an adult male from the Sierra de Nipe, Province of Oriente, Cuba, collected by Elizabeth Mitchell.

Paratypes.—Museum of Comparative Zoölogy no. 6924, a young specimen from Santiago de Cuba, Province of Oriente, Cuba, collected by Captain Wirt Robinson, January 22, 1904; and Museum of Comparative Zoölogy no. 8977, also a young specimen from near Gnautanamo, Province of Oriente, Cuba, collected by C. T. Ramsden in 1913.

This race differs from typical *equestris* in possessing decidedly smaller dorsal scales but with these scales similar in shape and with the same arrangement with relation one to the other. The ventrals as well as most of the other scales are smaller than the corresponding ones of *equestris*.

The new race possesses dorsals which differ from those of *luteogularis* in shape and arrangement in the same way that the corresponding scales of *equestris* do. To express this more definitely it may be said that the dorsals of *noblei* are rather squarish, and less closely placed one to another (in the adult) than those of *luteogularis*. The dorsals of the last named form are rather oval. In size the dorsals as well as the scales of other parts of the body are about the same size in *noblei* as in *luteogularis* or else smaller in *noblei*. In the type series scale counts taken around the body immediately caudad to the dewlap are about 83-86 (type about 86) and about 43-50 for scale counts taken in the region of the fifth caudal vertebra (type about 44). The corresponding counts for *equestris* are 56-72 and 27-36; for *luteogularis* 78-90 and 38-50 (these include Noble and Hassler's counts for the two forms). These counts, of course, cannot be very accurately made.

The color of *noblei* (in alcohol) differs from that of *equestris* in that the first named is abundantly dotted with light brown dorsally, including the limbs and tail. Each spot usually covers one scale. Only the larger of the two juvenile paratypes (no. 6924) shows any evidence of this marking. This dotting is not shown in any of our considerable series of the typical subspecies at all. *Luteogularis*, while, sometimes marked above with lighter has a different style of dorsal coloration to *noblei*, for in the former, if lighter dorsal markings do occur they usually occupy only the edges of each scale and then almost every one. Some specimens of *luteogularis* are banded with lighter or have some scales lighter than other of the dorsals and do not possess the definite type of spotting seen in the type of the new race.

The dewlap of the type is decidedly pinkish, a color which is not yet shown on the dewlaps of the two young paratypes.

The general ground color of the three races is rather similar bluish, greenish, or decidedly dark brown.

Measurements.

	Head and body	Tail	Total length
Type no. 26,653	145 mm.	321 mm.	466 mm.
Paratype no. 6924	91 mm.	tail broken	
“ “ 8977	44 mm.	92 mm.	136 mm.

Anolis equestris hassleri, subsp. nov.

Type.—Museum of Comparative Zoölogy no. 11,178, an adult female from Los Indios, Isle of Pines, collected by G. A. Link in 1912.

Paratype.—Carnegie Museum no. 704, an adult female with the same data and history as the type.

Diagnosis.—This race shows some of the characters of *equestris*, *luteogularis*, and *noblei*. A scale count taken just caudad to the dewlap around the body counts about 72-83 (type about 72) and a count taken around the tail about at the fifth caudal vertebra is about 40-44 (type about 44). Thus in one the count is within the range of *equestris* and in the paratype the count is within the range of *luteogularis* and hence *noblei*. The dorsals in arrangement resemble those of *equestris*, in shape they agree rather with *luteogularis* being rather ovate than squarish. In size the dorsals are rather intermediate between *equestris* on the one hand and *noblei* and *luteogularis* on the other. The type resembling some specimens of true *equestris* in this character and the paratype some individuals of the other races. In general the other scales are the same size or a bit larger than those of *luteogularis*.

Coloration in alcohol seems to be as undiagnostic but the spotting of *noblei* is not to be found and the dewlap shows no sign of pink, being rather grayish in the type and yellowish in the paratype.

Measurements.

	Head and body	Tail	Total length
Type no. 1178	140 mm.	272 mm.	412 mm.
Paratype no. 704	153 mm.	291 mm.	444 mm.

Anolis clivicolus, sp. nov.

Type.—Museum of Comparative Zoölogy no. 39,664, an adult male from Loma Cordero, Turquino Peak, 4000-6000 ft., Cuba, collected by J. Acuna, August 1, 1935.

Paratype.—Museum of Comparative Zoölogy no. 39,665, an adult female with the same data and history as the type.

Diagnosis.—One of the small series of forms related to *Anolis alutaceus*. It differs particularly in possessing a much broader and more rounded rostrum and a thicker and less spatulate head; also the supraorbital semicircles are separated by two (or three) rows of scales rather than one as is usually the case with *alutaceus*.

Description.—Head not elongate, about one and five-sixths times as long as broad (about twice as long as broad in the paratype) frontal ridges distinct converging anteriorly enclosing a depression, upper head scales rather small, weakly keeled or rugose, the supraorbital semicircles separated by two or perhaps three rows of scales approximately seven to nine enlarged supra-ocular scales, separated from the supraorbitals by one series of small scales, occipital about the size of the ear opening, separated from the supraorbitals by three series of scales (four in paratype); four canthal scales; five loreal rows (four and five in paratype); eight upper labials, ear opening suboval; dewlap moderate in size, barely indicated in the female paratype; gular scales smooth or feebly keeled; median dorsals decidedly enlarged and weakly keeled, diminishing in size down the sides and finally becoming granular, ventrals quadrangular or hexagonal, subimbricating, feebly keeled and slightly larger or about the same size as the dorsals, and similarly shaped; limbs rather long and slender, and adpressed hind limb reaching the anterior border of the orbit, digits rather feebly dilated, 17 lamellæ under phalanges II and III of the fourth toe (19 in paratype); tail feebly compressed.

Coloration in alcohol.—Light brownish gray above, the dorsum crossed by brown bands one on the anterior part of the dorsum and one at the base of the tail being most distinct; nape and sides spotted with brown; limbs with dark brown cross bars enclosing lighter areas; tail with brown cross bars; a dark brown band on top of head connecting the eyes, another just below the canthus rostralis, underside of head obscurely marked with brownish spots; belly and chest grayish, skin of dewlap dark gray, rear of femur dark brown bordered above with lighter. In the female the dorsum is covered by a longitudinal gray streak about 16 scale rows wide expanding appreciably on the posterior part of the head. This stripe is bordered on each side from the eye to the base of the tail with a narrow chocolate brown band, with an ill-defined light edge above and with the lower edge also poorly defined except posteriorly; sides gray or brownish; limbs brown without cross bands; tail cross banded with darker brown posteriorly; toes barred with dark brown as in the type, chest and belly gray or brownish gray, unmarked; markings on the rear of the femur and below the canthus as in the type. The coloration of this paratype recalls that of some specimens of *alutaceus* except that in latter there is usually a prominent white spot below the eye.

Measurements.

	Head and body	Tail	Total length
Type no. 39,664	32 mm.	72 mm.	104 mm.
Paratype no. 39,665	32 mm.	73 mm.	105 mm.

It is perhaps arguable that the female paratype of this form may represent a species distinct from the male holotype. Sexual dimorphism, however, is by no means rare in *Anolis* and in the absence of more material it is certainly conservatism and very probably correct to consider the specimens conspecific.

We wish to present our heartiest thanks to Dr. S. C. Bruner, of the Agricultural Experiment Station at Santiago de las Vegas for transmitting this material and to congratulate Mr. Acuna, his associate, on this interesting find.

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A NEW EASTERN RACE OF *GALAGO DEMIDOVII*.

BY BARBARA LAWRENCE AND SHERWOOD L. WASHBURN.

SCHWARZ's excellent review of the long-tailed lemurs or galagos (*Ann. Mag. Nat. Hist.* (10). 7, p. 41, Jan., 1931) admittedly leaves some question as to the exact extent of the range of *G. demidovii thomasi*, and does not attempt to discuss in any great detail the characteristics of the various forms recognized by him. The Museum of Comparative Zoölogy is fortunate in possessing good series of many of these forms and as far as our material goes we are quite in agreement with his conclusions.

While going over the collection we have found an interesting southeasterly extension of the range of *demidovii*: from Madehani in the Ukinga Mountains, Tanganyika Terr., we have a series of the comparatively large race *thomasi* of Elliot; and from the isolated rain forests on the Uluguru Mountains, Tanganyika Terr., an hitherto undescribed form. Both of these, because of their relatively large size and external similarity to subspecies of *senegalensis* found in adjacent areas, have previously been confused with forms of that species. On comparing these with other races of *demidovii* and *senegalensis* we were struck by their somewhat intermediate character particularly as regards their size and the shape of the premaxillaries. This is interesting in view of the fact that at one time *demidovii* was thought to be distinct enough to warrant full generic recognition. With the discovery of these two forms the separation of the two species becomes increasingly difficult and it has seemed of value to tabulate certain distinguishing cranial features, and to show that there is a gradual convergence between *G. demidovii* through its race *G. d. thomasi*, and *G. senegalensis zanzi-*

baricus and the more typical forms of *senegalensis* found in the open savannah country of East and South Africa, as follows:

Galago demidovii

Difference in size between m^2 and m^3 less, .1 mm. to .5, average .24;
 Hypocone or cingulum generally present on m^3 ;
 Premaxillaries drawn out into a point at acanthion well in front of the alveolar margin of the incisors;
 No swelling at the root of the canine;
 Rostrum longer, ratio of total length of skull to cranial width less, .497 to .556, average .521.

Galago senegalensis

Difference in size between m^2 and m^3 more, .3 mm. to .9, average .51;
 No hypocone or cingulum on m^3 ;
 Premaxillaries not drawn out into a point at acanthion;
 Pronounced swelling at the root of the canines;
 Rostrum shorter, ratio of total length of skull to cranial width more, .502 to .584, average .532.

Of the *senegalensis* group, *zanzibaricus* is the only one that has the premaxillaries somewhat projecting. Its molar teeth are smaller than in other members of the group, except for m^3 which is more nearly the width of m^2 although it is still much narrower as compared with m^2 than it is in forms of *demidovii*. The rostrum is characteristically broad on account of the swellings caused by the roots of the canines. Of the *demidovii* races, *thomasi* most nearly approaches *zanzibaricus*, and may be described more fully as follows:

Galago demidovii thomasi Elliot.

Ann. Mag. Nat. Hist. (7), 20, p. 189, Sept., 1907.

Galago matschiei Lorenz-Liburnau, Ann. Königl. Kais. Naturhist. Hofmus., Wien, 31, p. 237, 1917.

Galago senegalensis moholi Allen and Loveridge, not Smith, Bull. Mus. Comp. Zool. 75, no. 2, p. 84, Feb., 1933.

Description.—Back and dorsal surface of the hind legs 'prout's brown' (colors in quotation marks after Ridgway, *Nomenclature of Colors for Naturalists*, 1886) darkening to 'vandyke brown' on the top of the head, bases of the hairs 'blackish slate'. Examined under a lens, these hairs

prove to have the extreme tips dark 'seal brown' with a subterminal ring of 'prout's brown' imparting the general tone to the back. The dorsal surface of the fore limbs and the backs of the hands and the feet are 'russet'; the fingers and toes are sparsely covered with short 'cream buff' hairs. The extreme tips of the hairs of the under surface of the fore and hind limbs, the belly, and the cheeks as far as the ears are 'cream buff' with extensive 'slate-gray' bases which give a general grayish hue to the belly. The hairs on the chest and throat have a more pronounced wash of real 'buff' giving this area a much yellower appearance. The tail is long haired, 'bistre' with conspicuous 'clove brown' tips and fairly extensive 'hair brown' bases, the tip of the tail is a pronounced 'clove brown', relatively much darker. The general tint is produced by a mixture of 'clove brown' hairs with pale 'bistre', occasionally dark-tipped ones. In dorsal coloring *thomasi* resembles *zanzibarius* from the Uluguru Mountains so closely as to be almost indistinguishable from it. In the latter, however, the ventral surface and the cheeks are much yellower, the hairs being tipped with 'buff-yellow', deepening to 'orange-buff' on the outer surface of the thighs, the fore limbs and the shoulders. The 'slate-gray' bases of the hairs are less extensive and therefore are less conspicuous than in *thomasi*. In *zanzibarius* the short-haired tail is 'prout's brown' with an intermingling of very shiny 'broccoli brown' hairs that give it a slightly frosted appearance; the tip of the tail is 'vandyke brown.' The individual hairs are minutely tipped with 'vandyke brown' and have inconspicuous 'broccoli brown' bases. The dorsal surface of the head is definitely grayer than in *thomasi*. These differences obtain for all eight specimens examined; for purposes of identification, however, without the aid of comparative material the much paler ventral surface in *thomasi* and the longer-haired, smokier-colored tails are the most important characteristics. The other differences are scarcely apparent until the two series are laid out side by side.

The skull of *G. d. thomasi*, although unquestionably of the *demidovii* type, has many of its characteristic traits so modified that it much more resembles that of *zanzibarius* than do those of the West African forms. Unfortunately we have no specimens of *anomurus* with which to compare it. Compared with *G. d. demidovii* and *G. d. pusillus* the skull is slightly larger, the premaxillaries although drawn out into a point at acanthion have not the very pronounced, almost tubular extension found in the former; the molar teeth are narrower. Compared with *zanzibarius*, the skull of *thomasi* is smaller, total length ranging from 40.3 mm. to 41.0 and from 41.6 mm. to 42.8, (in these and the following measurements the first are those of *thomasi*, the second of *zanzibarius*). The rostrum in *thomasi* is longer in proportion to the total length of the skull and is much narrower without any swelling at the roots of the canines, (width across canines 5.9 mm. to 6.9: 7.1 mm. to 7.7); tooth row shorter both actually (13.1 mm. to 13.7: 14.3 mm. to 14.8) and in proportion to the total length

of the skull, as shown by ratio of length of cheek teeth to total length, (.331 to .342: .344 to .346). The teeth are smaller (m^2 , 2.6 mm. to 2.9: 3.2 mm. to 3.4); the difference in width between m^2 and m^3 varies from 0.1 mm. to 0.3 and from 0.3 mm. to 0.8. The premaxillaries are drawn out into a much more pronounced point than in *zanzibariensis*.

Remarks.—This series, collected by Mr. Arthur Loveridge at Madehani in the Ukinga Mountains, Tanganyika Terr., was described by Dr. G. M. Allen and Mr. Loveridge, (*Bull. Mus. Comp. Zoöl.* 75, no. 2, p. 84, Feb., 1933). In the absence of sufficient comparative material, it was originally referred to *G. senegalensis moholi*, but additional material has enabled us to reidentify it more satisfactorily.

Galago demidovii thomasi Elliot was described from Beni, Semliki River, Ituri District, Belgian Congo. The most southerly specimens recorded by Schwarz come from west of northern Lake Tanganyika, 'Yamba Yamba between Baraka and Kalembelembe.' He mentions, however, that the southern extension of the range is not known. Elliot's description is not very detailed, nor does Schwarz enlarge upon it to any great degree; he does, however, emphasize the larger size and longer fur of this form as compared with other forms of the species and in this our specimens agree. Total length of the skull as given by him ranges from 41 mm. to 42, in ours from 40.3 mm. to 41. Color variation amongst these galagos is so slight as to make it extremely difficult to draw any conclusions from Elliot's rather brief statements. He mentions that the head and upper parts of the body are 'drab, washed with Mars brown.' According to Ridgway this is one of the yellow browns and so is quite distinct from the much more pinky 'chocolate brown' of the Liberian specimens of true *demidovii* that we have examined. Further, he states that the under parts and inner side of the limbs are buff; our specimens agree in this also, differing from the decidedly 'ochraceous buff' of *demidovii*. The teeth, he says, are much larger than in *demidovii*, giving the length of the upper molar series as 11 mm.; the teeth in our series are definitely smaller but the length of the upper molar series ranges from 10.8 mm. to 11.6. Other cranial measure-

ments of our specimens (see table) agree quite well with those given by Elliot which are as follows: zygomatic width 25 mm., palatal width 14, width of the braincase 21. From the material at hand it seems highly probable that this series is an extreme southern representative of *G. d. thomasi*, following down the Rift Valley from the rain forests in the north.

***Galago demidovii orinus*, subsp. nov.**

Galago gallarum cocos Allen and Loveridge, Proc. Boston Soc. Nat. Hist. 38, no. 9, p. 425, Dec., 1927 (not of Heller).

Type.—Adult male skin and skull no. 22,453, Museum of Comparative Zoölogy, from Bagilo in the Uluguru Mountains, Tanganyika Territory, altitude 5,000 ft.; collected 17 Sept., 1926, by Mr. Arthur Loveridge.

Description.—Back, top of head, dorsal surface of arms and legs ‘mummy brown.’ The hairs are minutely tipped with dark ‘vandyke brown’ and have a narrow subterminal ring of pale ‘mummy brown’; the bases are ‘blackish slate.’ Belly washed with ‘buff-yellow,’ becoming whitish on the underside of the hind limbs and the upper arms and darkening on the throat, chin, and cheeks to ‘orange buff’; shoulders ‘tawny ochraceous’ anteriorly. On the ventral surface the pale tips of the hairs are not long enough to conceal the gray bases, which are particularly visible on the abdomen and on the under sides of the limbs. Outer sides of the thighs barely washed with ‘tawny ochraceous.’ Wrists paler than the back, verging on ‘tawny-olive,’ dorsal surface of the ankles like the back with a slight mingling of pale hairs. Hands, feet, and fingers pale ‘wood brown’; stripe on nose ‘buff’ verging towards ‘broccoli brown’ on the forehead. Tail deep ‘russet’ at base becoming darker at tip, individual hairs only very slightly paler at bases. Examined under a lens, some of the hairs prove to be ‘seal brown’ or very closely ringed with ‘seal brown’ throughout their length. The majority are ‘russet’ with a tip of ‘mummy brown’ and in some a more or less indefinite number of ill-defined subterminal rings of ‘mummy brown’ or ‘burnt umber.’ The tail is noticeably short-haired.

The skull is typical of the *demidovii* group with elongated premaxillaries and evenly tapering rostrum without swellings above the roots of the canines. It is almost as large as in *thomasi* with the upper tooth row somewhat longer in proportion to the total length of the skull. The premaxillaries are decidedly more elongated than in *thomasi* but not as much so as in *demidovii* and *pusillus*. There is much more difference between the width of m^2 and m^3 (0.5 mm.) than in any other members of the group; this is the only feature in which it approximates *senegalensis*. Compared with *zanzibaricus*, also found in the Uluguru Mountains, *orinus*

is decidedly smaller, hindfoot in the former 57.6 mm. to 59.8, in the latter 47.7, measurements taken on dried specimens. *Galago d. orinus* is much redder than *G. s. zanzibarius*; this is particularly noticeable on the head where the 'mummy brown' of the dorsal surface is even more pronounced than on the back. In *G. s. zanzibarius* the back is 'prout's brown' and the top of the head 'hair brown' slightly grizzled with whitish on the forehead, the stripe on the nose is white instead of buffy. In *G. d. orinus* the tail, also, is much redder verging on deep 'russet' at the base with the tip slightly darker due to the greater extension of 'mummy brown' tips on the individual hairs. *G. s. zanzibarius* further differs in having the dorsal surface of the hind legs much grayer, verging on 'sepia', and the outer sides of the thighs strongly tinged with 'tawny ochraceous.' Comparing *orinus* with the series of *thomasi*, the smaller size and generally redder appearance of the former are particularly noticeable; in *thomasi* the hind foot measures as much as 49.0 mm. to 52.0; in *orinus* the whole dorsal surface is brighter and the short-haired russet tail is strikingly different from the long-haired smoky tail of *thomasi*. Ventrally also *orinus* is brighter, and in this respect resembles *zanzibarius* quite closely. The stripe on the nose is buffy rather than whitish, a difference which obtains for all of the series examined but with more material this character may prove somewhat variable.

Discussion.—In December, 1927 (*Proc. Boston Soc. Nat. Hist.* 38, no. 9, p. 425), Dr. Allen and Mr. Loveridge referred the whole series collected from Bagilo, Uluguru Mountains, Tanganyika Terr., to *Galago gallarum cocos* Heller, mentioning that 'of the five specimens only one is cinnamon above, as described by Heller for this lemur. The four others are dark ceru drab above instead, the tail similar but becoming rather smoky at the tip in two, and decidedly dark in the remaining two.' And further that 'the skull of the type', i.e., *cocos*, 'as figured by Hollister has the last upper molar decidedly larger than in the present series.' Ernst Schwarz in his review of the galagos, Jan., 1931, makes *cocos* a synonym of *zanzibarius* Matschie:—'There can be no doubt that Heller's *cocos* is identical with this race,' i.e., *zanzibarius*, 'the size, coloration, and the large upper m³ are found both in the series at Berlin and the one of *cocos* studied by Heller and Hollister.' As the revised range of *zanzibarius* thus includes the coast strip opposite Zanzibar and hence the Uluguru Mountains, four of the specimens originally referred to *cocos* may be considered as

zanzibaricus. The fifth, the one that we have just described as *orinus*, differs so completely from Heller's original description of *cocos* as to make any revival of this name impossible. Heller describes *cocos* as being from the coastal belt and states that it is very similar to *gallarum*. From specimens we have at hand *gallarum* is a much paler animal than *orinus* with the bright ochraceous hind legs that are typical of the *senegalensis* group; further, he states that the 'chin, throat, and sides of neck' are 'blackish' in *cocos*, whereas in our specimens they are definitely 'orange buff.' The skull seems to be longer, (41 mm.), and the upper cheek teeth shorter (12.3 mm.) than in *orinus*. The fact that our form unquestionably belongs to the *demidovii* group seems to set it apart geographically from any galago previously described from this area, while its distinctive characters contrast it with the related members of this group.

Conclusion.—The discovery of this galago forms an interesting addition to the list of mammals found in the isolated patches of rain forest in the Uluguru Mountains. Dr. Allen and Mr. Loveridge have already described two new forms (Dec., 1927) *Crocidura maurisca geata* and *Chlorotalpa tropicalis*, both of them related to species not previously recorded east of the Great Lakes district, and noted the occurrence of *Otomys kempi* Dollman which up to that time had only been recorded from Mt. Mikenno and near Lake Kivu. These rain-forest forms, completely cut off from their closest relatives by about five hundred miles of intervening dry country, are an evidence of the probable former extension of the great forests of Africa. In the case of this galago we find it living alongside of a plains form that must have moved in from the lower country. And it is noteworthy that the external similarity of these two races is much greater than the structural similarity of the skull.

Number	Sex	Basal length	Palatal length	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Greatest width across swelling over roots of canines	Length of upper cheek teeth	Length of lower cheek teeth	Width of upper m2	Width of upper m3	Ratio of total length to width of braincase	Ratio of total length to length of upper cheek teeth	Ratio of length of upper cheek teeth to width outside molars	Locality	
M.C.Z. 13,367	♀	37.0	25.8	12.3	23.6	18.2	18.9	11.0	5.5	12.3	10.2	3.2	3.0	.51	.332	.895	Liberia, near Monrovia
M.C.Z. 29,695	♂	35.8	24.4	11.3	23.3	...	18.7	11.3	5.7	11.7	10.0	3.0	2.8	.523	.327	.966	Liberia, Gbanga
M.C.Z. 25,601	♂	39.8	27.9	13.5	25.5	19.4	19.8	12.6	6.8	13.6	11.1	3.2	3.0	.497	.342	.927	Liberia, Gbanga

Galago demidovii demidovii

Young

Galago demidovii pusillus

M.C.Z. 14,661	♂	37.2	25.3	12.5	22.6	19.7	19.4	11.3	6.4	11.8	9.9	2.9	2.5	.521	.317	.957	Cameroons, Melet
M.C.Z. 14,660	♂	35.9	25.0	12.2	22.9	19.8	20.0	11.3	6.6	11.8	9.6	2.9	2.7	.556	.329	.957	Cameroons, Melet
M.C.Z. 17,595	♂	36.2	24.9	12.2	...	...	...	10.6	5.8	11.3	...	...	2.5	...	.312	.939	Cameroons, Melet
M.C.Z. 17,596	♂	...	...	11.6	...	...	...	10.4	5.7	11.2	9.5	3.0	2.6	...	...	.921	Cameroons, Melet

Teeth Br.

Number	Sex	Greatest length	Basal length	Palatal length	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Greatest width across swelling over roots of canines	Length of upper cheek teeth	Length of lower cheek teeth	Width of upper m2	Width of upper m3	Ratio of total length to width of braincase	Ratio of total length to length of upper cheek teeth	Ratio of length of upper cheek teeth to width outside molars	Locality
<i>Galago demidovii thomasi</i>																	
M.C.Z. 26,451,	♀	40.3	29.1	15.4	23.7	19.6	20.0	11.8	6.4	13.6	11.5	2.9	2.6	.496	.337	.868	Tanganyika Terr., Madehani, Ukinga Mts.
M.C.Z. 26,450,	♀	41.0	29.5	15.3	24.6	20.5	21.0	12.4	6.9	13.7	12.8	2.9	2.8	.512	.334	.905	Tanganyika Terr., Madehani, Ukinga Mts.
M.C.Z. 26,449,	♂	38.2	26.6	13.8	21.8	19.0	19.9	10.6	5.9	13.1	10.7	2.8	2.7	.520	.342	.809	Tanganyika Terr., Madehani, Ukinga Mts.
M.C.Z. 26,446,	♀	40.5	28.8	15.0	23.9	19.6	20.6	11.7	6.2	13.4	11.2	2.6	2.4	.508	.331	.873	Tanganyika Terr., Madehani, Ukinga Mts.
<i>Galago demidovii orinus</i>																	
M.C.Z. 22,453,	♂	39.2	27.4	14.0	...	18.9	19.5	12.3	6.0	13.7	11.5	3.0	2.5	Br. .497	.35	.598	Tanganyika Terr., Baglio, Uluguru Mts.

Number	Greatest length	Basal length	Palatal length	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Greatest width across swelling over roots of canines	Length of upper cheek teeth	Length of lower cheek teeth	Width of upper m2	Width of upper m3	Ratio of total length to width of braincase	Ratio of total length to length of upper cheek teeth	Ratio of length of upper cheek teeth to width outside molars	Locality
<i>Galago senegalensis zanzibaricus</i>																
M.C.Z. 22,450, ♀	41.6	29.7	14.1	25.6	21.0	20.9	13.1	7.1	14.3	12.6	3.4	2.6	.502	.344	.915	Tanganyika Terr., Bagilo, Uluguru Mts.
M.C.Z. 22,449, ♂	42.8	30.8	14.4	...	21.2	21.5	13.6	7.7	14.8	13.7	3.2	2.9	.502	.346	.92	Tanganyika Terr., Bagilo, Uluguru Mts.
M.C.Z. 22,451, ♀	...	...	15.0	...	...	...	13.1	...	R 14.4	R 12.5	3.3	2.9	...	...	.91	Tanganyika Terr., Bagilo, Uluguru Mts.
<i>Galago senegalensis moholi</i>																
M.C.Z. 25,927, ♂	...	...	12.9	...	...	22.1	13.0	7.3	13.9	11.5	3.2	2.5	...	...	.935	Bechuanaland
M.C.Z. 33,908, ♀	41.5	29.5	14.3	28.5	24.3	24.1	13.9	7.8	14.2	11.5	3.3	2.8	.584	.342	.98	Transvaal, Waterberg Dist., Vaalwater

Number	Sex	Greatest length	Basal length	Palatal length	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Greatest width across swelling over roots of canines	Length of upper cheek teeth	Length of lower cheek teeth	Width of upper m2	Width of upper m3	Ratio of total length to width of braincase	Ratio of length of upper cheek teeth to length of total length	Ratio of length of upper cheek teeth to width outside molars	Locality
<i>Galago senegalensis braccatus</i>																	
M.C.Z. 31,723,	♂	42.6	29.6	13.8	...	22.2	22.9	14.1	7.8	15.1	12.8	3.5	2.9	.538	.354	.934	Kenya Col., Mt. Mbololo
M.C.Z. 31,724,	♀	44.7	31.3	...	...	24.2	24.3	...	9.0	...	13.2	3.5	2.7	.544	...	...	Kenya Col., Tsavo
M.C.Z. 22,760,	♂	48.5	34.6	16.4	32.7	25.9	24.5	16.1	10.0	16.9	13.9	3.7	3.2	.505	.349	.952	Tanganyika Terr., Mwanza
M.C.Z. 25,548,	♂	42.5	31.0	14.1	30.5	22.6	23.6	14.6	8.9	14.9	12.8	3.1	2.5	.555	.350	.98	Tanganyika Terr., Mwanosomano's
M.C.Z. 25,549,	♀	14.2	28.2	...	22.6	14.1	7.9	15.2	12.7	3.5	2.8	...	...	...	Tanganyika Terr., Mwanosomano's
<i>Galago senegalensis gallarum</i>																	
M.C.Z. 16,077,	♀	41.6	...	14.1	...	21.6	22.3	14.5	7.8	15.2	12.7	3.7	3.4	.536	.365	.954	Kenya Col., Guaso Nyiro
M.C.Z. 16,075,	♂	43.7 Br.	...	15.1	28.5	23.3	22.7	15.0	8.8	15.6	13.1	3.8	3.2	.52	.357	.961	Kenya Col., Guaso Nyiro
M.C.Z. 16,079,	♂	14.6	7.7	14.5	12.3	3.5	3.1	...	...	1.00	Kenya Col., Guaso Nyiro
M.C.Z. 16,076,	♂	15.2	...	...	...	14.8	9.0	...	12.8	3.7	3.3	...	...	...	Kenya Col., Guaso Nyiro

Number	Sex	Greatest length	Basal length	Palatal length	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Greatest width across swelling over roots of canines	Length of upper cheek teeth	Length of lower cheek teeth	Width of upper m ₂	Width of upper m ₃	Ratio of total length to width of braincase	Ratio of total length to length of upper cheek teeth	Ratio of length of upper cheek teeth to width outside molars	Locality
M.C.Z. 29,799,	♂	46.4	32.6	15.4	..	25.1	25.1	16.1	8.9	16.8	14.1	3.9	3.0	.541	.362	.952	Kenya Col., North Province
M.C.Z. 31,287,	♂	45.9	..	15.5	..	..	24.3	14.7	9.0	15.5	13.1	3.3	2.8	.53	.337	.95	Kenya Col., Kirui, Mt. Elgon
M.C.Z. 31,286,	♀	14.9	12.5	3.2	2.6	Kenya Col., Kirui, Mt. Elgon

Galago senegalensis albipes

Occasional Papers
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A NEW SHARK FROM TASMANIA.

BY LUIS HOWELL RIVERO

WHILE comparing the Cuban *Squalus* with the specimens of the same genus in the collection of the Museum of Comparative Zoölogy, a specimen was found, which although identified as *Squalus acanthias* has proved not to belong to that species. Further study of the specimen makes clear that it is a new species, and it is here described.

***Squalus tasmaniensis*, sp. nov.**

Holotype.—Female, M. C. Z. Cat. Selachians no. 146, from Hobart Town, Tasmania.

Measurements of the holotype (in millimeters).—

Total length:	247
Head (to last gill opening):	50
Body (from tip of snout to vent):	124

Description.—Head almost $\frac{1}{5}$ of the total length, depressed; snout tapering, depressed and rounded, its length to anterior part of orbit equal to $3\frac{1}{2}$ the distance from tip of snout to last gill opening. Nostrils transverse, halfway between mouth and tip of snout, anterior valve broadly rounded with a rudimentary process on its hinder margin. Orbit farther from first gill opening than from end of snout; its length almost equal to snout and is contained almost 4 times in the length of the head, almost equal to the length of all five gill slits, its posterior end reaching groove of mouth. Mouth with a short deep groove and a labial fold at each angle, its width $1\frac{1}{4}$ preoral length. Teeth with cutting edges on both jaws; upper jaw with narrower teeth and one median tooth, its cusp median, erect, pointed, with two lateral lobes; lower teeth broader and more parallel to the jaw, two rows in use and in both rows the upper median tooth is clearly seen. Spiracles large, opening upward and located behind posterior end of orbit. Gill openings a little less than half the length of the orbit, all in front of the pectorals.

First dorsal originates behind axil of pectorals a distance nearly equal to snout; hind margin slightly concave, hind angle produced; base of fin equal twice the distance from tip of snout to first gill slit; dorsal spine strong, without grooves and very small. Distance between dorsals equal to about distance from tip of snout to middle of base of pectorals. Second dorsal smaller, its base $\frac{2}{3}$ that of the first one; hind margin concave, hind angle much produced; spine much longer than in the first dorsal, but not so high as fin. Caudal almost twice as long as deep, without notch, subcaudal lobe produced, hinder margin and terminal rounded. Origin of ventrals located midway between anterior part of base of pectorals and base of caudal, nearer to second dorsal than to first; the distance from second dorsal equal to about one and one-half to first. Pectorals subtriangular, longer than broad, hind margin slightly concave, hind angle rounded, applied to sides it reaches origin of first dorsal.

Scales formed by a thin median ridge, curved backwards and ending posteriorly by a blunt point, its anterior angle rounded, its upper margin almost parallel to the body, alike on all parts of body. These scales somewhat resemble a claw, but are not as curved or pointed.

Color brown with hinder angles of dorsal, ventrals, hind margin of pectorals and ventral surface whitish. No spots are evident in any part of the body.

This specimen resembles *Squalus acanthias* Linné in many aspects, and was identified as such by Garman. The long orbit, long snout, dermal denticles, median upper teeth and coloration differ much from those of *Squalus acanthias*. Its proportions and development as compared with specimens of *S. acanthias* of the same size show it to be an adult and not a juvenile. It has been also compared with other species of the genus, and it differs from all, especially in the median upper teeth and in the pattern of the dermal denticles.

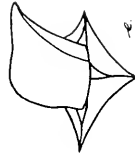
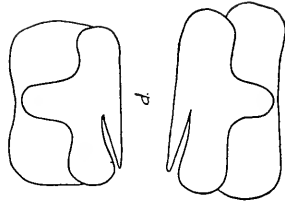
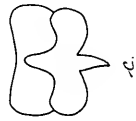
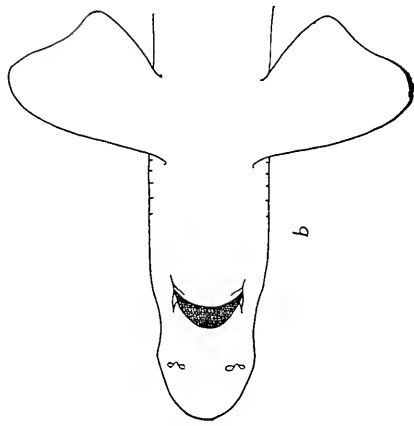
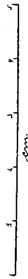
Type locality.—Hobart Town, Tasmania.

Museum of Comparative Zoölogy.

EXPLANATION OF PLATE 10.

Squalus tasmaniensis, sp. nov.

- FIG. A. Outline of lateral aspect.
- FIG. B. Outline of ventral aspect.
- FIG. C. Upper median tooth.
- FIG. D. Lateral upper and lower teeth.
- FIG. E. Dermal denticle.



Occasional Papers
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A NEW *ATELOPUS* FROM PANAMA AND A NEW
HEMIDACTYLUS FROM COLOMBIA.

BY BENJAMIN SHREVE.

In the course of my work on neotropical Reptilia and Amphibia in the Museum of Comparative Zoölogy I have found the following new forms.

Atelopus chiriquiensis, sp. nov.

Type.—Museum of Comparative Zoölogy no. 19,966, a gravid female, 'from Mr. Lewis' place,' Rio Chiriqui, Viejo and branches, Panama Republic, collected by S. F. Hildebrand, February 4-6, 1935.

Paratypes.—Museum of Comparative Zoölogy no. 19,967-71, all males, except for no. 19,970 which is a gravid female, all with the same data and history as the type.

Diagnosis.—Perhaps most closely related to *Atelopus lævis* from which it differs in not having prominent spiny warts on the sides (see description), in possessing a decidedly longer head, more extensively webbed feet, and a shorter first finger; it also differs in coloration.

Description.—Habit medium; head longer than broad, its length contained about twice and a half in the type and paratype female, and twice, or a little more, in the paratype males, in the length of the rest of the body; snout protruding, longer than the diameter of the eye, loreal region concave; upper surface of head slightly concave; nostril about equidistant between tip of snout and eye (a little nearer the tip of the snout in some of the paratypes); interorbital space broader than the upper eyelid; fore limb slightly longer than the trunk; fore arm of male paratypes enlarged; fingers rather short, depressed; first finger very small, extending much less than second; fingers webbed at the base; toes rather short, depressed, and almost fully webbed (toes of paratypes almost fully to about three-quarters webbed); sub-articular tubercles of hands and feet distinguishable but not very prominent; two flat, rather ill-defined metatarsal tubercles; a large flat metacarpal tubercle also rather ill defined; upper surfaces smooth; sides, upper parts of thigh, and humerus with small smooth warts

(some of the paratypes show small warts on the back also); males of this species apparently considerably smaller than females; the tibio-tarsal articulation of adpressed hind limb reaches the shoulder (type and female paratype) or just behind the eye (male paratypes).

Coloration in alcohol.—Brown above with slight suffusion with yellow on head and back; sides and upper and lower surfaces of limbs (except under side of thighs) chocolate brown with grayish or whitish spots; belly brownish white, shading into gray on chest and under side of head, marbled with chocolate brown; under side of thighs colored similarly to belly; tips of digits whitish; upper lip gray.

The female paratype, no. 19,970, is dark grayish-brown above; sides and upper surfaces of limbs greenish yellow, marbled with dark grayish-brown; upper surface of snout suffused with greenish yellow; ventral surfaces brownish white marbled with dark brown; hands, feet, and upper lip as in type.

The male paratypes (note the apparent sexual dichromatism), are gray above suffused more or less with greenish yellow. No. 19,971 is very strongly suffused with this color, while in no. 19,969 it is barely evident; below brownish white, suffused more or less with gray, immaculate or slightly marked with brown under the thighs; tips of digits whitish as in the type.

Measurements.

	Head and body	Head	Hind limb	4th toe.
Type no. 19,966	40 mm.	12 mm.	52 mm.	12 mm.
Paratype no. 19,970	38 mm.	12 mm.	46 mm.	10 mm.
Paratypes no. 19,967-9 and 19,971	29-30 mm.	10-11 mm.	38-40 mm.	7-8 mm.

***Hemidactylus neotropicalis*, sp. nov.**

Type.—Museum of Comparative Zoölogy no. 39,706, a female?, from Curumani, northeast of Saloa, Rio Cesar, above El Banco, Magdalena river, Magdalena Department, Colombia, collected by R. E. Stadelman, October 9, 1935.

Diagnosis.—Apparently most similar to *Hemidactylus brookii* from which it differs in possessing smaller, less closely placed tubercles on the dorsum, in fact all the tubercles of this new form are smaller than the corresponding ones of *brookii*, also differs from *brookii* in that the enlarged tubercles of the tail are less numerous, smaller, and not arranged in regular transverse rows (see description), and in addition the scales of the snout are decidedly smaller in the new species; decidedly different in coloration.

Description.—Snout rounded, longer than the distance between the eye and the ear opening, about once and a half the diameter of the orbit; forehead very slightly concave; ear opening almost oval, vertical, about

two-thirds the diameter of the eye; inner digit well developed; five to six lamellæ under the inner toe, five to six under the inner finger, seven to eight lamellæ under the fourth toe, six to seven lamellæ under the fourth finger; scales of snout larger than those of posterior part of head where the latter scales are mixed with larger tubercles; rostral four sided, about twice as broad as high, with a median cleft above; nostril pierced between the rostral, first labial, and three nasals; 10 or 12 upper labials, 8 or 9 lower labials, mental large, rather triangular, more than twice as long as the adjacent labials, its apex between two large chin shields which are in contact behind; a smaller chin shield on each side of the larger pair; upper surface of body covered with minute granules intermixed with large tubercles, which are suboval, trihedral, and considerably larger than their interspaces; the tubercles tend to form oblique lines on the dorsum with but little tendency to form horizontal rows, about 16 rows across the middle of the back; ventral scales roundish, hexagonal, and imbricating; no femoral or preanal pores (which are usually present in males of this genus); tail tapering, covered above with small scales, intermixed with these are large, keeled tubercles, which tend to form two lateral lines, elsewhere the tubercles are irregularly placed, fewer and less conspicuous toward the end of the tail; under side of tail with enlarged, transversely dilated plates.

Coloration in alcohol.—Grayish brown above, dorsum strongly suffused with dark gray; rear of head suffused with light brown; below whitish, except for belly which is gray; lower surfaces, under the tail especially, profusely stippled with grayish brown; majority of digital lamellæ also grayish brown.

Measurements.

	Head and body	Tail	Total length
Type no. 39,706	62 mm.	64 mm.	126 mm

Remarks.—This specimen has been compared carefully with examples of *Hemidactylus mabouia* and *turcicus* as well as specimens of *brookii*. *Hemidactylus peruvianus* Weigmann is obviously distinct as it lacks the enlarged dorsal tubercles of *neotropicalis*. The arrangement of the dorsal tubercles of this new form approximates that found in *mabouia*, but the tubercles are larger and not rounded.

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THE CRANE-FLIES (TIPULIDAE) OF NEW ENGLAND
FOURTH SUPPLEMENTARY LIST.

BY CHARLES P. ALEXANDER.

THE basic list of the crane-flies, Tipulidae, of New England is that provided by Mr. Charles W. Johnson in his monumental 'Diptera of New England.'¹ This work recorded 264 species of Tipulidae as having been found in the area in question. In three supplementary lists by the present writer² a considerable number of additional species were reported, to 1930 bringing the list to 318 species. Since that date, still further collecting has resulted in adding 28 species to the list, these being recorded at this time, bringing the nominal total to 346. However, it should be noted here that among the species given by Mr. Johnson in his basic list, there are included a few that were founded on erroneous records and such names should be deleted from the total. Such species include *Tipula appendiculata* Loew, *T. frigida* Walker, *T. ignota* Alexander (*discolor* Loew, preoccupied), *T. simulata* Walker (*trivittata* Say) and *T. suspecta* Loew (*fragilis* Loew). It may be noted that virtually all such names are based on materials that were collected in the White Mountains, New Hampshire, by Mrs. Annie T. Slosson and determined by Coquillett without comparison with the type material of the various forms. It should be observed further that the record of *Tipula macrolabis* Loew (Johnson, *l.c.*, p. 38, as *macrolabris*) in reality pertains to *T. youngi* Alexander.

The plan of the present report is about the same as followed in

¹Occas. Papers Boston Soc. Nat. Hist. 7, no. 15: 1-326, 1925.

²*Ibid.*, 5: 169-174, 1925.

'' 5: 223-231, 1927.

'' 5: 267-278, 1930.

the previous supplements, that is, the recording of the additional forms, a discussion of the crane-fly fauna of a part of the White Mountains, New Hampshire, and the description of two novelties discovered in conjunction with the survey.

ADDITIONS TO THE TIPULIDAE OF NEW ENGLAND.

319. **Prionocera sordida** (Loew). Berlin. Ent. Zeitschr. **7**: 298, 1863.

Massachusetts: Mattapan, Suffolk Co., May 1, 1929 (*B. I. Gerry*).

320. **Tipula (Yamatotipula) subeluta** Johnson. Bull. Amer. Mus. Nat. Hist. **32**: 42-43, 1913.

Massachusetts: Nantucket Island, Polpis, August 6; Taupanshaw, August 7, September 9, 1929 (*C. W. Johnson*). (*Johnson*, Pub. Nantucket Maria Mitchell Assoc. **3**, no. 2: 121, 1920.)

321. **Tipula (Schummelia) ideii** Alexander. Can. Ent. **60**: 55, 1928.

New Hampshire: White Mountains, Tuckerman Trail, altitude 2,700 feet, July 4, 1933 (*W. H. Harrison*); 2,800 feet, July 7, 1933 (*C. P. Alexander*). (*Can. Ent.* **66**: 116-118, 1934.)

322. **Tipula (Oreomyza) illinoiensis** Alexander (**versicolor** Loew, preoccupied). Insec. Inscit. Menst. **3**: 128, 1915.

New Hampshire: Bretton Woods, June 24, 1913 (*C. W. Johnson*). A rather weak species, closest to *senega* Alexander, but apparently distinct.

323. **Tipula (Oreomyza) nebulipennis** Alexander. Can. Ent. **51**: 170-171, 1919.

New Hampshire: White Mountains, Carriage Road, altitude 4,700 feet, July 8, 1933 (*M. M. Alexander*); Lakes of Clouds Hut, altitude 5,000 feet, July 8, 1933 (*C. P. Alexander*). (*Can. Ent.* **66**: 116-118, 1934.)

324. **Tipula (Oreomyza) ternaria** Loew. Berlin. Ent. Zeitschr. **8**: 57, 1864.

New Hampshire: Franconia, White Mountains, May 7, 1935 (*P. Clark, G. C. Crampton*).

325. *Nephrotoma opacivittata* (Dietz). Trans. Amer. Ent. Soc. **44**: 123, 1918.

Massachusetts: Chesterfield Gorge, August 3, 1928 (*C. P. Alexander*).

326. *Dolichozepea* (*Orozepea*) *tridenticulata* Alexander. Bull. Brooklyn Ent. Soc. **26**: 177-178, 1931.

Massachusetts: Goshen, Hampshire Co., July 1, 1931 (*G. C. Crampton*).

327. *Dolichozepea* (*Orozepea*) *walleyi* (Alexander). Can. Ent. **63**: 139-140, 1931.

Massachusetts: Amherst, May 27, 1933 (*H. C. Potter*).

328. *Limonia* (*Discobola*) *nigroclavata* Alexander. Diptera of Connecticut (*in press*).

Massachusetts: Holliston, Middlesex Co., September 16, 1929 (*B. I. Gerry*).

329. *Dicranota* (*Plectromyia*) *petiolata* (Alexander). Can. Ent. **51**: 194-195, 1919.

New Hampshire: headwall of Tuckerman Ravine, Mount Washington, White Mountains, altitude 5,000 feet, August 24, 1932 (*C. P. Alexander*). (Can. Ent. **66**: 116-118, 1934.)

330. *Phyllolabis lagganensis* Alexander. Bull. Brooklyn Ent. Soc. **26**: 183-184, 1931.

Described from Laggan, Alberta.

New Hampshire: Valleyway Trail, along Snyder Brook, Mount Madison, White Mountains, altitude 4,200 feet, August 26, 1935 (*C. P. Alexander*).

A most interesting discovery, adding the genus *Phyllolabis* to the fauna of eastern North America. Hitherto the known species in the Nearctic region had been restricted to the western United States and Canada, the most easterly known record being the Rocky Mountain National Park, Colorado. Osten Sacken¹ had

¹The genus *Phyllolabis* O.S. (Dipt., Tipul.); a remarkable case of disconnected areas in geographical distribution. Berlin Ent. Zeitschr. **41**: 374-376, 1897.

earlier discussed the broken distribution of the genus, at that date being known only from a single species in northern Europe and two others in the western United States.

It should be noted that the costal dilation of the wing, as discussed for the male sex at the time of the original characterization of the species, is found in both sexes (fig. 3). The present specimens were taken by sweeping the low balsam firs along the trail. Great moss-covered cliffs and boulders are in this vicinity but the specimens did not frequent the wet rock faces, as is often the case in this genus.

331. **Dactylolabis pemetica**, sp.nov. (figs. 1, 2).

Maine: Cañon Brook, between Dike and Cadillac Mountains, Mount Desert Island, altitude 500-600 feet, June 23, 1935 (*A. E. Brower, W. H. Harrison, C. P. & M. M. Alexander*).

New Hampshire: headwall of Huntington Ravine, Mount Washington, altitude 4,600 feet, August 15, 1935 (*C. P. Alexander*).

332. **Dactylolabis hudsonica** Alexander. Bull. Brooklyn Ent. Soc. **26**: 181-182, 1931.

Maine: Mount Desert Island, Duck Brook, June 18, 1935 (*C. P. Alexander, W. H. Harrison and William Procter*). Cañon Brook, Dike Mountain, altitude 500-600 feet, June 23, 1935 (*C. P. Alexander, A. E. Brower and W. H. Harrison*).

Massachusetts: Mount Toby, Franklin Co., May 15-25, 1934 (*C. P. Alexander and A. B. Gurney*).

333. **Limnophila (Idiolimnophila) emmelina** Alexander. Proc. Acad. Nat. Sci. Philadelphia for 1914: 597, 1914.

Massachusetts: Central Vermont siding, along Roaring Brook, Mount Toby, Franklin Co., May 27, 1934 (*A. B. Gurney*).

334. **Limnophila (Phylidorea) caudifera** Alexander. Bull. Brooklyn Ent. Soc. **22**: 111, 1927.

Vermont: Woodcrest Farm, near Stowe, altitude 1,000 feet, June 17-18, 1927 (*C. P. Alexander*). For a more detailed account of this habitat see *Occas. Papers Boston Soc. Nat. Hist.* **5**: 270-276, 1930.

335. ***Pilaria harrisoni***, sp.nov.

New Hampshire: along the Webster Scout Trail, Osgood Ridge, Mount Madison, White Mountains, altitude 2,000 feet, August 23, 1935 (*C. P. Alexander and W. H. Harrison*).

336. ***Hexatoma (Eriocera) cinerea*** (Alexander). *Psyche* **19**: 169-170, 1912.

Maine: Mount Desert Island, head of Somes Sound, east of Patty Lot Hill, sea level, June 23, 1935 (*C. P. Alexander, W. H. Harrison and William Procter*).

Massachusetts: vicinity of Boston (type locality).

337. ***Chionea primitiva*** Alexander. *Can. Ent.* **49**: 204, 1917.

Massachusetts: Amherst, November 13, 1933 (*A. B. Gurney*).

338. ***Rhabdomastix (Sacandaga) brittoni*** Alexander. *Jour. N. Y. Ent. Soc.* **41**: 93, 1933.

Connecticut: Kent Falls, July 23-24, 1931 (*C. P. Alexander*) (type locality).

339. ***Erioptera (Erioptera) chlorophylloides*** Alexander. *Bull. Brooklyn Ent. Soc.* **14**: 106-107, 1919.

Connecticut: Manitic Lake, Hartford Co., August 6, 1929 (*C. P. Alexander*). Stafford Springs, Tolland Co., June 14, 1933 (*C. P. Alexander*). Natchaug State Forest, June 14, 1933 (*C. P. Alexander*). Putnam, Windham Co., June 15, 1933 (*C. P. Alexander*).

340. ***Erioptera (Erioptera) chrysocomoides*** Alexander. *Jour. N. Y. Ent. Soc.* **37**: 50-51, 1929.

Massachusetts: near Central Vermont tracks, east of Amherst, July 27, 1926 (*C. P. Alexander*).

341. ***Erioptera (Erioptera) subchlorophylla*** Alexander. *Bull. Brooklyn Ent. Soc.* **14**: 107-108, 1919.

Massachusetts: Orleans, Cape Cod, August 22, 1933 (*R. L. Armstrong*).

342. ***Erioptera (Erioptera) subfurcifer*** Alexander. *Jour. N. Y. Ent. Soc.* **37**: 51, 1929.

Connecticut: State Line Pond, near Stafford Springs, Tolland Co., altitude 1,000 feet, June 14-15, 1933 (*C. P. Alexander*). Bog,

two miles east of Putnam, Windham Co., June 15, 1933 (*C. P. Alexander*).

343. **Erioptera (Ilisia) graphica** Osten Sacken. Proc. Acad. Nat. Sci. Philadelphia for 1859: 227, 1859.

Massachusetts: Framingham, July 23, 1929 (*B. I. Gerry*).

344. **Ormosia holotricha** (Osten Sacken). Proc. Acad. Nat. Sci. Philadelphia for 1859: 226, 1859.

Vermont: Mount Haystack, altitude 2,000 feet, May 13, 1934 (*C. P. Alexander and Harry Pratt*).

Massachusetts: Mount Toby, May 19, 1934, May 9, 1935 (*C. P. Alexander*).

345. **Molophilus laricicola** Alexander. Jour. N. Y. Ent. Soc. 37: 55-56, 1929.

Maine: Mount Desert, Sea Wall Bog, June 19, 1935 (*C. P. Alexander and W. H. Harrison*).

New Hampshire: Errol, Coos Co., August 27, 1932 (*C. P. Alexander*).

Vermont: Willoughby Lake, Orleans Co., in bog, June 21, 1931 (*C. P. Alexander*).

346. **Toxorhina (Toxorhina) magna** Osten Sacken. Proc. Philadelphia Ent. Soc. 4: 232, 1865.

Massachusetts: Taupaushaw, Nantucket Island, August 27 (*C. W. Johnson*). (Pub. Nantucket Maria Mitchell Assoc. 3, no. 2: 121, 1930.)

CRANE-FLIES OF THE WHITE MOUNTAINS, NEW HAMPSHIRE

Since 1932, the writer has been engaged in an intensive survey of the tipulid fauna of New England's greatest mountain mass. To this date the study has embraced only the ranges adjoining the most easterly of the notches, Pinkham Notch, with the adjacent Carter and Presidential Ranges. Unusually valuable co-operation has been heartily extended by Mrs. Alexander and by Mr. Walter H. Harrison, botanist and naturalist, of Amherst, Massachusetts. It is planned in future years to continue the survey so as to include the northern and western peaks of the White Mountains.

A certain number of collecting stations mentioned in the accompanying list deserve discussion :

Tuckerman Ravine and Trail; from *Pinkham Notch* (2,000 feet), via *Hermit Lake* (3,600 feet); floor of ravine to top of headwall (3,800-5,000 feet).

Huntington Ravine, Mount Washington, fan and headwall, 4,000-5,200 feet.

Alpine Garden, above the headwalls of Tuckerman and Huntington Ravines, altitude about 5,000 feet.

Raymond Traverse, between Hermit Lake and Huntington Trail, 3,300-3,600 feet.

Great Gulf Trail, between Dolly Copp Camp and the Great Gulf Shelter, along the Peabody River and branches, 1,200-3,000 feet.

Dolly Copp Camp, on Peabody River, south of Gorham; largest public camp of the White Mountain National Forest; 1,200 feet.

Madison Spring Huts, between Mounts Adams and Madison; 4,800-5,000 feet.

King Ravine, Mount Madison, via Short Line, to 5,200 feet.

Valleyway Path, along Snyder Brook, Mount Madison, from Appalachia Station, near Randolph, to Madison Springs, 4,800-4,900 feet.

Webster Scout Trail, from summit of Mount Madison to Dolly Copp Camp, via Osgood Ridge and Culhane Brook.

Imp Face, 3,235 feet, on Carter Range, and trail to same from Dolly Copp Camp, 1,200 feet.

Carter Notch, 3,500 feet, between Carter Dome and Wildcat Mountains along Nineteen Mile Brook; Glen House, 1,620 feet, via the aqueduct.

Carriage Road to summit of Mount Washington, from Glen House.

All stations mentioned are on or adjacent to the Pinkham Notch Highway, Route 16, and all are included within the limits of the White Mountain National Forest.

Dolichozeza (Dolichozeza) americana Needham. Tuckerman Trail, 2,700-3,800 feet, July 2-3, 1933; Great Gulf Trail, 2,900-3,000 feet, July 4, 1933.

Dolichopeza (Oropeza) obscura (Johnson). Tuckerman Trail, 2,000 feet, July 2, 1933.

Dolichopeza (Oropeza) similis (Johnson). Tuckerman Trail, 2,800 feet, July 3, 1933.

Dolichopeza (Oropeza) venosa (Johnson). Tuckerman Trail, 2,400 feet, July 7, 1933; Great Gulf Trail, 2,200 feet, July 4, 1933.

Dolichopeza (Oropeza) walleyi (Alexander). Carriage Road, 3,100 feet, July 8, 1933.

Nephrotoma incurva (Loew). Dolly Copp Camp, 1,200 feet, June 30, 1933; Tuckerman Trail, 2,600 feet, July 3, 1933.

Nephrotoma penumbra Alexander. Tuckerman Ravine, 4,400 feet, July 2, 1933; Alpine Garden and slopes of Mount Monroe, 5,000-5,200 feet, July 9, 1933; very common, fluttering about over the alpine vegetation; one specimen was found emerging from its pupal skin, protruding from a cushion of *Diapensia*.

Tipula (Yamatotipula) cayuga Alexander. Dolly Copp Camp, 1,200 feet, June 30, 1933.

Tipula (Yamatotipula) iroquois Alexander. Tuckerman Trail, 2,700-4,300 feet, July 2, 1933.

Tipula (Yamatotipula) sayi Alexander. Mount Jefferson, 5,000 feet, August 22, 1935.

Tipula (Vestiplex) fultonensis Alexander (*hinei* Alexander). Tuckerman Trail, 4,100 feet, July 2, 1933.

Tipula (Schummelia) hermannia Alexander. Dolly Copp Camp, 1,200 feet, June 30, 1933.

Tipula (Schummelia) idei Alexander. Tuckerman Trail, 2,700-2,800 feet, July 4-7, 1933.

Tipula (Oreomyza) latipennis Loew. Great Gulf Trail, 1,400 feet, July 4, 1933, teneral.

Tipula (Oreomyza) fragilis Loew. Nineteen Mile Brook, 2,500 feet, August 28, 1932; Webster Scout Trail, 3,000 feet, August 23, 1935.

Tipula (Oreomyza) insignifica Alexander. A few specimens at and near Madison Spring Huts, 4,800-4,875 feet, August 22-23, 1935. The specimens were found in the wet areas near the Springs and along the upper reaches of Snyder Brook; they occurred in dense balsam Krummholz, with many cold springs and

boggy areas; besides the dominant balsam, there occurred low stunted alder and birch, with patches of hellebore (*Veratrum*), chickweed (*Stellaria borealis* Bigel.), some *Solidago* and *Senecio*, and dense carpets of moss. The species had previously been known only from the unique type specimen, taken on the Alpine Garden, Mount Washington, by an unknown collector, and now preserved in the collection of the Boston Society of Natural History.

Tipula (Oreomyza) nebulipennis Alexander. Carriage Road, 4,700 feet, July 8, 1933; Lakes of Clouds Hut, 5,000 feet, July 8, 1933.

Tipula (Oreomyza) penobscot Alexander. Tuckerman Ravine, 3,300-3,900 feet, July 3, 1933; Carriage Road, 3,050 feet, July 8, 1933.

Tipula (Oreomyza) senega Alexander. Dolly Copp Camp, 1,200 feet, June 30, 1933; Great Gulf Trail, 1,400 feet, July 4, 1933.

Tipula (Oreomyza) entomophthoræ Alexander. Tuckerman Trail, 3,600-3,800 feet, July 2, 1933.

Tipula (Lunatipula) mainensis Alexander. Nineteen Mile Brook, 2,500 feet, August 28, 1932; Carter Notch, 3,000 feet, August 18, 1935; Tuckerman Trail, 2,000-2,500 feet, August 14, 1935, many specimens, flying close to ground; Carriage Road, 2,000 feet, August 25, 1932.

Tipula (Lunatipula) duplex Walker. King Ravine, 1,800-2,600 feet, August 26, 1935.

Tipula (Lunatipula) monticola Alexander. Great Gulf Trail, 1,200 feet, July 4, 1933.

Tipula (Lunatipula) triplex Walker. Dolly Copp Camp, 1,500 feet, August 26, 1932.

Phalacrocera tipulina Osten Sacken. Hermit Lake, 3,600 feet, July 2, 1933.

Limonia (Limonia) cinctipes Say. Huntington Trail, 3,500 feet, August 15, 1935.

Limonia (Limonia) fusca Meigen (*pubipennis* Osten Sacken). Imp Face Trail, August 23, 1932; Dolly Copp Camp, 1,200 feet, June 30, 1933; Great Gulf Trail, 1,900 feet, July 4, 1933; Tuckerman Trail, 2,200-3,800 feet, July 3, 1933.

Limonia (Limonia) globithorax (Osten Sacken). Imp Face Trail, August 23, 1932; above Hermit Lake, 4,000 feet, August 24, 1932; King Ravine, 1,800-3,800 feet, August 26, 1935.

Limonia (Limonia) hudsonica (Osten Sacken). Dolly Copp Camp, 1,200 feet, June 30, 1933; Carriage Road, 3,200 feet, July 8, 1933.

Limonia (Limonia) immatura (Osten Sacken). Lakes of Clouds Hut, 5,000 feet, August 22, 1935 (*Paul Reis*).

Limonia (Limonia) indigena (Osten Sacken). Dolly Copp Camp, 1,200 feet, June 30, 1933; Tuckerman Trail, 2,000 feet, August 24, 1932, 2,400 feet, July 2, 1933.

Limonia (Limonia) simulans (Walker). Glen Ellis Falls, August 22, 1932; Huntington Ravine, 3,000 feet, August 21, 1935 (*Paul Reis*).

Limonia (Limonia) solitaria (Osten Sacken). Dolly Copp Camp, 1,200 feet, June 30, 1932; Great Gulf Trail, 1,300 feet, July 4, 1933; Carriage Road, 2,900 feet, July 8, 1933; King Ravine, 1,800 feet, August 26, 1935.

Limonia (Limonia) triocellata (Osten Sacken). Great Gulf Trail, 2,400 feet, July 4, 1933.

Limonia (Limonia) tristigma (Osten Sacken). Glen Ellis Falls, August 22, 1932; Glen House, 1,800 feet, August 28, 1932; Carter Notch, 3,000 feet, August 18, 1935; Carriage Road, 2,500 feet, August 25, 1932; Huntington Ravine, 4,600 feet, August 15, 1935.

Limonia (Discobola) argus (Say). Glen Ellis Falls, August 22, 1932; Carter Notch, 2,500 feet, August 28, 1932; Webster Scout Trail, 2,500-3,000 feet, August 23, 1935; King Ravine, 2,500-4,000 feet, August 26, 1935.

Limonia (Dicranomyia) iowensis (Rogers). Tuckerman Trail, 4,400 feet, August 14, 1935; Madison Spring Hut, 4,900 feet, August 22, 1935.

Limonia (Dicranomyia) liberta (Osten Sacken). Dolly Copp Camp, 1,200 feet, June 30, 1933; King Ravine, 2,700 feet, August 26, 1935.

Limonia (Dicranomyia) profunda (Alexander). Carter Notch, 3,500 feet, August 28, 1932; Carriage Road, 3,500 feet, July 8, 1933; Tuckerman Trail, 4,000 feet, August 14, 1935.

Limonia (Dicranomyia) spinifera (Alexander). Dolly Copp Camp, 1,200-1,500 feet, August 16, 1935, August 26, 1932; Nineteen Mile Brook, 2,500 feet, August 28, 1932; Carriage Road, 2,000 feet, August 25, 1932; King Ravine, 1,700-2,000 feet, August 26, 1935.

Limonia (Dicranomyia) uliginosa (Alexander). Tuckerman Ravine, 4,300 feet, July 2, 1933.

Limonia (Rhipidia) maculata (Meigen). Carter Notch, 3,500 feet, August 28, 1932; Carriage Road, 2,500 feet, August 25, 1932; Huntington Ravine, 3,500 feet, August 21, 1935; King Ravine, 1,500-2,000 feet, August 26, 1935.

Antocha (Antocha) opalizans Osten Sacken. Dolly Copp Camp, along Peabody River, 1,200 feet, July 1, 1933.

Dicranoptycha germana Osten Sacken. Nineteen Mile Brook, 2,500 feet, August 28, 1932.

Ula elegans Osten Sacken. Webster Scout Trail, 2,000 feet, August 25, 1935; King Ravine, 2,700 feet, August 26, 1935.

Ula paupera Osten Sacken. Nineteen Mile Brook, 2,500 feet, August 28, 1932; Great Gulf Trail, 2,900 feet, July 4, 1933; Tuckerman Ravine, 3,750 feet, July 2, 1933; Webster Scout Trail, 3,500 feet, August 25, 1935; Snyder Brook, 3,000 feet, August 26, 1935.

Pedicia (Pedicia) albivitta Walker. Dolly Copp Camp, 1,200 feet, August 16, 1935.

Pedicia (Pedicia) margarita Alexander. Nineteen Mile Brook, male and female, 2,000 feet, August 18, 1935 (*Walter Harrison*); Hermit Lake Hut, at light, 3,600 feet, August 14, 1935 (*Walter Harrison*).

Pedicia (Nasiternella) hyperborea (Osten Sacken). Tuckerman Ravine Trail, 2,800-4,000 feet, July 2-7, 1933; Carriage Road, 4,200 feet, in roadway with wind blowing violently (*M. M. Alexander*). For a detailed discussion of this noteworthy discovery, including that of the subapterous female, consult a separate reference (*Can. Ent.* **66**: 116-118, 1934).

Pedicia (Tricyphona) auripennis (Osten Sacken). Tuckerman Trail, 2,700 feet, July 7, 1933.

Pedicia (Tricyphona) autumnalis (Alexander). Nineteen Mile

Brook, 2,500 feet, August 18, 1935, August 28, 1932; King Ravine, 1,800 feet, August 26, 1935.

Pedicia (Tricyphona) calcar (Osten Sacken). Tuckerman Trail, 2,700-4,200 feet, July 2, 1933.

Pedicia (Tricyphona) inconstans (Osten Sacken). Dolly Copp Camp, 1,200 feet, June 30, 1933, August 16, 1935; Tuckerman Headwall, 4,500-5,000 feet, in hellebore patches, abundant, August 14, 1935, August 24, 1932.

Pedicia (Tricyphona) vernalis (Osten Sacken). Dolly Copp Camp, 1,200 feet, June 30, 1933; Tuckerman Trail, 3,700-3,800 feet, July 2, 1933.

Dicranota (Eudicranota) pallida Alexander. Still known only from the unique type, collected in the White Mountains by Morrison.

Dicranota (Dicranota) iowa Alexander. Tuckerman Trail, 2,700-3,700 feet, July 2, 1933. Earlier reported by Johnson as *noveboracensis* Alexander, from 4,000-5,000 feet, Tuckerman Trail, July 8-21 (*Occas. Papers Boston Soc. Nat. Hist.* 5: 22, 1922).

Dicranota (Amalopina) flaveola (Osten Sacken). Glen Ellis Falls, August 22, 1932; Imp Face Trail, 2,500 feet, August 23, 1932; Nineteen Mile Brook, 2,500 feet, August 28, 1932; Hermit Lake, 3,500-3,600 feet, July 3, 1933, August 14, 1935; Tuckerman Ravine, 3,800-4,500 feet, July 3, 1933, August 14, 1935; Madison Spring Hut, 4,900 feet, August 22, 1935; King Ravine, 1,500-3,000 feet, August 26, 1935.

Dicranota (Plectromyia) modesta (Osten Sacken). Tuckerman Trail, 2,700-3,700 feet, July 2, 1933; Chandler Brook Cabin, Great Gulf Trail, 3,500 feet, July 4, 1933.

Dicranota (Plectromyia) petiolata (Alexander). Tuckerman Headwall, 5,000 feet, August 24, 1932.

Dicranota (Rhaphidolabis) cayuga (Alexander). Tuckerman Trail, 3,800 feet, July 2, 1933; Chandler Brook Cabin, Great Gulf Trail, 3,500 feet, July 4, 1933.

Dicranota (Rhaphidolabis) rubescens (Alexander). Dolly Copp Camp, 1,200 feet, June 30, 1933, 1,500 feet, August 26, 1932; Great Gulf Trail, 1,900 feet, July 4, 1933; Glen House, 1,800 feet, August 28, 1932; Carriage Road, at Halfway House,

3,500 feet, August 25, 1932; Tuckerman Ravine, 4,500 feet, August 14, 1935; King Ravine, 2,500 feet, August 26, 1935.

Dicranota (Rhaphidolabis) tenuipes (Osten Sacken). Dolly Copp Camp, 1,500 feet, August 26, 1932; Glen House, 1,800 feet, August 28, 1932; Tuckerman Trail, 2,000 feet, August 24, 1932; Raymond Traverse, 3,300 feet, August 15, 1935; King Ravine, 1,800-2,500 feet, August 26, 1935.

Adelphomyia americana Alexander. Dolly Copp Camp, 1,500 feet, August 26, 1932; Imp Face, 2,000 feet, August 30, 1932; Glen House, 1,800 feet, August 28, 1932; Carriage Road, 2,000 feet, August 25, 1932; Webster Scout Trail, 1,500 feet, August 25, 1935.

Adelphomyia cayuga Alexander. Imp Face Trail, 2,000 feet, August 23, 1932.

Adelphomyia minuta Alexander. Great Gulf Trail, 1,300-2,000 feet, July 4, 1933.

Adelphomyia pleuralis Dietz. Great Gulf Trail, 1,350 feet, July 4, 1933.

Epiphragma fascipennis (Say). Tuckerman Trail, 2,200 feet, July 2, 1933.

Phyllolabis lagganensis Alexander. Valleyway Trail, 4,200 feet, August 26, 1935 (see p. 275 for detailed account).

Dactylolabis pemetica, sp.nov. Huntington Ravine, headwall, 4,600 feet, August 15, 1935 (see p. 288 for detailed account).

Dactylolabis supernumeraria Alexander. Great Gulf Trail, 2,750-3,300 feet, July 4, 1933.

Prolimnophila areolata (Osten Sacken). Tuckerman Trail, 2,000-4,200 feet, July 2-7, 1933; Great Gulf Trail, 1,300 feet, July 4, 1933.

Pseudolimnophila contempta (Osten Sacken). Great Gulf Trail, 1,300 feet, July 4, 1933.

Archilimnophila toxoneura (Osten Sacken). Great Gulf Trail, 1,200 feet, July 4, 1933.

Limnophila (Elæophila) aprilina Osten Sacken. Great Gulf Trail, 1,900 feet, July 4, 1933.

Limnophila (Elæophila) johnsoni Alexander. Dolly Copp Camp, 1,200 feet, June 30, 1933; Great Gulf Trail, 1,900 feet, July 4, 1933; Carriage Road, 2,800 feet, July 8, 1933.

Limnophila (Prionolabis) munda Osten Sacken. Great Gulf Trail, 2,200 feet, July 4, 1933; Tuckerman Trail, 2,200-3,000 feet, July 2, 1933.

Limnophila (Prionolabis) rufibasis Osten Sacken. Dolly Copp Camp, 1,200 feet, June 30, 1933; Carriage Road, 2,700 feet, July 8, 1933.

Limnophila (Prionolabis) simplex Alexander. Great Gulf Trail, 2,200 feet, July 4, 1933.

Limnophila (Phylidorea) subcostalis Alexander. Tuckerman Ravine, 4,200 feet, July 2-3, 1933, abundant in hellebore patches.

Limnophila brevifurca Osten Sacken. Tuckerman Headwall, 5,000 feet, August 24, 1932.

Shannonomyia lenta (Osten Sacken). Glen Ellis Falls, August 22, 1932; Dolly Copp Camp, 1,500 feet, August 26, 1932; Glen House, 1,800 feet, August 28, 1932; Nineteen Mile Brook, 2,000 feet, August 18, 1935.

Pilaria harrisoni, sp.nov. Webster Scout Trail, 2,000 feet, August 23, 1935 (description on p. 291).

Utomorpha pilosella (Osten Sacken). Dolly Copp Camp, 1,200 feet, June 30, 1933; Great Gulf Trail, 1,900 feet, July 4, 1933.

Hexatoma (Eriocera) spinosa (Osten Sacken). Tuckerman Trail, 2,000 feet, July 2, 1933.

Elephantomyia (Elephantomyia) westwoodi (Osten Sacken). Nineteen Mile Brook, 2,500 feet, August 28, 1932; Imp Face Trail, 2,000 feet, August 23, 1932; Dolly Copp Camp, 1,200 feet, June 30, 1933.

Cladura (Neocladura) delicatula Alexander. Nineteen Mile Brook, 1,800-2,500 feet, August 28, 1932, very abundant; Carriage Road, 2,500 feet, August 25, 1932; Webster Scout Trail, 2,200-2,500 feet, August 25, 1935; King Ravine, 1,800-3,500 feet, August 26, 1935.

Cladura (Cladura) flavoferruginea Osten Sacken. Nineteen Mile Brook, 2,500 feet, August 28, 1932; Webster Scout Trail, 2,000 feet, August 25, 1935; King Ravine, 2,000-2,700 feet, August 26, 1935.

Neolimnophila ultima (Osten Sacken). Tuckerman Trail, 2,200 feet, July 2-7, 1933.

Gonomyia (Gonomyia) bidentata Alexander. Glen Ellis Falls,

August 22, 1932; Glen House, 1,800 feet, August 28, 1932; Imp Face Trail, August 23, 1932; Dolly Copp Camp, 1,500 feet, August 26, 1932.

Lipsothrix sylvia (Alexander). Great Gulf Trail, 1,900-2,200 feet, July 4, 1933.

Rhabdomastix (Sacandaga) flava (Alexander). Dolly Copp Camp, 1,200 feet, July 1, 1933.

Erioptera (Erioptera) septemtrionis Osten Sacken. Dolly Copp Camp, 1,200 feet, August 30, 1932; Tuckerman Ravine, 3,800 feet, July 3, 1933; Madison Spring Hut, 4,900 feet, August 22, 1935.

Erioptera (Erioptera) viridula Alexander. Great Gulf Trail, 2,200 feet, July 4, 1933.

Erioptera (Mesocyphona) needhami Alexander. Dolly Copp Camp, 1,200 feet, June 30, 1933.

Erioptera (Empeda) stigmatica (Osten Sacken). Dolly Copp Camp, 1,200 feet, August 16, 1935; Tuckerman Trail, 3,300-4,400 feet, July 2, 1933, August 14, 1935; Hermit Lake, 3,500 feet, August 24, 1932.

Ormosia dentifera Alexander. Great Gulf Trail, 3,200 feet, July 4, 1933.

Ormosia bilineata Dietz. Great Gulf Trail, 2,000 feet, July 4, 1933.

Ormosia luteola Dietz. Tuckerman Ravine, 4,000-5,000 feet, August 24, 1932; Webster Scout Trail, 3,000 feet, August 23, 1935.

Ormosia monticola (Osten Sacken). Hermit Lake, 3,500 feet, August 24, 1932; Raymond Traverse, 3,300 feet, August 15, 1933; Webster Scout Trail, 3,000 feet, August 23, 1935.

Ormosia deviata Dietz. Hermit Lake, 3,500 feet, August 24, 1932; Tuckerman Headwall, 4,500-4,800 feet, August 14, 1935, very abundant in hellebore patches; Raymond Traverse, 3,300 feet, August 15, 1935; Madison Spring Hut, 4,700 feet, August 26, 1935.

Ormosia nubila (Osten Sacken). Glen Ellis Falls, August 22, 1932; Imp Face Trail, 2,000 feet, August 23, 1932; Dolly Copp Camp, 1,500 feet, August 26, 1932; Carriage Road, 2,000 feet.

August 25, 1932; Madison Spring Hut, 4,700 feet, August 26, 1935.

Ormosia megacera Alexander. Nineteen Mile Brook, 2,500 feet, August 28, 1932; Great Gulf Trail, 2,500 feet, July 2, 1933; Carriage Road, 3,000 feet, July 8, 1933; Tuckerman Trail, 2,700 feet, July 7, 1933.

Ormosia mesocera Alexander. Great Gulf Trail, 1,900 feet, July 4, 1933; Tuckerman Trail, 3,700 feet, July 2, 1933.

Ormosia nimbipennis Alexander. Nineteen Mile Brook, 2,500 feet, August 28, 1932; Imp Face Trail, 2,000 feet, August 23, 1932; Tuckerman Ravine, 4,500 feet, August 14, 1935, August 24, 1932; Webster Scout Trail, 2,300 feet, August 25, 1935; King Ravine, 2,500 feet, August 26, 1935.

Ormosia pygmaea Alexander. Dolly Copp Camp, 1,200 feet, August 16, 1935; Tuckerman Trail, 2,000 feet, August 14, 1935; Snyder Brook, 4,000 feet, August 26, 1935.

Molophilus fultonensis Alexander. Great Gulf Trail, 1,350-2,000 feet, July 4, 1933; Tuckerman Trail, 2,700 feet, July 7, 1933.

Molophilus hirtipennis (Osten Sacken). Tuckerman Trail, 4,200 feet, July 2, 1933.

Dasymolophilus ursinus (Osten Sacken). Great Gulf Trail, 1,400-2,000 feet, July 4, 1933.

DESCRIPTIONS OF NEW SPECIES.

Dactylolabis pemetica, sp.nov.

General coloration of mesonotum dark brown, the scutellum black, the mediotergite yellowish brown; presecutum without distinct stripes; thoracic pleura brownish yellow, the anepisternum and sternopleurite a trifle more infuscated, the surface pruinose; wings (male) pale brown, the stigma very large, distorting the veins of the anterior radial field, the anterior branch of R_s being chiefly atrophied; wings (female) more uniformly yellow, including the veins, the venation normal for the genus: cell $1st M_2$ with inner end strongly arcuated in both sexes.

Male.—Length about 7-9 mm.; wing 8-9.5 mm.

Female.—Length about 6-7 mm.; wing 7-8 mm.

Rostrum brownish black; palpi black. Antennae black throughout; flagellar segments oval. Head brownish black, the front and broad anterior vertex pruinose.

Pronotum brownish black, somewhat paler laterally. Mesonotal prescutum almost uniformly dark brown, subnitidous, without evident stripes, in cases with the humeral region more yellowish pollinose; scutum dark brown; scutellum black; mediotergite yellowish brown. Pleura brownish yellow, the anepisternum and sternopleurite a trifle more infuscated, the surface pruinose; dorso-pleural region light yellow. Halteres pale, the knobs weakly darkened. Legs with the coxae brownish yellow; trochanters yellow; femora yellow basally, passing into brown; tibiae and tarsi brownish black. Wings (fig. 1, ♂; fig. 2, ♀) strongly dimorphic in venation in the two sexes, the radial field of the male being much distorted by the enlargement of the stigma. Wings of male uniformly tinged with pale brown, the costal border more or less infumed, in cases dark brown, the color produced especially by

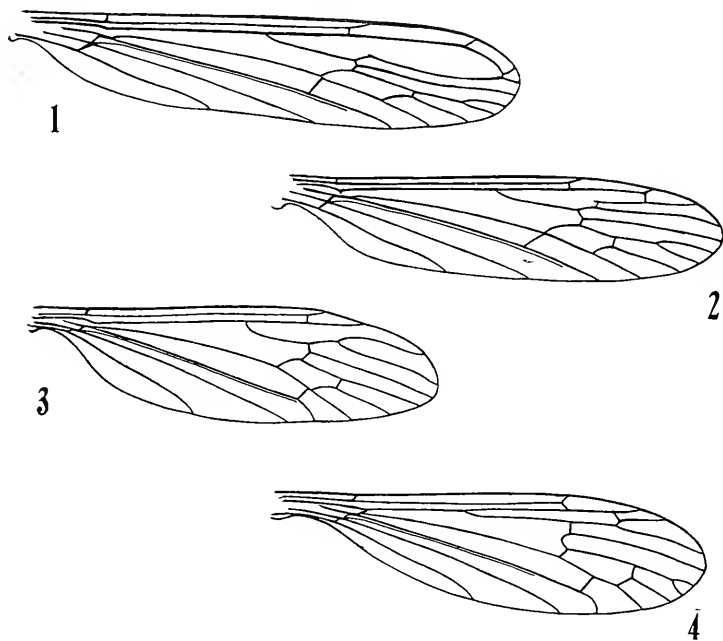


FIG. 1. *Dactylolabis pemetica*, sp.nov.; venation of male.

FIG. 2. The same; venation of female.

FIG. 3. *Phyllolabis lagganensis* Alexander; venation.

FIG. 4. *Pilaria harrisoni*, sp.nov.; venation.

the darkening of the included veins; wings of female clearer yellow; stigmal region faintly darkened in both sexes; veins brown to yellowish brown in the male, clearer yellow in female; costal fringe with numerous delicate setae in

both sexes; stigmal area of male with abundant delicate trichia. Venation (male) normal except for the radial field, which is curiously distorted by the unusually large stigmal area; branches R_4 and R_5 are normal but the anterior branch of R_s is chiefly atrophied, on its outer portion being fused with R_{1+2} , the combined element bending down to vein R_4 and lying parallel to outer border of wing. In the female, the radial field is quite normal for the genus; cell $1st M_2$ elongate, with its inner end strongly arcuated in both sexes; *m-cu* at or close to fork of M .

Abdomen with basal tergites brown, the outer segments, including hypopygium, more brownish black; sternites more uniformly pale.

Habitat.—Maine, New Hampshire.

Holotype.—Male, Cañon Brook, between Dike and Cadillac Mountains, Mount Desert Island, Maine, altitude 600-700 feet, June 23, 1935 (C. P. Alexander).

Allotopotype.—Female, same date (M. M. Alexander).

Paratopotypes.—Twenty-five of both sexes, same dates (A. E. Brower, W. H. Harrison, C. P. and M. M. Alexander).

Paratype.—One female, headwall of Huntington Ravine, Mount Washington, New Hampshire, altitude 4,600 feet, August 15, 1935 (C. P. Alexander).

The specific name, *pemetica*, is derived from Pemetica, the Indian name for Mount Desert Island. The type series was taken along Cañon Brook where the flies occurred on the sheer walls of the cañon and on the sloping granitic stream-bed immediately above this point. The males were to be found resting on the vertical rock walls where the surface was wet with dripping and percolating waters, being associated with equally numerous specimens of *Dactylolabis montana* (Osten Sacken). The females taken were found nearby but chiefly on the sloping rocky bed of the stream margin where they were found to be ovipositing in the diatomaceous ooze and algal growth covering these rocks. The males were not readily disturbed and were most easily secured by placing the net over them while they rested on the sheer walls, whereupon they invariably flew backward into the bag.

The very remarkable fly herewith described is unique in the degree of sexual dimorphism as it involves the wing veins. The enlarged stigma of the male fills the space between veins R_1 and R_4 , the anterior branch of the sector being almost entirely atrophied. The only other generally similar species in the Nearctic region is *Dactylolabis cubitalis* (Osten Sacken), which has the coloration of the thorax gray, the prescutum with four distinct

brown stripes, the wings of both sexes normal and entirely similar in venation, and with cell *1st M*₂ short, its inner end not conspicuously arcuated.

Distortion of the wings and their venation is found in certain other species of *Dactylolabis*, notably *D. wadzickii* (Nowicki) of the Hungarian Tatras, but in no case is the venation so profoundly modified as in the male of the present fly, nor is there definite evidence of sexual dimorphism in any other species of the genus. The only other crane-fly known to me with a tremendously enlarged hairy stigma in the male, distorting the veins in this field, is the eriopterine genus and species, *Empedomorpha empedoides* (Alexander) of the plains and Great Basin region of the western and southwestern United States (Kansas, Colorado, Texas, New Mexico and Arizona), an otherwise entirely different fly.

Pilaria harrisoni, sp.nov.

Mesonotum uniformly brownish yellow, the surface subnitidous, unmarked; antennae black throughout; wings weakly suffused with brown, the small stigma darker brown, restricted to cell *R*₂; vein *R*₂ only a little longer than *R*₂₊₃; vein *R*₃ diverging strongly from *R*₄; *r-m* strongly arcuated; cell *1st M*₂ elongate, exceeding any of the veins beyond it; cell *M*₁ present but very small; *m-cu* shortly beyond mid-length of cell *1st M*₂.

Female.—Length about 8 mm.; wing 8 mm.

Rostrum and palpi black. Antennae black throughout; flagellar segments passing through oval to long-oval, with long conspicuous verticils. Head brownish black, gray pruinose.

Mesonotum uniformly brownish yellow, the surface subnitidous, unmarked. Pleura yellow. Halteres pale throughout. Legs with the coxae and trochanters yellow; femora and tibiae yellow; tarsi black, the basitarsi chiefly testaceous-yellow. Wings (fig. 4) with a weak brownish tinge, the costal field slightly clearer yellow; stigma very small, darker brown, restricted to cell *R*₂; veins dark brown. Venation: *Sc* relatively long, *Sc*₂ ending almost opposite level of fork of *R*₃; *R*₂ only a little longer than *R*₂₊₃; *R*₃ diverging strongly from *R*₄, cell *R*₃ at margin about one-half longer than cell *R*₂; *r-m* very strongly arcuated; cell *1st M*₂ elongate, gradually widened outwardly, longer than any of the veins beyond it; cell *M*₁ present but very small, less than one-half its petiole; *m-cu* shortly beyond mid-length of cell *1st M*₂.

Abdominal tergites brown, the sternites a very little brighter; ovipositor with the elongate valves brownish horn-color, the tips of the cerci paler.

Habitat.—New Hampshire.

Holotype.—Female, Osgood Ridge, along the Webster Scout Trail, Mount

Madison, White Mountains, altitude 2,000 feet, August 23, 1935 (C. P. Alexander and W. H. Harrison).

I take unusual pleasure in dedicating this crane-fly to Mr. Walter H. Harrison, of Amherst, Massachusetts, companion on many profitable field excursions, to whom I am vastly indebted for many rare insect specimens. The fly is readily told by the venational peculiarities of an unusually elongate cell *1st M*₂ and a very small cell *M*₁. The venation of the outer radial field is much as in *Pilaria stanwoodae* (Alexander) which has cell *M*₁ lacking and with cell *1st M*₂ much smaller, shorter than vein *M*₁₊₂ beyond it. The latter fly is confined to sphagnum bogs whereas the species above defined as new was swept from herbaceous vegetation in dry balsam and spruce woodland.

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A NEW SUBSPECIES OF THE RED-BELLIED TERRAPIN
***PSEUDEMYIS RUBRIVENTRIS* (LE CONTE).**

BY H. L. BABCOCK.

***Pseudemys rubriventris bangsi*, subsp. nov.**

Type.—Museum of Comparative Zoölogy, no. 16,778. An adult from Boot Pond, Plymouth, Massachusetts, collected by H. J. Thayer, 1912.

Paratypes.—M. C. Z. no. 7047. Boot Pond, Plymouth, Mass. Collected by F. A. Lucas, 1912. M. C. Z. no. 16,777. Boot Pond, Plymouth, Mass. Collected by H. J. Thayer, 1912. B. S. N. H. no. 1100. Hillfield Pond, Plymouth, Mass. Collected by H. L. Babcock, 1916. B. S. N. H. no. 1202. Boot Pond, Plymouth, Mass. Collected by W. G. Reed, 1919. B. S. N. H. no. 1210. Island Pond, Plymouth, Mass. Collected by H. L. Babcock, 1919.

Diagnosis.—This group has long been isolated, being restricted in distribution to a few ponds located in Plymouth County, Massachusetts. The area constitutes one of the "southern islands" which are to be found as far north as Nova Scotia and contain southern forms of plant and insect life. The highly arched carapace and black color of these terrapins is very marked. Fortunately Le Conte in his original description gave the length and height of the type which shows a markedly flatter carapace than in the Plymouth group. Eight examples of the Plymouth form and twelve of the typical form have been examined.

Carapace high, the greatest height of shell being included in its greatest length 2.4 times. (Plymouth County, Massachusetts.) . . . *P. r. bangsi*

Carapace lower, the greatest height of shell being included in its greatest length 2.63 times.¹ (Atlantic coast from extreme northeast Florida to New Jersey and southern Long Island.) *P. r. rubriventris*

Remarks.—The ponds from which this terrapin has been recorded are, Gunner's Exchange, Hoyt, Island, Nigger, Hillfield, Boot, Upper West, Micajah, Great South, Crooked, and Billington Sea. These turtles are not abundant, are very shy and are difficult to capture. In proposing subspecific distinction for this isolated group I associate the name of my friend the late Mr. Outram Bangs who first called my attention to this unique New England colony.

¹In Le Conte's type specimen (from the Delaware River) the greatest height of shell is included in its greatest length 2.75 times.

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SOME NEW SPECIES OF CHYTRIDS.

BY F. K. SPARROW, JR.

IN a recent collection of Green Algae from Crooked Lake, Washtenaw Co., Michigan made on Oct. 15, 1937, a number of chytridiaceous fungi were found. Of these, five appear to be new, and descriptions of them are given forthwith:

Rhizohidium chaetiferum, sp.nov.¹

Sporangium globosum, raro subglobosum, hyalinum, plerumque 12 μ diam., sursum duae partes pilis longis tenuibus ramosis vel simplicibus lucisque ad 30 vel 50 μ longis praeditae; zoosporae globosae, uniguttulatae, diam. 3 μ , cilio singulo postico praeditae, terminaliter vel subterminaliter a papillae deliquescensione liberatae, osteolo liquificationis demum post sporarum liberationem sensim dilalato; systemate rhizoidali tenui, ramosissimo, ex apice tubi penetrantis exoriente. Sporae perdurantes extramatricales, globosae vel paululo subglobosae, diam. 12 μ globulo singulo crasso praeditae; membrana crassa vel projectionibus brevibus apice truncatis vel pilis longis vel ambobus intermixtis tecta; systemate rhizoidali ramoso. Germinatio ignota. Saprophytium in speciebus *Cladophorae* et *Oedogonii*.

Phlyctochytrium dentiferum, sp.nov.

Sporangium paululo subsphaericum, 10-15 μ alta, 10-14 μ diam., hyalinum prope apicem seriebus 2 concentricis dentium solidorum convergentium circumdatum; serie apicali ex 4 dentibus minutis ca. 2 μ altis, 2 μ latis divergenter bipartitis sessilibus circum emissionis papillam positis; serie exteriore ex 6 grandiusculis ca. 4 μ altis, 2.5 μ latis bipartitis sessilibus vel subelevatis. Systema intramatricali ex vesicula late fusiformi, sphaerica vel irregulari infrasporangiali diam. 5-15 μ , 5-12 μ alta constans, rhizoidea 2 opposita ferente; rhizoideis ultimo ramosis. Zoospora sphaerica, diam. 7 μ , singulo globulo sphaerico paululo eccentrico diam. 4 μ , praedita atque cilio posteriore 30 μ longo. Sporae perdurantes non obviae.

In speciebus *Cladophorae* saprophytium vel subparasiticum.

¹I am indebted to Prof. H. H. Bartlett for the Latin descriptions of these species.

Phlyctochytrium urceolare, sp.nov.

Sporangium hyalinum 10-14 μ altum, 7-11 μ diametro, prope apicem ad 5-6 μ angustatum, forma modice variabile sed plerumque subcylindricum vel turbinatum sursum paululo expansum usque ad seriem primam dentium 6 sessilium bipartitorum solidorum erectorum vel sensim divergentium, ad apicem versus abrupte angustatum usque ad papillam terminalem, a serie secunda dentium 4 minute bipartitorum erectorum solidorum circumdatam. Systema intramaticale ex vesicula late fusiformi vel interdum sphaerica infrasporangiali 3-5 μ diam., 7-10 μ alta constans, aut anguste fusiformi plerumque basi rhizoideum solitarium ferente aut late fusiformi vel sphaerica rhizoidea 2 opposita ferente; rhizoideis ultimo ramosis. Zoosporae sphaericae, diam. 4 μ , singulo globulo sphaerico paululo eccentrico diam. 2 μ praeditae atque cilio posteriore 20 μ longo. Sporae perdurantes non obviae.

In speciebus *Cladophorae* saprophytium vel subparasiticum.

Phlyctochytrium bullatum, sp.nov.

Sporangium subsphaericum vel late urecolatum, 10.5-23 μ altum, 12-26 μ diametro, hyalinum duobus seriebus concentricis dentium solidorum apicalium bipartitorum praeditum: serie interiore ex 4 minutis sessilibus divergentibus circum papillam orificialem, serie exteriori ex 6 valde divergentibus longioribus, singulatim terminalibus in solidum latum apice intus arcuatum umbonem. Systema intramaticale ex vesicula infrasporangiali vel late fusiformi vel interdum sphaerica vel irregulari, 10-20 μ diam., 6-10 μ alta constans, unilateraliter vel bilateraliter rhizoideum latum plerumque distanter ramosum ferens; rhizoideis per cellulas algae ramificientibus. Zoosporae sphaericae, diam. 8 μ , singulo globulo sphaerico vel hemisphaerico paululo excentrico diam. 4-5 μ atque cilio posteriore circ. 40 μ longo praeditae. Sporae perdurantes non obviae.

In speciebus *Cladophorae* saprophytium vel subparasiticum.

Diplophlyctis laevis, sp.nov.

Sporangium late vel irregulariter pyriforme, 20-35 μ longum, ad basin 13-35 μ diam.; vesicula infrasporangiali subglobosa 4-5 μ diam. rhizoideis 1 vel multis validis praedita; tubulo demissionis crasso ad apicem versus angustato longitudine variabili, interdum 50 μ longo, apice membranam algae penetrante et plerumque solum breviter emergente. Zoosporae sphaericae, diam. 7 μ , singulo globulo sphaerico diam. 3 μ praeditae atque cilio posteriore 30 μ longo. Sporae perdurantes sphaericae vel ellipsoideae, 11-18 μ , 12-18 μ ; guttulis multis aequalibus; apophysi 5-7 μ diam.; membrana laevi ca. 2 μ crassa. Germinatio non visa.

In speciebus *Cladophorae* saprophytium.

*Department of Botany,
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THREE NEW SUBSPECIES OF THE FAMILY BOIDAE.

BY OLIVE GRIFFITH STULL

AFTER the publication of my *Check List of the Family Boidae* (1935 Proc. Boston Soc. Nat. Hist. **40**, No. 8, 387-408), Dr. L. D. Brongersma called to my attention the fact that the type locality of Schlegel's *Python curtus* (1872, Dierentuin Gen. Nat. Amsterdam, Rept., 54, fig.¹) is Sumatra. Thus the name *curtus* rightly applies to the Sumatra form, the name *breitensteini* (Steindachner, 1881, Stizb. Ak. Wiss. Wien, **82**:267, type locality Teweh, Borneo) to the Borneo form, and there is no name available for the mainland subspecies. This form I name in honor of Dr. Brongersma.

***Python curtus brongersmai*, new subspecies.**

Type.—Museum of Comparative Zoölogy, Harvard University, No. 29,779.

Type locality.—Singapore, Malay Peninsula.

Paratype.—U. S. National Museum No. 53,427, Kuala Lumpur, F. M. S.

Diagnosis.—This form may be distinguished from the Sumatran form, *Python curtus curtus* Schlegel, and from the Bornean form, *Python curtus breitensteini* Steindachner, by the presence of 2 supraocular plates instead of one, by the entrance into the orbit of 2 supralabials as compared to none (usually²), and the higher average number of ventrals (170.5 in *brongersmai*, 162.5 in *breitensteini*, and 159.6 in *curtus*²).

Description.—Male. Squamation: scale rows 51-55-33; ventrals 174; caudals 32 divided; supralabials 10, with 5 and 6 entering the eye, and 1

¹At that time this publication was available nowhere in the United States, but there is now a copy in the library of the Museum of Comparative Zoölogy, Harvard University.

²A problematical specimen from Sumatra in the British Museum, whose scale counts were kindly sent to me by Dr. H. W. Parker, has 2 supralabials entering the eye, whereas all other Sumatran specimens examined have none. This same specimen has the highest number of ventrals found for the form (171 as compared to 152-156, average 154, for other Sumatra specimens, 168-174, average 170.5, for mainland specimens.

and 2 pitted; infralabials 19, with 2-4 and 10-14 pitted on the right side, 3-5 and 12-14 on the left; preoculars 2; rostral pitted; 10 loreals on either side, and 2 small azygos plates. Anal spurs are present.

Coloration: (much faded in alcohol) dorsum brown with irregular dark mid-dorsal streak with darker spots in it; sides lighter with darker spots outlined with white; belly white.

Dentition: mandibular teeth, 19; premaxillary, 2, and maxillary, 19; palatine, 6; pterygoid, 13.

This specimen measures 1180 mm., with a body length of 1068 mm., and a tail length of 112 mm., the tail thus forming 9.4 per cent of the total.

Variation.—The paratype differs from the type in the following counts: scale rows 49-55-33; ventrals 170; infralabials 19 on the right side, 18 on the left; postoculars 2 on the right side, 3 on the left; 9 loreals on either side; no azygos plates. There are 18 instead of 19 mandibular teeth. This specimen measures 490 mm., with the tail measuring 50 mm. and thus forming 10.2 per cent of the total length.

Two specimens in the British Museum from Malacca and Kuala Lumpur, F. M. S., whose scale counts were sent by Dr. H. W. Parker, have respectively 58 and 54 scale rows at midbody; 170 and 168 ventrals; 28 and 27 caudals; 19/19 and 18/19 infralabials; 2 preoculars; 2 postoculars; 2 supraoculars; and 2 supralabials entering the eye on either side.

Further study of the South American genera of Boidae reveals the fact that certain specimens of *Epicrates* from Bolivia and Peru which have previously been referred tentatively to *Epicrates cenchria cenchria* form a geographic group sufficiently distinct to entitle it to subspecific rank. As no previous name seems to be available for this group, I name it in honor of Mrs. Helen T. Gaige.

Epicrates cenchria gaigei, new subspecies.

Type.—Museum of Zoölogy, University of Michigan, No. 77,236, collected by Jose Steinbach.

Type locality.—Dept. Santa Cruz, Bolivia.

Paratypes.—Museum of Zoölogy, University of Michigan, Nos. 68,068-68,070, Dept. Santa Cruz, Bolivia, 60,693 and 63,207, Buena Vista, Dept. Santa Cruz, Bolivia, all collected by Jose Steinbach, and 56,862, Manao, Bolivia, collected by M. Gonzales; and Field Museum of Natural History, No. 5,594, Tingo Maria, Peru.

Diagnosis.—This form is distinguished from *Epicrates cenchria cenchria* by the lower number of scale rows (40-45 instead of 47-51); from *E. cenchria crassus* by the larger number of ventrals (231-267 as compared to 215-241), the greater number of caudals (45-59 instead of 37-45), and the greater proportionate tail length (.114-.153 in *gaigei* as compared to .089-

.110 in *crassus*); from *E. cenchria maurus* by the lower number of scale rows (40-45 instead of 47-53); from *E. c. barbouri* (see below) by the larger number of ventrals (237-261 instead of 233).

Description.—Female. Squamation: scale rows 33-45-23; ventrals 257; caudals 59; supralabials 12 on the right side, 13 on the left, with 1-10 pitted; infralabials 16 on the right side, with 1-6 and 9-11 pitted, 15 on the left, with 1-11 pitted; preoculars 2; postoculars 3; supraocular 1; supralabial 7 on the right side, 7 and 8 on the left, entering the eye. Small anal spurs are present.

Coloration: top of the head brown with a black stripe extending from snout to nape, where it bifurcates to join the black stripe on either side running from the snout posteriorly through the eye to the nape; ground color of dorsum brown, with alternating rows of black spots; the spots of the mid-dorsal row ring-shaped, brown-centered, 49 in number on the body 9 on the tail, sometimes fused with one another; a faint, diffuse brownish stripe passing down the vertebral line the length of the body through the center of this series of spots; a lateral row of ocelli on either side, alternating with the mid-dorsal spots and also with the next lower series of spots, each ocellus consisting of an upper elongate convexly curved portion and a narrower but deeper ventral portion partially separated by a narrow gray crescent-shaped central streak; alternating with these lateral ocelli and with one another are two series of smaller black spots on either side, more or less irregularly arranged, the lower series smaller and intruding somewhat onto the belly; belly yellowish-white, except for the intrusion of the lateral markings, which impinge on the ventrals more posteriorly, and most beneath the tail.

This is the largest specimen of the form that was examined, the body measuring 940 mm., the tail 170 mm., with the tail thus forming 15.3 per cent of the total.

Variation.—The scale counts of the paratypes listed above are as follows: scale rows 31-34 at the neck, 40-45 at midbody, 19-23 anterior to the vent; ventrals 237-261; caudals 45-58; supralabials 13 in the six Bolivia specimens, 12 in the Peru specimen, with from 1-6 to 1-9 pitted (usually 1-8); in the Peru specimen supralabials 6 and 7 entering the eye, 7 and 8 in the Bolivia specimens, excepting the left side of Mich. No. 68,069, where 7 only enters; infralabials 14-17 (usually 15 or 16), with 1-8 to 1-10 pitted; preoculars 2; postoculars 3 or 4 (more often 4).

The teeth in three specimens (Mich. Nos. 60,693, 68,068-9) are as follows: mandibular teeth 20-22; maxillary, 19-22; palatine, 5; pterygoid, 15-18.

Tail length varies from 11.4 to 13.3 per cent of the total length.

Another form which seems to be sufficiently distinct to merit subspecific recognition, in spite of its representation by a single specimen, is found on Marajo Island. This I name in honor of Dr. Thomas Barbour.

Epicrates cenchria barbouri, new subspecies.

Type.—Museum of Comparative Zoölogy, Harvard University, No. 22,442.

Type locality.—Marajo Island, Para, Brasil.

Diagnosis.—This form may be distinguished from *Epicrates cenchria cenchria* by the lower number of scale rows (45 instead of 47-51); lower number of ventrals (233 instead of 250-275), lower number of caudals (51 instead of 53-63), and lower number of supralabials (11 as compared to 12-14); from *E. cenchria maurus* by the lower number of scale rows (45 instead of 47-53), and lower number of supralabials (11 instead of 12-13); from *E. cenchria crassus* by the higher number of ventrals (233 instead of 215-230), higher number of caudals (51 instead of 37-45), and lower number of supralabials (11 as compared to 12-14); from *E. cenchria gaigei* by the lower number of ventrals (233 instead of 237-261), and lower number of supralabials (11 as compared to 12-13).

Description.—Female. Squamation: scale rows 33-45-23; ventrals 233; caudals 51; supralabials 11, with 1-7 pitted and 6 and 7 entering the orbit; infralabials 15, with 1-11 pitted; preoculars 2; postoculars 4; supraocular 1. Anal spurs are present.

Coloration: (considerably faded in alcohol) above pale reddish brown, a darker brown streak from the snout along the median line of the head to the nape where it bifurcates and returns to form two incomplete ocelli, a dark, more or less interrupted streak from the nostril, through eye to temple, a shorter streak between it and the median streak in the upper temporal region. Along the vertebral line is a series of light-centered, dark-edged, saddle-shaped markings, commencing as ocelli anteriorly and coalescing irregularly (these are 5 in number, representing a series of about 49 spots more or less fused); on the side of the nape a dark band, edged above and below with lighter soon breaks up to form a series of dark-centered light-edged ocelli, very irregular in outline and frequently coalescing; on the flank below these are numerous dark brown blotches of irregular outline; on the tail are 9 dark-centered ocelli. The belly is uniform yellowish-white except where the lateral pigmentation impinges on the ventrals and beneath the tail where there is considerable reddish brown mottling.

Dentition: mandibular teeth 22; maxillary, 21; palatine, 5; pterygoid, 16.

The specimen measures 670 mm., of which 83 mm. are tail length, the tail length thus forming 12.3 per cent of the total.

Occasional Papers
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A PSEUDOGARYPIN PSEUDOSCORPION IN THE
WHITE MOUNTAINS.

BY ARTHUR PAUL JACOT.

As the genus *Pseudogarypus* is known only from west of the Rocky Mountains and as only two species are known from the United States, it is quite a surprise to find a third species down east. Since it was found in the White Mountains, one immediately thinks of an alpine species confined to one of the summits. Unfortunately for romance, these individuals were found on the spruce flats between Mount Lafayette and the Amonoosuc at an elevation of only 1360 feet.

The type of this genus is *Garypus bicornis* Banks (1, p. 8) taken from between the laminae of rocks, Specimen Ridge, Yellowstone National Park, and not the species refigured and redescribed as such by Chamberlin (2), from Bear Lake, Utah. This Utah specimen differs from the type, from *P. hesperus*, and from the White Mountain species in two characteristics which merit segregating it in another genus:

Cerogarypus, gen. nov.

Characters.—Pseudogarypinæ with the usual trilobed front, slender thorax, and broad abdomen, but with no spines on mesal end of pedal coxæ I, and no sclerotized roof over posterior eye which is directed laterad.

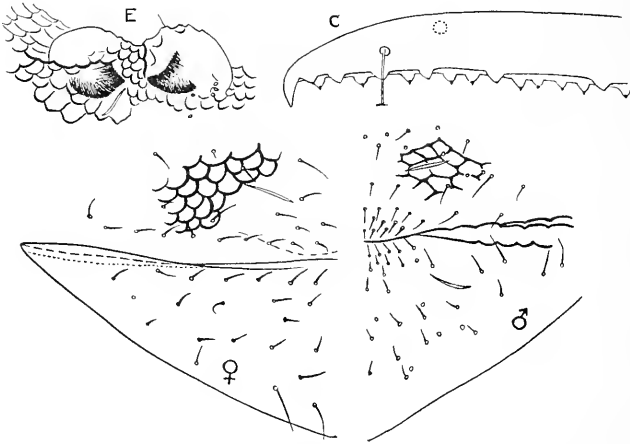
Type.—*Pseudogarypus bicornis* Chamberlin 1923 (non "Banks").

Since *Pseudogarypus bicornis* Chamberlin is a homonym, I propose the name **Cerogarypus agassizi**, nom. nov. This species has been adequately figured by Chamberlin (2). The chelæ bear 40 and 33 marginal teeth; setæ t and st of movable arm of chelæ and sb and b are subequally spaced.

I take pleasure in naming the White Mountain species after Nathan Banks to whom we owe the greater part of our knowledge of these interesting animals in the eastern United States.

***Pseudogarypus banksi*, sp. nov.**

Differs from *P. bicornis* Banks in that the lateral horns of anterior end of cephalon are broadly connected with middle lobe. In *P. bicornis* the horns are deeply separated from the central lobe, so that there projects between them a rounded lobe but at a lower level. From the center of the lower lobes there springs a short but conspicuous bristle which extends forward to level of the horns and central lobe. Sclerotized plate over posterior eye rounded, not projecting much further laterad than anterior eye (figure E). In *P. bicornis* this plate is angular, the anterior edge straight, projecting much further laterad than posterior margin which is diagonally snipped off. Lateral fold of thorax continuous to side of abdomen, with a short second fold above it laterad of first abdominal segment. In *P. bicornis* the fold is abruptly swollen in the center. A characteristic of both these species is that abdominal segments I are much shorter than the second, and very oblique.



Differs from *P. hesperus* (3, p. 232, figs. 20B, 21H, 38A-B, 63) from Puyallop, Washington, in having widely spaced teeth (figure C), as in *P. bicornis*. All three of these species have the teeth of the chelæ to the number of about 32/24. The figures of *P. hesperus* represent the eyes as separated by more than their diameter. In both *P. bicornis* and *P. banksi* they are much closer (figure E).

Total length of adults 2.3 to 2.5 mm., breadth of abdomen 1.6 to 1.7 mm.

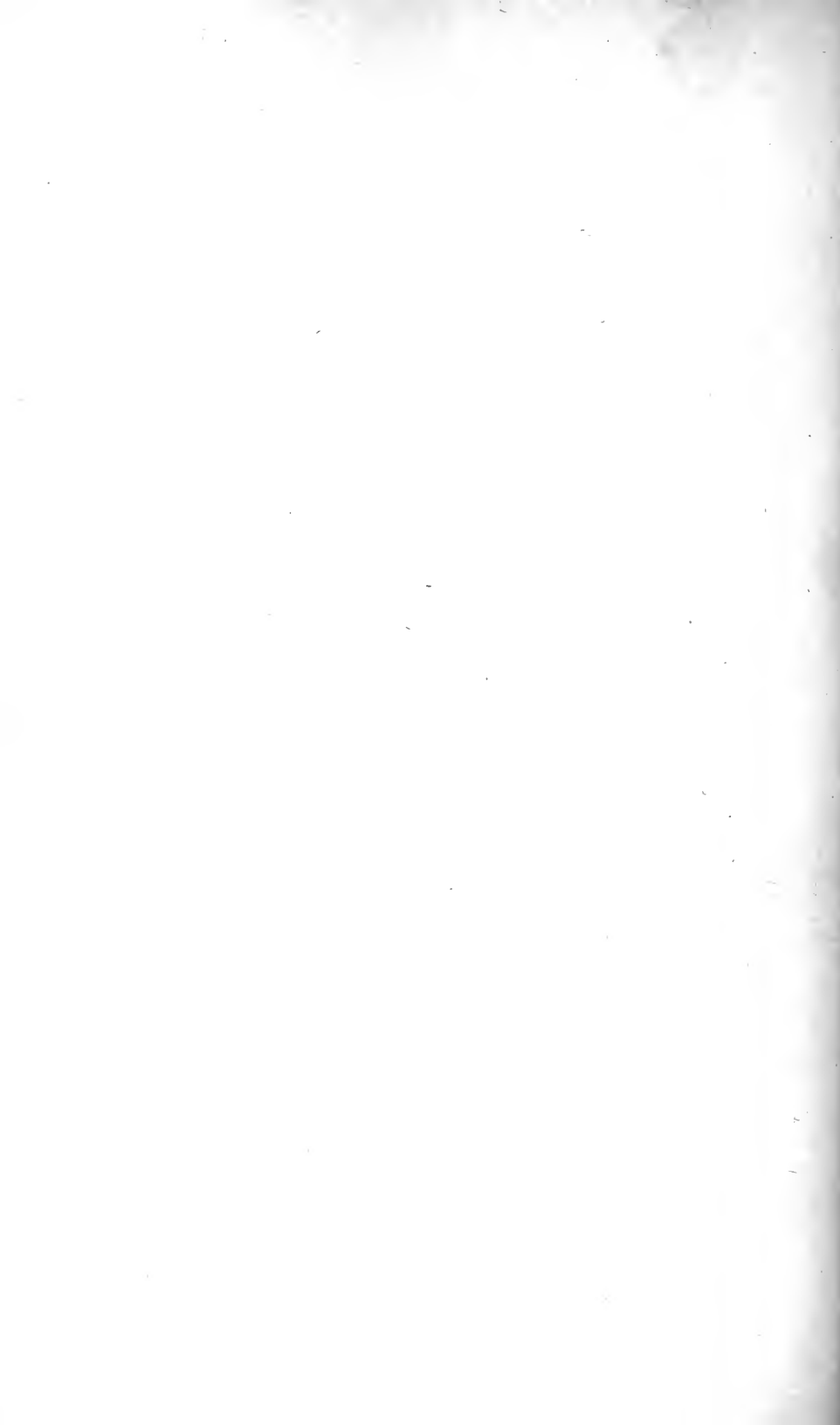
As Chamberlin makes no special mention of sexual dimorphism in this genus, I figure the arrangement of bristles of the second and third sternites of both male and female (all figures are equally enlarged).

Cotypes.—Four females, one male, three immatures, found under bark of a long dead, standing tree bole, Gale River Experimental Forest, Pierce

Bridge, N. H., taken August 29th; mounted in balsam on two microslides, to be deposited at the Museum of Comparative Zoölogy, Harvard University.

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PSEUDEMYS NELSONI, A NEW TURTLE
FROM FLORIDA.

BY A. F. CARR, JR.

IN common, no doubt, with most American herpetologists who have given the matter attention, I have long been puzzled by the section of *Pseudemys* known currently as the “*rubriventris* group.” The forms comprising this so-called group—*rubriventris*, *alabamensis* and *texana*¹—were first associated by Baur (1893) on the basis of a common skull character: the upper jaw bears a deep median notch bounded by a strong cusp on either side.

The possession of this feature by all three forms has been accepted generally as justification for considering them a natural and discrete subgeneric alliance. An examination of the material available, and field work in a critical area in the distribution of the forms, have suggested a number of interesting problems and have indicated the occurrence of an unnamed species in Florida.

Stejneger and Barbour (1933) give as the range of *rubriventris*, “Atlantic Coast from extreme northeast Florida to Long Island, New York; Plymouth, Massachusetts;” that of *alabamensis* is defined as, “Gulf Coast from extreme northwestern Florida to Louisiana.” Thus, the impression is received that peninsular Florida is not inhabited by a member of the group; this, however, is not the case. Lonnberg (1894) found *rubriventris* in Orange Co., Marion Co. and the St. Johns River, while Brimley (1907), and Van Hyning (1933) record it from Orlando (Orange County) and Alachua County, respectively. DeSola (1935), who gives Dr. Wright credit for calling attention to its occurrence in the

¹The relationships of this form will be discussed in another paper.

Everglades, lists it as *P. alabamensis*. Actually, the terrapin to which these authors have referred is abundant thruout the peninsular, in some areas outnumbering *floridana*.

Among naturalists with whom I have conversed, opinion as to the proper name for the Florida red-bellied terrapin has been about equally divided between *alabamensis* and *rubriventris*. During the past year I have had the opportunity of examining several topotypes (including the types) and other specimens of *alabamensis* and numerous examples of typical *rubriventris*: a comparison of these with a large number of Florida specimens has shown that the peninsular population is consistently different from either of the named species.

A search for intergrades between the peninsular form *alabamensis*, in the Florida panhandle, has produced nothing. Moreover, I have been unable to locate a specimen or authentic record of *rubriventris* from the area between northern Florida and northern North Carolina. Mr. C. S. Brimley, Raleigh, North Carolina, and Mr. E. B. Chamberlain, Charleston, South Carolina, inform me that they have never seen it in their respective states. Further, a study of the range of individual variation in the three forms indicates that certain characters do not overlap.

The affinities of the unnamed terrapin are not obvious. The similar contours and proportions of the carapace in it and *alabamensis*¹ might be pointed out—pending the possible establishment of the spurious nature of the latter form.

¹Although I regard any final disposition of the form known as *P. alabamensis* as premature until breeding experiments have demonstrated the method of inheritance of the character by which it is diagnosed—the cusp-bounded notch in the upper jaw—I have seen strong evidence that it may eventually be placed in the synonymy of *P. f. mobiliensis*.

As mentioned above, the Check List gives the range of *alabamensis* as the coastal strip from extreme northwestern Florida to Louisiana. This territory constitutes a good portion of the range of *P. f. mobiliensis* (or all that of *mobiliensis* and part of that of Brimley's problematical race, *viroscana*). I have seen the types of *alabamensis*, the types of *mobiliensis* (PANS 241 and PANS 242) and numerous topotypes of each, and in every case I have observed that, had the specimen of *alabamensis* been decapitated, I could in no way have distinguished it from *mobiliensis*. Moreover, six specimens of *alabamensis* from New Orleans showed the same black background of cara-

On the other hand, the black ground color of the carapace, the range of variation in distribution of dorsal red pigment [cf. Agassiz (1857) pl. 26-27], and the reduction in head striping all suggest northern *rubriventris*. The nearest morphological ally of the Florida turtle seems to me to be *P. r. bangsi*. If this is an intrinsic genetic relationship, and not merely superficial convergence, it perhaps may be explained best by postulating the fragmentation of an old coastal plain stock. Subsequent to isolation of the three stocks, *rubriventris* may have become modified thru adaptation to life in higher streams, while *bangsi* and the Florida colony, confined to more limnetic situations, have retained the primitive characters.

Whatever its affinities, the Florida form appears to be distinct with reference to both geography and range of variation. Until intergrades are found I think it should be given specific designation. It is named for Mr. George Nelson, preparator-in-chief, Museum of Comparative Zoölogy, in recognition of his extensive contributions to museum collections of Florida reptiles and amphibians.

***Pseudemys nelsoni*, sp. nov.**

Diagnosis.—Allied to the races of *P. rubriventris* but distinguished as follows. Height of carapace greater (length/height ratio: *nelsoni*, males 2.18-2.52, av. 2.32, females 1.93-2.28, av. 2.16; *rubriventris*, males 2.53-3.27, av. 3.01, females 2.41-2.83, av. 2.60). Depth of bridge greater (depth-of-bridge-at-marginal-suture-six/length ratio: *nelsoni*, males 5.56-7.60, av. 6.35, females 5.14-6.92, av. 5.78; *rubriventris*, males 8.33-12.04, av. 9.99, females 6.60-9.27, av. 7.86). Vertebral plates convex and slightly keeled behind in *nelsoni*, concave or flat and unkeeled in *rubriventris*. Shell usually constricted in region of sixth marginals in *rubriventris*, rarely slightly constricted in *nelsoni*; greatest width of carapace usually anterior to middle in *nelsoni*, posterior to middle in *rubriventris*. Markings on lower marginals

pace and soft parts and the same shell contours that distinguish the local phase of *mobiliensis* (*vioscana*). Finally, three specimens of *alabamensis* from within the range of *suwanniensis* (Appalachicola, and Crystal River, Citrus Co., Florida) are in all respects except jaw structure typical *suwanniensis*.

Whether *alabamensis* is a mutant of *mobiliensis*, or whether this is an instance of concurrent geographic variation can only be determined by examining litters of known parentage.

solid and smudge-like in *nelsoni*, concentric or inclosing light areas in *rubriventris*; markings on bridge lacking or consisting of a few large spots or bars in *nelsoni*, usually present and comprising oblong concentric or light centered figures in *rubriventris*.



FIG. 1. *Pseudemys nelsoni*, male paratype.

Distinguished from *alabamensis* as follows. Stripes on side and top of head in adult (in area between lower edges of tympana) usually 4-6 in *nelsoni*, 13-17 in *alabamensis*. Upper marginals with concentric figures in *alabamensis*, each with one or two inconspicuous vertical or longitudinal light bars in *nelsoni*. Ground color of carapace and soft parts brownish in *alabamensis*, sooty black in *nelsoni*.

General description.—Carapace longitudinally rugose and highly arched, its highest point at, or slightly anterior to, middle of long axis. Length/width ratio, males 1.31-1.47, av. 1.40, females 1.32-1.47, av. 1.38; greatest width/width at marginal suture six ratio, males 1.0-1.07, av. 1.04, females 1.00-1.05, av. 1.01.

Lower jaw strongly serrate with a tooth at symphysis; upper jaw usually weakly serrate with a median notch bordered by fairly distinct cusps.

Coloration: Ground color of carapace black; vertebrals each with an obsolescent vaguely H-shaped light figure; each costal with a λ-shaped, transverse, red, yellow or orange figure which is typically broad and conspicuous, but often obscure or lacking. An occasional specimen shows the accentuation and diffusion of red pigmentation as figured by Agassiz i.e.. This is usually accompanied by more or less extensive mottling of the bridge, lower marginals, and plastron with dusky, irregular patches of pigment. I have seen two such examples in which the carapace was almost entirely red. Light ventral coloration barely encroaching on upper marginals. Plastron red, orange, or light greenish yellow; dusky dendritic pattern usually, but not always, lacking. Ground color of head and limbs lustrous black; markings greenish yellow to orange yellow. Shoulder and groin pale.

Head striping markedly reduced in adult, consisting essentially, and

usually entirely, of the following lines. An orbito-mandibular stripe, forking at angle of jaw to send one branch to the lower margin of the orbit and another along the mandible almost to the symphysis; a maxillary stripe, extending obliquely from nostril about half way to angle of jaw; a tympano-orbital, from postero-dorsal corner of orbit to upper margin of tympanum, sometimes continuing along the neck; a supra-temporal, running obliquely upward along dorso-lateral edge of neck and head across temporal fossa to inner border of orbit (the portion of this stripe between the orbit and the anterior margin of the temporal fossa is often obliterated). Less frequently present and usually faint is the paramedian, which may either extend along the top of the head to the tip of the snout, or join the supra-temporal a short distance behind the orbit. A conspicuous sagittal stripe of varying length is usually present midway between the orbits.

Holotype.—Museum of Comparative Zoölogy 39888. Fellsmere, Indian River County, Florida; 1936; George Nelson, collector. Adult female. Length, 280 mm.; width 200 mm.; height 129 mm.; width at marginal suture six 198 mm.; height of bridge at marginal suture six 53 mm.

Allotype.—MCZ 43847. Sulfur City, Lake Co., Florida; May 1, 1935; A. Carr, collector. Adult male. Length 197 mm.; width 150 mm.; height 83 mm.; width at marginal suture six 142 mm.; height of bridge at marginal suture six 35 mm.

Paratypes.—MCZ 43848. Lake Newnan, Alachua Co., Fla.; April 1, 1938; A. Carr, collector. MZUM 83131. Sugarfoot Prairie, Alachua Co., Fla.; Nov. 15, 1934; A. and T. Carr, collectors. MZUM 83129. Pond near Gainesville, Alachua Co., Fla.; May 8, 1935; G. W. Van Hyning and A. Carr, collectors. MZUM 83130. Sulfur City, Lake Co., Fla.; May 1, 1935; A. Carr, collector. CM 12995. Gainesville, Alachua Co., Fla.; Dec. 14, 1932; Wesley Clanton, collector. Dept. Biol., Univ. Fla. 1748. Lake Newnan, Alachua Co., Fla.; March 24, 1938; A. Carr, collector. Dept. Biol., Univ. Fla. 741. Sugarfoot Prairie, Alachua Co., Fla.; Nov. 15, 1934; A. and T. Carr, collectors. CM 12996. Gainesville, Alachua Co., Fla.; April 1935; B. Bellamy, collector.

Specimens examined.—*P. nelsoni*: (Florida) Alachua Co., 55; Lake Co., near Umatilla 12; Marion Co., Silver Springs 18; Levy Co., near Manatee Springs 1; Orange Co., Apopka 6; Polk Co., Winter Haven 4; Indian River Co., Fellsmere 2; Lee Co., Bonita Springs 7; Collier Co., Tamiami Canal 4; Dade Co., Tamiami Canal 3; Homestead 2; Monroe Co., Pinecrest 4, near Flamingo 2.

P. r. rubriventris: Washington, D. C. 16; Pennsylvania, Philadelphia 2; Delaware, 1, Rehoboth Beach 2; Maryland, Bryan Point 1; Virginia, Ferry Landing 1; New Jersey, Vineland 1, Dennisville 1, Beasley's Point 1, Hamnton 1.

P. r. bangsi: Massachusetts, Plymouth 4.

Acknowledgments.—I am grateful to Dr. Thomas Barbour for his interest in this study and for his many courtesies during the course of its persuance. To Mr. Arthur Loveridge, Dr. Leonhard Stejneger and Dr. Doris Cochran, I wish to express thanks for their kindness in making available material in their charge. For valuable information or for the gift of specimens, I am indebted to Messrs. C. S. Brimley, Raleigh, North Carolina, E. B. Chamberlain, Charleston, South Carolina, E. Ross Allen, Silver Springs, Florida, and H. Yehl, Hammonton, New Jersey.

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SOME SMALL MAMMALS OF MOUNT DESERT ISLAND,
MAINE.¹

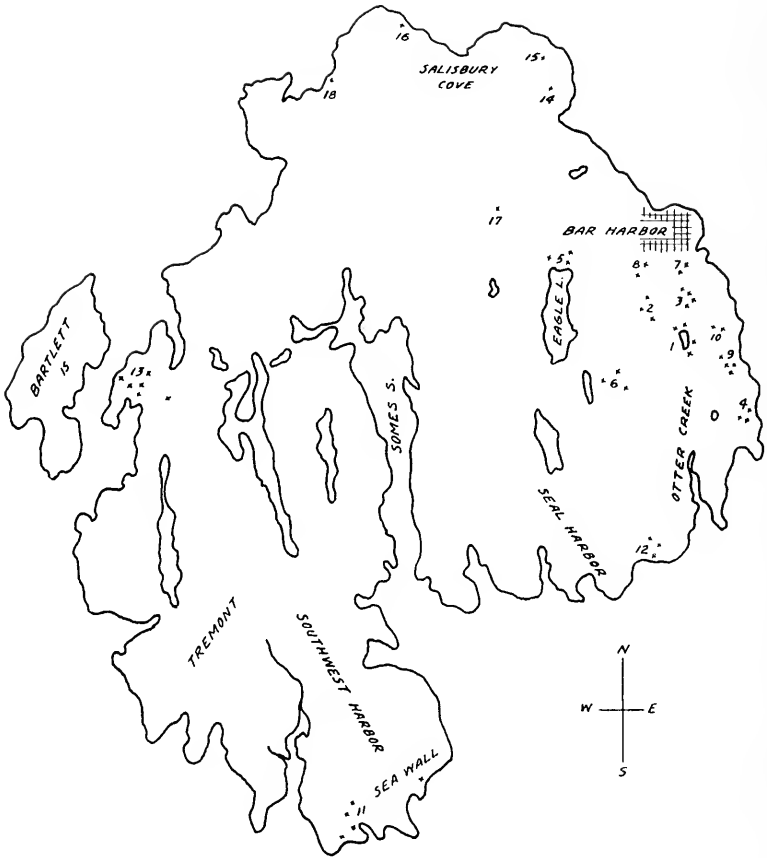
BY MANLIF LELYN BRANIN.

FOR many years Mount Desert Island has been of particular interest to geologists and botanists because of its geologic formations and its rich and varied flora. On account of its low mountains, fertile valleys, fresh-water lakes and marine inlets, together with its proximity to the Labrador current, there exist interesting combinations of environments for the support of plant and animal life. As a result, many typically southern as well as some extremely northern varieties of plant life are to be found there. Along with the pitch pine (*Pinus rigida*) and mountain holly (*Nemopanthus mucronata*), for example, may be found the creeping juniper (*Juniperus horizontalis*), the crowberry (*Empetrum nigrum*) and the Labrador tea (*Ledum groenlandicum*).

Because of the varied flora known to occur there, it was thought that a study of the small mammals of the region might net some interesting results. A number of ordinary snap-traps accordingly were placed at various trapping stations during the period from July 26, 1934, to September 23, 1934. From six to fifty traps were set daily, with the exception of a few rainy days, and a total of 154 specimens was secured. Of this number, approximately 150 were trapped by the writer and the remaining specimens were contributed by other interested individuals. Whenever possible, traps were placed either in runways or at tunnel entrances.

Traps were placed at eighteen different centers on the Island. Since a proportionately small number of individuals was secured

¹This paper in part was read at the Annual Meeting of the American Society of Mammalogists held in Washington, D. C., May 4 to 8, 1937.



Map of Mount Desert Island showing locations of the various trapping centers.

- | | |
|--|--------------------------------|
| 1. The Tarn | 10. Champlain Meadow |
| 2. Sieur de Monts Spring | 11. Sea Wall |
| 3. Public Camp Ground | 12. Little Hunter's Beach |
| 4. Anemone Cave | 13. Pretty Marsh |
| 5. Eagle Lake | 14. Dreamwood |
| 6. Cadillac Mountain summit | 15. Ireson Hill |
| 7. Great Meadow at Ledge Lawn | 16. Leland Point |
| 8. Kebo Valley Country Club | 17. 4 miles west of Bar Harbor |
| 9. Woods-meadow east of Champlain Mountain | 18. Blunt's Point |

at each, detailed descriptions of the locations are not here included. The various centers, however, are shown on the accompanying map. Each point at which one or more specimens was taken is represented by an "X." A list of the species trapped at each center is given in table 1.

RELATIVE ABUNDANCE OF SPECIES.

In so far as this study may be considered a reliable criterion, *Peromyscus* with a total of 39 specimens appears to be the most numerous single species of small mammal on the Island, although the number of *Blarina*, 35 specimens, and of *Evotomys*, 34 specimens, taken is not appreciably less. The number of individuals of *Microtus* on the other hand seems correspondingly small, but this may to some extent be attributable to the fact that meadow

TABLE 1

Frequency and distribution of species with respect to trapping centers.

	<i>Peromyscus</i>	<i>Evotomys</i>	<i>Blarina</i>	<i>Microtus</i>	<i>Zapus</i>	<i>Mus</i>	<i>Napaeozapus</i>	<i>Mustela</i>	<i>Condylura</i>	<i>Sorex</i>	total
The Tarn	3		1			2			1		7
Sieur de Monts Spring	5	5	7							1	18
Public Camp Ground	7	2	4	1	1	4					19
Anemone Cave	1	2	2							1	6
Eagle Lake	4										4
Cadillac Mountain	9	3	4								16
Great Meadow				2							2
Kebo Valley C. C.	2				1						3
Champlain Woods-Meadow	1	7	5	4	3	1	1	1		1	24
Champlain Meadow			1	3							4
Sea Wall	5	7	3							1	16
Little Hunter's Beach			3							1	4
Pretty Marsh	2	6	3	2						2	15
Dreamwood					1						1
Ireson Hill		2									2
Leland Point			1								1
4 miles W. Bar Harbor			1								1
Blunt's Point				1							1

environments were not trapped as extensively and frequently as other environments, particularly lightly wooded areas. Also, small snap-traps would seem to be ill-suited to capturing the larger specimens, and that factor might partially account for the decreased incidence of *Microtus*. Of the two species of jumping mice (Branin '36, '36a) found, *Zapus* appears to be the more abundant. *Sorex*, although widely distributed on the Island, apparently is not as numerous as *Blarina*, *Peromyscus* and *Evotomys*.

SIZE OF INDIVIDUALS.

The measurements of specimens here reported fail to agree with those given by Johnson ('27) for *Microtus* and *Evotomys* in this region. Although Miss Johnson does not indicate whether or not all six specimens of *Microtus* taken by her were adults, she states that the average total length of adults is six and three-quarters inches. This exceeds the measurements of any of the twelve which I trapped. Eight of mine measured in excess of four and three-eighths inches and were recorded as "adults." They varied in length from about five and seven-sixteenths inches (139 mm.) to approximately six and three-eighths inches (162 mm.), with an average of about five and seven-eighths inches (149 mm.). Thus there is a difference between Miss Johnson's measurements and mine of seven-eighths of an inch for the average length of adults; an amount which to me seems to be significant and which scarcely seems attributable to differences in methods of measuring specimens.

Similar discrepancies are evident in the total length measurements of adults of *Evotomys*. Miss Johnson does not say how many of the thirty *Evotomys* trapped by her were adults, but she states that the total average length of adults is five and three-quarters inches. This exceeds by at least a quarter of an inch the length of my largest specimen. Of the thirty-one individuals in my collection, variations of from 99 mm. to 139 mm. (slightly under five and one-half inches) in total body length were found. Twenty-four of these measured in excess of 120 mm. and were assumed to be "adults." They averaged 128.7 mm. in total length, or almost three-quarters of an inch less than the average given by Johnson for adults of the same species.

TABLE 2

Comparative lengths of Microtus and of Evotomys from Mt. Desert Island and from elsewhere in eastern Maine.

	<i>Microtus</i>		<i>Evotomys</i>	
	number of adults	average size (mm.)	number of adults	average size (mm.)
Present study	8	149	24	128.7
Bowdoin Collections	25	158.5	60	133.7
Johnson's results	6(?)	171	30(?)	146

Through the courtesy of Dr. Manton Copeland it has been possible to compare the above measurements with those of all specimens from eastern Maine in the several collections at Bowdoin College. In interpreting this data, which is shown in table 2, it is significant to note that the number of individuals included in the Bowdoin Collections exceeds that of the combined totals of the other two collections.

EFFECT OF MOISTURE ON DISTRIBUTION.

Undoubtedly moisture is an important factor in determining the distribution of the various species on Mount Desert Island. *Peromyscus*, for example, was found most frequently in moderately dry woods, while *Evotomys* seemed to prefer a more moist wooded environment. Not infrequently the latter was trapped in decidedly damp wooded areas. *Blarina* on the other hand seemed to be equally at home in either semi-dry or moist environments, as did *Sorex*. Of the latter, however, the number of individuals taken was too small to adequately judge the type of environment preferred. Attempts made to trap any of these genera in excessively dry areas, which were far removed from any available water supply, were unsuccessful. Such a result was to be expected. In a general way, these findings support the data given by Miss Johnson on the influence of moisture on the distribution of small mammals in this area. Miss Johnson also mentions the overlapping of habitats of *Evotomys* and *Blarina*. This likewise is in agreement with my observations.

ALTITUDE AND DISTRIBUTION.

Apparently the higher altitudes have little effect upon the distribution of *Peromyscus*, *Evotomys* and *Blarina*, for all of these

were trapped on or near Cadillac Mountain summit, which is the highest mountain on Mount Desert Island, at heights of 1450 to 1525 feet above sea level as well as at low altitudes only 5 to 100 feet above sea level. Johnson (*op. cit.*) found that at the highest level at which she trapped, around 675 feet, *Peromyscus* is more numerous than *Evotomys*, while at intermediate altitudes from 150 to 250 feet above sea level the two species occur in equal numbers. At her lowest trapping level, approximately 40 feet above sea level, she found *Microtus*, *Evotomys* and *Blarina*, but no *Peromyscus*. The failure of Miss Johnson to find the latter at low altitudes probably is attributable to the small number of trapping centers established by her. In the present study, specimens of *Peromyscus* were trapped at various intermediate altitudes from 5 to 1525 feet above sea level. *Evotomys* and *Blarina* also were taken at all altitudes, but at the higher levels they were less numerous than *Peromyscus*.

BAIT PREFERENCES.

A number of different kinds of bait were used, such as prune, bacon, fig newton, moths, cheese, peanuts and pork, but not with equal frequency. Bacon proved to be the most serviceable for all around purposes, at least one individual of each species being taken on it. Raw prune also seemed to be acceptable to most of the species and it was used quite frequently. Food materials which proved to be ineffective as bait were soon discarded and substances more acceptable to the various animals were substituted for them.

LIST OF SPECIES.

Peromyscus maniculatus abietorum (Bangs).

One of the most abundant small mammals on the Island. Specimens were secured at ten different trapping centers, namely: the Tarn, Sieur de Monts Spring, Public Camp Ground, Anemone Cave, Eagle Lake, Cadillac Mountain summit, Kebo Valley Country Club, woods-meadow east of Champlain Mountain, Sea Wall and Pretty Marsh.

Evotomys gapperi ochraceus Miller.

Probably almost as abundant as *Peromyscus*. Specimens were taken at: Sieur de Monts Spring, Public Camp Ground, Anemone Cave, Cadillac Mountain summit, woods-meadow east of Champlain Mountain, Sea Wall, Pretty Marsh and Ireson Hill.

***Microtus pennsylvanicus* (Ord).**

Although a proportionately small number of individuals was taken, the meadow mouse is probably widely distributed and abundant on Mount Desert Island. Specimens are included from: Public Camp Ground, Great Meadow, woods-meadow east of Champlain Mountain, Pretty Marsh and Blunt's Point. In addition to these, individuals were seen at several other points on the Island.

***Zapus hudsonius hudsonius* (Zimmermann).**

The Hudson Bay jumping mouse was trapped at widely separated locations on the Island, but it is rather uncommon. Individuals were taken at: Public Camp Ground, Kebo Valley Country Club, woods-meadow east of Champlain Mountain and at a point near Dreamwood.

***Napaeozapus insignis insignis* (Miller).**

The Woodland jumping mouse was trapped at only one location (Braun, '36), although a brood of six immature mice was seen. They were captured alive by Mr. Verne Lunt of Bar Harbor along a small woodland creek about a mile south of the Tarn. The trapped specimen was taken at the woods-meadow station east of Champlain Mountain.

***Mus musculus musculus*.**

A number of individuals of the house mouse were trapped near the Public Camp Ground and at the Tarn. Both of these places are frequented by picnic parties during the summer months.

***Blarina brevicauda talpoides* (Gapper).**

The short-tailed shrew is about equal in numbers to *Evotomys*, according to my records. Specimens were taken at: the Tarn, Sieur de Monts Spring, Public Camp Ground, Anemone Cave, Cadillac Mountain summit, woods-meadow east of Champlain Mountain, Champlain Meadow, Sea Wall, Little Hunter's Beach, Pretty Marsh, Leland Point and at a point about midway between Whales Back and Young's Mountain (approximately four miles due west of Bar Harbor).

***Sorex cinereus cinereus* Geoffroy.**

Although only eight specimens of the masked shrew were secured, apparently it is distributed over most of the Island. Individuals are included from widely separated points, including: Sieur de Monts Spring, Anemone Cave, woods-meadow east of Champlain Mountain, the grassy tundra at Sea Wall, woods near Little Hunter's Beach and Pretty Marsh. One additional specimen was rescued from a cat by Mr. Verne Lunt at his home near Indian Point. This shrew probably is rather common in some areas.

***Condylura cristata*.**

No attempt was made to trap moles. The single specimen of star-nosed mole here included was brought in by Mr. Lunt whose C.C.C. company unearthed it along the main road near the south end of the Tarn.

Mustela cicognanii Bonaparte.

Although trapping efforts were directed primarily toward securing mice and shrews, one specimen of the Bonaparte weasel was killed by an ordinary snap-trap at the woods-meadow center adjoining Champlain Mountain. The mounted skin and carcass are now preserved in the Nature Museum at Acadia National Park, specimen number 57.

Tamias striatus lysteri (Richardson).

Three Lyster chipmunks were caught. They are common in most parts of the Island.

Glaucomys sabrinus macrotis Mearns.

The only two flying squirrels secured were caught in large snap-traps by Dr. A. E. Brower at the State Forestry Station near the Jackson Memorial Laboratory.

Most of the specimens referred to above are now preserved as alcoholics in the Nature Museum of Acadia National Park, Bar Harbor, Maine. It should be noted that the above list of species does not include all of the small mammals native to Mount Desert Island, but rather only those taken during the progress of this study. The list is known to be incomplete.

ACKNOWLEDGMENTS.

I wish to thank Dr. Lee R. Dice, University of Michigan, and Dr. Seth Benson, University of California, for identifying *Peromyscus maniculatus abietorum* and for checking my identifications of *Blarina*, *Evotomys* and *Microtus*. Dr. Dice also read the manuscript. Identification of the *Sorex* specimens was made by Dr. Hartley H. T. Jackson of the U. S. Biological Survey. The *Glaucomys* and several specimens of *Peromyscus* were contributed by Dr. A. E. Brower of the Maine State Forestry Department. The *Condylura*, immature *Napaeozapus* specimens and one of the *Sorex* specimens were collected by Mr. Verne Lunt of Bar Harbor. The study was made possible through the co-operation of Mr. Arthur Stupka, Park Naturalist, Acadia National Park.

SUMMARY.

1. An annotated list of small mammals trapped on Mount Desert Island is given.
2. *Peromyscus* was found to be the most abundant small mammal on the Island; *Evotomys* and *Blarina* were slightly less

- abundant. *Sorex* although found in widely scattered areas was not trapped as often as *Blarina*.
3. Of the two species of jumping mice present on the Island, *Zapus* was taken most frequently.
 4. The measurements of *Microtus* and *Evotomys* here reported do not agree with those given by Johnson ('27) for similar specimens from this locality.
 5. In accordance with Miss Johnson's findings, moisture was found to be an important factor in determining the distribution of the various species on the Island.
 6. *Peromyscus*, *Evotomys* and *Blarina* were trapped at high altitudes (1450 feet above sea level) as well as at low altitudes (less than 100 feet above sea level). Neither high nor low altitudes act as barriers to these species on Mount Desert Island, although altitude probably influences their numerical distribution.

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Occasional Papers
OF THE
Boston Society of Natural History.

NEW MITES FROM THE WHITE MOUNTAINS.

BY ARTHUR PAUL JACOT.

THE following species were obtained from the organic layers of a long unburned spruce stand at the Gale River Experimental Forest, near Pierce Bridge, New Hampshire, in connection with my U. S. Forest Service studies on spruce humus reduction. Types are to be deposited at the National Museum.

Brachychthonius approximatus, sp. nov.

Figures 1 and 2

Resembling *B. bifurcatus* (9, p. 249, figs. 5, 6) but pseudostigmatic organ head simply fusiform; rostrum distinct, broad, short, rostral bristles inserted thereon, approximate, parallel; notogastral bristles b3 close to lateral edge of notogaster; b2 and c1 more anterior than b4 and c3; d1 and d2 unusually approximate; posterior end of adanal covers broad, truncate; color orange; size: fairly large, total length (contracted) 0.27 mm., breadth 0.164 mm.

Cotypes.—Three specimens from lower part of humus (H-) layer; taken July 19th, slide 37F1-3Hb-3.

Eniochthonius borealis, sp. nov.

Larger than *E. pallidulus*: average length 0.385 mm., average breadth 0.225 mm.; distal half of pseudostigmatic organs slightly clavate, without filaments but with four or five barbules. In specimens of *E. pallidulus* from both the White Mountains and the mountains of North Carolina the organs bear nine to twelve (usually ten or eleven) filaments on one side and a few barbs on the opposite side.

Cotypes.—Nine (thirteen) specimens from punky log; taken August 9th, slide 37F1w-4.

Heminothrus longisetosus interlamellaris, subsp. nov.

Figures 3 and 4

Differs from the species (17, p. 9 where it was made a subspecies of *H. paolianus* 6, p. 99, pl. 8, fig. 89) in having long, stout interlamellar bristles

which lie prone along the cephaloprothorax. Interlamellar area and vertex roughened by small, oval, pocks which are concentrically arranged, the center being a little anterior of transverse plane of insertion of interlamellar bristles. Posterior to lamellar apophyses are three transverse rows of these pocks which extend posterolaterad half way to pseudostigmata; region about pseudostigmata smooth; distal third of pseudostigmatic organs with hyaline featherlike fringe along the vitaline central shaft, making them broad distally and somewhat abruptly pointed.

Cotypes.—Eighteen immatures and twenty-nine adults from spruce litter; taken September 22nd, slide 37F4L36.

Oppia splendens Michael and authors, not Koch

Michael (12, p. 394) in calling his "variable" species *Notaspis splendens* says,—"it must be understood that I select it as being a common and typical form among a number of minute and closely allied creatures, all of which Koch probably included in his species; indeed it is more than likely that he had not the means of distinguishing them." I heartily concur.

Michael's description of the lamellae and cephaloprothoracic ridges shows he had more than one species before him. The fact that he called the species "variable" proves it, for the species are locally quite constant and vary in details which were quite invisible to even Michael. Michael did not see lamellar and interlamellar bristles though present in all these species (easily seen in lateral aspects).

Even Paoli (13) overlooked the shoulder bristle and the posteriormost (lowest) bristle of mesal row.

I now propose the following name for this wrongly determined species as represented in the White Mountains:

Oppia lignivora, sp. nov.

Notogaster complete, anterior edge definite but pinched together at sides and horizontally undulate (best seen in lateral aspect), without thickened band, bearing the usual bristle above undulation, followed (posteriad) by a vertical fissure; notogastral bristles twenty; cephaloprothorax somewhat as figured by Paoli (13, pl. 3, fig. 15) but interlamellar ridge broad, flat (Paoli has not indicated lateral edge of the ridge); interlamellar bristle springing from the obliquely truncate anterior edge of the ridge; rostral bristles more remote than figured by Paoli; sides of cephaloprothorax granular, even behind pseudostigmata; exopseudostigmatic bristle well developed; tectopedial ridges well developed; pseudostigmatic organs as figured by Paoli, varying in shape with aspect; tectopedia II as figured by Paoli.

Cotypes.—Twenty-eight specimens from spruce humus; taken September 22nd, slide 37F4F22.

Regensburg individuals differ in having the fourth bristle of mesal row much more approximate than the fifth, while in the New Hampshire specimens

they are subequally remote (exactly above each other in dorsal aspect). Furthermore the interlamellar ridges have the sides (both mesal and lateral) strongly concave while in the type material (New Hampshire) they are nearly straight, diverging from anteriorly. If Paoli's figure is accurate, these ridges are less developed in the circum-mediterranean subspecies.

According to my investigations the immature stages of this species may be found within decaying wood and probably within decaying leaves, more especially spruce and fir leaves. Adults are never common. Michael's statement is based on his confusion of several species.

***Autogneta longilamellata flumengalei*, subsp. nov.**

Figures 5 and 6

Differs from the species (12, p. 392, pl. 28, figs. 13-15) in the much longer, more slender, distally sharply pointed (almost attenuate) pseudostigmatic organs; interlamellar ridges weak, the mesal edge barely discernible, the proximal half extending to pseudostigmata where it is angularly bent, serifs at proximal end resemble those figured by Paoli (13, pl. 2, fig. 20) rather than those figured by Michael, that is they form posteriorly directed lapets, slightly broader than a square with truncate posterior edge; posterior extension (spur) of pseudostigmata at least as broad as the pseudostigmata, the posterior edge with two or three undulations; lamellar ridges stout, margins crenulate; fourth pair of mesal bristles conspicuously more approximate than fifth pair; distal third of femora I and II and ventral face of femora III and IV rugose-pebbled (in gum arabic mounts).

Cotypes.—Eleven specimens from spruce litter; taken September 22nd, slide 37F4L9.

This species is common in long unburned spruce *humus*, over 500 specimens having been obtained from a one square foot sample of humus fifteen inches deep. They were in the upper six inches. Only twenty-three were extracted from a sample five to seven inches deep.

***Quadroppia*, gen. nov.**

Oppias with well developed translamella; lamellotectopedial ridge more or less developed; a deep transverse groove along anterior edge of translamella; all bristles very short except the rostrals; notogastral bristles eighteen, one of the posterior bristles having dropped out; anterior edge of notogaster behind pseudostigmata with a stout boss splitting posteriorly into two ridges; anal and genital apertures separated by a distance slightly less than the length of either; the five genital cover bristles not linearly arranged; bristles ad2 and ad3 unusually close; size small: total length $0.2 \pm$ mm.

Type.—*Notaspis quadricarinata* 12, p. 385, pl. 31, figs. 13-15.

Quadroppia skookumchucki, sp. nov.*Figures 11 and 12*

Rostrum smooth, no sculpturing anterior of translamella; lamellotectopedial ridge strongly and angularly bent anterior near lamella, ventral end bifurcate, the posterior branch reaching back to insertion of legs I, the anterior branch reaching forward half way to insertion of rostral bristle; lower notogastral ridge long or short, mesal ridge half length of notogaster; a third long ridge extends along side of notogaster half way between usual lower ridge and ventral edge of notogaster; bristles ad1, ad2, and ad3 subequally spaced; length of males 0.18 mm., breadth 0.098 mm.

Cotypes.—Eighty specimens from spruce litter; taken September 22nd, slide 37F4L-14.

Named after one of the tributaries of Gale River on the flank of Mt. Lafayette.

Differs from *Quadroppia illinoisensis* **comb. nov.** (11, p. 651, pl. 2, figs. 10, 11) and *Quadroppia ferrumequina* **comb. nov.** (10, p. 11) from western North Carolina in having no sculpturing in area in front of translamella.

Suctobelbella longicuspis lanceolata, subsp. nov.*Figures 9 and 10*

Pseudostigmatic organ head slender, lanceolate, pointed; notogastral bristles shorter (half as long as in the species), shorter than interspaces; long (anterior) lacinia longer, straight, but distal end curved anterior; rostrum barely projecting anterior of insertion of cusps; other lacinia crowded close to major cusp, not forming a bandlike series, not visible in true lateral aspect; rostrum curved ventrad (resembling that of a tapir), dorsal face strongly crenulate; size as the species.

Cotypes.—Eleven specimens from lower part of humus (H-) layer; taken July 19th, slide 27F1-3Hb-6.

This is an extreme development of the species.

Metabelba craigheadi, sp. nov.*Figure 13*

Pseudostigmatic organs long, setiform, distal end broadly recurved but not flagelliform, smooth; interlamellar bristles short, stout, straight, erect; notogastral spines slender, somewhat blunt; notogastral bristles curved, smooth, only the first pair directed forward, somewhat longer than others, sometimes crossing; bristles of posterior legs more or less whorled, with four or five stout pectinations; size: length of body 0.4 mm., breadth 0.24 mm.

Cotypes.—Twenty-one specimens from spruce litter; taken September 22nd, slide 37F4L-41.

I take pleasure in naming this species after Dr. Frank Cooper Craighead, Chief of Forest Insect Investigations, U. S. Bureau of Entomology.

Haffenferrefia, gen. nov.

Notogaster high arched, anterolateral angles produced as in *Haffenferrefia*; lamellae widely separated; lamellar bristles inserted a short distance (width of lamellae) proximad of distal end of lamellae; tectopedia I and II well developed; anterior edge of notogaster concave (as in *Adoristes*); face of cephaloprothorax almost perpendicular, that is nearly at right angles to plane of venter.

Type.—*Galumna nitidula*, 4, p. 491, pl. 17, fig. 27.

Banks's figure is made with animal tilted back onto its anus, so that cephaloprothorax is much more visible than if animal lay flat on its venter.

Peloribates europaeus americanus, subsp. nov.

Differs from the species (18, p. 338, figs. 20, 21) in that notogastral bristles are slightly heavier and faintly burred along distal third; interlamellar bristles stouter, closely barbed; lamellar bristles equally stout, burred; rostral bristles stoutest, barbed-ciliate (described from gum-arabic mounts). The porose areas have a different arrangement. Size varies enormously.

Cotypes.—Twenty-one specimens from spruce litter; taken July 19th, slide 37F1L-28.

Ceratozetes gracilis cuspidatus, subsp. nov.

Figures 7 and 8

Rostrum pinched together, lower edge restricted, forming two short approximate cusps or denticles, bulging anterior wall thickened, thinning on median plane (figure 7); cusp of tectopedia I very long, extending well beyond insertion of rostral bristles and laterad of the bristles as a conspicuous cusp; cusp of ventral plate (genae) extending anteriorly as far as tectopedial cusp; lamellar bristles very stout, strongly barbed; average length of females 0.37 mm., breadth 0.2 mm.

Cotypes.—One hundred eighteen specimens from spruce litter; taken July 19th, slide 37F1-2Ha-24.

Pelops simplex franconia, subsp. nov.

Differs from the species (7, p. 51, which is Koch's *P. acromios*) in that bristles 1 and 2 of marginal series are much shorter (half) and more slender than the other notogastral bristles (marginal bristles 3 are intermediate); cusps of tectopedia I gradually tapering (in the species the lateral face is bowed out, bluntly angled), lateral face, if anything, slightly concave.

Cotypes.—Ten specimens from spruce litter, Gale River Exp. Forest (that is, a few miles north of the Franconia Notch); taken September 22nd, slide 37F4L51.

The specific characters are: pseudostigmatic organ head slender, pointed, somewhat apiculate; undulations of anterior edge of notogastral bridge

weak; notogastral bristles well spaced, long (i:1 and i:2 inserted at corners of a square, not quite as long as sides of square), pencil-shaped, ridged, burred.

Microtydeus albus, sp. nov.

Figures 16 and 17

Without pigment, eyeless; smooth; pseudostigmatic organs stout, rodlike, bent backward near middle, as long as cephaloprothorax; interpseudostigmatic bristles distinct, one-fourth length of organ, inserted posteromesad of organs; propseudostigmatic bristles minute, inserted anterolaterad of organs; lateral bristles and shoulder bristles as long as posterior bristles; posterior end of abdomen furrowed by two transverse folds; posterior edge of middle fold (penultimate segment) bearing two pairs of bristles; ultimate segment bearing three pairs of bristles (one pair being paranal), these ten bristles are fine, tapering, at least one-third length of pseudostigmatic organs; bristles of dorsum of abdomen minute; proximal cusp of mandibles as long as height of distal end of mandibles, distal cusp one-third as long; distal segment of palps slender, three times as long as broad; total length of ovigerous female (including mandibles) 0.15 mm., breadth 0.058 mm., length of abdomen 0.09 mm.

Cotypes.—Eight specimens from litter and humus; taken July 14th, slide 37F1F-74.

The single oval egg occupies nearly the entire abdomen.

Most closely related to *M. subtilis* of European authors. It is beyond the bounds of credence that Koch saw and described a species of this genus.

Cyta novangliae, sp. nov.

Differs from *C. latirostris* (see 14, p. 17, figs. 23, 24) in having much longer anterior and pseudostigmatic bristles, inserted in equally large cups; no subcutaneous sclerotized ridge between median eye and anterior bristles, or anywhere else; only the anterolateral eye is dark; there is no dark color pattern in mounted specimens; size: total length of body (including mandibles) 0.67 mm., to base of mandibles 0.52 mm., breadth 0.27 mm.

Cotypes.—Two specimens from spruce litter; taken July 19th, slide 37F1F-80.

Ammonia americana 3, p. 171, fig. 5, from Washington, D. C., differs in arrangement of cephaloprothoracic bristles. *Cyta brevipalpa* 8, p. 73, pl. 3, fig. 13, is not a *Cyta*.

Sericothrombium ammonoosuci, sp. nov.

Figures 18 to 21

Total length 3 mm.; tarsi I slightly larger than tibiae I, three times as long as broad (0.56 mm. long, 0.19 mm. broad); some body bristles stout, clavate, and some slender, rodlike.

Cotypes.—Four specimens mounted in balsam (38F1-XY2a and -XY2b) and four in gum arabic (38F1-XY1) taken May 18th from moss and fallen twigs over which they were meandering at Gale River Exp. Forest, Pierce Bridge (over the Ammonoosuc). They were quite common here and there in the old spruce-yellow birch woodlands.

In dimensions of tarsus I, this species agrees with *S. scharlatinum* Berl. of Europe but the bristles are quite distinct.

Differs from its closest described ally of the eastern United States,—*T. marinus* 1, p. 73, in being larger; in the longer eyestalks; in the longer legs IV (entire tarsus surpassing abdomen); in the short "second" joint of palpus.

T. gemmosum 2, p. 595, another *Sericothrombium* is recorded from the White Mountains of New Mexico.

This is the vermilion spring-time gem of the emerald mosses of the Ammonoosuc country.

Schwiebea humicola, sp. nov.

Figures 14 and 15

Rostral area broad, truncate to slightly concave; rostral bristles short, about equal to dorsal length of tibiae, inserted very close to anterior edge and very close together, insertions enclosed by a crescentic ridge or depression; cephalic plate twice as broad as long, anterior edge emarginate, posterior edge truncate; minute bristle anterior to gland opening situated twice as far from opening as length of tibiae; another minute bristle slightly laterad to gland; total length of largest female 0.459 mm.

Cotypes.—Two ovigerous females from bottom of humus (H-) layer; taken July 19th, slide 37F1-3Hb-1.

Dr. Oudemans has very kindly sent me his set of very fine figures of *Schwiebea talpa*. The female closely resembles in dorsal aspect *S. cavernicola* 16, p. 697, figs. 6, 7; the cephalic plate extends further posteriad than the bristles and further anterior than the rostrals which are intermediate in position between *S. cavernicola* and *S. ipidis* 15, p. 151, figs. 50-55. These three European species appear to me to be subspecies of the one species. The chief differences lie in tarsi I. In the genotype the sense club is very stout, with barely swollen distal end. There are two rudimentary bristles at side of sense club. The long dorsal bristle originates at side of the spur. The ventral spur is quite short and there is but one distal bristle (each side) inserted near the lateral spines.

Thus the American species differs in the arrangement of notogastral bristles, breadth of rostrum, size of cephalic plate, and details of tarsi I. It resembles *Rhizoglyphus elongatus* (which is a *Schwiebea*) 5, p. 22, pl. 6, figs. 53, 54, in lateral aspect but all bristles are shorter, especially the rostrals.

Brachychthonius approximatus, sp. nov.

- FIG. 1. Dorsal aspect and anal area.
 FIG. 2. Pseudostigmatic organ.

Heminothrus longisetosus interlamellaris, subsp. nov.

- FIG. 3. Vertex with interlamellar bristles, a pseudostigmatic organ, and lamellar apophyses.
 FIG. 4. Distal half of a pseudostigmatic organ.

Autogneta longilamellata flumengalei, subsp. nov.

- FIG. 5. Cephaloprothorax, dorsal aspect.
 FIG. 6. Pseudostigmatic organ.

Ceratozetes gracilis cuspidatus, subsp. nov.

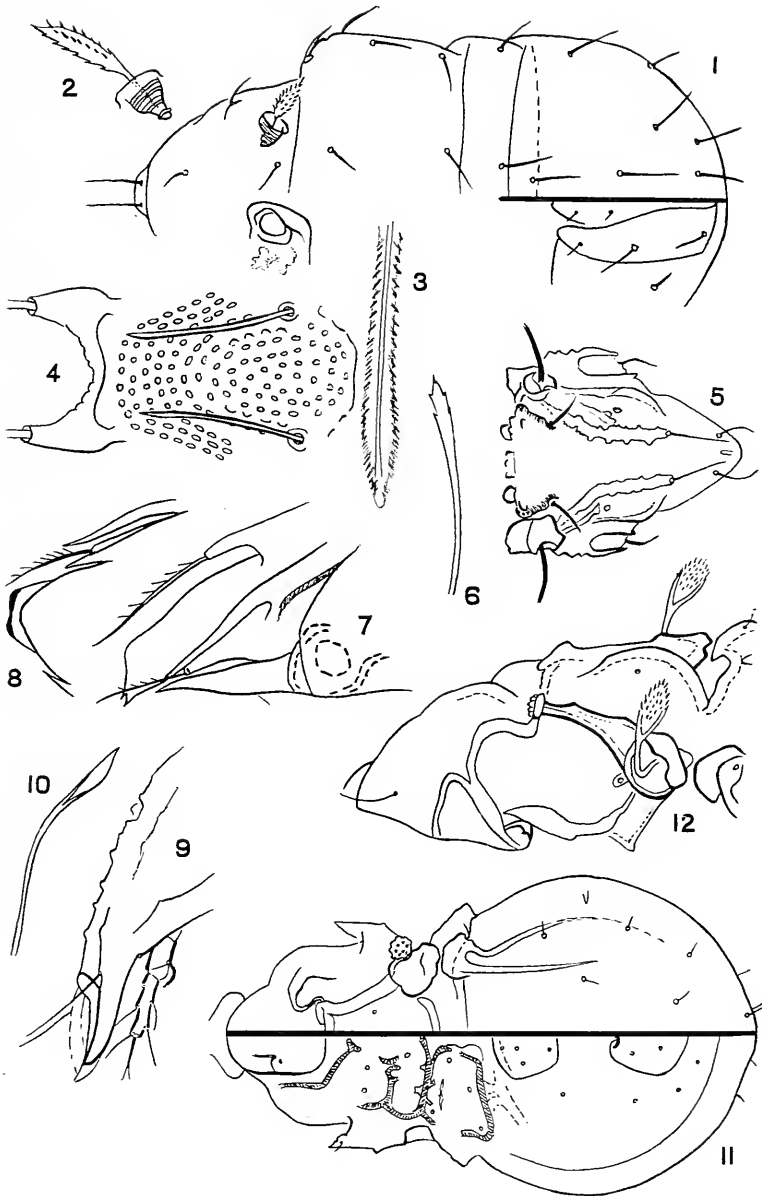
- FIG. 7. Lateral aspect of anterior half of cephaloprothorax.
 FIG. 8. Periphery of same, ventral aspect.

Suctobelbella longicuspis lanceolata, subsp. nov.

- FIG. 9. Lateral aspect of rostrum and palp.
 FIG. 10. Pseudostigmatic organ.

Quadroppia skookumchucki, sp. nov.

- FIG. 11. Dorso/ventral aspects, legs and mouth parts omitted.
 FIG. 12. Cephaloprothorax, lateral aspect, somewhat dorsal.



Metabelba craigheadi, sp. nov.

FIG. 13. Leg IV, lateral aspect.

Schwiebea humicola, sp. nov.

FIG. 14. Dorsal aspect, legs and mouth parts omitted.

FIG. 15. Leg I, lateral aspect.

Microtydeus albus, sp. nov.

FIG. 16. Lateral aspect, legs II to IV omitted.

FIG. 17. Dorsal aspect, and genital area, legs omitted.

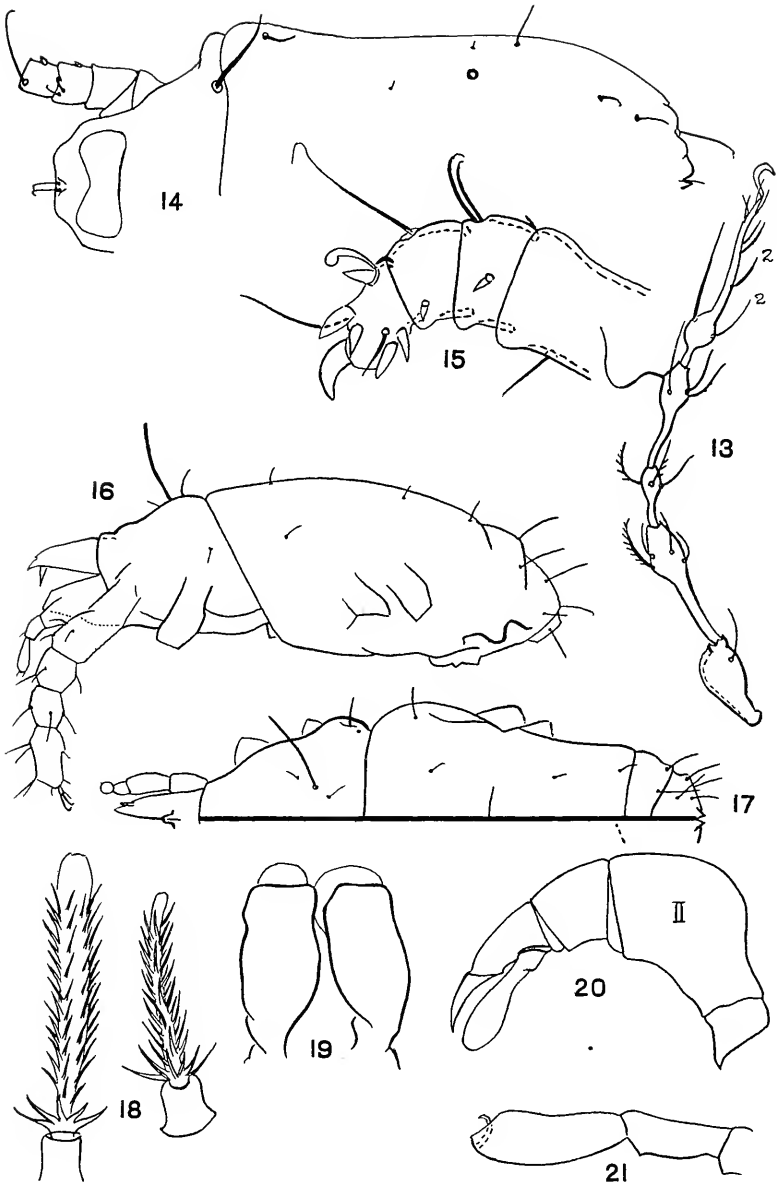
Sericothrombium ammonoosuci, sp. nov.

FIG. 18. Two types of dorsal bristles.

FIG. 19. Palp segments II (and III), dorsal aspect.

FIG. 20. Palp, lateral aspect, bristles omitted.

FIG. 21. Tarsus and tibia I, lateral aspect, depilated.



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Further details of the above are to be found in my, "Annotated Bibliography of the Moss-Mites (Oribatoidea-Acarina)."

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Occasional Papers
OF THE
Boston Society of Natural History.

HAIDEOTRITON WALLACEI, A NEW SUBTERRANEAN
SALAMANDER FROM GEORGIA.

BY A. F. CARR, JR.

THE remarkable salamander described below was recently received by my friend, Dr. Howard K. Wallace, arachnologist of the Department of Biology, University of Florida. Brought up by an air-lift pump from a 200-foot well at Albany, Dougherty County, Georgia, the creature was secured and sent to Gainesville by Mr. Hummel, County Sanitary Engineer. By good fortune the specimen is a sexually mature female with eggs in the body cavity.

At first glance the salamander seemed to me superficially similar to *Necturus*, but a circumspect dissection and a series of X-ray photographs show that lungs are absent and that there is no anterior projection of the pubis. As Dunn (1926)¹ has pointed out in his discussion of the affinities of *Typhlomolge rathbuni*, the comparison of a neotenic form with transformed individuals affords little or no evidence of relationship. Moreover, there can be no sound basis for the postulated definitive form necessary for such a comparison.

¹Dunn, E. R. 1926. The salamanders of the family Plethodontidae. Smith College, Northampton, Mass., p. 255-257.

Using Dunn's points of comparison and reasoning, I readily reach the same conclusion that he did with *Typhlomolge*—that here, again, is a modified plethodontid larva, perhaps of the *Eurycea* group, not far removed from *Eurycea*, *Pseudotriton*, and *Typhlomolge*, but generically different from any form known. The extreme simplicity of the skull and atlas of the present form would seem to indicate a more degenerate animal, and thus, a more confirmedly subterranean (and possibly a more ancient) form than *Typhlomolge*. The more complete degeneracy of the eyes may further support this view. The astonishingly elongate and spatulate head is, as far as I know, unique among amphibians.

I am indebted to Dr. Thomas Barbour, Museum of Comparative Zoölogy, for valuable suggestions and advice; to Dr. Theodore E. White of the same institution for information concerning amphibian osteology; to Dr. Doris Cochran, United States National Museum, for the loan of specimens of *Typhlomolge* and *Typhlotriton*; to Professor J. Speed Rogers, Department of Biology, University of Florida, for photographs of the living animal; to my brother, Mr. T. D. Carr, for the difficult X-ray pictures; and especially to Dr. Wallace for the privilege of announcing this extraordinary discovery.

*Haideotriton*², gen. nov.

Diagnosis.—Skull simple, larval, mostly unossified; premaxilla single; nasal spines not fused, fontanelle present; maxillae lacking; quadrates extremely long and slender, more than half the length of the mandibles, and with the mandibles, forming a smooth, elongate oval; condyles sessile; atlas elongate, only slightly broadened anteriorly, odontoid process very small; caudal vertebrae with neural and haemal spines; carpus and tarsus unossified; head spatulate, not suddenly constricted or compressed; tongue

²*Haides* = the lower regions, *triton* = salamander.

free in front; toes 4-5, free; no palmar tubercles; tail not constricted at base; neotenic, almost entirely unpigmented, and without eyes or eye-spots.

Haideotriton wallacei, sp. nov.

Type.—Museum of Comparative Zoölogy 19875; gravid female, from a 200-foot artesian well at Albany, Dougherty County, Georgia, May 19, 1939.

Diagnosis.—A small, blind, white, perennibranch salamander with long legs (adpressed palms overlapping); gill rami very long, the adpressed third (the longest) ramus extending to the third costal groove; tail fin not pointed posteriorly.

Description.—Costal grooves 11; vomerine and parasphenoid teeth in continuous series; maxillae and mandibles toothed; mouth very small, almost entirely terminal; mandible and side of head with numerous papillate glands or lateral line organs; snout only slightly narrower than posterior part of head; gular fold strong, extending to dorsal surface; vent without papillae; tail moderately compressed, finned above and below, the fin rounded distally.

Dimensions in millimeters: total length 75.5, length of head 12.5, snout to posterior edge of vent 42.0, posterior edge of vent to tip of tail 33.5, greatest width of head 8.0, greatest width of snout 6.5, axilla to groin 19.5, fore limb 10.5, hind limb 11.5.

Coloration: In life, body pale, pinkish white, vaguely opalescent; viscera and eggs plainly evident through body wall; limbs transparent, the larger blood vessels readily discernible; tail and fin very faintly suffused with yellow; gills blood red. After preservation, dull white, with widely scattered clusters of dark pigment cells.

Remarks.—Fortunately I was able to keep the type alive for a week before a fall from the X-ray table killed it. During this period it showed no signs of suffering from the effects of its strenuous change of environment. Much of the time it remained motionless on the bottom of the aquarium in a most unusual position, the anterior portion of the body being elevated at a sharp angle by the long and completely straightened fore limbs. In normal locomotion the limbs were used, their effect being

augmented by deliberate, undulating, fishlike movements of the body and tail. When stimulated by sudden vibration—a tap on the aquarium, a footfall, or even a loud voice in the room—it dashed wildly about the aquarium with its legs trailing back against its sides. During such outbursts of activity the creature's movements were almost too rapid to be followed with the eye, and on one occasion it jumped completely out of the aquarium. When taken out of the water and placed on a wet board it appeared entirely helpless and incapable of controlled locomotion. It could not be induced to take food. Although bits of hamburger, mashed amphipods, and tubificid worms, when dropped into the aquarium, were usually investigated and muzzled about in the sand, they were not swallowed.



Haideotriton wallacei, type. Enlarged.



X-ray photographs of the skeletons of *Typhlomolge rathbuni* (left) and *Haideotriton wallacei* (right). Enlarged. Note the peculiar ossifications in the otic region of *Haideotriton*.

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NOTES ON *ELAPHE* AND A NEW SPECIES

BY T. BARBOUR AND A. F. CARR, JR.

It would be hard to find a group of snakes for which our current system of nomenclature works with more unsatisfactory results than the members of the genus *Elaphe*. The forms currently called *obsoleta*, *confinis*, *quadrivittata*, *deckerti*, *guttata*, *rosacea*, and the new form *williamsi*, which we describe in this paper, are all so similar when young that their close relationship is obvious.

Similar in habits and extraordinarily uniform in details of squamation, the fixity and at once diversity of the patterns of coloration in adult specimens are really remarkable. This shows especially vividly in living individuals. A group of adults from a given locality is extraordinarily uniform, but live individuals from different but not at all distant regions are frequently recognizable as distinct, if only slightly so.

In most cases it is unsatisfactory to say that *this* form is a subspecies of *that* form, for the relationship is, in many instances, not that of a linear series of related types but is rather what one might represent by a stellate pattern with some hypothetical ancestor at the center of a star and the descendant races at the end of each ray. This is a feeble

attempt, to be sure, at trying to express what we mean. The new form *Elaphe williamsi* is obviously related, on the one hand, to *confinis* and, on the other hand, to *quadrivittata*. Although it is in a sense intermediate between the two, it cannot be shown to intergrade with either, any more than *deckerti* intergrades with *quadrivittata* and *rosacea*, although it is distributed over an area between the ranges of the other two forms.

Elaphe guttata would seem, at first sight, to be very distinct, occurring, as it does, through the ranges of several other forms. Nevertheless one suspects that this may be due to recent extension of range, because the young again emphasize the similarity to all the other forms of the group.

Elaphe q. deckerti appears to be the least stable of any of the forms, and is only feebly differentiated from *quadrivittata* in south-central Florida, roughly at about the latitude of the north shore of Lake Okeechobee.

Taking all these matters into consideration in the light of our present knowledge, it seems wisest to use binominals for all these forms, no matter how closely related they may be, where intergradation has not certainly been shown to occur.

From what we know from field observations and from study of the preserved material at hand, it is evident that the range of *E. obsoleta* is much greater than that of *E. confinis*, the former, the pilot black snake, extending much further northward. In the areas where *confinis* may not be expected to occur, the pilot snakes seem to be all black, with occasionally some scattered whitish markings. Conversely, there is a small area in the panhandle of West

Florida where only *confinis* occurs and these are apparently all alike and with a typical grayish-brown spotted coloration. Elsewhere, scattered far and wide throughout the enormous range occupied in common by the two species, individuals occur which cannot satisfactorily be named one way or the other. We suspect that the two forms arose in regions well separated one from the other and then spread to occupy a large area in common.

The situation is somewhat parallel to that found in the eastern black and brown pine snakes. Here all the northerly pine snakes are pied black and all the Florida peninsula pine snakes are brown. The few we have seen from Georgia, and they are very few, were brown. Both brown and black forms occur in South Carolina, but so far neither of us has ever seen an individual which could not be definitely put into one category or the other. Whether this is owing to the fact that in Georgia and South Carolina, pine snakes occur in very widely scattered colonies, each of which may represent a "pure culture" so to speak, or whether there is sufficient physiological differentiation here to inhibit hybridization is obviously an open question. We believe, on the contrary, that, in the case of the pilot black snake and the brown rat snake, hybridization, and the results of miscegenation, extending back a very long time, may be presumed to account for these abundant intermediate types. Although the corn snake, *Elaphe guttata*, occurs in the range of a number of other *Elaphes*, and *E. rosacea* would not appear to be distantly related, every corn snake is immediately identifiable as such and no evidence of hybridization with another *Elaphe* is to be observed. The case of *quadrivittata* is interesting inasmuch as here the southern specimens form a well-defined geographical race. The individuals in Central Florida may end up by differentiating into another race worthy of a name, for in some respects they do not seem to constitute graded intermediates between

deckerti, with its restricted range, and the widespread *quadrivittata* of the southeastern states.

As we have said, the close interrelationship of all these forms is indicated by the fact that young specimens of the different races are almost impossible to tell apart. We believe it fair to state that the form in which the juvenile coloration persists is the most primitive form—we believe this to be *confinis*. Conversely the form in which the adult coloration is most different from the juvenile is the most advanced form. This quite certainly is *quadrivittata*. It is interesting to note that this is the species which seems to be most actively in process of differentiation and the only one in which at present trinominals seem to us necessary to indicate actual intergrading relationship (with *deckerti*, and as we have said elsewhere, with the possibility that another race intermediate between these two may have a sufficiently well defined range to warrant another name).

The new snake seems to be restricted to the great Gulf Hammock, a well defined area of forest roughly fifteen by one hundred miles in area, situated in the counties from Levy to Pasco, which border the Gulf of Mexico in northwestern peninsular Florida. This form apparently replaces *E. q. quadrivittata* in the area. *E. confinis* has not yet been found in any adjoining region but it may occur. This new species is fully as distinct as any of its closely related congeners. It is a pleasure to associate with it the name of Mr. Harold Williams, of Dunellon, Florida, who collected the type series.

Elaphe williamsi, sp. nov.

Type.—Museum of Comparative Zoölogy no. 45,705, adult male from near Lebanon, Levy County, Florida. *Paratypes*: Mus. Comp. Zoöl. no. 45,706-7, same locality.

Diagnosis.—Apparently related to both *E. confinis* and *E. q. quadrivittata*, in squamation agreeing more closely with the latter (ventrals: *quadrivittata* 225-242, av. 235, *williamsi* 230-240, av. 235, *confinis* 234-250, av. 238, subcaudals: *quadrivittata* 85-100, av. 91, *williamsi* 86-93, av. 89, *confinis* 70-89, av. 81). Distinct in coloration and pattern: ground color white or gray (instead of tan as in *quadrivittata*), with black or very dark brown markings constituting a series of dorsal and lateral blotches (as in *confinis*) connected by four longitudinal stripes (as in *quadrivittata*).

Description.—Rostral twice as broad as its depth at notch, just visible from above; nostril between two nasals. Internasals broader than long, two-thirds the length of the prefrontals; frontal 1.1-1.4 times as long as broad, as long as, or longer than its distance from the rostral, much shorter than the parietals, 1.6-2.0 times as broad as a supraocular; loreal about twice as long as deep; preocular 1; diameter of eye contained 1.1-1.2 times in combined lengths of supralabials bordering it; postoculars 2; temporals 1-2 or 2-3; upper labials 8, the fourth and fifth entering the orbit; length of anterior sublinguals equal to or slightly greater than that of the posterior; midbody scales in 27 rows, the first 4-9 rows smooth, the others more or less keeled; ventrals 230-240; anal divided; subcaudals 86-90.

Coloration.—Ground color above whitish or light gray, the central portions, at least, of nearly all the scales gray; four dark brown or black longitudinal stripes evident along most of length and at mid-body covering scale rows 3, 4, and 5, and 10, 11, and 12; a dorsal series of about 29 dark saddles formed by a broadening and confluence of the dorso-lateral stripes usually more or less evident and about 29 in number on the body; lateral stripe usually irregularly broadened at points alternating with the dorsal saddles; tail lacking the lateral stripes, and with the dorsal blotches very indistinct or lacking; ventral surface white anteriorly with a few diffuse and irregularly spaced and shaped dark blotches; these blotches are most evident and most regularly arranged in Mus. Comp. Zoöl. 45,707, a young adult female, in which the belly is marked by a series of faint but definitely squarish mid-ventral blotches; this series of markings alternates with a series of ventro-lateral dark markings formed by the darkened ends of 2, 3, or 4 (usually 3) of the intervening ventrals; lower surface of tail and posterior part of body generally dark and irregularly mottled.

Measurements.—Total length of male (type) 1400 mm., of largest female, 1330 mm.

Range.—Known only from the Gulf Hammock section of Levy County, Florida. The type series is from Lebanon in the south-central section of the county. In addition to these preserved specimens the junior author has seen two live individuals in the collection of Mr. Harold Williams from the mouth of the Withlacoochee River and a badly mashed specimen on the highway about twelve miles north of Lebanon.

Remarks.—In using a binominal for the present form we do not necessarily imply for it complete disjunction in either range or characters but rather our inability, at present, to demonstrate actual genetic intercourse between it and its obviously close relatives, *confinis* and *quadrivittata*. The restricted range which it occupies lies only slightly to the south of the area in which true *confinis* is known to occur, and is embraced entirely within the range of *quadrivittata*. Within this region the new form is apparently the only representative of the *confinis-quadrivittata* complex. These facts indicate the possibility that examination of additional material from various localities in the Gulf Hammock territory may demonstrate complete intergradation between *williamsi* and one or the other of the related forms. Moreover, it is not impossible that the Gulf Hammock form may constitute a graduated link between the nominally distinct *confinis* and *quadrivittata*, making necessary nomenclatural change for several forms. In a much more extensive study of North American *Elaphes* we hope to determine more conclusively relationships among the members of this difficult group of snakes.

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NOTES ON A COLLECTION OF BIRDS FROM
NORTHERN CELEBES

By S. DILLON RIPLEY

IN the fall of 1939, Mr. J. J. Menden visited the northern part of the island of Celebes with the intention of collecting birds. Unfortunately his visit was cut short by the war before he was able to work in the mountains. Thus the resulting collection, amounting to 264 skins of 87 species, is much smaller than at first intended. In 1940 these birds were secured by the Museum of Comparative Zoölogy. With the kind permission of Dr. Thomas Barbour, Director of the Museum, and Mr. J. L. Peters, Curator of Birds, I have been able to study this collection. My thanks are due to them and also to Mr. J. C. Greenway, Jr., Associate Curator of Birds, for their help, as well as to the authorities of the United States National Museum and the American Museum of Natural History for the loan of comparative material.

Mr. Menden spent the months of September, October, November, and part of December in the field. From September 11 to December 12 he was at Boemboelan, a village on the south shore of the northern (Manado) peninsula of Celebes (Lat. $0^{\circ} 22' N.$, Long. $122^{\circ} 4' E.$). From September 3 to 6 he had collected on Oena Oena, one of the Togian Islands in the Gulf of Tomini, about forty-four miles southwest of Boemboelan.

Oena Oena (Una Una on the English maps) is a nearly circular coral island about six and one-half miles in diameter, with a volcanic core less than three hundred meters high. The only previous collection from the Togian Islands was made by Dr. A. B. Meyer on Togian Island proper in 1871. Walden (1872, 1874) described three new forms from this collection, *Loriculus quadricolor*, *Criniger aureus*, and *Ducula pulchella*. Later Sharpe (1893) described *Halcyon meyeri*, a species based in part on the abnormal character of an upturned bill. This form has since been united with *H. c. chloris*. Meyer, in his "Field-notes on the Birds of Celebes" (1879, p. 144), records 58 species as occurring on the Togian Islands, to which this collection adds two new records, *Falco mohuccensis occidentalis* and *Streptopelia chinensis tigrina*, raising to 60 the total number of forms known from the Islands. As well as this, specimens of *Macropygia albicapilla*, recorded by Meyer as occurring on the Islands, prove to belong to an undescribed race.

In the following notes on the birds collected by J. J. Menden, all measurements are given in millimeters, the wing pressed flat against the ruler, the bill measured along the entire length of the exposed culmen.

COLYMBIDAE

1. *Poliiocephalus ruficollis tricolor* (G. R. Gray)

2 ♂ ad., Boemboelan, Sept. 30.
Wing, 104, 108. Iris, red brown.

PHALACROCORACIDAE

2. *Haliëtor m. melanoleucos* (Vieillot)

2 ♂ ad., Boemboelan, Sept. 19, Oct. 1.
Wing, 232, 237. Iris, grayish; ocular area, gray.

Haliëtor melanoleucos melvillensis Mathews (1912, p. 74) from Melville Island, based on the character of "a thicker, heavier bill," seems inapplicable.

ANHINGIDAE

3. *Anhinga melanogaster* Pennant

♂, 2 ♀, Boemboelan, Oct. 12, Nov. 2, 5.
Wing, ♂ 336; ♀ 344 (molt).

ARDEIDAE

4. *Butorides striatus javanicus* (Horsfield)

♂ im., ♀ juv., Boemboelan, Oct. 2, 4.
Wing, ♂ 169.

CICONIIDAE

5. *Dissoura episcopus neglecta* Finsch

2 ♀, Boemboelan, Oct. 24, 31.
Wing, 464, 466.

ANATIDAE

6. *Anas g. gibberifrons* S. Müller

2 ♂, 2 ♀, Boemboelan, Sept. 15, 27, 30.
Wing, ♂ 185, 189; ♀ 180 (worn), 182.

ACCIPITRIDAE

7. *Elanus caeruleus hypoleucus* Gould

2 ♂, 2 ♀, Boemboelan, Sept. 19, 22, 28.
Wing, ♂ 287, 307; ♀ 295, 302.5. Iris, red; feet, yellow.

8. *Pernis c. celebensis* Walden

♀ ad., Boemboelan, Oct. 26.
Wing, 379. Iris, yellow; ocular area, yellow.

9. *Accipiter trinotatus* Bonaparte

♀ ad., ♀ im., Boemboelan, Sept. 15, Oct. 15.
Wing, ad. 172.5; im. 167. Iris, yellow; ocular area, golden yellow;
bill, black; feet, golden yellow.

10. *Accipiter soloënsis* (Horsfield)

♂ ad., ♀ ad., ad.—, ♂ im., ♀ im., Boemboelan, Oct. 14, 21, 23,
Nov. 11.
Wing, ad. ♂ 188; ♀ 197; im. ♂ 198; ♀ 187.

11. *Accipiter griseiceps* (Schlegel)

♂ ad., Boemboelan, Oct. 26.
Wing, 173. Iris, yellow; bill, black; feet, yellow.

12. *Accipiter r. rhodogaster* (Schlegel)

♀ im., Boemboelan, Nov. 9.
Wing, 199.5. Iris, yellow.

It seems questionable to include this form in the species *virgatus*, on account of the striking difference in the immature plumages. In *rhodogaster*, as Meyer and Wiglesworth point out (*Birds of Celebes*, vol. 1, p. 32, 1898), the plumage on the upper surface is hazel-rufous, spotted with black, while in *virgatus* and its races the upper surface

is grayish dark brown. The wings and tail in the immature *rhodogaster* are also much more heavily barred in proportion than in *virgatus*. The same condition of plumage applies also to the race, *rhodogaster sulaensis*.

13. *Spizaetus nipalensis lanceolatus* Temminck & Schlegel

♀ ad., ♂ im., ♂ juv., Boemboelan, Sept. 21, 22, Oct. 31.

Wing, ♀ 395; ♂ im. 389; juv. 349. Iris, brown; bill, black; feet, yellow.

The similarity in both adult and immature plumages between this bird and *Pernis celebensis*, as pointed out by Meyer and Wiglesworth (1898, vol. 1, pls. 2 and 3), is remarkable.

14. *Ichthyophaga n. nana* (Blyth)

♀ ad., Boemboelan, Oct. 15.

Wing, 415.

Ichthyophaga i. ichthyaetus (Horsfield), listed by Peters (1931, p. 259) as occurring in Celebes, is a much larger bird which when adult has the basal part of the tail white. Celebes as a locality for this species (listed by Sharpe 1874) is certainly open to question. Boemboelan is a northward extension of range for *nana*, according to Stresemann (1936, p. 363).

15. *Circus assimilis quirundus* Mathews

2 ♂ ad., ♀ im., Boemboelan, Sept. 27, Oct. 21, 31.

Wing, ♂ 376, 394; ♀ im. 432.

16. *Spilornis r. rufpectus* Gould

2 ♂ ad., 2 ♀ ad., ♀ im., Boemboelan, Sept. 13, 15, 30, Oct. 11, 26.

Wing, ♂ 307, 320; ♀ 342, 348; ♀ im. 345.

17. *Pandion haliaëtus cristatus* (Vieillot)

♂ ad., Boemboelan, Oct. 2.

Wing, 412.

FALCONIDAE

18. *Falco moluccensis occidentalis* (Meyer & Wiglesworth)

♂ ad., 3 ♀ ad., Togian Islands (Oena Oena), Boemboelan, Sept. 5, 29, 30, Oct. 11.

Wing, ♂ 222; ♀ 236, 240, 241.5. Iris, brown; ocular area, yellow green; bill, grayish white; feet, clear yellow.

This species has not been previously recorded from the Togian Islands.

MEGAPODIIDAE

19. *Megapodius nicobariensis gilbertii* G. R. Gray

2 ♂ ad., Boemboelan, Nov. 7, 8.

Wing, 205, 211. Iris, brown; ocular area, red; bill, brown; feet, brown.

20. *Macrocephalon maleo* S. Müller

2 ♂ ad., 2 ♀ ad., juv.—, Boemboelan, Sept. 18, 28, 30, Oct. 5.

Wing, ♂ 295, 298; ♀ 297, 301. Iris, brown; bill, green, gray green; ocular area, yellow; feet, blue gray.

In the skin, the pink suffusion on the white feathers of the breast, abdomen, and under tail coverts in both sexes fades with time.

Meyer and Wigglesworth in their description of the plumage of the chick (1898, vol. 2, p. 679) neglect to point out that there is a band of darker color across the upper breast paralleling the dark band in the adult plumage. In the chick the color of this band is dark tawny brown or bistre, the same color as the back. Soft parts of the chick are as follows (from label): iris, brown; ocular area, flesh color; bill, brown; feet, flesh color.

PHASIANIDAE

21. *Gallus g. gallus* (Linné)

2 ♂, 2 ♀, Boemboelan, Sept. 22, Oct. 6.

Wing, ♂ 221, 234; ♀ 202, 208.

TURNICIDAE

22. *Turnix suscitator rufilata* Wallace

♀, Boemboelan, Nov. 3.

Wing, 89. Iris, gray; bill, yellow gray; feet, gray green.

RALLIDAE

23. *Rallus philippensis chandleri* (Mathews)

♂ ad., ♀ ad., Boemboelan, Sept. 23, Dec. 12.

Wing, ♂ 140.5; ♀ 129. Iris, red brown; bill and feet, gray.

24. *Rallus torquatus celebensis* Quoy & Gaimard

2 ♂ ad., 2 ♀ ad., Boemboelan, Sept. 18, 20, 21, 28.

Wing, ♂ 150, 164.5; ♀ 151, 153. Iris, red.

One of the females has the throat region virtually entirely black; the other specimens have white edging on the throat feathers.

Stresemann has named a race *remigialis* (1936, p. 368) from south Celebes on the basis of larger size, wing ♂ 167 as against 149-158 for north Celebes, and different wing pattern. The Boemboelan male (wing 164.5) is uncomfortably close in size to *remigialis*, but the M.C.Z. collection lacks any specimens for comparison.

25. *Rallina eurizonoides minahasa* Wallace

2 ♀ ad., Boemboelan, Sept. 15, Oct. 2.

Wing, 142, 147. Iris, reddish brown.

The smaller of the two specimens differs from the other specimen as follows: the inner wing coverts are blackish instead of dark olive

bistre (vide Meyer and Wigglesworth, 1898, vol. 2, p. 700), and they are irregularly barred with white. Traces of this barring occur on two of the outermost scapulars also.

26. *Amaurornis isabellina* (Schlegel)

♂ ad., 2 ♀ ad., Boemboelan, Sept. 15, 25, Oct. 30.
Wing, ♂ 154; ♀ 157, 167. Iris, brown; bill, clear green.

27. *Amaurornis phoenicurus variabilis* Stresemann

2 ♂ ad., 2 ♀ ad., Boemboelan, Sept. 20, 21, 23, 25.
Wing, ♂ 143, 155; ♀ 141, 148.

Stresemann (1936, p. 369) distinguishes this race from *javanica* on the basis of the reduction of the white frontal field ("reduced in size or quite absent") and the difference in wing formula. Two of the Javan specimens in the M.C.Z. (nos. 218833, 218834) show a reduction in the frontal field comparable to that in two of the Celebes birds (4 and 4 mm. as against 4 and 3.5 mm.). Two birds from Sumatra and the Mentawi Islands also have equally reduced white frontal fields. Three other Javan specimens also have the wing formula $8 < 1 < 7$ listed by Stresemann for the Celebes form. Lacking specimens of *leucomelana*, I have been unable to compare them, but *variabilis* seems to be at best a very thin race.

CHARADRIIDAE

28. *Pluvialis dominica fulva* (Gmelin)

♂, ♀, Togian Islands (Oena Oena), Sept. 5.
Wing, ♂ 165 (worn); ♀ 160.

COLUMBIDAE

29. *Treron pompadora griseicauda* Wallace

♂ ad., ♀ ad., Boemboelan, Sept. 29.
Wing, ♂ 146.5; ♀ 143. Iris, brown; ocular area, yellow; bill, yellowish green; feet, red.

30. *Treron vernans zalepta* (Oberholser)

2 ♂ ad., ♀ ad., ♀ im., Boemboelan, Sept. 12, Oct. 11, 23.
Wing, ♂ 142.5, 147; ♀ 141; ♀ im. 142.

31. *Leucotreron subgularis epia* Oberholser

♂, 3 ♀, Boemboelan, Sept. 29, Oct. 21, 22.
Wing, ♂ 177, ♀ 165, 166, 167; tail, ♂ 141; bill, ♂ 18. Iris, brown; bill, yellow; feet, red.

Comparison of these birds with a male from Gimpoe in south-central Celebes showed certain differences which were confirmed when

compared with the material in the American Museum of Natural History and the United States National Museum. Oberholser (1918) proposed the name *epia* for *Columba gularis* Quoy and Gaimard, which was preoccupied. The type locality of *gularis* was Manado. Thus the birds from the northern peninsula which includes Manado must be called *epia*, and the south-central bird lacks a name:

Leucotreron subgularis restrictus, subsp. nov.

Type. — No. 166923, Museum of Comparative Zoölogy, ♂ ad., Gimpoë, south-central Celebes, collected 22 August, 1917, by H. C. Raven.

Characters. — Similar to *L. s. epia* from north Celebes from which it differs as follows: throat and breast more gray, less suffused with creamy; gular patch darker, more blackish; abdominal patch more richly colored, extending directly down to the rufous-chestnut under tail coverts in contrast to *epia* in which a band of gray separates the two; crown and nape uniformly whitish-gray merging directly into the green of the shoulders. In *epia* the whitish-gray of the crown becomes yellowish-gray on the nape before merging into the green of the shoulder area. Size about the same. The tail of *restrictus* seems to be slightly shorter in proportion to the wing, giving a smaller wing-tail index. The bill is slightly longer, Gimpoë ♂ 19-19.5, Boemboelan, Minehassa, Pinedapa ♂ 17.5-18.5.

Measurements of type. — Wing, 175; tail, 132; wing-tail index, 75%; bill, 19.

Another male from Gimpoë (U.S.N.M. no. 251697) measures: wing, 176.5; tail, 137.5; wing-tail index, 77%; bill, 19.5.

Discussion. — A male from Tawaya, north of Palu Bay, collected by Doherty (A.M.N.H. no. 548844) represents a somewhat intermediate condition. The breast is rather free from the creamy suffusion of the northern birds, but the nape color is not like the Gimpoë birds. On the whole it should be placed with *epia*.

A male from Pinedapa, near the southwestern shore of the Gulf of Tomini, collected by Raven (U.S.N.M.) shows clearly the creamy yellow wash on the nape and breast characteristic of *epia*.

On the basis of these specimens the range of *restrictus* should be defined as south-central Celebes, south of Palu Bay and an undetermined distance south of the Gulf of Tomini.

The occurrence of this pigeon in south-central Celebes is interesting from a zoogeographical point of view. In plumage this bird represents one extreme of the species *subgularis*, the opposite extreme of which is found on the Sula Islands with intermediates on Peling and Banggai and in north Celebes. Comparing some of the characters of the races of this species shows the following features:

	gular patch	throat and breast	abdominal spot	nape
<i>mangoliensis</i> Sula Islands	pale	suffused with creamy yellow	lacking	yellowish green
<i>subgularis</i> Peling, Banggai	dark	suffused with yellowish cream	present, very small	greenish yellow
<i>epia</i> north Celebes	darker	suffused with creamish	present, small to large	yellowish gray
<i>restrictus</i> south-central Celebes	darkest	lacking suffusion	present, largest	whitish gray

Evidently this bird is rare within its small range. Stresemann (1939, p. 385) lists *subgularis* as a species absent in the southeast peninsula and the south, and there are no specimens in the Heinrich collection (A.M.N.H.) from the south-central area although a big series was collected in the northern peninsula. Presumably, therefore, there is a population difference here, to explain which further field study is needed.

32. *Ptilinopus m. melanospila* (Salvadori)

♂ ad., Boemboelan, Sept. 19.
Wing, 111.5.

33. *Ducula aenea paulina* Bonaparte

2♂ ad., 2♀ ad., Boemboelan, Sept. 17, 19, 30.
Wing, ♂ 218, 220; ♀ 220, 227.5.

34. *Ducula bicolor* (Scopoli)

♂ ad., Boemboelan, Sept. 25.
Wing, 226. Iris, brown; ocular area, blue; bill, blue; feet, blue.

35. *Ducula luctuosa* (Temminck)

2♂ ad., ♀ ad., Boemboelan, Sept. 15, 18.
Wing, ♂ 241, 244; ♀ 242. Iris, brown; ocular area, blue; bill, greenish blue (tip yellow); feet, blue.

36. *Ducula forsteni* (Bonaparte)

♂ ad., Boemboelan, Nov. 7.
Wing, 265. Iris, clear brown; ocular area, red; bill, black; feet, red.

37. *Turacoena m. manadensis* (Quoy & Gaimard)

2♂ ad., 2♀ ad., Boemboelan, Oct. 2, 20, 24, 28.

Wing, ♂ 199, 203; ♀ 192, 195. Iris, red brown; ocular area, red; bill and feet, black.

38. *Macropygia amboinensis albicapilla* Bonaparte

2♂ ad., Boemboelan, Oct. 28, 30.

Wing, 162, 166. Bill, 14, 16.

In one of the specimens the throat is distinctly white, and the characteristic white tipped breast feathers extend all the way down the center of the abdomen.

39. *Macropygia amboinensis atrata*, subsp. nov.2♂ ad., 2♀ ad., Togian Is. (*Oena Oena*), Sept. 3, 5.

Type. — No. 270115, Museum of Comparative Zoölogy, ♂ ad., *Oena Oena*, Togian Islands, collected 3 September, 1939, by J. J. Menden.

Characters. — Similar to *M. a. sanghirensis* Salvadori from which it differs as follows: bill larger; upper surface browner, duller, particularly on the tail; under parts dark, lacking the whitish tips of the breast feathers; size somewhat larger. From *albicapilla* this race differs by its larger size and darker plumage. The female differs as the male.

Measurements.

		wing	tail	bill
<i>sanghirensis</i> (A.M.N.H.)				
Siao	2♂ (1 not sexed)	170, 180	191, 192.5	15, 16
Simboekoe	♂	169	183.5	16
Tagulandang	2♂	167, 171.5	182.5	15.5, 16
Gt. Sanghir	♂ (not sexed)	166	187	14
<i>atrata</i> (M.C.Z.)				
Oena Oena	♂ (type)	182.5	194	21
" "	♂	181	195	19

Discussion. — It is interesting to find such a distinctive large race on the Togian Islands, so well separated from the Sanghir Islands by the northern peninsula. These birds follow the characteristic pattern of low island populations by having generally larger measurements and, in this case, strikingly larger bills.

40. *Streptopelia chinensis tigrina* (Temminck)2♂ ad., 2♀ ad., Togian Is. (*Oena Oena*), Sept. 4, 5, 6.

Wing, ♂ 151, 151; ♀ 143, 148.

This is a new species for the Togian Islands. Meyer (1879, p. 137) remarks that it was introduced into Celebes from Java in 1835. Perhaps it has reached the Togian Islands since his visit there in 1871.

41. *Chalcophaps i. indica* (Linné)

♂ ad., Boemboelan, Sept. 28.

Wing, 152.5.

42. *Gallinolumba t. tristigmata* (Bonaparte)

♂ ad., ♀ ad., Boemboelan, Sept. 28, Oct. 15.

Wing, ♂ 174; ♀ 169. Iris, red brown; ocular area, violet; feet, violet.

Both birds have a completely developed nuchal collar. The breast spot of the male is very bright and quite extensive.

PSITTACIDAE

43. *Trichoglossus ornatus* (Linné)

5♂ ad., 3♀ ad., Boemboelan, Oct. 1, 3, 12, Togian Is. (Oena Oena), Sept. 3, 4.

Wing, ♂ 121, 128.5, 129.5, 131, 138; ♀ 117, 125, 126. Iris, red brown; bill, orange red; feet, gray green.

In plumage this species is very variable. One male from Boemboelan has the nuchal collar broken at the nape by the blackish crown feathers which are continuous with the green of the back.

44. *Kakatoe s. sulphurea* (Gmelin)

3♂ ad., ♀ ad., Boemboelan, Sept. 13, 29, Oct. 3.

Wing, ♂ 221, 228, 233; ♀ 232.

45. *Prioniturus f. flavicans* Cassin

♂ ad., Boemboelan, Sept. 15.

Wing, 193.

46. *Prioniturus p. platurus* (Vieillot)

2♂ ad., 2♀ ad., Boemboelan, Sept. 17, 29, Oct. 28.

Wing, ♂ 179.5, 186; ♀ 175, 177.

47. *Tanygnathus s. sumatranus* (Raffles)

2♂ ad., 2♀ ad., Boemboelan, Sept. 19, 25, 26.

Wing, ♂ 203, 210; ♀ 210, 211.

A female in the M.C.Z. collection from Parigi collected by Raven has pronounced bluish terminal and subterminal bars on the feathers of the forehead and crown, a coloring that is much reduced in the Boemboelan birds.

48. *Loriculus s. stigmatus* (S. Müller)

2♂ ad., ♀ ad., ♀ im., Boemboelan, Sept. 22.

Wing, ♂ 94.5, 96; ♀ 92.5; ♀ im., 86.5.

It is unfortunate that no examples of *L. s. quadricolor* were obtained from the Togian Islands. Walden's original description of that form (1872, p. 398) indicates that it is intermediate between *stigmatus* and *amabilis ruber*. Perhaps *amabilis* is conspecific with *stigmatus*.

CUCULIDAE

49. *Cuculus s. saturatus* Blyth

♀, Boemboelan, Nov. 4.

Wing, 190.5.

50. *Eudynamys scolopacea melanorhyncha* S. Müller

2♂ ad., 2♀ (II yr.), 2♀ im., Boemboelan, Sept. 15, 19, Oct. 10, 24.

Wing, ♂ 208, 215; ♀ (II yr.) 192.5, 193; ♀ im., 189, 189. Iris, red, red brown, wine red (im.); bill and feet, gray, gray (one II yr. bird); black, gray black (the other); black, gray (one im. bird); black, black (the other).

The two birds called II yr. are in the plumage characterized by Riley (1924) as immature female or *Typus II* Stresemann (1940, p. 455). The male with a wing of 215 represents the largest measurement known for this form. The bill of this specimen measures 32.5; tail, 201.

51. *Rhamphococcyx c. calorhynchus* (Temminck)

2♂ ad., 2♀ ad., Boemboelan, Sept. 15, 18, 19.

Wing, ♂ 177, 181.5; ♀ 177, 182. Iris, red; ocular area, black; bill (upper mandible), yellow.

The color of the crown seems to be a rather variable character to use for the separation of geographical races. Two specimens in the M.C.Z. collection from the north, Paleleh and Tandjong Penjoe, collected by Raven (1914-15) show a tendency to brownish foxing and general paling out compared to Menden's recent series.

52. *Centropus bengalensis sarasinorum* Stresemann

♂ ad., ♂ im., ♀ ad., ♀ im., Boemboelan, Sept. 11, 17, 28, Oct. 2.

Wing, ♂ ad. 161.5; ♂ im. 148; ♀ ad. 176; ♀ im. 153.

53. *Centropus c. celebensis* Quoy & Gaimard

2♂ ad., 2♀ ad., Boemboelan, Sept. 15, 21, 27.

Wing, ♂ 181, 181; ♀ 180, 187. Iris, red.

STRIGIDAE

54. *Otus m. manadensis* (Quoy & Gaimard)

♂, 2♀, Boemboelan, Dec. 4, 8.

Wing, ♂ 154; ♀ 142, 142.5. Iris, ♂ brown, ♀ clear brown; bill, ♂ blackish brown, ♀ gray; feet, gray.

Stresemann (1940, p. 429) gives the iris color as yellow but lists one specimen from 2500 m. as having a brown iris. It would be interesting to discover the reason for this variation, provided it really exists.

55. *Ninox perversa* Stresemann

3♂ ad., ♀ ad., Boemboelan, Sept. 30, Oct. 4.

Wing, ♂ 180 (worn), 190, 191; ♀ 175.

56. *Ninox s. scutulata* (Raffles)

♂ ad., Boemboelan, Oct. 28.
Wing, 238.

CAPRIMULGIDAE

57. *Eurostopodus macrotis macropterus* (Bonaparte)

2 ♀ ad., Boemboelan, Dec. 3, 11.
Wing, 254, 255.

ALCEDINIDAE

58. *Cittura c. cyanotis* (Temminck)

4 ♀ ad., Boemboelan, Sept. 12, 15, 27, Oct. 2.
Wing, 95.5, 102, 103, 104. Iris, rose; bill and feet, red.

59. *Halcyon m. monachus* (Bonaparte)

♂ ad., ♀ ad., Boemboelan, Sept. 27, Dec. 1.
Wing, ♂ 138; ♀ 147.

60. *Halcyon c. chloris* (Boddaert)

4 ♂ ad., 4 ♀ ad., Boemboelan, and Oena Oena, Togian Islands,
Sept. 4, 5, 6, 30, Oct. 4, 22.

Wing, ♂ (Boemboelan) 104, 106, (Togian Is.) 112, 115; ♀
(Boemboelan) 107, 111.5, (Togian Is.) 112.5, 113.

The birds from Oena Oena are somewhat larger than those from Boemboelan, although Stresemann (1940, p. 413) remarks that the "smaller" birds from southeast Celebes are undistinguishable from Togian Island birds. The four specimens from Oena Oena do have somewhat blacker ear coverts, a character used by Sharpe for *H. c. meyeri*, a race discarded by Meyer & Wigglesworth (1898, vol. 1, p. 296). However, this character can be matched by one Celebes bird.

61. *Ramphalcyon m. melanorhyncha* (Temminck)

2 ♀ ad., Boemboelan, Oct. 14, 21.
Wing, 147, 152.

The smaller specimen may well be a male.

62. *Ceyx f. fallax* (Schlegel)

♂, Boemboelan, Oct. 21.
Wing, 58.5.

63. *Alcedo atthis hispidoides* Lesson

—, Boemboelan, Dec. 7.
Wing, 75.

MEROPIDAE

64. *Merops superciliosus philippinus* Linné

2 ♂ ad., ♀ ad., ♀ im., Boemboelan, Nov. 30, Dec. 2, 7.
Wing, ♂ 129, 133; ♀ 130; ♀ im. 125.

CORACIIDAE

65. *Coracias temminckii* (Vieillot)

2♂ ad., 2♀ ad., Boemboelan, Sept. 17, 19, 21.

Wing, ♂ 181, 186.5; ♀ 186, 187.

BUCEROTIDAE

66. *Rhyticeros cassidix* (Temminck)

2♂ ad., 2♀ ad., Boemboelan, Sept. 12, 15.

Wing, ♂ 444, 463; ♀ 382, 387.

The irides of the males are marked on the labels "red brown" and "red," those of the females "brown."

67. *Penelopides e. exaratus* (Temminck)

2♂ ad., 2♀ ad., Boemboelan, Sept. 12, 13, 21.

Wing, ♂ 243, 247; ♀ 225.5, 230. Iris, brown; ocular area, yellow (♂), black (♀); bill, gray; feet, black.

The two males have some new feathers still in the sheath on the throat. The sheaths and the feathers within them are distinctly yellow, although the feathers of the throat generally have faded to white.

PICIDAE

68. *Lichtensteinipicus f. fulvus* (Quoy & Gaimard)

2♂ ad., 2♀ ad., Boemboelan, Sept. 12, 15.

Wing, ♂ 179.5, 181; ♀ 176, 179.5 (worn). Iris, yellow.

PITTIDAE

69. *Pitta erythrogaster celebensis* Müller & Schlegel

2♂ ad., Boemboelan, Sept. 29, Dec. 4.

Wing, 105, 109.

ARTAMIDAE

70. *Artamus m. monachus* Bonaparte

2♂ ad., ♀ ad., Boemboelan, Sept. 13.

Wing, ♂ 153, 156.5; ♀ 162.

The female has a longer wing than any of the series given by Stresemann (1940, p. 130).

CAMPEPHAGIDAE

71. *Coracina leucopygia* (Bonaparte)

3♂ ad., ♀ ad., Boemboelan, Sept. 12, 13, 17, Oct. 11.

Wing, ♂ 148.5, 150.5, 152.5; ♀ 149.5. The iris of these specimens is marked as gray in one case, brown in the others. This is a yellow-eyed species, so it is doubtful whether they are correctly labeled.

TIMELIIDAE

72. *Malacocincla c. celebensis* (Strickland)

3♂ ad., ♀ ad., Boemboelan, Oct. 17, 21, Nov. 7.

Wing, ♂ 68.5, 72, 75.5; ♀ 70. The specimen marked male, with

a short wing, may be wrongly sexed. A male and female in the M.C.Z. collection from Pinedapa, type locality of *connectens* (Mayr), measure ♂ 76, ♀ 69. The flanks of these two specimens are definitely darker and carried more extensively towards the breast than in any of the specimens of *celebensis*.

SYLVIIDAE

73. *Locustella fasciolata* (G. R. Gray)

♀, Boemboelan, Oct. 2.

Wing, 75.

74. *Acrocephalus arundinaceus orientalis* Temminck & Schlegel

♂ ad., Boemboelan, Sept. 17.

Wing, 90.

75. *Cisticola exilis rustica* Wallace

♂ ad., Boemboelan, Oct. 18.

Wing, 44.

MUSCICAPIDAE

76. *Hypothymis p. puella* (Wallace)

2♂ ad., ♀ ad., ♀ im., Boemboelan, Sept. 14, 30, Oct. 2, 21.

Wing, ♂ 71, 75.5; ♀ ad. 72; ♀ im. 72.

NECTARINIIDAE

77. *Anthreptes malacensis citrinus* Stresemann

3♂ ad., ♀ ad., Boemboelan, Sept. 14, Oct. 3, 11, 18.

Wing, ♂ 66.5, 66.5, 67; ♀ 61.5.

Stresemann (1940, p. 59) gives the range of *celebensis* as south and south-central Celebes, *citrinus* as northeast, southeast and north-central Celebes.

A male and female in the M.C.Z. collection from Toli Toli, collected in December 1914 by Raven, seem to differ from the series of Boemboelan birds and two others in the M.C.Z. collection marked Minahassa, collected by A. B. Meyer, in just those characters used by Stresemann (1932) to distinguish *celebensis* from *citrinus*. The Toli Toli birds are duller, lacking the brighter yellowish green tint of the other birds. This cannot be entirely due to fading, as the A. B. Meyer birds collected in 1871 are still fairly bright. As Toli Toli is well within the range given for *citrinus*, it seems doubtful if *citrinus* can be upheld.

78. *Cinnyris sericea grayi* (Wallace)

2♂ ad., Boemboelan, Sept. 14.

Wing, 57.5, 58.5.

79. *Cinnyris jugularis meyeri* Hartert

2♂ ad., ♂ im., ♀, Boemboelan, Sept. 22, 24, Oct. 16, 18.

Wing, ♂ 53.5 (worn), 54; ♂ im. 50; ♀ 47.5.

PLOCEIDAE

80. *Lonchura atricapilla jagori* (Martens)

♂ ad., 2 ♀ ad., Boemboelan, Nov. 7, 12.

Wing, ♂ 50; ♀ 50, 50. The shortest wing measurement given by Stresemann (1940, p. 36) is 51 mm.

DICRURIDAE

81. *Dicrurus hottentottus* Wallace

3 ♂ ad., ♀ ad., Boemboelan, Sept. 17, 19, 21, 30.

Wing, ♂ 156, 165, 170; ♀ 164.5. Iris, white. Stresemann's longest wing measurement for this form (1940, p. 33) is 166 mm.

STURNIDAE

82. *Scissirostrum d. dubium* (Latham)

2 ♂ ad., 2 ♀ ad., Boemboelan, Sept. 22.

Wing, ♂ 99, 101; ♀ 95.5, 96.

83. *Scissirostrum dubium pelingense* Neumann

2 ♂ ad., ♀ ad., ♀ im., Togian Is. (Oena Oena), Sept. 3, 4, 5.

Wing, ♂ 103, 109; ♀ 102; ♀ im. 97.5.

These specimens differ from *dubium* by being larger and slightly darker. In these characters they agree with *pelingense* Neumann (1939). Neumann in his description neglected to mention that *pelingense* is slightly darker than *dubium*. The Togian birds present the impression of being slightly intermediate between Celebes and Peling populations, a fact which agrees well with the geographical relationships of the islands. Presumably, for example, the Togian Islands are more open to swamping from Celebes. This condition, however, is too small to merit recognition.

84. *Streptocitta albicollis torquata* (Temminck)

3 ♂ ad., 2 ♀ ad., Boemboelan, Sept. 13, 14, 21, Oct. 4, 15.

Wing, ♂ 146.5, 147.5, 148; ♀ 143, 147.5. One female has a longer wing than any specimen listed by Stresemann (1940, p. 25).

85. *Aplonis panayensis neglectus* (Walden)

2 ♂ ad., ♀ ad., ♀ im., Boemboelan, Togian Is. (Oena Oena), Sept. 4, 29.

Wing, ♂ 111, 111; ♀ ad. 109; ♀ im. 106. Iris, red, wine red.

A male and a female from the Togian Islands have long (♂ 21.5, ♀ 20) stout bills, that of the male being thicker dorsoventrally than any bird from the Celebes. It would be interesting to see whether a larger series would confirm this difference.

ORIOOLIDAE

86. *Oriolus chinensis celebensis* (Walden)

2 ♂ ad., 2 ♀ ad., Boemboelan, Sept. 17, 30.

Wing, ♂ 140, 143; ♀ 139.5, 140.

CORVIDAE

87. *Corvus enca* subspecies

♀ ad., ♀ im., Boemboelan, Sept. 12, 17.

Wing, ♀ ad. 265; ♀ im. 269. Bill, ♀ ad. 44; ♀ im. 49.

These two specimens are so much smaller than anything recorded by Stresemann (1940, p. 15) or Meyer and Wigglesworth (1898, vol. 2, p. 582) that I prefer to leave the subspecies in doubt, although in general characters they resemble *celebensis*.

A series of *celebensis* in the M.C.Z. collection measures as follows:

		wing	bill
Likoepang, N. Celebes	♂	282.5	53
Toboli	♂	275.5	54
Likoepang	♀	275	50
Paleleh	♀	276	51.5

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